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PROCEEDINGS

3RD INTERNATIONAL CONFERENCE OF PHARMACY AND HEALTH SCIENCES 2021 (ICPHS 2021)

UNIVERSITI KUALA LUMPUR ROYAL COLLEGE OF MEDICINE PERAK

ORGANIZED BY

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FACULTY OF PHARMACY AND HEALTH SCIENCES
UNIVERSITI KUALA LUMPUR ROYAL COLLEGE OF MEDICINE PERAK
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ADICHUNCHANAGIRI UNIVERSITY
Sri Adichunchanagiri College of Pharmacy
India

UNIVERSITAS AIRLANGGA
Faculty of Pharmacy
Indonesia

PROCEEDINGS

3RD INTERNATIONAL CONFERENCE OF PHARMACY AND HEALTH SCIENCES 2021 (ICPHS 2021)

THEME:
MODERN RESEARCH, INNOVATION AND PRACTICE:
THE NEED OF THE HOUR

2 - 3 AUGUST 2021
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Overview of ICPHS

The International Conference of Pharmacy and Health Sciences (ICPHS) is an initiative undertaken by the Faculty of Pharmacy and Health Science (FPHS), Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP), Ipoh, Malaysia, aims to emphasize on the present and future status of health care in the community. ICPHS is a biennial event organised by the Faculty of Pharmacy and Health Sciences (FPHS), UniKL RCMP. The first ICPHS was held in 2016, followed by the second ICPHS in 2018. The 2020 edition was rescheduled to 2021 due to the Covid-19 pandemic.

About ICPHS 2021

ICPHS 2021 was held for the third time in 2021 and this year it was organized in ZOOM online platform on 2-3August 2021. This conference was held to give a forum for Malaysian and international academicians, researchers, healthcare professionals (such as pharmacists and other healthcare professionals), and students to learn, discuss, exchange ideas, and form networks. ICPHS 2021 provided a high-yield, interactive educational experience on topics relating to pharmacy and health sciences (Medical imaging, Physiotherapy and Pharmaceutical Technology). The ICPHS 2021 topics were chosen to be relevant to the participants' personal development as well as their clinical, educational, and research interests. The ICPHS also served as a venue for specialists to investigate and share meaningful insights about best practices, as well as scientific information from scientists involved in health-care research. The theme **"Modern Research, Innovation, and Practice: The Need of the Hour"** seemed ideal for ICPHS 2021, which emphasizes the interaction of theory, research, innovation and practice. ICPHS 2021 primarily focused on presentations and discussion of the most up-to-date information on a number of key topics relating to community health holistically.

Objectives of ICPHS 2021

- To bring together eminent scientists, academicians, and clinicians in order to facilitate beneficial exchange of ideas, knowledge and expertise.
- To promote greater collaboration and a more proactive approach to disease management and prevention.
- To encourage academicians researchers, and postgraduate students to establish the network with experts in their respective fields.
- To showcase and display high-quality, cutting-edge research and innovation.
- To disseminate update information to a larger group of audiences and stakeholders.

Editorial Note

Welcome to the conference proceedings of the **"International Conference of Pharmacy and Health Sciences 2021 (ICPHS 2021)"** held on the ZOOM online platform on 2-3 August 2021, with the theme **"Modern Research, Innovation, and Practice: The Need of the Hour."** Accepting papers that pass a rigorous review procedure is necessary for ensuring the high quality of an international conference.

ICPHS 2021 received a huge number of scientific papers. The papers were from a various sectors in health sciences, including academia, industry, and government, and came from all over the world. A minimum of two reviewers from the scientific and publication committees were assigned to review each paper. In response to the reviewer comments, the authors revised their abstracts and full manuscripts, and the scientific committee finished the final review and agreed to accept it. During the two-day conference, we had two keynote speakers, 12 invited speakers, 28 e-Video, and 124 e-Poster presentations. During the prize giving ceremony, the best three e-Poster and e-Video presentations were recognized. We would like to extend our heartfelt gratitude to all of the authors whose scientific contributions have been included in this proceedings. It is because of all you excellent contributions and hard work that we have been able to prepare this conference proceedings.

We would like to thank all of our keynote and invited speakers who made all the efforts to create the materials and for sharing their vast and varied expertise in delivering outstanding talks. We would also like to express our gratitude to all of our e-Poster and e-Video presenters for their hard work in delivering interactive that address the learning needs of students at all levels, including postgraduates, undergraduates, graduates, and professionals. We are grateful to our scientific session chairpersons and judges for their tireless efforts in reviewing the papers in their tracks and organizing the assigned task of other volunteer reviewers, members of the ICPHS 2021 technical program committee, and designated reviewers.

We hope that this conference will provide everyone with an insightful and fruitful experience that will lead to collaborations in collaborative education, practice, and future research. Finally, we would like to congratulate all of the members of the organizing committee on the conference success. We hope that the participants enjoyed the amazing International Conference of Pharmacy and Health Sciences 2021 (ICPHS 2021) program in the ZOOM online platform that we put together for them. Looking forward to welcome you at the next ICPHS in 2023.

Acknowledgement

The ICPHS 2021 organizing committee would like to thank the following committee members and reviewers for their support in reviewing and revising all of the content present in this conference proceedings.

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KEYNOTE SPEAKERS PRESENTATIONS

THE OXFORD VACCINE: FROM LAB TO THE GLOBAL COMMUNITY

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The SARS CoV-2 pandemic continues to place a significant burden on healthcare systems and economies worldwide. The ChAdOx1 nCoV-19 (AZD1222) vaccine is a replication incompetent adenoviral vectored vaccine that encodes the SARS CoV-2 spike protein. ChAdOx1 nCoV-19 is being distributed for vaccination in more than 160 countries across six continents and has been administered to over 200 million individuals in mass vaccination programmes in multiple countries. The WHO (World Health Organization) has granted ChAdOx1 nCoV-19 Emergency Use Listing, and the vaccine has already been supplied to 100 countries through the COVAX Facility. In this lecture I will describe the development, testing and use of ChAdOx1 nCoV-19 globally.

MODERN RESEARCH, INNOVATION AND PRACTICE: THE NEED OF THE HOUR - TRUST, JUSTICE AND FAIRNESS

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The need of the hour in the context of the current Covid-19 pandemic is no less than that of trust, justice and fairness. These ethical values are imperative and relevant not only in modern research, innovation and practice, but in fact form the very basis of quality and responsible healthcare since time immemorial. The absence of ethical values is bound to jeopardise the delivery and outcomes of responsible healthcare activities or programmes; rendering them life-threatening if not fatal. In other words, it goes against the purpose of providing the best option available to treat, heal and care. This presentation will look at the current situation in dealing with the on-going pandemic to meet the need of the hour.

INVITED SPEAKERS PRESENTATIONS

EXPRESSIVE ARTS PRACTICES AS THERAPEUTIC TOOLS FOR PSYCHOLOGICAL THERAPY IN HEALTH CARE SETTING

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Expressive Arts as one of contemporary non-verbal approaches are beneficial as therapeutic tools in psychological therapies when words are limited to bypass cognitive level, for communication, as medium for therapy and self-care alternative. Limits by verbal expression, we can turn to visual imaginations or other creative arts work that symbolically represent personal meaning of unconscious, unspoken and hindering life difficulties. Interestingly, working through expressive arts practices as additional method for verbal psychological therapy, will assist a person to express, explore, gain insight and share about personal issues, inner life and painful experiences symbolically. Several studies indicated the therapeutic power of expressive arts as added value and therapeutic tools to tackle mental health issues that foster communication, self-expression, inner exploration, unexpected life discovery, and ultimately promote psychological healing as well as enhancing wellbeing. Evidence-based researches indicates the positive benefit of expressive arts to deal with stress, anxiety, depression, panic attack, loss and grief, cancer care, suicidal thought, self-harm or other mental health relates issues. However, in order to be competent and skillful in utilizing expressive arts, health care professional must have adequate training and practices with proper supervision under qualified supervisor in this respective field. This presentation will focus on various research findings of the benefits to added expressive arts in psychological therapies, as well as personal engagement mainly with Mental Health Primary Care, National Health Services, that enhances knowledges and skill practices in order to avoid potential risk to the clients. Moreover, with regards to bringing these unique approaches as essential for health setting, global practices will also share. For instances, recent collaboration with WHO, Arts & Health Lead as well as few International authorities that show significant benefit in health care setting worldwide, as eyes opening for the positive movement professionally within local context.

MODERN AND INNOVATIVE HEALTH SCIENCES ASSESSMENT IN THE POST COVID SPACE

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In the first half of 2020, the COVID19 pandemic had an immediate and massive impact on health sciences education. This led to abandoned campuses and academic staff scrambling to create emergency remote learning materials for health science students. As it is more than a year since the impact of the COVID19 pandemic, now is a good time to reflect on what health sciences assessment looks like in the post COVID space, and what opportunities exist to facilitate student learning through assessment. This presentation will explore how assessment practices have changed because of COVID19 and what constraints exist in terms of assessing health science students. Opportunities that exist to create assessment tasks that appropriately assess whether students have met learning outcomes, and measures designed to reduce the risk of breaches of academic integrity, will also be discussed

CHARACTERIZATION OF ASIAN HONEY AND ITS POTENTIAL MEDICINAL BENEFITS: A SUSTAINABLE RESEARCH

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Although honey is extensively used in food and food products, little is known on its purity and medicinal properties. In this study, the physicochemical and antioxidant properties of eight Malaysian honey samples were compared to that for Manuka honey, followed by investigation on their medicinal values. The mean 5-hydroxymethylfufural (HMF) content (a carcinogen) in the samples (35.98 mg/kg) is within the International Honey Commission guideline for tropical honey. However, honey kept for more than one year has high HMF levels and honey should therefore be consumed within one year of its processing. Tualang honey had the highest concentration of phenolic compounds (352.73 ± 0.81 mg galic acid/kg), flavonoids (65.65 ± 0.74 mg catechin/kg), indicating its strong antioxidant properties. Six phenolic acids (benzoic, gallic, syringic, trans-cinnamic, p-coumaric and caffeic acids) and five flavonoids (catechin, kaempferol, naringenin, luteolin and apigenin) were identified for the first time. Manuka and gelam honeys are rich in calcium and may be useful for osteoporosis. Rubber tree honey is rich in iron and may be suitable for anaemics. Honey is best stored in glass bottles since honey stored in plastic containers contained some plasticisers transferred from the bottles. Tualang Honey has similar antibacterial properties with manuka honey but is more active against *Stenotrophomonas maltophilia* and *Acinetobacter baumannii*. Besides having good antimicrobial properties, other honey products can improve memory deficits, is useful in diabetic wounds, ameliorate hepato-nephrotoxocities, is cardioprotective and is useful in immunosuppressed individuals

THE POTENTIAL OF DRUG REPURPOSING IN LUNG CANCER TREATMENT: RATIONALE AND ACHIEVEMENTS

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Chemotherapy is the first-line treatment for advanced stage of lung cancer in which chemotherapeutic drugs are administered intravenously for systemic circulation. The basic mechanism of chemotherapeutic drug is to inhibit the proliferation of cells growing at an abnormal state and lead the cancerous cell to follow normal cell death pathway (apoptosis). Owing the route of administration, the delivery of chemotherapeutic drugs is often not target-specific, hence the unavoidable toxic effects and causing toxicity towards neighboring healthy tissues as well as promoting multi-drug resistance in cancer cells. The discovery and design of new potent drugs is a popular option to overcome these issues but is faced with multiple constraints such as lengthy process (from drug discovery to clinical use), exorbitant cost, regulatory burdens and staggering failure rates. Therefore, drug repurposing or repositioning of drug through the discovery of new use for existing old drugs previously used for other diseases treatment or introduction of new administration method could be an alternative option to improve lung cancer therapy. This talk would focus on the (i) the potential of "old" drugs to be used to treat lung cancer in terms of their mechanism of actions, (ii) introduction of inhalation delivery route to treat local lung cancer and (iii) the potential role of protein in lung cancer treatment.

INNOVATIONS IN MEDICAL PHYSICS: THE USE OF NATURAL AND ALTERNATIVE RESOURCES FOR THE FABRICATION OF TISSUE EQUIVALENT PHANTOMS

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Medical physics involves the delivery of radiation dose to the patients for the benefits of therapy and diagnostic imaging. Dosimetric works and quality control play important role in medical physics to ensure the accuracy of radiation dose to patients and sufficient diagnostic information. Phantom materials are the important tools in dosimetric studies and quality control as they simulate the attenuation characteristics of human tissues towards ionizing radiations. Water and several solid materials have been proposed by many international dosimetric protocols as water and tissue equivalent phantoms. These materials however, are still unable to fully simulate the physical and dosimetric properties of human tissues. Several natural and alternative resources had been identified as potential phantom material including the *Rhizophora spp*., oil palm trunk and polyvinyl alcohol (PVAL) gels for various applications in the medical physics works. The fabrication of composites and particleboards from these materials had further given the advantages to be developed as phantoms of various sizes and shapes. This features enabled them to be fabricated of specific body parts for better accuracy of dosimetric studies and quality control works. Several studies on these materials showed excellence agreement of dosimetric characteristics when compared to water and human soft tissues in various applications in medical physics including diagnostic imaging, nuclear medicine imaging and radiotherapy.

EVOLVING TRENDS IN PHYSIOTHERAPY RESEARCH – STROKE REHABILITATION

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Stroke is a common cause of disability worldwide. Many individuals following a stroke need significant rehabilitation, which a physiotherapist usually provides within a hospital or clinical setting. Though conventional motor rehabilitation is effective, the major limitation is an inadequate dose of rehabilitation therapy in terms of repetition and intensity. There is much interest in researching new rehabilitation technologies to augment conventional therapies for reducing neurological disability and improving function. From clinical experience and observations, the physiotherapist may generate novel ideas that can be transformed into new knowledge and eventually become evidence-based. The Internet of Things in rehabilitation aimed at improving patient's mobility, enhance their quality of life and ensure their safety. Many such technologies are available such as gait training with robotic-assisted therapy and augmented or virtual reality, assistive devices, wearable sensors and smartphone applications. Such devices are quite helpful in engaging patient's interest and motivation. During the COVID-19 pandemic, most individuals with post-stroke disabilities may be hindered from receiving their recommended rehabilitation therapy after discharge into the community due to fear of infection. Telerehabilitation is a possible solution that allows remote rehabilitation supervision and eliminates access barriers. Wearable sensor technology addresses many of these limitations and offers home-based therapies which can be monitored remotely. Most of the sensors currently in vogue are either inertial measurement units or electromyography-based sensors. Combining telerehabilitation with in-person services reduces the personal visit to rehabilitation centres.

INNOVATIVE APPROACH TO SYNTHESIZE HEALTH ECONOMIC EVIDENCE TO SUPPORT GLOBAL POLICY DECISION

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Given the increasing need to improve efficiency in allocating limited resources, economic evaluation of health technology is an important tool to help support policy makers in making an evidence-informed decision. Cost-utility analysis (CUA) is commonly applied for this purpose by estimating an incremental cost-effectiveness ratio i.e., a ratio between incremental cost and incremental effectiveness between two health interventions. The CUA provides helpful information to support decision making but it is not available in some countries when needed. Synthesis of CUAs from multiple studies by applying meta-analysis is therefore desirable to assist policy makers where CUA evidence is lacking. This presentation will cover the foundation of economic evaluation of health technology, the need to summarize them with systematic review and meta-analysis, and the methodological approach including incremental net benefit to synthesize economic evaluation evidence across studies to provide an overall summary stratified by perspective, WHO region, and level of country income.

SEMISYNTHETIC PLATFORMS FOR PRODUCING POTENT SEMISYNTHETIC PROTEIN-ADJUVANT FUSION VACCINES

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Vaccines are among the most effective means to prevent the spread of infectious diseases. Nevertheless, traditional vaccine technologies have failed to yield vaccines for many important diseases. Folded protein antigens are a leading approach for the development of new, effective and safe vaccines. However, their poor immunogenicity necessitates technologies to improve their potency, as well as tailoring the types of immune responses elicited towards these antigens. Towards this goal, we have developed platform technologies that enable the efficient, site-specific incorporation of immunostimulatory molecules (e.g. Toll-like receptor agonists) into folded protein antigens using chemical or enzymatic bioconjugation techniques, to generate defined vaccine molecules. These processes have proven highly efficient for folded recombinant antigens up to 110 kDa, with 68-90 % reaction yields within 4 h. These adjuvant-antigen fusion vaccines ensure that both immunostimulatory components and antigen are delivered to the same cell, providing a means to target dendritic cells, and can elicit significantly more potent immune responses than mixtures of antigen and adjuvant. For example, in a mouse model of disease, the conjugation of a synthetic lipopeptide TLR2 agonist onto recombinant protein antigens provided several log-fold higher antigen-specific IgG antibody titers, and provided protection against microbial challenge, when compared to simple mixtures of the antigen with the TLR2 agonist or alum, which were not protective. Overall, such approaches are expected to provide a useful platform for the development of novel and improved vaccines.

VISUALISING THE FUTURE OF CLINICAL PHARMACIST

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The role of Clinical Pharmacy in the health care system is changing rapidly. This change is almost universal among different countries and is related to developments in medical technology, health economics, informatics, socio-economic status, and professional relations. Transitions to new systems of clinical pharmacy are difficult to anticipate. Even with well-defined targets, it remains uncertain what the future of clinical pharmacy will bring us. However, the construction of plausible scenarios may help us better in preparing for the new world ahead. The digitalization of health and medicine and the growing availability of Electronic Health Records (EHRs) has encouraged healthcare professionals and clinical researchers to adopt cutting-edge methodologies in the realms of Artificial Intelligence (AI) and Big Data Analytics to exploit existing large medical databases. Specialty pharmacies, which once occupied only a small niche in the pharmacy marketplace, are now a sizeable part of the broader pharmacy industry. The emergence of Specialty Pharmacies has been significantly correlated with the rapid growth of specialty drugs due to the increasing demands for "personalized" medications that treat chronic diseases by taking into account the individual variability in genes. My Presentation aims to give an overview of the future trends in the field of Clinical Pharmacy. Knowing the diverse area of work, each and every Clinical Pharmacist can visualize their future ahead, wherein themselves being incorporated as part of the core, multidisciplinary teams within practices, helping to improve patient care and access.

MODERN ANALYTICAL METHOD DEVELOPMENTS IN THE EVALUATION OF NATURAL PRODUCTS

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Natural products usage is growing rapidly throughout the world. The phenomenon is much influenced by the paradigm of "back to nature" in the community. Although many studies have been carried out to obtain an evidence base of natural product or natural derive drug activities, there are still many aspects that are not known yet. The quality variation of natural product is significant. It has become essential, therefore, it should be ensured that all products are safe and have suitable quality. Quality consistency has become an important attribute in the safety aspect of natural products. Good quality consistency will guarantee the effectiveness of natural product but poor of it will lead to increase of the safety risk. The complex chemical composition of natural medicines makes it difficult to simply apply the commonly used evaluation methods in chemical drugs. A system for assessing the quality consistency of natural products is absolutely required. It begins with the concept of chemical compound quality to evaluate natural product, including the raw material. First, based on single component analysis and then an improvement of multi-component analysis. The quality control process can apply two approaches, which are determination of chemical marker and metabolite profiling. This concept requires an adequate analytical method to ensure the correct identity and composition of the compound contents. Various analytical methods, such as infrared spectroscopy, NMR, thin layer chromatography, liquid chromatography, gas chromatography, and so on, have been developed by researchers for this purpose, and are expected to be applied in the industrial process.

SCIENCE BEHIND SMART DEVICES FOR HEALTHCARE NEED TO BE EXPLORED

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In this presentation, I shall discuss the overall perspective of the work which is being performed in our lab where new synthetic routes are being developed to a variety of functional oxide materials particularly semiconductors. In the past decade, the field of semiconductors has enlarged its scope enormously, embracing a far wider range of problems than ever before. At the heart of subject is the quest to understand, how unexpected phenomena emerge when large numbers of constituents interact with one another. These constituents, traditionally electrons, atoms, and molecules, have now been extended to a vast array, including complex biological molecules, functional nanomaterials, and even grains of sand.

Medical electronics is most widely developing fields of this era and by using medical electronics doctors and surgeons can do medical examinations in a very fast and smart way. These devices make equipment with precision and these applications made medical field very simple and perfect identification of diseases. Remote patient monitoring is the most common application of internet of things devices for healthcare. Such devices can automatically collect health metrics like heart rate, blood pressure, temperature, and more from patients who are not physically present in a healthcare facility, eliminating the need for patients to travel, or for patients to collect it themselves. Certain interesting possibilities shall be discussed in this talk.

E-VIDEO

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E-POSTER PRESENTATIONS

EXTEMPORANEOUS COMPOUNDING IN RETAIL PHARMACY: ARE WE PREPARED?

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Background: Extemporaneous compounding involved preparation of pharmaceutical products to meet the demand for certain products or doses which are unavailable in the market. An extemporaneous product prepared based on prescription shall be supplied to the intended patient within 24 hours after preparation. This compounding practice has been gradually disappearing with the development of the mass-produce of standard dose of medications in the late 1950s. **Objective:** To assess the knowledge, perceived practice in compounding practice among community pharmacies in Selangor. **Materials and Methods**: A cross-sectional study was conducted among 244 community pharmacists in Selangor from April to May 2019. A self-administered validated questionnaire was used in this study. The data collected were analyzed by using the SPSS® version 23. **Results**: Overall, 99.6% (n=243) of Malaysian community pharmacies do not provide compounding services. Most of the community pharmacists involved in this study had high level of knowledge of compounding service (91.8%, n=223). The findings showed that there is a significant positive correlation among knowledge-perceived practice (r=0.304, p=0.000) and significant negative correlation between perceived practice factors influencing community pharmacists (r=-0.133, p=0.038). **Conclusion**: In conclusion, prevalence of extemporaneous compounding and dispensing in Malaysian community pharmacies is very low. Low demand for compounding prescriptions may contribute to lack of compounding services in the community. Introduction of dispensing separation policy may help in expansion of community pharmacy services and extensive collaboration between medical practitioners and community pharmacists in providing quality pharmaceutical care to the public.

Keywords: *Extemporaneous compounding, Community pharmacist, Malaysia, Knowledge*

IN-SILICO INVESTIGATION TO STUDY INTERACTIONS OF TENOFOVIR AND VALGANCYCLOVIR WITH SARS-COV-2

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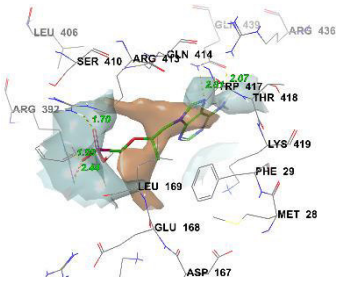
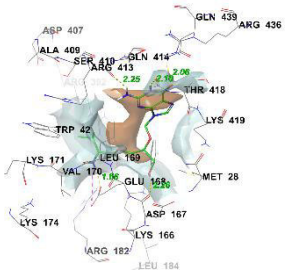
Background: The entire world is witnessing the second wave of novel coronavirus 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and is more contagious and deadly than the first wave. The available FDA-approved antiviral drugs are not revealing remarkable results to treat this novel virus but helped to minimize severity of the disease. This drives our attention to investigate structure features essential to bind SARS-CoV-2 receptors and develop new therapeutic agents. **Objective:** Molecular docking study of polymerase inhibitors viz., Tenofovir and Valganciclovir was performed on RNA-dependent RNA polymerase (RdRp) to study binding interactions to design new leads. **Materials and Methods**: The protein structure of RdRp (PDB ID: 4O4R) was downloaded from RSCB protein data bank and molecular docking was performed using Schrodinger software. **Results and Discussion:** Molecular docking study exhibited dock scores of -7.376 and -6.429 and binding free glide energy of -30.619 and -41.803 for Tenofovir and Valganciclovir, respectively. The 3D-bonding poses of Tenofovir revealed that amino acid GLU439 is in two H-bond interactions with free primary amino -NH_2 and purine ring nitrogen -N=. Amino acids ARG413 showed H-bonding with phosphoryl oxygen P=O and ARG392 showed two H-bonds with hydroxy groups. The binding of Valganciclovir exhibited involvement of amino acids GLN439, TRP417, ARG413, ASP167, GLU168 and LEU169 with various functional groups. **Conclusion**: The overall study showed good dock score and binding free energy and helped to comprehend key structural features essential to bind RdRp of SARS-CoV-2 to facilitate the discovery of novel COVID-19 inhibitors.



Tenofovir



Valganciclovir

Keywords: *RdRp, SARS-CoV-2, Tenofovir, Valganciclovir, Docking*

A STUDY ON DIABETES-RELATED SELF-CARE PLAN AND ITS DETERMINANTS AMONG PATIENTS WITH DIABETES IN A WARANGAL REGION, TELANGANA

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Background: The prevalence of epidemiological diseases, including diabetes, has continued to presently increase because of the adaption of Western culture and lack of self-care activities among patients with diabetes. **Objective:** In this cross-sectional study, we aimed to measure self-care plans and determinants among diabetes outpatients in Warangal. **Materials and Methods**: We conducted prospective observational study among diabetes outpatient's clinics in Warangal, India. We used the expanded Summary of Diabetes Self-Care Activities (SDSCA) questionnaire. The SDSCA is divided into diet (three items; score range, 0–21), physical activity (two items; score range, 0–14), blood sugar testing (one item; score range, 0–7), foot care (four items; score range, 0–28), and medication adherence (one item; score range, 0–7). **Results**: Respondents (mean age, 52.3 (standard deviation (SD), 11.01) years) had an overall SDSCA score of 49.18 ± 3.57 (SD). Mean scores for the diet, physical activity, foot care, medication adherence, and blood sugar testing scales were 12.79 (SD, 1.61), 10.24 (SD, 1.77), 15.67 (SD, 1.5), 5.66 (SD, 1.17), and 4.80 (SD, 0.68), respectively. Patients receiving combination of diet exercise and oral medication, hemoglobin A1C (HbA1C) levels of <7.5 ($P < 0.001$)) had significantly higher mean scores for blood sugar testing, diet, physical activity, and adherence ($P < 0.001$) compared with those who received only oral medication and injectable (HbA1C of >7.5). **Conclusion**: Taken together, our results revealed that patients with diabetes in Warangal had poor self-care planning, highlighting the need for strengthening initiatives that generate awareness regarding diabetes and improving related self-care practices.

Keywords: *Diabetes, Self-care, Diet control, Physical activity, Foot care, Medication adherence*

ASSESSMENT ON PARACETAMOL USE AMONG PARENTS IN TREATING THEIR CHILDREN FOR FEVER

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Background: Paracetamol is commonly used to treat fever in children. Parents can easily purchase paracetamol over the counter in Malaysia, sometimes without consultations from healthcare providers, which potentially may lead to an event like paracetamol poisoning in children. **Objective:** This study aims to assess the paracetamol use among Malaysian parents in treating their children for fever. **Materials and Methods:** This was a cross-sectional quantitative structured interview conducted in August 2019. Data was collected using a questionnaire from a total of 93 parents in Penang. **Results:** Most parents were between the age of 26 to 40 years (67.7%) and were female (74.2%). Majority of the parents (42.0%) went for tertiary education. The parents mostly (87.1%) had used paracetamol to treat their children for fever. About half of the parents (53.1%) used paracetamol to treat their children's fever when the body temperatures were between 37.5˚C – 38.0˚C. The popular forms of paracetamol used were syrup (66.1%) and chewable tablets (20.2%). Paracetamol was served by parents mostly every 6-hourly (45.7%) and 4-hourly (38.3%). In children aged 1 – 3 years old, 37.5% parents served the paracetamol syrup exceeding the recommended total daily dose. Meanwhile, children with age groups of 7 – 9 years (52.2%) and 10 – 12 years (64.7%) were served by parents with paracetamol below the recommended total daily dose. **Conclusion:** Parents were unaware of the appropriate body temperatures to administer paracetamol. A trend of inaccurate paracetamol dosing was found among the parents. Paracetamol use needs to be improved to ensure better treatment outcomes.

Keywords: *Paracetamol, Parents, Children*

POPULATION PHARMACOKINETICS OF GENTAMICIN IN NEONATES WITH BODY WEIGHT OF LESS THAN 2000 GRAMS: A PRELIMINARY DATA

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Background: Gentamicin is one of the most prescribed antibiotics for culture-proven or suspected sepsis in neonates. However, the clinical use of aminoglycosides is limited by their potential ototoxicity and nephrotoxicity. **Objective:** The purpose of this study was to characterize the population pharmacokinetic (PK) parameters of gentamicin neonates with body weight of 2000 grams and below regardless of gestational age for optimization of dosing regimens in this population. **Materials and Methods**: Neonates who received gentamicin from Jan to December 2019 were identified from the therapeutic data monitoring (TDM) record book retrospectively. All neonates treated with gentamicin for at least three days were recruited in the study. Gentamicin concentration data, along with clinical and demographic characteristics, were retrieved from the TDM record. The data were modelled using non-parametric approach using Pmetrics software®. **Results**: A total of 30 samples from 15 neonates were included in the model building. The PK parameters of gentamicin were described with a one-compartment model. The R2, bias, and precision for the observed versus population predicted model were 0.601, 0.981, and 6.29, while the R^2, bias, and precision for the observed versus individual predicted model were 0.991, −0.0415, and 0.285, respectively. The average parameters estimate, for a mean body weight of 1740 gram, were rate of elimination (Ke) = 0.088 hr-1 (CV 33%) and volume of distribution (Vd) = 0.825 L (CV 19%). **Conclusion**: The final model estimates of Ke and Vd will be helpful in individualizing the loading and maintenance doses in neonates with body weight of 2000 grams or less in the current setting.

Keywords: *Gentamicin, Neonates, Pharmacokinetics*

ADVERSE DRUG REACTIONS REPORTING: KNOWLEDGE, ATTITUDE AND PRACTICE AMONG HEALTHCARE PROVIDERS AT A TERTIARY HOSPITAL IN NORTHERN REGIONOF MALAYSIA

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Background: Adverse drug reaction underreporting is a great challenge to Pharmacovigilanceworldwide. **Objectives:** This study aims to identify the healthcare provider's knowledge, attitude, and practice andfactors associated with Malaysia's ADR reporting system. **Methods:** A cross-sectional study was conducted using self-administered questionnaires among healthcare providers in Hospital Sultan Abdul Halim, Kedah. Descriptive statistics are utilized for selected variables. **Results:** A total of 332 study questionnaires were distributed, and 269 (81.0%) participants were dulyfilled. There were 40.9% (n=110) pharmacists, 39.0% (n=105) doctors and 20.1% (n=54) nurses. Half of the participants knew how to define pharmacovigilance (n=137, 50.9%) and ADR (n=131, 48.7%).The majority of participants are aware of ADR reporting procedures (n=174, 64.7%) and ADR reportingcentre in Malaysia (n=207, 77.0%). Most of the participants agreed that reporting ADR is necessary(n=260, 96.6%), should be mandatory (n=252, 93.7%), and reporting ADR will increase patient safety(n=264, 98.1%). Among the participants who had reported an ADR (n=115), only 39.1% (n=45) reportedall types of ADR. The most important factor that encouraged participants to report ADR was the seriousness of ADR (n=155, 57.6%), whereas a lack of knowledge on how to report ADR might discourage them from reporting ADRs (n=136, 50.6%). **Conclusion:** This study reveals that most participants have good knowledge, a positive attitude, and good practice towards ADR reporting in Malaysia. The continuous education and updates regarding ADRs, including the reporting procedures, were essential for improving ADR reporting and monitoring in enhancing medication safety.

Keywords: *Knowledge, Attitude, Practice, Adverse Drug Reactions Reporting, Healthcare Providers*

THE EFFECT OF THE IMPLEMENTATION OF MOVEMENT CONTROL ORDER DURING COVID-19 PANDEMIC ON BODY WEIGHT, PHYSICAL ACTIVITY AND LIFESTYLE OF UNIKL RCMP STUDENTS

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Background: Coronavirus disease (COVID-19) is an infectious disease which emerged in December 2019 from Wuhan, China and has since spread worldwide. In March 2020, the World Health Organization (WHO) declared the outbreak as pandemic. Malaysian government has implemented a Movement Controlled Order (MCO) to combat this pandemic which has limited outdoor activities and affected public's social lives, physical activities and eating habits as they were prohibited from leaving their house unless necessary. **Objective:** This study was conducted to identify the effects of COVID-19 pandemic on body weight, physical activity, and lifestyle among Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP) students. **Materials and Methods:** A cross-sectional study was conducted among 330 UniKL RCMP students by distributing online questionnaires via various platforms. Descriptive data was presented as frequency and percentages (%) or means and standard deviations of means. The association between body mass index (BMI) and physical activity classification as well as BMI and lifestyle classification were analyzed using Chi-square test. **Results:** The percentage of students who were inactive rose during COVID-19 pandemic while students who were highly and moderately active reduced. During pandemic, majority (80.6%) of the students had poor dietary habits. This study has also proven that the pandemic has negatively impacted the students as 56.4% of them reported an increase in body weight. **Conclusion:** This study can increase general awareness regarding the consequences of the changes in physical activity, lifestyle, and weight among students and provide an insight on how the pandemic has affected them.

Keywords: *COVID-19, Body weight, Physical activity, Dietary habits*

IMPACT OF EMERGENCY REMOTE TEACHING (ERT) ON MENTAL HEALTH STATUS AND EDUCATION OF UNIKL-RCMP STUDENTS DURING COVID-19 PANDEMIC

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Background: The movement control order (MCO) implemented during the COVID-19 pandemic has caused higher learning institutions to utilize online teaching, otherwise known as emergency remote teaching (ERT). Besides the changing mode of teaching and learning, prospective stressors were found to affect students' mental health. **Objective:** This study is aimed at evaluating the effect of ERT and associated stressors on mental health status and education among undergraduate students of UniKL RCMP. **Materials and Methods**: A cross-sectional study was undertaken with data collection conducted from March to April 2021. An online questionnaire was delivered to a convenient sample of 307 students of UniKL RCMP, using the snowball method. The data was analyzed using SPSS version 21. **Results**: Out of 307 respondents, anxiety (68.7%), stress (41.4%), and depression (55.7%), ranging from mild to severe, were found to occur among the undergraduates. Prospective stressors, which include living conditions, Internet accessibility and lack of sleep, predominantly affect undergraduate mental health problems. The negative impact of ERT was found to be on students' level of attentiveness (reduced by 51.5%) and assessment grades or marks (37.8%). Students disagreed (58.3%) that completing the course virtually is more effective than face-to-face learning, while 45.9% of them felt that they have lagged in their education. **Conclusion**: ERT with some stressors was reported to have caused drawbacks in education and gave rise to mental health issues among students during the COVID-19 pandemic.

Keywords: *ERT, Mental health, Online teaching, Stressors, Pandemic*

CHEMISTRY, BIOSYNTHESIS, PHYSICOCHEMICAL AND BIOLOGICAL PROPERTIES OF RUBIADIN: A PROMISING NATURAL ANTHRAQUINONE FOR NEW DRUG DISCOVERY AND DEVELOPMENT

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Background: Rubiadin, a 1,3-dihydroxy-2-methyl anthraquinone, primarily originates from *Rubia cordifolia* Linn (Rubiaceae). It was discovered for the first time in 1981 and has been reported for many biological activities. **Objective:** The present study aimed to provide comprehensive evidence of Rubiadin's phytochemistry, biosynthesis, physicochemical and biological properties. **Methods:** Relevant literature was gathered from numerous scientific databases, including PubMed, ScienceDirect, Scopus and Google Scholar between 1981 to up to date. The distribution of Rubiadin in numerous medicinal plants, as well as its method of isolation, synthesis, characterisation, physiochemical properties, and biosynthesis pathways, were extensively included. **Results:** Rubiadin fits all five of Lipinski's rules for drug-likeness properties. Rubiadin is biosynthesized via the polyketide and chorismate/o-succinylbenzoic acid pathways. Rubiadin is a powerful molecule with anticancer, antiosteoporotic, hepatoprotective, neuroprotective, anti-inflammatory, antidiabetic, antioxidant, antibacterial, antimalarial, antifungal, and antiviral properties. Its anticancer, photodynamic therapy and antiosteoporosis properties are well-established compared to other biological properties. The mechanism of action, however, is unknown. Hence, *in-silico* molecular docking study was performed against proteins with PDB IDs of 3AOX, 6OLX, 6OSP, and 6SDC to explore the anticancer mechanism of Rubiadin. The toxicity profile, pharmacokinetics and possible structural modifications were also described. Rubiadin was also proven to have the highest binding affinity to targeted proteins in an *in-silico* study, therefore it may be a safe anticancer molecule. **Conclusion:** In order to present Rubiadin as a novel candidate for future therapeutic development, advanced studies on pre-clinical, clinical trials, bioavailability, permeability, and administration of safe doses are necessary.

Keywords: *Rubiadin, Rubia cordifolia, Biosynthesis, Physicochemical properties, Anticancer, Pharmacology*

EMBELIN ALLEVIATES SEVERE AIRWAY INFLAMMATION IN OVA-LPS-INDUCED RAT MODEL OF ALLERGIC ASTHMA

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Background: Asthma is a chronic lung disease, which causes wheezing, tightness in the chest, shortness of breath and coughing. **Objective:** The current study aimed to evaluate the effect of embelin against ovalbumin (OVA)-lipopolysaccharide (LPS)-induced severe airway inflammation in experimental animals and study their possible mechanism of action. **Materials and Methods:** Rats (n=36) were divided into six groups. Group I served as normal control. Groups II-VI were sensitized with severe allergens (OVA and LPS) on the 7th, 14th and 21st days, followed by OVA and LPS challenge for 30 minutes three times/week for three weeks. Group II acted as an asthmatic disease control and received the only vehicle. On the other hand, groups III-V received embelin (12.5, 25 and 50 mg/kg, p.o. respectively) and group VI received standard dexamethasone (2.5 mg/kg, p.o.) for 15 days from day 27. Lung function parameters and pro-inflammatory cytokines were measured at the end of the experiment on day 42. **Results:** Significant inhibition of eosinophils, neutrophils, lymphocytes, and monocytes in blood and bronchoalveolar lavage fluid (BALf) was seen in the groups, which received embelin (25 and 50 mg/kg) and dexamethasone (2.5 mg/kg) treatments. Moreover, lung function parameters were normalized by embelin (25 and 50 mg/kg) with a significant reduction of interleukin (IL)-4, IL-5 and IL-13. The lung histopathological changes confirmed the protective effect of embelin against severe airway inflammation. **Conclusion:** Overall, our findings indicate that embelin can alleviate severe airway inflammation in the OVA-LPS-induced model of allergic asthma occurring by suppression of T Helper Type 2 (Th2)-mediated immune response.

Keywords: *Embelin, OVA-LPS-induced severe asthma, Allergic inflammation, Th2-mediated inflammatory cells*

OPTIMIZATION OF CINNARIZINE GASTRORETENTIVE CONTROLLED-RELEASE MUCOADHESIVE BEADS

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Background: Cinnarizine is a weakly basic drug which is extensively absorbed from the upper part of the gastrointestinal tract. Hence, developing a mucoadhesive gastroretentive delivery system will result in the enhanced solubility and dissolution of cinnarizine. **Objective:** The objective of the present study was to optimize alginate/Carbopol® 940 based gastroretentive beads for the controlled release of cinnarizine via experimental design. **Materials and Methods:** Sodium alginate and Carbopol® 940 were used as polymers in this study. The polymeric beads were prepared using the ionic gelation method with sodium alginate as the microsphere forming agent and Carbopol® 940 as the rate retardant for drug release. Eleven formulations (F1 to F11) were developed using Design-Expert software. The concentration of polymers was chosen as independent variable whereas the mucoadhesive percentage, entrapment efficiency, cumulative drug release at 8 hours were selected as dependent variables. The formulations were evaluated for surface morphology using SEM, entrapment efficiency, mucoadhesion percentage and in-vitro drug release. **Results:** SEM photographs of the microspheres showed near uniformity of surface and were spherical in shape. Microspheres with greater concentrations of Carbopol® 940 exhibited good mucoadhesive properties, whereas microspheres with higher concentrations of sodium alginate showed greater rate of release at 8 hours as well as entrapment efficiency. The optimized formulation was interpreted as batch F4 as it fulfilled the maximum desirability as per the software. **Conclusion:** In summary, the experimental design approach was effectively utilized in the optimization of cinnarizine gastroretentive controlled release mucoadhesive beads with maximum mucoadhesion, drug entrapment and drug release.

Keywords: *Cinnarizine, Mucoadhesive, Beads, Microspheres, Optimization, Alginate, Carbopol 940*

THE STUDY OF AMIKACIN DOSAGE ADEQUACY BASED ON THERAPEUTIC DRUG MONITORING (TDM) IN NEONATES AND PAEDIATRICS IN HOSPITAL RAJA PEREMPUAN ZAINAB II (HRPZII)

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Introduction: Body weight, age, and kidney function, especially in neonates and paediatrics had significantly influenced amikacin distribution and/or clearance, resulting in large pharmacokinetics variability with a direct effect on therapeutic trough and peak levels monitored when coupled with amikacin dose regimen. **Objective:** This study was conducted to investigate amikacin dose adequacy based on TDM obtained from paediatrics and neonates' patients. **Materials and Methods:** A retrospective study was conducted from July to September 2020 at HRPZII, Kota Bharu, Kelantan. 450 blood samples were collected from neonates (255) and paediatrics (145 infants and 50 children) that were on amikacin and had TDM performed in HRPZII from 1st January to 31st December 2019. Data were analysed using Statistical Package for Social Sciences (SPSS) Version 25.0. The significant level was set at $p < 0.05$. **Results:** 96.44% of neonates and paediatrics patients except for children achieved therapeutic trough concentration (<5mg/L). Majority of the patients (84.22%) had subtherapeutic peak concentration, with only 11.33% attaining therapeutic peak concentration (20 - 30 mg/L). Out of 109 (24.22%) adequate samples analyzed, neonates achieved the most maximum concentration (45.87%), followed by infants (39.44%) and children (14.68%). The analyzed data revealed that mean volume of distribution and half-life affected amikacin dosage adequacy in neonates ($p <0.001$; $p=0.008$) and children ($p<0.001$; $p=0.043$) but not in infants ($p=0.08$; $p=0.230$). However, amikacin toxicity in neonates ($p<0.001$) and infants ($p<0.001$) were only affected by mean half-life. **Conclusion:** Majority of neonates and infants had non-toxic trough concentrations; however, only 24.22% of them had accomplished adequate maximum concentration of amikacin with the given dose regimen.

Keywords: *Amikacin, Dosage adequacy, Toxicity, Paediatrics, Neonates*

KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING NUTRICOSMETICS IN MALAYSIA

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Background: Nutricosmetics are foods or herbal supplements that promote general health and appearance and have gained worldwide popularity. However, some nutricosmetics contain chemical substances that have negative health effects on consumers and may contribute to environmental degradation problems. Many consumers lack awareness in addressing this issue. **Objective:** This study is aimed to assess the knowledge, attitude, and practice (KAP) regarding nutricosmetics and their relationship among individuals living in Malaysia. **Materials and Methods**: A total of 386 respondents participated in this cross-sectional survey. The data collection was done through distribution of online Google forms via various mediums. The acquired data were analyzed using the SPSS version 23, Chi-square test and Spearman's correlation for this study. **Results**: Results revealed that individuals in Malaysia have a moderate KAP regarding nutricosmetics. Mean scores for knowledge, attitude and practice were 4.48 (out of 7), 14.79 (out of 25) and 3.78 (out of 26), respectively. A significant association was found between gender ($p = 0.000$), level of education ($p = 0.001$), district of residence ($p = 0.033$) and occupation ($p = 0.000$) with the total score of practice regarding nutricosmetics. Besides, a significant relationship between knowledge and attitude, knowledge, and practice as well as attitude and practice of respondents regarding nutricosmetics was also found. However, there was no reported association between demographic data with knowledge and attitude regarding nutricosmetics. **Conclusion**: The study concluded that better knowledge regarding nutricosmetics is associated with positive attitude and practice; however, further studies among a larger population are required.

Keywords: *Nutricosmetics, Beauty supplement, Knowledge, Attitude, Practice*

IN SILICO DESIGN, ADMET SCREENING, MM-GBSA BINDING FREE ENERGY OF NOVEL 1,3,4 OXADIAZOLES LINKED SCHIFF BASES AS PARP-1 INHIBITORS TARGETING BREAST CANCER

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Background: The PARP-1 enzyme has recently gained a great deal of attention as a potential anti-cancer agent because it belongs to the PARP family of proteins that are essential to the single-stranded DNA repair process. PARP-1 inhibitors inhibit mitosis, inflammation, gene transcription and finally causes cell death, all of which result in cytotoxic potential. As a result, PARP-1 inhibitors have the potential to cause cell death selectively, especially in breast and ovarian cancers. The FDA has already licensed many PARP-1 inhibitors, including BMN673 (Talazoparib). **Objectives: 1,3**,4-oxadiazoles linked to Schiff bases (**T1-21**) were designed and subjected to *in silico* analysis against PARP-1 (PDB ID:5DS3) enzyme targeting against breast cancer. **Methods:** All the newly designed compounds were subjected for *in silico* analysis, ADMET screening by QikProp module and MM-GBSA binding free energy calculations by using Schrodinger suit 2019-2. The PARP-1 enzyme shows the binding affinity against the newly designed molecules (T1-21) based on the glide scores. **Results: Compounds** T21, T12 showed very good glide scores by the molecular docking studies and compared with the standard Tamoxifen. The binding free energies by the MM-GBSA assay were found to be consistent. The pharmacokinetic (ADMET) parameters of all the newly designed compounds were found to be in the acceptable range. **Conclusion:** The selected 1,3,4-oxadiazole-Schiff base conjugates seems to be one of the potential sources for the further development of anticancer agents against PARP-1 enzyme. The results revealed that some of the compounds T21, T17, T14, T13, T12, T8 with good glide scores showed very significant activity against breast cancer.

Keywords: *1,3,4-oxadiazoles, Breast cancer, Molecular docking, PARP-1 inhibitors, MM-GBSA assay*

ANTIOXIDANT POTENTIAL OF COFFEE ARABICA – A REVIEW

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Background: Coffea species are well-known and widespread all over the world. *Coffee Arabica* accounts for 80% of the world's exports, and its sensorial characteristics are considered more appealing than other species. *Coffee Arabica* contains several biologically active constituents that display high antioxidant potential. Antioxidants may therefore prevent the production of free radicals by interacting directly with free radicals or indirectly by inhibiting or increasing the expression. **Objective:** This review aim is to provide the latest scientific information and a better understanding of the antioxidant potential of *Coffee Arabica*. **Materials and Methods**: The search for articles was carried out through the PubMed, Google Scholar, Scopus, and Science Direct databases. The date of published articles was within the year 2008 to 2021. Some of the few keywords had been used to search for reliable articles such as "antioxidant," "Arabica," "*in vivo*," or "*in vitro*." **Results**: As a result, determining the antioxidant activity of this *Coffee Arabica* would aid in determining their potential as a source of natural antioxidants. However, a single analysis would be inadequate to demonstrate antioxidant activity. It is recommended that several different standard methods be performed to confirm the different modes of action of free radicals, which can precisely and quantitatively measure the antioxidant capacity. **Conclusion**: Though the antioxidant capacity of Coffee Arabica has a particular influence on caffeine and chlorogenic acid in the prevention of oxidative stress, further *in vivo* research is required to establish a systematic basis and safety profiles.

Keywords: *Antioxidant, Arabica, Chlorogenic acid, Melanoidins, In vivo, In vitro*

ANTIOXIDANT AND SUN PROTECTION POTENTIAL OF SUNSCREEN CREAM COMPRISING LEAVES EXTRACT OF *Graptophyllum pictum*

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Background: Sunscreen products today consist of several synthetic Ultraviolet (UV) filter molecules to protect the skin epidermis from UV radiation damage, potentially hazardous for long-term use. *Graptophyllum pictum* leaves or locally known as "Puding," or purple leaves, has been considered as plant antioxidant and photoprotection source. **Objective:** The present study aimed to evaluate the antioxidant and sun protection potential of sunscreen cream comprising ethanolic extract of *G. pictum* leaves. **Methods:** Different concentrations [1% (F1), 2% (F2) and 3% (F3)] of *G. pictum* leaves extracts containing sunscreen creams were formulated and evaluated for *in vitro* antioxidant activity using DPPH method. All the formulated creams were also evaluated to determine the sun protection factor (SPF) value. **Results:** The F1, F2 and F3 showed potent antioxidant activity with IC_{50} values of 203.01±6.11, 51.37±5.10 and 34.11±3.23 µg/ml, respectively in DPPH method. The SPF value of all the three formulated creams was increased in a concentration-dependent manner. Overall, the formulation cream (F3) showed the highest SPF value (20.01±0.01) with potential antioxidant activity compared to F1 and F2. **Conclusion:** The present research found that a sunscreen cream containing *G. pictum* leaves has potential antioxidant and sunscreen protection properties, both of which are important for protecting skin from UVB rays. However, more research is needed to prove its potential value in sun protection, including the evaluation of physiochemical properties and assessment of formulated creams in various other methods.

Keywords: *Graptophyllum pictum*, *Antioxidant, Sun protective factor, UVB protection*

PERCEIVED STRESS, CAUSES OF STRESS, AND COPING STRATEGIES AMONG UNIKL RCMP STUDENTS DURING COVID-19 PANDEMIC

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Background: During the coronavirus disease (COVID-19) pandemic, people face many physical and social distancing consequences, which significantly affects students. University students were subjected to emotional stress as they must fulfil the university's increasing requirements of assignments and tests and a variety of distractions during online classes. **Objective:** This study aims to identify perceived stress, causes of stress, and coping strategies among Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP) students during the COVID-19 pandemic. **Materials and Method:** A total of 325 respondents participated in this cross-sectional study which was conducted by distributing online questionnaires through Google form via various platforms. Descriptive analysis was used to assess respondents' level of perceived stress and identify the causes of stress and coping strategies. Chi-square test was also used to identify the association between sociodemographic profiles with the level of perceived stress, causes of stress and respondents' coping strategies. P-value <0.05 was considered statistically significant. **Results:** This study revealed that the majority of UniKL RCMP students experienced moderate levels of stress during the COVID-19 pandemic. Academic stressors (55.6%) and worried about the future (54.2%) were among the major stressors. Students used multiple coping strategies, religion (84.6%) and positive reframing (84%). **Conclusion:** Findings from this study have proved that students had a moderate stress level during the pandemic. This study will provide valuable insight to lecturers, parents, and counsellors to control these potential factors to overcome the high level of stress experienced by students.

Keywords: *COVID-19, Stress, Coping strategies*

SYNTHESIS AND DOCKING STUDIES OF NOVEL *N*-PIPERAZINYL FLUOROQUINOLONE ANALOGUES AS ANTIBACTERIAL/ ANTIMYCOBACTERIAL AGENTS

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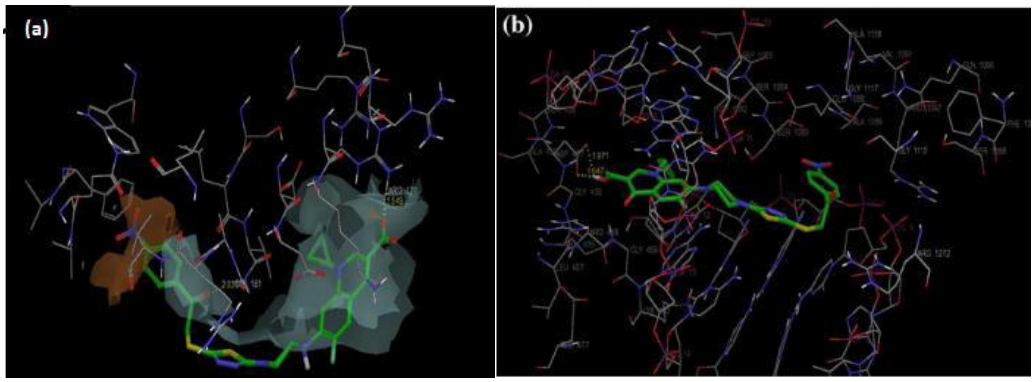
Background: Tuberculosis is a serious infectious disease that affects mostly lungs and may spread to other organs of the body. Co-infection with tuberculosis and bacteria has been reported in immunosuppressed patients and leads to clinical complications. This motivates us to develop new therapeutic agents which may help to treat concurrent tubercular and bacterial infections. **Objective:** To synthesize and characterize novel *N*-piperazinyl fluoroquinolone derivatives, evaluate them for antibacterial/antimycobacterial activity, and study the binding properties using docking analysis. **Materials and Methods**: A series of Fluoroquinolones (ofloxacin derivatives) were synthesized by reacting 1,3,4-thiadiazole with fluoroquinolone in the presence of DMF. The newly synthesized compounds were characterized by IR, NMR and mass spectra analysis and were screened for antibacterial and antimycobacterial activity. Molecular docking was performed using Schrodinger software. **Results and Discussion:** The titled compounds exhibited good antibacterial activity against *S. aureus* and *C. bacterium* whereas revealed poor activity against *P. aeruginosa* and *E. coli*. The compound methyl-substituted-*N*-piperazinyl fluoroquinolone was found to be the most efficient antimycobacterial agent amongst the series. Molecular docking study exhibited dock score of -8.576 and revealed that the synthesized compounds and target proteins were actively involved in a binding pattern and had significant correlation with biological activity. **Conclusion**: The overall study showed the emergence of new antibacterial/antimycobacterial compounds, and docking study helped to understand key structural features and binding modes to design new leads.



Keywords: *Fluoroquinolones, Antibacterial, Antimycobacterial, Docking*

PROMISING TRIBAL HERBS USED FOR MANAGEMENT OF DIABETES

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Background: Diabetes is a dreadful disease spread across the world alarmingly. The World Health Organization (WHO) projects that diabetes will be the seventh leading cause of death by 2030. Physicians are lookout for alternative treatment methods that are safe, effective, and economical. The Indian traditional system of medicine is replete with the use of plants for the management of diabetic conditions. As per the Siddha system, Tridosham or Vatham, Pitham, and Kapham are in a state of equilibrium, and this potentiates the well-being of the human body. **Materials and Methods:** Herbs like *Wrightia tinctoria, Plumbago Zaylanica, Terminalia chebula, Persea macrantha, Phyllanthus emblica, Coscinium fenestratum and Zingiber officinalis* are mentioned in ethnomedicinal literature for various therapeutic properties, which include hypoglycemic Type 2 Diabetes. In this context, the new oral antidiabetic drug ethanolic extract of Polyherbal Formulation (PHF) presents interesting therapeutic properties. Collection of fresh crude drugs were dried under shade. They were ground powders individually and sieved and weighed equal amounts of all herbal drugs and transferred herb powder into mud pot. The pot is tightly covered with cloth and sealed. The sealed pot is buried under the soil and fully covered with sand. After fermentation, it allows it to ferment for 24 hours after fermentation transferred to a glass bottle and stored and used for further extraction and evaluation studies. **Results and Conclusion:** From the results, we concluded that streptozotocin (STZ)-induced hyperglycemia, polydipsia and polyphagia can be treated by administration of ethanolic extract of PHF (200-400mg/kg) to STZ – diabetic rats reduce the blood glucose level near to normal levels and restored the body weight, food & water intake, and oxidative defence after 28 days of the treatment. Thus, the extract possesses an antidiabetic effect and protective effect of pancreatic β cells.

Keywords: *Polyherbal formulation, Anti-diabetic, Type 2 Diabetes, Tribal herbs*

KNOWLEDGE, ATTITUDE AND PRACTICE OF SELF-MEDICATION AMONG PHARMACY STUDENTS IN UNIVERSITY ROYAL COLLEGE OF MEDICINE PERAK

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Background: Self-medication is being practised by pharmacy students equally exposed to its hazards like the general population. It should be opted only in the appropriate situations and not inadvertently. Proper education regarding the safe practice of self-medication should be provided to all pharmacy students. **Objective**: This study aims to investigate knowledge, attitude, and practice (KAP) of self-medication among pharmacy students in Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP). **Materials and Methods**: A cross-sectional study involving 109 students was conducted by distributing voluntary self-administrated online questionnaire. The data obtained were expressed as frequency (n), percentage (%) and mean to determine the level of respondents' KAP on self-medication. A Chi-square test was also used to identify the association between respondents' demographic characteristics with the level of knowledge and practice on self-medication. **Results**: Findings from this study showed that majority of the respondents had a good level of knowledge (62.40%) and neutral attitudes (69.70%) towards self-medication practice. It was also reported that most of respondents (99.10%) practised self-medication and 90.83% of them self-medicate because of minor illnesses. Analgesics (77.98%) was the major type of drug class involved in self-medication followed by antihistamine (71.56%) and vitamins or supplements without prescription (62.39%). **Conclusion**: Knowledge of pharmacy students on self-medication practice increase with higher year and semester of study. This study is able to provide an insight on the level of awareness of pharmacy students towards self-medication while helping the university to prepare them in providing reliable consultation in real-life practice.

Keywords: *Self-medication, Pharmacy students, Medication*

THE *IN-SILICO* INVESTIGATION ON CHRISTANOATE AND CHRISTENE COMPOUNDS AS POTENTIAL INHIBITORS OF COVID-19

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Background: Molecular docking is an important tool used throughout history in the discovery and development of various drugs. Currently, the world is affected by the spread of the airborne Covid-19 virus, which is causing an increase in the number of mortality due to its severe complications. The *in-silico* technique is applied extensively to discover potential compounds that may combat the viral activity of the airborne Covid-19 virus. **Objective:** This study aimed to explore the potential of christanoate and christene for the treatment of COVID-19 via molecular docking tool and to visualize the protein-ligand interactions between the bioactive compounds with the SARS-COV-2 protein crystal structures (PDB 6LU7, PDB 6CS2, PDB 6M1D, PDB 6M71, and PDB 2GHV). **Materials and Methods**: The protein crystal structures were obtained from the Protein Data Bank and based on the literature, the structure of the compounds was generated using ChemDraw. The proteins and ligands were docked using the Autodock tools and visualized using the Biovia Discovery tools, with the control docking conducted using favipiravir as the control. **Results**: Results showed that both compounds have the potential to inhibit protein activity with a low binding score indicating high affinity towards the active site residues, which is comparable to the reference drug used. Multiple interactions between the residues and the compounds' functional groups were observed which includes hydrogen, alkyl, π-alkyl, and π-sigma bonds. **Conclusion**: The results suggested that christanoate and christene can be further explored as potential antiviral compounds against Covid-19.

Keywords: *Christene, Christanoate, Covid-19, Molecular docking, In silico*

KNOWLEDGE, ATTITUDE AND PERCEPTION OF OBESITY TREATMENT AMONG MALAYSIANS

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Background: Obesity is a multifactorial disorder marked by an excess of body fat. Based on the National Health and Morbidity Survey 2019, 1 in 2 adults in Malaysia is overweight or obese. Nowadays, obesity is becoming a global and Malaysian health issue as people's lifestyles shift from rural to urban due to modernization. **Objective:** This study aimed to explore the knowledge, attitude, and perception (KAP) of obesity and its treatment among Malaysians. **Materials and Methods**: A cross-sectional study was conducted among 433 Malaysian respondents aged from 12 to 64 and above from March to April 2021. Obesity and its treatment awareness were measured using a 41-item questionnaire that included four domains: sociodemographic, obesity, treatment, as well as knowledge, attitude, and perception. The data collection was done through distribution of an online Google form and distributed to the public using an online platform. The statistical programme Statistical Package for Social Sciences (SPSS)® version 25 was used to analyse the data, and Microsoft Office Excel 2019® was utilized to manage the data. **Results**: Findings from this study reported that majority, 77%, of the respondents had high level of knowledge regarding obesity and its treatment. Besides, 88.9% demonstrated positive attitude towards the general attitude of it. In comparison, 90.6% showed the correct perception of it. **Conclusion**: In-depth knowledge regarding obesity and exposure to management is key to the success of obesity treatment. More effort should be devoted to improving the public's knowledge of the overall health benefit of weight control, thereby increasing their active participation in weight reduction programs.

Keywords: *Knowledge, Attitude, Perception, Obesity, Treatment, Management*

DRUG UTILIZATION EVALUATION OF ANTIHYPERTENSIVES IN A TERTIARY CARE TEACHING HOSPITAL

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Background: A study on antihypertensive usage in a tertiary care teaching hospital is necessary to realise that drugs inappropriate use represents a potential hazard to the patient and unnecessary expenses. This necessitates a periodic review of the pattern of drug utilization to ensure safe and effective treatment. The goal is to focus on the factors related to prescribing, dispensing, administering, and taking medication. **Objective:** To analyze the drug utilization evaluation of antihypertensive in a tertiary care teaching hospital. **Materials and Methods**: A prospective, observational, and analytical study was carried out for six months in the inpatient from different departments of a tertiary care teaching hospital in the Mysore district with the aim of drug utilization evaluation antihypertensive. **Results**: A total of 332 patients were taken into the study. 32% (103) of the patient were in the age group of 41-50 years, and this was found to be higher in a male population, 57%. During the study, 51.6 % of the patients were stage 1 hypertension, followed by prehypertension and stage-2 hypertension. The most common class of drugs prescribed in the study was Angiotensin-converting enzyme (ACE) inhibitors, 31.1 %, followed by calcium channel blocker (CCB) 21.4 %. The most prescribed medication in the study was captopril 21.7 % and nifedipine 14.3%. Diabetes mellitus was the most common comorbid condition, 35.7 % associated with hypertension, followed by hyperthyroidism 14.5 %. **Conclusion**: This study concluded that providing insight into the prescription pattern of antihypertensive medication concerning various comorbidities control helps the prescriber to pay more attention towards specific factors that affecting the outcome of various comorbidities.

Keywords: *DUE, Antihypertensives, JNC*

CORRELATION BETWEEN GLYCOSYLATED HAEMOGLOBIN (A1C) AND AWARENESS OF DIABETES MELLITUS (DM) COMPLICATIONS AMONG DM PATIENTS IN HOSPITAL TUANKU AMPUAN NAJIHAH

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Background: Diabetes Mellitus (DM) complications can cause significant morbidity and mortality. Lowering glycosylated haemoglobin (A1c) is important in preventing DM complications. **Objective:** This study aims to identify prevalence of DM complications, assess the awareness of DM complications, and investigate the correlation between A1c and awareness of DM complications among DM patients in Hospital Tuanku Ampuan Najihah (HTAN). **Method:** A cross-sectional survey involved DM patients above 18 years old who had follow-up at Medical Outpatient Department (MOPD) HTAN. Data was collected via convenience sampling with self-administered questionnaire from August 2020 to February 2021. Spearman's correlation was used to assess correlation between A1c reading and awareness score of DM complication. **Results:** Out of 122 respondents, it was reported that 48 (39.3%) had more than one complication, followed by 40 (32.8%) with one complication and 34 (27.9%) with no complication. Cardiovascular disease (42, 29.0%) was the highest reported complication. Two-third of the respondents (82, 67.2%) were aware of more than half of the listed DM complications. Most of the respondents (117, 95.9%) were aware that lower limbs paresthesia's and numbness, as well as poor wound healing, were among DM complications; meanwhile, diabetic ketoacidosis was the complication that respondents were least aware of (20, 16.4%). There was a significant negative correlation between A1c reading and awareness score (r^2 =- 0.505, p=< 0.01). **Conclusion:** Majority had one complication and able to recognize at least more than half of the listed DM complications. Better awareness of DM complications was associated with better diabetic control.

Keywords: *Diabetic Mellitus, Complication, A1c, Diabetes, Glycosylated hemoglobin*

KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) TOWARDS TELEPHARMACY SERVICES DURING COVID-19 PANDEMIC: A CROSS-SECTIONAL STUDY AMONG INDIVIDUALS LIVING IN MALAYSIA

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Background: Telepharmacy is a conventional method for the practitioner to deliver healthcare to patients virtually and remotely from one another. This service is beneficial, especially during the coronavirus disease (COVID-19) pandemic, whereby people are advised to stay at home and practice physical and social distancing. **Objective:** This study aimed to investigate knowledge, attitude, and practice (KAP) towards telepharmacy services during the COVID-19 pandemic among individuals living in Malaysia. **Materials and Methods**: A cross-sectional study was carried out by distributing online questionnaires among 437 individuals living in different states in Malaysia. Descriptive analysis was used to summarize the socio-demographic characteristics. Chi-Square Test and Fisher Exact Test were used to identify the association between demographic characteristics and level of KAP. Spearman's correlation was also used to assess the relationship between the dependent variables. **Results**: This study found that Malaysians have a good level of attitude (80.5%) towards telepharmacy services despite having poor level of knowledge (43.9%) and practice (70.5%). A significant association ($p < 0.05$) was found between respondent's demographic characteristics with level of knowledge, which are district/state of residence and household income, level of attitude (gender, race, level of education, occupation), and level of practice (race, household income). There was a significant, positive correlation between knowledge – practice ($r_s=0.407$, $p<0.001$), knowledge – attitude ($r_s=0.229$, $p<0.001$) and attitude – practice ($r_s=0.207$, $p<0.001$). **Conclusion**: The adoption of telepharmacy services can provide the solution for individuals requiring pharmaceutical assistance from their healthcare professionals during the COVID-19 pandemic.

Keywords: *Knowledge, Attitude, Practice, Telepharmacy, COVID-19*

KNOWLEDGE, ATTITUDE AND PRACTICE ON THE USAGE OF SUN PROTECTION PRODUCTS IN DAILY SKINCARE ROUTINE AMONG UniKL RCMP STUDENTS

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Background: Excessive exposure to ultraviolet light (UV) radiation causes damaging effects to skin, which can eventually develop into skin cancer. Sun protection practice is needed as prevention from UV radiation. However, many are lacking awareness of the importance of sun protection usage in daily lives/skincare routines. **Objective:** This study is aimed to assess the knowledge, attitude, and practice (KAP) of sun protection products as daily skincare routine among undergraduate students from Universiti Kuala Lumpur Royal College of Medicine, Perak (UniKL RCMP). **Materials and Methods**: A total of 148 respondents aged 18 years and above participated in this cross-sectional survey. The data collection was done through distribution of online Google form via several applications such as WhatsApp, Instagram, and Facebook messenger. Descriptive and inferential statistics were used where appropriate. **Results**: Majority of the respondents were females (82.4%) compared to males (17.6%). Mean scores for knowledge, attitude and practice were 6.1 ± 2.1, 32.7 ± 6.7 and 88.3 ± 14.0, respectively. Current educational study was the only demographic characteristic significantly associated with KAP scores ($p < 0.05$). Positive but weak correlations were observed between knowledge-attitude ($r = 0.22$, $p < 0.01$), knowledge-practice ($r = 0.26$, $p < 0.01$) and attitude-practice ($r = 0.27$, $p < 0.01$). **Conclusion**: In conclusion, UniKL RCMP students showed a positive attitude and good practices on using sun protection products; however, their knowledge was lacking. It is recommended to emphasize more public health campaigns and education programmed to improve sunscreen and skin cancer knowledge.

Keywords: *Knowledge, Attitude, Practice, Sun Protection, Sun Protection Product, Sunscreen*

CHARACTERIZATION AND EVALUATION OF INHIBITION OF MICROPARTICLE AND MICROPARTICLE EMULGEL OF VIRGIN COCONUT OIL WITH ALGINATE AGAINST *PROPIONIBACTERIUM ACNES* AND *CANDIDA ALBICANS*

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Background: Kopyor coconut is found on Java Island, Indonesia. Virgin coconut oil is one of the products which has many benefits both as medicine and cosmetic. **Objective:** Manufacture of microparticles to increase public acceptance of VCO and to evaluate the inhibition of VCO against microbes. **Materials and Methods:** In this study, antimicrobial evaluation using well diffusion method and microparticles were made by aerosolization and freeze dry. As a formula that is applied to skin for antimicrobial treatment, VCO microparticles were formulated in emulgel using HPMC K15M. **Result:** VCO contains saturated fatty acids (such as capric acid, caprylic acid, and lauric acid) and unsaturated fatty acids (such as palmitic acid, oleic acid, and linoleic acid), which have antimicrobial activities. VCO microparticles have a spherical shape, smooth surface, and voluminous white powder with a distinctive smell of coconut oil. VCO microparticle have yield 67,384 ± 1,68% (F1) dan 80,384 ± 1,06% (F2). Evaluation of the emulgel has a pH that is in accordance with the pH of skin (4.5-6.5). Based on the antimicrobial activity test of VCO kopyor against *Propionibacterium acnes* and *Candida albicans,* there was no inhibition zone. **Conclusion:** VCO has no antimicrobial activities. This is because fatty acids contained in kopyor are not free fatty acids. In addition, the content of kopyor fatty acids, especially lauric acid (21.73%), is lower than VCO according to the APCC (Asian and Pacific Coconut Community) by 43-53%. Further research on activity is recommended to be tested on experimental animals (*in vivo*).

Keywords: *VCO, Antimicrobial, Microparticle*

PREVALENCE AND ASSOCIATED RISK FACTORS OF NECK PAIN AMONG UNIVERSITY STUDENTS IN KUANTAN, PAHANG DURING COVID-19 PANDEMIC

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Background: Coronavirus disease (COVID-19) pandemic had created a shift in academic learning. Majority of university students are required to stay at home and continue their studies through online platforms, which predisposes to various musculoskeletal disorders. Among the various musculoskeletal disorders, neck pain is prominent and affects function, productivity, and overall quality of life. **Objective:** To determine the prevalence of neck pain and its associated risk factors among university students in Kuantan, Pahang. **Materials and Methods**: This is a cross-sectional study with a total of 121 eligible university students in Kuantan, Pahang. Online self-administered questionnaire with 4 different sections (Section A; demographic data, section B; standardized Nordic musculoskeletal questionnaire, section C; general risk factors and section D; ergonomic risk factors) were administered. Results were analyzed using SPSS version 26. **Results**: Overall neck pain prevalence among university students in Kuantan, Pahang during last 12-months was 58.7%. The highest mode of study that causes neck pain was laptop (57.0%), and least was desktop (9.1%). Prolonged sitting (p<0.001), uncomfortable posture (p<0.001), repetitive arm and hands movements (p<0.001), prolonged sustaining of same posture (p=0.001), neck bending or prolonged forward head position (p<0.01), elbow in 90 degrees angle when using laptop (p=0.035) are the associated risk factors of neck pain. **Conclusion**: This study concluded that university students in Kuantan, Pahang have a high prevalence of neck pain during COVID-19 pandemic. Habitual and ergonomic risk factors are significantly associated with neck pain.

Keywords: *Neck pain, Risk factors, University students*

STUDY ON KNOWLEDGE, AWARENESS, AND PERCEPTION OF ANALGESIC USED AMONG STUDENTS IN HIGHER EDUCATIONAL INSTITUTION IN IPOH

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Background: Analgesics are a class of drugs that are designed to relieve pain, inflammation, and fever. Most analgesics such as paracetamol and ibuprofen can be easily purchased without prescriptions. Poor knowledge about analgesics may lead to the drug being abused or cause addiction among its users. Analgesics can also develop toxicity and adverse drug reaction if they are taken inappropriately. **Objectives:** This study was performed to evaluate the level of knowledge, awareness, and perception of analgesics used among university students in Ipoh. **Materials and methods:** A cross-sectional study using a structured survey questionnaire and online Google form as the research tool was conducted from February 2020 to May 2020. The question was in the English language. The questionnaire was divided into four sections, which include the respondents' demographic characteristics, knowledge, awareness, and perception. The data were analyzed by using SPSS and Microsoft Excel. **Results:** Out of the total respondents (n=169), 71% were female, and 29% were male. The result showed that 86.4% of the respondents had poor level of knowledge, while only 13.6% had good level of knowledge. Besides, the majority of the respondents (73%) were found to have a low level of awareness. Lastly, 52% of the respondents have a good perception level, while other 48% have a poor perception level. **Conclusion:** The finding showed that the respondents' level of perception can be classified as good while the level of knowledge and awareness are poor, which may contribute to high potential of adverse effects.

Keywords: *Analgesics, Knowledge, Awareness, Perception, Analgesics used*

KNOWLEDGE, AWARENESS AND PERCEPTION OF UNIKL-RCMP PHARMACY STUDENTS TOWARDS ORAL CONTRACEPTIVE USE

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Background: Malaysia still recorded the lowest prevalence rate of contraception use and highest percentage of unmet needs for it amongst ASEAN countries. As many women prefer to seek pharmacists' advice on oral contraceptives, this study will discover pharmacy students' readiness to educate the community. **Objective:** This study aims to explore the knowledge, awareness and perception of Universiti Kuala Lumpur Royal College of Medicine, Perak (UniKL RCMP) pharmacy students towards oral contraceptive use. **Materials and Methods**: A cross-sectional study was conducted using a pre-tested online questionnaire on pharmacy students of UniKL RCMP from February to May 2021. Categorical data were presented as means (± s.d). Pearson's Correlation was used to determine association between variables. **Results**: The total response was 51% (116/223), with the majority from degree level (62.1%) and females (77.6%). Thirty-one (27.5%) respondents have good knowledge, while 81 (69.8%) have good awareness of oral contraceptives. Majority of the respondents have positive perceptions towards the use of oral contraceptives (89.7%). Students from degree programmes had higher scores than diploma students in all domains, and students at later years of study exhibited better knowledge, awareness, and perception. **Conclusion**: The education process is found to influence students' level of knowledge, awareness, and perception of oral contraceptives. More than 70% of the students have a good level of awareness. Majority of them have strong positive perceptions but only a moderate level of knowledge of oral contraceptives. Therefore, the students need better education on oral contraceptive use.

Keywords: *Knowledge, Awareness, Perception, Oral contraceptives*

KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) TOWARDS COVID-19 PREVENTIVE MEASURES AND SYMPTOMS: A CROSS-SECTIONAL STUDY AMONG INDIVIDUALS LIVING IN KEDAH

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Background: Coronavirus disease (COVID-19) is a serious global health problem that was first detected in Wuhan, China. Insufficient level of knowledge, attitude, and practice (KAP) towards the preventive measures of COVID-19 lead to the economic downturn rise in the number of infected people daily and increase mortality rate. **Objective:** This study aimed to evaluate KAP towards COVID-19 preventive measures and symptoms among individuals living in Kedah. **Materials and Methods**: A cross-sectional study was conducted by distributing online questionnaires among 388 individuals living in different districts in Kedah. Descriptive frequency analysis was used to summarize the socio-demographic characteristics. The Chi-Square Test and Fisher Exact Test were used to identify the association between demographic characteristics and level of KAP. Spearman's correlation was used to assess the relationship between the dependent variables. **Results**: The mean score obtained for knowledge, attitude, and practice were 9.67 ± 1.64, 20.89 ± 3.03 and 10.13 ± 1.12, respectively. A significant association ($p < 0.05$) was found between respondent's demographic characteristics with the level of knowledge (age, gender, level of education, marital status, occupation) and level of practice (gender, level of education). This study also reported no significant association between respondent's demographic characteristics with the level of attitude. There was a positive correlation between knowledge – attitude ($rs = 0.103$, $p<0.05$), knowledge – practice ($rs = 0.111$, $p<0.05$) and attitude – practice ($rs = 0.207$, $p<0.05$). **Conclusion**: This study will provide essential groundwork data to help health officials facilitate the implementation of effective policy regarding COVID-19 preventive measures in Kedah.

Keywords: *Knowledge, Attitude, Practice, COVID-19*

PHARMACOGNOSTICAL CHARACTERISATION OF THE LEAVES OF SERINGAN (*Flemingia strobilifera*)

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Background: The leaves of *Flemingia strobilifera* (Fabaceae), or locally known as Seringan, is commonly used in traditional medicine, especially for postnatal care among Malay women in Perak, Malaysia. The plant is easily found at the edge of rubber or palm oil plantations and within bushes adjacent to jungle throughout Perak, Malaysia. Despite its popularity, the pharmacognostic and quality standard reference for this plant is not yet available in Malaysian Herbal Monograph. **Objective:** The current study aimed at documenting the macro- and micro-morphology character and the preliminary chemical features of the plant leaves. **Materials and Methods**: The leaves were subjected to macro morphology and microscopic examination. The extractive values determination was also carried out. **Results**: The leaf was simple, ovate-lanceolate shape with slight wavy margin. Microscopy revealed the presence of trichomes on lower and upper epidermis and parasitic stomata on lower epidermis. Water-soluble extractive value was ≥13% and ≥4% respectively for hot and cold method. Ethanol-soluble extractive values were ≥8% and ≥5%, respectively, for hot and cold methods. **Conclusion**: The diagnostic features of the plant, together with the preliminary chemical analysis values, can be used to ascertain the identity and quality of the plant.

Keywords: *Flemingia strobilifera, Macro morphology, Microscopy, Physico-chemical analysis, Standardization*

SYNERGISTIC ANTIMICROBIAL EVALUATION AND MOLECULAR DOCKING STUDIES OF SWERTIAMARIN AND QUERCETIN TARGETING DIHYDROPTEROATE SYNTHASE ENZYME

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Background: Swertiamarin (Sw) and Quercetin (Qu) are plant isolated compounds and reported for several pharmacological properties based on the traditional use of the plants in the treatment of diseases. **Objective:** The present study aims to evaluate the synergistic antimicrobial activity of iridoid (Sw) and flavonoid glycoside (Qu) based on a molecular docking study. **Materials and Methods:** Sw was isolated from methanol extract of *Enicostemma axillare*. The Sw, Qu and the combination of Sw and Qu (SQC) were evaluated against *Escherichia coli, Klebsiella pneumonia, Proteus mirabilis, Methicillin-resistant Staphylococcus aureus, Pseudomonas aeruginosa* and *Candida albicans* using the turbidimetric method. A molecular docking study of Sw and Qu was done on the target site of dihydropteroate synthase (DHPS) of 3TYC (Protein Data Bank ID). **Results:** In the molecular docking study, Sw and Qu have shown good binding energy and interaction energy with the selected target site DHPS of 3TYC protein. Sw and Qu combination has shown significant synergistic effect and shown good docking score. The Sw and Qu exhibited good antimicrobial activity in all the tested microorganisms at lower concentrations (2.5 µg/ml). **Conclusion:** Our study explored that a combination of selected phytoconstituents found significant antimicrobial activity.

Keywords: *Swertiamarin, Quercetin, Antibacterial activity, Antifungal activity, Synergistic study, Molecular docking.*

MEDICATION USE BY OLDER PATIENTS WITH TRIPLE CARDIOVASCULAR RISKFACTORS

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Background: The management of complex drug regimens in the elderly is challenging as comorbidities coupled with polypharmacy increase drug-drug interactions and adverse drug reactions. The information on medication usage among the elderly with triple cardiovascular risk factors (CRFs) is scarce. **Objectives:** This study aimed to investigate medication use among the local elderly patients with triple CRFs, namely type 2 diabetes mellitus, hypertension and hypercholesterolemia. **Methods:** This cross-sectional study was part of the Malaysian longitudinal ageing study known as the Transforming Cognitive Frailty to Later Life Self-sufficiency (AGELESS). The data of 817 respondents were extracted from the database and screened before being subjected to analysis using IBM Statistical Package for Social Science software (SPSS) version 26. **Results:** A total of 127 respondents (15.5%) above 60-year-old were found to have three CRFs. Other common comorbidities include glaucoma (40.2%), joint problem (31.5%) and heart disease (15.0%). The maximum number of diseases was 7, with a mean of 4.2 ± 1.2 per respondent, whereasthe average number of medications received by each respondent was 5.5 ± 2.3. Three most common medications used in the respondents were statins (81.9%), biguanides (69.3%) and calcium channel blockers (47.3%). The total number of medications was significantly correlated with the number of diseases ($r = 0.26$, $p = 0.003$) and age ($r = 0.20$, $p = 0.027$) of patients. **Conclusion:** The number of medications used among the elderly with three CRFs differed. Medication review and improving medication self-management skills among elderly patients is an essential part of optimising drug therapy.

Keywords: *Cardiovascular risk, Elderly, Medications, Comorbidities*

A STUDY ON THE MANAGEMENT OF SEPSIS IN THE INPATIENTS OF A TERTIARY CARE HOSPITAL

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Background: Sepsis is a life-threatening organ dysfunction caused by a dysregulated host response to an infection. Selecting the appropriate class of antibiotic, vasopressor, and other supportive treatment plays a significant role in the management of sepsis. **Objectives:**1) To study the treatment pattern of various types of sepsis 2) To study the extent of adherence to the Standard Treatment Guidelines (STG) 3) To study the various nutrition supplements prescribed during treatment and 4) To report any drug-related issues during treatment. **Methods:** It was a hospital-based prospective observational study carried out in General Medicine, ICU and PICU wards of St. Philomena's Hospital, a tertiary care hospital, for a period of 6 months. The available treatment plans were evaluated for adherence to Standard Treatment Guidelines of St. Philomena's Hospital. **Results:** A total of 45 patients were included in the study. Penicillin (64.44%) was found to be the most frequently prescribed class of antibiotic, followed by Cephalosporin (57.78%). Norepinephrine was the most frequently administered vasopressor which was associated with lower mortality compared to other vasopressors. Twenty-five patients from the study group received treatment according to STG. **Conclusion:** Among sepsis patients admitted to the hospital, urosepsis was found to be the most common. Treatment included antibiotics (Piperacillin/Tazobactam, Meropenem and Clindamycin), vasopressors (Norepinephrine) and nutritional supplements. A good number of sepsis cases (n=25) were treated according to STG.

Keywords: *Sepsis, Antibiotics, Vasopressors, Nutritional supplements*

TO STUDY THE PRESCRIBING PATTERN OF ANTIBIOTICS IN THE PEDIATRICS DEPARTMENT OF ST. PHILOMENA'S HOSPITAL

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Background: Overuse and inappropriate prescription of antibiotics are one of the significant causes of the development of antimicrobial resistance. Everyone is at risk of antibiotic-resistant infections, especially Infants and children, due to underdevelopment of the immune system, which made drug therapy a major component of pediatric management in a hospital. **Objectives:** 1) To study the prescribing pattern of antibiotics in Pediatrics. 2) To study the escalation and de-escalation pattern of antibiotics. 3) To report the various drug-related problems. **Methods:** A prospective hospital-based observational study was carried out for a period of 6 months at St. Philomena's Hospital. **Results:** During the study period of six months, a total number of 213 patients were recruited. In this study, male patients were higher in number. It was observed that the majority were between the age group of 1- 5 years, and most of the patients were diagnosed with respiratory tract infections. Antibiotics like aminoglycosides were the major choice of empirical treatment in which most of the drugs were administered through intravenous route. A culture sensitivity test was carried out in more than 75% of patients. The most prescribed antibiotic during discharge was found to be amoxicillin-clavulanate. **Conclusion:** To conclude the study by stating that the choice of aminoglycosides as the empirical agent is not much appreciated. On the other hand, there are no nosocomial infections reported, representing that the infection control committee is at its best.

Keywords: *Pediatrics, Antibiotics, Aminoglycosides*

ASSESSMENT OF RISK FACTORS FOR CARDIOVASCULAR DISEASES AMONG ADULTS AND GERIATRICS

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Background: Cardiovascular diseases (CVD) are a class of diseases that involve the heart or blood vessels. It is found that the risk factors are not the same for adults and geriatrics. **Objectives:** 1) To compare the various risk factors associated with cardiovascular diseases among adults and geriatrics. 2) To assess the most common type of cardiovascular disease in these patients. 3) To prepare patient information leaflets to guide the patients in managing the risk factors and counsel the patients. 4) To make note of the medications prescribed for these patients. 5) To predict the risk of developing CVD in the study patients in the next 10 years using JBS3 risk calculation. **Methods**: It was a hospital-based observational study carried out in both inpatients and outpatients of St. Philomena's Hospital. Patient's risk factors for CVD were assessed. Patient information leaflets were given, and patient counselling was done. **Results**: Out of 161 patients, IHD and CCF were the most common CVD's mainly affecting the geriatrics. Risk factors like obesity, family history, high cholesterol and diet were common in adults and geriatrics. According to the JBS3 scale used, the majority of the geriatrics were at a higher risk of developing CVD in the next 10 years. **Conclusion**: The risk factors and the risk of developing CVD were more common in geriatrics. Hypertension and diabetes mellitus were the most common comorbidities mainly observed in geriatrics. JBS3 risk assessment was proven to be statistically significant.

Keywords: *Cardiovascular, Geriatrics, Adults*

EFFECT OF CLINICAL PHARMACIST INTERVENTION IN SUBJECTS WITH ESSENTIAL HYPERTENSION VISITING THE DEPARTMENT OF CARDIOLOGY OF A TERTIARY CARE HOSPITAL

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Background: Pharmaceutical care is a professional practice in which pharmacist's role has been clinically proven to improve many outcomes regarding patient health, including greater patient safety, improve disease and drug therapy management, and improved quality of life. **Objectives:** To assess the impact of clinical pharmacists' intervention in improving the quality of life and treatment outcomes in patients with essential hypertension. **Methods**: A 6-month prospective, randomized interventional study was carried out. Patients were randomized into case and control groups, respectively. Case group received pharmaceutical care. The quality of life of the study patients was assessed using questionnaire on Health-Related Quality of Life (HRQoL) [RAND-36] at baseline and subsequent follow-up visits. Medication adherence among the study patients was determined using an 8-point Morisky Medication Adherence Scale (MMAS-8). **Results**: Out of 80 patients, 51 patients had comorbidities such as diabetes mellitus, hypothyroidism, asthma, or COPD. The mean systolic blood pressure and the mean diastolic blood pressure had a significant difference at baseline and followed up at the case group compared to control group. **Conclusion**: The provision of pharmaceutical care by the clinical pharmacist was instrumental in improving treatment outcomes among the study patients in terms of blood pressure reduction, improvement in HRQoL scores and medication adherence.

Keywords: *Hypertension, Pharmaceutical care, Quality of life, Medication adherence*.

DRUG UTILIZATION EVALUATION OF OSELTAMIVIR AT A TERTIARY CARE HOSPITAL

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Background: Oseltamivir is the most commonly used and misused medication. This raises a need for a multidisciplinary team to create an optimal program to monitor its use and rationalize the drug use, thereby reducing the risk of adverse effects and resistance of the drug towards the causative organisms. **Objective:** The objective of our study was to analyze the prescribing pattern, evaluate the rationality of prescription and drug-related issues of Oseltamivir. **Methods**: A prospective hospital-based observational study was carried out for a period of 6 months. Descriptive statistics were used to analyze the data. **Results**: 140 patients were enrolled in the study in which 64 were male and 76 were female. During the study, 55(39.28%) patients were diagnosed with LRTI, followed by 15(10.71%) patients with viral fever. 57(40.71%) patients were found to have co-morbidities. 41(29.29%) patients were found to be in the age group of 40-60 who were predominant. Culture sensitivity test was performed in only 48(34.29%) patients, in which growth was observed only in 25(52.08%) patients' specimens. Microbial growth was observed in sputum culture specimen followed by blood culture with Gram-positive cocci and Klebsiella pneumonia being maximum in number. 45(32.14%) patients received oseltamivir as prophylaxis, and 95(67.86%) patients received treatment. 5 ADR (nausea, vomiting, insomnia, redness of eyes, dizziness) and 11 errors were found in the study. **Conclusion**: WHO and ICMR guidelines were analyzed, and among 140 patients, 95 patients have prescribed oseltamivir according to the guidelines. Moreover, whereas 45 patients were prescribed oseltamivir which were not according to the guidelines, we conclude the study by stating that at some point, oseltamivir was prescribed irrationally at the study centre.

Keywords: *Oseltamivir, DUE, Rational Prescribing*

A STUDY ON PREVALENCE OF DEPRESSION AND ANXIETY DISORDER AMONG PATIENTS WITH GI DISORDERS (IRRITABLE BOWEL SYNDROME, GASTROESOPHAGEAL REFLUX DISEASE AND PEPTIC ULCER)

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Background: Gastrointestinal disorders refer to any conditions or diseases that occur within the gastrointestinal tract. Depression and anxiety have been implicated in many GI Disorders, especially IBS, GERD and PUD, and an in-depth study about their co-relation can help in better treatment of both disorders. **Objectives:** The study was carried out to find out the prevalence of any mood disorder among patients with GI disorders. The main objectives are: 1) To determine the prevalence of Depression and Anxiety among patients with GI disorders. 2) To study the treatment pattern of GI disorders. 3) To study the extent of medication adherence among these patients. **Methods**: A prospective hospital-based observational study was conducted for a period of 6 months at St. Philomena's Hospital. The subjects were included after obtaining ethical clearance and informed consent. Hamilton's Depression and Anxiety scale was used as standard questionnaires to detect the prevalence of depression and anxiety. **Results:** During the study, a total of 80 patients with GI disorders (IBS/GERD/PUD) were included. (48.75%) patients had GERD, (40%) patients had IBS and (11.25%) patients had PUD. (73.75%) patients had depression and (83.75%) patients had anxiety; (73.75%) patients had high adherence and (26.25%) patients had medium adherence; Majority of patients showed interest in receiving patient counselling. **Conclusion:** Among GI disorders, GERD patients were higher in number. Majority of patient population showed prevalence of Depression and Anxiety. More than fifty percentage of the study population had high adherence to medication regimens.

Keywords: *Gastrointestinal Disorders, Mood Disorders, Medication adherence*

PHARMACIST INTERVENTION IMPACT ON TYPE 2 DIABETES PATIENTS GLYCEMIC CONTROL IN A TERTIARY CARE HOSPITAL

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Background: Diabetes is a chronic and complex metabolic disorder requiring an interdisciplinary approach. Pharmacists are experts in medication management and can optimize therapeutic outcomes for patients with diabetes. **Objectives:** 1) To assess the parameters of glycemic control – fasting blood sugar (FBS), post prandial blood sugar (PPBS), and glycated hemoglobin among outpatients (HbA1c); 2) To provide patient education to one group of patients; 3) To assess the impact of the educational intervention on blood sugar levels and HbA1c. **Methods**: This was a hospital-based prospective interventional study carried out in the general medicine outpatient department. Parameters of glycemic control for patients were measured at the baseline and the end of the follow-up period of 3 months and compared using appropriate statistical tests. **Results**: A total of 50 patients were included in the study. Compared to the baseline, the values for average FBS, PPBS, and HbA1c decreased statistically significantly ($p<0.005$) at the end of the study period within each group. The group which received the pharmacist-led education had a statistically significant greater difference ($p<0.005$) in the average values for FBS (41.5 mg/dL vs 15.0 mg/dL), PPBS (58.8 mg/dL vs 26.4 mg/dL, and HbA1c (0.67% vs 0.17%) from baseline to the end of the study period compared to the group which did not receive education. **Conclusion**: Pharmacist led educational intervention program for the management of type 2 diabetes had a positive impact in lowering the levels of glycemic parameters. Pharmacists play a significant role in disease management and prognosis.

Keywords: *Diabetes, Counselling, Pharmacist-led education program*

DRUG UTILIZATION EVALUATION OF ANTIMICROBIAL AGENTS IN INTENSIVE CARE UNIT PATIENTS AT ST. PHILOMENA'S HOSPITAL

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Background: Antimicrobial agents (AMAs) are the most frequently prescribed drugs in the ICU. Thus, the total consumption in ICU is approximately ten times higher than the general hospital wards. Guidelines will help physicians to prescribe rationally and to choose the best effective, most appropriate antibiotic for the patient. **Objectives:** 1) To analyze and record the prescription pattern of AMAs used in ICU. 2) To evaluate the most common class of antimicrobials used in ICU. 3) To identify and report any drug-related reactions to the concerned physician. **Methods:** A prospective observational study was carried out at MICU for a period of 6 months and included all patients prescribed antimicrobial agents. Results were analyzed using descriptive statistics. **Results:** Among 175 patients included in the study, a culture sensitivity test was carried out for 69.71% patients, of which 57.37% showed growth and the most identified microorganism was *Escherichia coli*. Among 459 antimicrobials prescribed, the most common indications were for prophylaxis followed by UTI > sepsis > RTI. Combination therapy was prescribed for 78.28% of patients and monotherapy for 21.71%patients. Cefoperazone + sulbactam/clindamycin/clarithromycin was the most commonly used triple therapy, followed by Cephalosporin + tazobactam/clindamycin as dual therapy and cefoperazone + sulbactam as monotherapy. 6 ADRs and 9 drug interactions were observed and reported. **Conclusion:** It was observed that the antibiotics were rationally used in the ICU, and no single nosocomial infection was reported.

Keywords: *Antimicrobial utilization evaluation, Culture sensitivity test, Combination therapy*

A STUDY ON INCIDENCE AND PRESCRIBING PATTERN OF NEUTRACEUTICALS AMONG INPATIENTS IN A TERTIARY CARE HOSPITAL

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Background: Neutraceuticals are defined as nutritional supplements which include vitamins, lipids, proteins, carbohydrates, minerals, herbs, and other related products used to boost the nutritional content of diet. The main purpose of using neutraceuticals is to improve overall health, energy, improve immunity and reduce the risk of illness and age-related conditions. **Objectives**: 1) To analyze the prescribing pattern of neutraceuticals in Inpatient wards of a tertiary care hospital. 2) To monitor the adverse drug reaction induced by neutraceuticals. **Methods**: It was a hospital-based prospective, observational study conducted for a period of 6 months. Research students participated in ward rounds, monitored, and documented the data of patients included in the study. Results were analyzed using descriptive statistics. **Results**: During the study, a total of 2150 patients have been admitted to Inpatient ward, out of which 300 patients received neutraceuticals. During the study, various neutraceuticals were prescribed where 67% of patients received multivitamins, 18% of patients received mixed neutraceuticals, 7.66% of patients received minerals, 6.33% of patients received probiotics, and 1% of patients received proteins. It was observed that patients with multiple comorbidities and abnormal laboratory values required neutraceutical support the most. A very minimal number of Adverse Drug Reactions were identified. **Conclusion:** In the study, it was observed that neutraceuticals were prescribed majorly for patients with multiple comorbidities and abnormal diagnostic values. Multivitamins were most commonly prescribed. Most of the time, neutraceuticals were prescribed rationally though there were some exceptions.

Keywords: *Neutraceuticals, Comorbidities, Inpatients*

A STUDY ON PRESCRIBING PATTERNS AMONG PATIENTS COMPLAINING WITH COLD AND COUGH AT A TERTIARY CARE HOSPITAL

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Background: Common cold is an acute contagious disease of the Upper Respiratory Tract marked by inflammation of mucous membranes of the nose, throat, eyes and eustachian tubes with a watery and purulent discharge caused by any of these several viruses (such as *rhinovirus* or an *adenovirus*). Cough is a forceful expulsion of air from lungs that helps clear secretion, foreign antibodies, and irritants from the airway. **Objectives:** The objectives of the study are: 1) To study the management pattern of common cold and cough. 2) To study the etiology of common cold and cough. 3) To report any drug-related issue during treatment. **Methods:** It was a hospital-based retrospective study conducted for a period of 6 months. Relevant information from patient's case sheets was recorded in data collection form and assessed accordingly. **Results:** A total of 260 patients were included in the study. Cephalosporin (71.2%) was the most frequently prescribed class of antibiotics, followed by aminoglycoside. Cefoperazone/salbactum was found to be frequently prescribed empirically and cefuroxime as post-empirical. 31 patients experienced ADRs from the following drugs: Metronidazole, Ceftriaxone and Meropenem. **Conclusion:** We conclude by stating that though various classes of drugs managed cold and cough, it was observed that antibiotics were prescribed in majority of cases without even carrying out culture tests.

Keywords: *Cold and cough, Antibiotics, ADRs*

A COMPARATIVE STUDY ON PREVALENCE OF CVD AMONG PRE AND POST MENOPAUSAL WOMEN

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Background: Heart disease is the top killer of women, and a woman's risk for heart disease increases around the time she goes through menopause - typically between ages 50 and 54. Scientific studies and literature have been published and showed a strong relationship between menopause and CVD. Therefore, this study was carried out to determine the prevalence of CVD among menopause patients. **Objective:** To assess and compare the prevalence of cardiovascular disease among pre-menopausal and post-menopausal women by using JBS3 scale. **Methods**: A hospital-based prospective observational study was carried out at St. Philomena's hospital. The researcher analyzed the prescription of post-menopausal and pre-menopausal patients from the case record form of study subjects. Patient's BMI status, lipid profile, ECG, routine investigation was collected. Data were pooled, and a suitable statistical method was applied. **Results**: A total of 100 patients were enrolled for the study, among which 57 were post-menopause, and 43 were pre-menopausal patients. It was found that the majority of patients were between the age range of 40-45 years and 56-59 years. ECG value was found to be abnormal for post-menopausal patients compared to pre-menopausal patients. Echocardiogram reports demonstrated that post-menopause was associated with greater left ventricular relative thickness and reduced mid-wall fractional shortening than pre-menopause. By using JBS3 scale, it was found that post-menopausal patients had more risk of developing CVD than pre-menopausal patients. **Conclusion**: It can be concluded that post-menopausal patients are more prone to develop CVD than pre-menopausal patients.

Keywords: *Post-menopausal patients, pre-menopausal patients, Cardiovascular disease, JBS3 score*

ASSESSMENT OF INCIDENCE OF MEDICATION ERRORS AND ADOPTING STRATEGIES FOR CONTROLLING THE SAME IN A TERTIARY CARE CENTRE

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Background: A medication error is a failure in the treatment process that leads to, or has the potential to lead to, harm to the patient.' The outcome of the errors may vary from mild to even fatal consequences to the patient. Educational interventions can be employed to minimize the occurrence of errors. **Objectives:** 1) To identify medication errors such as prescription, administration and dispensing errors in the patients admitted in medicine wards; 2) To assess the consequences of medication errors in patients, and 3) To plan and implement educational strategy so that medication errors can be avoided in future. **Methods:** A prospective interventional study was conducted in the medicine wards of the hospital. Data were collected using structured data collection form. An information leaflet was developed to educate the health care professionals in reducing medication errors. **Results:** In a total of 120 medication errors identified, prescribing errors 98 (81.66%) were the most common, followed by administration errors 16 (12.5%). The possible causes of medication errors were failure to adhere to work procedures, illegible prescription, inadequate training of the staff, inexperience, wrong labelling/instruction, and lack of attention. Detailed information leaflet was submitted to the health care staff of medicine wards. There was a significant reduction in the incidence of prescribing errors 48 (64%) and administration errors 16 (12.5%). **Conclusion:** It can be concluded that clinical pharmacy research team helped in the documentation of medication errors and planned an intervention utilizing an information leaflet that helped minimize the medication errors.

Keywords: *Medication errors, Information leaflets, NCC MERP*

EFFECT OF COVID-19 ON THE ROLE OF COMMUNITY PHARMACISTS IN PERAK

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Background: Community pharmacists complement the private health care system in Malaysia. As an essential service, they have to stay open throughout this Coronavirus disease 2019 (Covid-19) pandemic to ensure the public will get their essential medications and healthcare items. However, the pandemic has affected their role tremendously. **Objective**: This study aims to evaluate the effect of the Covid-19 pandemic on the role of the community pharmacists in Perak, as well as the perception and reaction of the community pharmacists on their role during the pandemic. **Materials and methods:** The study engaged a cross-sectional convenience sampling method to collect the data, and the targeted respondents were community pharmacists around Perak. A Google form questionnaire was prepared and distributed to the respondents via email and social media. The questionnaire consisted of four sections, demographic data, the significance of community pharmacist's role, and the precautionary measures taken in response to the Covid-19 pandemic. **Results:** A total of 60 community pharmacists responded to the survey, and this was above the minimum sample size required, which was 50, at a confidence level of 90% with a margin error of 10%. The results revealed that 71.7% of the respondents preferred to have close contact during the counselling session, 60% of patients mentioned the drop of pharmaceutical care services given by the personnel, especially involving with the chronic illness patients, and 83.3% agreed that the community pharmacist was the main source of information for the public during the Covid-19 pandemic. **Conclusion:** The Covid-19 pandemic has affected the community pharmacists significantly, especially in their role in applying pharmaceutical care to patients, especially those with chronic illness. The counselling session during drug dispensing was affected due to maintaining a proper distance which could lead to errors in dispensing. The community pharmacist must also ensure the continuous supply of essential drugs and healthcare items vital to the public.

Keywords: *COVID-19, Community pharmacists, Effect, role, Action, Pharmaceutical care, Perak*

A STUDY ON PREVALENCE OF STRESS IN ACADEMIA

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Background: Academic and work-related stress are detrimental issues across various countries, cultures, and ethnic groups. The significance of this study is immensely unblemished due to the fact that it contemplates the aspect of stress among academia, who are the door keepers for future professionals with a set of enormous expectations and reforms as per the new era. **Objective**: To identify the prevalence of stress in academia, correlate the impact of profession on stress, and assess the quality of life in Academia. **Methods:** A prospective, cross-sectional, multi-centric study conducted at Adichunchanagiri University. The stress was measured by using Perceived Stress Scale and Quality of Life by using WHO Quality of Life Questionnaire. **Results:** Among 888 students, Engineering students had the highest level of stress, with significant relationship between course of study and stress (p=0.00). Further, the course of study had significant effect on physical health (p=0.000) and social health (p=0.03). Among 112 staff, Engineering staff had the highest level of stress with significant relation to profession (p=0.01) and gender (p=0.039). Further profession had significant effect on environmental health (p=0.03). **Conclusion:** Stress, physical health and social health were significantly related to the course of study among the students; profession was significantly associated with stress and environmental health among the staff. It is high time to work together to advocate change, starting with calling for a systematic effort to understand how the current culture, value systems, and working environment contribute to stress and the mental-health crisis in academia.

Keywords: *Academia, Stress, Quality of Life*

IMPACT OF ANEMIA ON DEPRESSION AND COGNITIVE ABILITY IN ADOLESCENT GIRLS

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Background: Anemia is a critical public health problem worldwide that affects women and children throughout the lifecycle, where adolescence is an opportune time for interventions to address anemia, as it is an important time of growth and development. Anemia not only affects the growth of adolescent girls but also their cognitive ability and mental health. **Objective:** To assess the impact of Amenia on Depression and Cognitive ability in adolescent girls. **Methods**: A cross-sectional study was conducted among adolescent girls. After receiving consent from each participant, the blood was withdrawn for estimating hemoglobin (Hb%) values. The Montreal Cognitive Assessment (MoCA) and Major Depression Inventory (MDI) were used for testing cognitive dysfunction and depression, respectively. The results were interpreted by using suitable statistics. **Results**: Out of 200 adolescent girls included in the study, 26.5% were diagnosed with anemic and 9.5% depression, whereas 28% experience cognitive impairment**.** Mean MoCA and MDI scores of the anemic subjects were identified as 23.75,3.507, respectively. Adolescents of age above 15 (p=0.001) have significant relation with anemia. There is no statistical significance for Anemia on Depression and Cognitive ability. **Conclusion**: The study concluded that adolescent girls who experience anemia, depression, cognitive impairment, and age have a significant relationship with anemia. There is a need to initiate programme for supplementation of iron and folic acid among adolescents to prevent the consequences of anemia. Since the current study was a pilot study, a more detailed study will be done on adolescent subjects to confirm the significance of anemia on the cognitive domains and depression."

Keywords: *Adolescent, Anemia, Depression, Cognitive ability*

A STUDY ON OTC DRUG USE IN COMMUNITY PHARMACY

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Background: In the current pandemic situation, patients are less likely to visit doctors for minor ailments. They prefer to take over counter medication as self-care. Medication patterns are an important health indicator because they reflect disease prevalence and therapeutic resource utilization in a community. Therefore, OTC drugs self-medication is often used as a significant indicator in evaluating the effectiveness of the health sector. Due to malpractices, self-prescribing is viewed as a larger problem in the health sector. With easy access to medication, this has become a more serious problem in developing countries. **Objective:** The study's goal is to look at information, mindset, and practice in the context of OTC drug use in community pharmacies. **Methods:** A prospective cross-sectional study was conducted in and around B G Nagar and its villages using validated data collection forms, questionnaires, and patient interviews. **Results:** A total of 263 subjects were recruited for the study, of which 176 (66.9%) subjects are self-medicating and 220 (84%) relying on community pharmacists for information. The main influencing factor is disease recurrence 197(74.9%), and the most commonly used OTC medication are analgesics 87(33.1%) followed by cough and cold preparations 41(15.6%). 232(88.2%) agree OTC medication is cheaper and convenient.196 (74.5%) believe that OTC medications can be used to treat common diseases. Note, the project is currently ongoing with a larger sample size on focus. **Conclusion:** The use of OTC drug use is prominent and need awareness programmes to promote rational drug use.

Keywords: *OTC, Community pharmacy, Factors influencing, Attitude*

SCREENING OF CARDIOVASCULAR DISEASE RISK FACTOR'S IN COMMUNITY PHARMACIES IN RURAL INDIA

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Background: Screening of cardiovascular disease risk factors enables early detection and primary prevention of CVD and minimizes the health associated cost. **Objective:** To screening of CVD risk factors in community pharmacies in rural India. **Methods**: A cross-sectional study conducted between February to April 2021, among 1200 healthy individuals were screened obesity, high blood pressure, waist circumference and history of smoking and alcohol intake. A structured questionnaire is used to get a physical activity and diet of participants. Main outcomes are Prevalence of overweight/obesity, hypertension, smoking and alcohol intake. **Results**: A total of 341subjects were screened, among 76.8% were male, and 23.2% were female. Based on age groups, 51.6% are below 45years, 31.4% are between 45-65 years and 17% are above 65 years. Prevalence of smoking and alcohol intake were 38.1%and 41.6%, respectively. Among 24% and 10% of males and females are either overweight (BMI≥25kg/m2) or obese (BMI≥30kg/m2), respectively. Using BP>130/80mmHg prevalence of hypertension was 26.7%, using BP>140/90mmHg prevalence of hypertension was 26.1%. Among 10.3% were previously hypertensive. Were 22% are high waist circumference and 9.4% are insufficient physically active and 23.8% are insufficient intake of fruits and vegetables. **Conclusion**: This study shows screening of CVD risk factors in community pharmacies and has the potential to discover previously undiagnosed risk factors. This community pharmacies-based model serves as a cost-effective method for primary prevention of CVD.

Keywords: *Community pharmacies, Obesity, Blood pressure*

ASSESSMENT OF KNOWLEDGE TOWARDS COVID 19 VACCINE AMONG THE VACCINATED POPULATION OF RURAL INDIA

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Background: Corona virus disease 2019, the deadly disease which has affected more than 200 countries caused by SAR Co-V-2, has a huge impact on loss of life and livelihood. Since the corona virus strain is highly contagious, harmful, and affecting the population widely and globally, "Vaccine "has become the effective strategy to eradicate corona virus and protect the population. Getting vaccinated is voluntary and is a societal responsibility. **Objective:** The study aims to assess the knowledge and attitude towards vaccination in rural India. **Methods:** This is a prospective survey was conducted on 596 individuals of rural Indian population using a validated questionnaire to assess the knowledge and attitude about the covid 19 vaccines. **Results: A** total of 596 participants were included in the study. As the study includes half the number of students (54.5%), the results show participants have good knowledge of the covid 19 vaccines. Almost (82.5%) of medical professionals strongly agree that taking vaccines can overweigh the risk, and about (37.8%) of the participants source for knowing about covid 19 vaccines was through news channels. It was also found that more than 2/3rd of people who responded that protective immunity against covid 19 belonged to low income (<1 lakhs) category (49.4%). **Conclusion:** The most important factor for most populations to get vaccinated is the fear of life. Half of the participants are students, and medical professionals are not scared and have good knowledge about vaccination and feel no harm in taking covid 19 vaccines.

Keywords: *COVID 19 vaccine, Knowledge, Rural India*

TO ASSESS NUTRITIONAL STATUS OF PREGNANT WOMEN LEADING TO MALNUTRITION

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Background: Pregnancy is a physiological stage. Maternal nutrition and health are important factors that affect embryonic development. Maternal malnutrition has a significant, serious and long-term impact on the mother and children, which plays an important role in premature birth, still birth condition and affects their fetus. Therefore, it is necessary to evaluate the nutritional status of pregnant women to avoid various complications. **Objective:** To study the nutritional status leading to malnutrition in pregnant women. **Methods:** An observational prospective study was conducted to assess nutritional status of pregnant women. Data was obtained using data collection forms, which included socio-economic status, anthropometric measurements, biochemical investigations, and dietary intake (24 hours of dietary recall) to assess malnutrition. **Results**: A total of 30 pregnant women were included in the study**,** of which majority, 76.6% of them were in the age group of 20-25 years, and 23.3% were 26-30 years of age. Family annual income of 66.6% of pregnant women was less than 1 lakh, 13.3% of them had less than 2.5lakh and 20% had above 2.5lakh. 10% of subjects were underweight, 80% had normal BMI, 10% were overweight. 50% of subjects had mild anemia, 6.6% had moderate anemia, while 50% had normal hemoglobin. By assessing the data, we found that 56.6% of pregnant women were well-nourished, and 43.3% were malnourished. **Conclusion:** Nutritional status of pregnant women was affected due to factors like Income, Hemoglobin levels, body mass index and their dietary intake.

Keywords: *Malnutrition, Pregnant Women, Anemia*

ASSESSMENT OF MALNUTRITION IN CHILDREN

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Background: Malnutrition is the main reason for the changes in child mortality and morbidity. Several socioeconomic factors may influence malnutrition in children. In children, nutritional deficiency may cause diarrhea, recurrent illness, and other chronic diseases. Therefore, it is necessary to assess malnutrition in children. **Objective:** To assess malnutrition in children by using anthropometric measurement. **Methods**: A prospective observational study was conducted to assess malnutrition in children. Data were obtained using data collection forms which included information about anthropometric measures such as height, weight, BMI and MUAC of children aged 6 months to 7 years. **Results**: A total of 40 children were included in the study, of which 55% were male, and 45% were female. 35% of them were 3 to 5 years old, and 32.5% of them were 6months to 2 years, and 32.5% of children were 6 to 7 years. 57.5% of parent's annual income was above 11,000, and 12.5% had above 1 lakh, and 30% had above 2.5lakh.60% of the children were severely underweight, 7.5% were moderately underweight and 32.5% children were normal, while 80% of children had normal MUAC and 20% of them had low MUAC. From the above data 62.5% were malnourished and 37.5% were well nourished. **Conclusion**: This study concluded children's underweight measures acute and chronic malnutrition and wasting represents a failure to receive adequate nutrition. Likewise, children`s gender, age, size at birth, height, weight and low MUAC also predicts wasting among children.

Keywords: *Malnutrition, MUAC, BMI, Wasting, Anthropometric*

ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE IN HYPERTENSIVE PATIENTS IN A TERTIARY CARE TEACHING HOSPITAL

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Background: Hypertension is a major cause of cardiovascular complications around the world. This is also called the "sleeping snake," which bites when it wakes up. Despite significant progress in raising awareness, treating, and controlling HTN, undiagnosed and uncontrolled HTN continues to be a major public health problem. **Objective:** This study aims to assess the knowledge, attitude, and practice in hypertensive patients. **Methods:** A prospective cross-sectional study was conducted on the sample size of 300 hypertensive patients admitted to the AH&RC during the period from February 2021 to June 2021. A well-designed data collection form was used to collect the sociodemographic details, patient history of illness, personal, social, family and medication. A well designed and validated KAP questionnaire of knowledge, attitude and practice on hypertension consisting of 22 questions were used to determine the KAP scores. **Results:** A total of 300 patients met the inclusion criteria, and 62.3% of them were males, and 37.7% were females. 42.8% of total patients had hypertension for <5 years, and 57.2% had hypertension for >5 years. 80% of the total patients were educated, and 20.5% were illiterates. More than 60% had moderate knowledge, more than 75% had moderate attitude, and more than 70% had adequate practice towards hypertension. **Conclusions:** knowledge about hypertension in hypertensive patients is not adequate and is alarmingly poor in them. This study signifies that patient require support and guidance from the clinical pharmacist for improving their knowledge towards hypertension.

Keywords: *Attitude, Hypertension, Knowledge, Practice*

COVID-19 PATIENT WITH STEVEN JOHNSON SYNDROME - A CASE REPORT

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Covid-19, a virus caused by SARS-CoV-2, has sparked widespread panic, driving the use of off-label treatments with dubious clinical efficacy and safety. Steven Johnson Syndrome is a rare, life-threatening, immune complex-mediated hypersensitivity reaction that typically involves the skin and mucous membranes, causing extensive apoptosis with the collection of clinical symptoms of mucocutaneous eruption and usually associated with medicine use. In this case report, we will look at a 42-year-old man with a history of systemic hypertension who was RT-PCR positive for Covid-19 and developed Steven Johnson syndrome immediately after finishing a 14-days treatment regimen with the standard mild to moderate in-home quarantine protocol. This is the first time we have come across SJS in a patient on Covid-19.

Keywords *Covid-19, Steven Johnson Syndrome, Drug-Induced, Adverse Drug Reaction.*

A STUDY OF ANTIBIOTIC RESISTANCE ON PATIENTS IN TERTIARY CARE TEACHING HOSPITAL OF SOUTH INDIA

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Background: The word "antibiotic" is derived from "anti" (meaning against) and "biotikus" (meaning fit for life), and therefore, it means "life-killing." Infections with antibiotic-resistant organisms are associated with significant morbidity and mortality. Antibiotic-resistant infections are increasing nationally and globally. This is primarily due to the selective pressure created by the broad use of antibiotics. **Objective:** To study antibiotic resistance and to identify the bacteria causing antibiotic resistance. **Methods**: This is prospective, observational study. Blood and urine samples are collected from patients, samples taken to microbiology laboratory and analysis of collected samples are done. **Results**: A total of 8 patients was enrolled in the study. Out of that, two Gram-positive bacteria were identified (staphylococcus and enterococcus), and three-gram negative bacteria were identified (Klebsiella, *E. coli*, NFGNB). In gram-positive bacteria's staphylococcus and enterococcus both were resistant to ampicillin, cefotaxime, norfloxacin, cotrimoxazole, chloramphenicol, nitrofurantoin was 100%, resistant to ofloxacin was 66.6%, resistant to levofloxacin was 60 % and sensitive to penicillin, linezolid, vancomycin was 100%, sensitive to gentamicin was 66.6%, sensitive to ciprofloxacin was 50%.In gram-negative bacteria's like E.coli, Klebsiella, NFGNB resistant to ampicillin, cefotaxime, nalidixic acid was 100%, resistant to amoxiclav, levofloxacin, ofloxacin was 80 %, resistant to gentamicin, cefepime was 66.6 % and sensitive to tobramycin was 70%, sensitive to nitrofurantoin was 50%, sensitive to meropenem was 40%. **Conclusion**: Higher rates of ampicillin, cefotaxime, nitrofurantoin resistant staphylococcus isolates were observed, and high rates of ampicillin, cefotaxime resistant *E. coli* isolates were observed.

Keywords: *Antibiotic resistance, Sensitive*

ASSESSMENT OF ATTITUDE TOWARDS COVID-19 VACCINE AMONG THE VACCINATED POPULATION OF RURAL INDIA

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Background: Coronavirus disease (COVID-19) is a deadly disease caused by SARS-CoV-2, is a serious public health concern worldwide and is highly contagious. With the distribution of vaccines underway, it is very important to examine community acceptance of COVID-19 Vaccinations. Interpreting people's knowledge, attitude, practices, and concerns regarding COVID-19 vaccine will improve its mass acceptance. **Objective:** To assess the attitude towards COVID 19 vaccine among the vaccinated population of rural India. **Materials and methods:** This are a Prospective study conducted at AH&RC for over a period of 6 months. A validated questionnaire from previously published articles was used for collecting data, and it was circulated through google generated links via WhatsApp, mail and/or by direct enquiry. Frequency and percentages were calculated for categorical variables. Data were analyzed using SPSS 20.0(IBM) software. A Chi-square test was used, and P-value <0.05 using two-tailed test was considered statistically significant. **Results:** A total of 596 subjects participated in the survey, of which 569(95.4%) subjects believed that taking the COVID 19 vaccine is a societal responsibility, 503(84.4%) subjects said that even after getting vaccine, they need to follow preventive measures, 517(86.7%) subjects were proud and confident after taking vaccines. And most of the subjects, 563(94.5 %), recommended vaccines for their family and friends. This study interpreted that the subjects have positive attitude about vaccination. **Conclusion:** Half of the participants, being students are not scared and have a positive attitude towards vaccination. Many sources influenced them for getting vaccinated.

Keywords: *Vaccination, COVID-19, Attitude*

A STUDY OF DRUG BURDEN INDEX OF ANTICHOLINERGIC AND SEDATIVE MEDICATIONS IN ELDERLY PATIENTS

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Introduction: The Drug Burden Index is an evidence-based tool that measures a person's total exposure to medications with sedative and anticholinergic properties and has been shown to be independently associated with impairment in cognitive and physical function, which are assessed by Barthel index, a standardized tool to Quality of Life. **Methods**: A retro-prospective study was conducted in Adhichunchanagiri Hospital and Research Centre, B.G Nagar. Data collection form was used to collect all the necessary information. Drug burden index for the prescribed Anticholinergic and sedative medications using standardized Drug Burden Index formula and the physical ability of study participants were assessed using Barthel index. **Results**: Among 100 participants, 64 were males, and the rest 36 were females .53 participants (53%) were found to be highly exposed to Anticholinergic and sedative medications whose calculated Drug burden index was ≥1 and the rest 47 participants (47%) had a Drug burden index of <1. Out of total of 32 drugs prescribed, the commonly prescribed drugs were Lorazepam (32%), Tramadol (15%), trihexyphenidyl and Risperidone (9%), and most common Adverse drug reaction associated were constipation (21%), drowsiness (19%). Among 49 participants, 42 were found to be dependent, and 7 were independent. **Conclusion**: Among the participants, above 50% were associated with high drug burden index exposure and out of 49 participants, the physically disabled/dependent was 42 as per Barthel index. Commonly prescribed medications found were lorazepam, tramadol, trihexyphenidyl, risperidone and levocetirizine, causing common adverse drug reactions such as constipation, dry mouth, drowsiness, dizziness, pruritus.

Keywords: *DBI, Anticholinergics, Sedatives, Geriatrics*

PRESCRIBING PATTERN OF ANTIDIABETIC DRUGS AND ACHIEVEMENT OF GLYCEMIC CONTROL IN TYPE TWO DIABETIC MELLITUS PATIENTS IN A TERTIARY CARE TEACHING HOSPITAL

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Background: Despite the worldwide availability and use of Anti-diabetic drugs, different mechanisms to reduce blood glucose are used. The extensive therapy options are available for various stages of type 2 diabetes. **Objective:** To study the prescribing pattern of anti-diabetic drugs and achievement of glycemic control in type two Diabetic Mellitus patients in a tertiary care teaching hospital. To study the impact of adherence on glycemic achievement and to identify the drug interaction of anti-diabetic drugs with other drugs. **Methods:** A prospective observational study was carried out over a period of 9 months. The patients prescribed anti-diabetic drugs were enrolled in the study after procuring their written consent. All the patient data, including the prescription, lab data, and patient adherence, were audited and recorded using a specific scale. Drug interactions were identified using Stockley's drug interaction and Micromedex. The data collected and documented were subjected to suitable statistical analysis. **Results:** As a result of the study most frequently prescribed category of drugs were found as Biguanides111 (39.08%) followed by Insulin preparations 107(37.67%). Metformin was prescribed drug74(52.85%) followed by Metformin + Glimepiride 37(26.42%). Out of the total population under the study, 41.4% attained glycemic control, whereas rest, 58.6%, remained with uncontrolled glycemic control. **Conclusion:** From the study, it was concluded that most of the subject's Glycemic control could not be achieved due to a lack of medication adherence, which can be improved by proper education and awareness.

Keywords*: Glycemic control, Medication adherence, Oral hypoglycemic agent*

INHIBITORS FROM *Christia vespertilionis* LEAVES EXTRACTS

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Background: *Christia vespertilionis,* known as 'Rerama' in Malaysia, is a medicinal plant belonging to Fabaceae family and is used to manage diabetes traditionally. **Objective**: The study aims to identify *C. vespertilionis*'s α-glucosidase inhibitors using a Gas Chromatography-Mass Spectrometry (GCMS) based metabolomics approach. **Materials and Methods:** The extraction of *C. vespertilionis* leaves extracts were done using numerable solvents including ethyl acetate, ethyl acetate; hexane, ethyl acetate: methanol, methanol, and hexane. The extracts were tested for α-glucosidase inhibitory assay, and profiling GC-MS analysis were done. Chemometric tools were applied to identify the significant chemical markers present in the plant's leaves. **Results:** The leaves extracts showed the IC_{50} value of α-glucosidase ranging from 0.204 µg/mL to 0.475 µg/mL with ethyl acetate: hexane extract exhibiting highest inhibitory activity with the lowest IC_{50} value of 0.204 µg/mL. The multivariate data analysis has revealed a total of 24 α-glucosidase inhibitors from *C. vespertilionis* leaves. **Conclusion:** This plant has significant potential to manage hyperglycemia. Further studies of *in vitro* in the animal model and toxicity should be carried out to enhance its uses in the pharmaceutical field.

Keywords: *Metabolomics, α-Glucosidase inhibitory activity, Multivariate data analysis, Christia vespertilionis*

DEVELOPMENT AND VALIDATION OF AN LC-MS/MS METHOD FOR DETERMINATION OF ATORVASTATIN IN HUMAN PLASMA

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Background: A rapid, sensitive, and selective LC-MS/MS method was developed and validated to determine Atorvastatin in human plasma. **Objective:** The purpose of this study was to develop and validate a specific and sensitive liquid chromatography-tandem mass spectrometry method for quantification of Atorvastatin in human plasma. **Materials and Methods**: Protein precipitation was used for sample preparation and analysis, followed by liquid chromatography-tandem spectrometric analysis and an electrospray-ionization interface. Atorvastatin was analyzed on a Zorbax Eclipse XDB-C_8 (100 mm X 4.6 mm, 3.5 µm) column with the mobile phase run isocratically with tertbutyl methyl ether: n-hexane (70:30, v/v). Atorvastatin and Rosuvastatin were recorded at the total ion current of their relevant multiple reaction monitoring. The LC-MS/MS system is composed of an Agilent 1100 infinity combined with an AB Sciex Qtrap 4000 Thermo Finnigan TSQ quantum discovery triple quadrupole mass spectrometer. **Results**: The method was validated for accuracy, precision, linearity, selectivity, lower limit of quantification and matrix effect. Atorvastatin has checked the various stability studies like short-term stability at25^{0}C, long-term stability for 55 days at -70^{o}C, wet extract stability for 54 hours, autosampler stability for 63 hours, and bench-top stability 14 hours and freeze-thaw stability at -60^{o}C. **Conclusion**: The resulting method was fully validated according to international guidelines and demonstrated good selectivity and sensitivity with minor levels of a matrix effect and high accuracy. Hence, it can be used for routine drug analysis of Atorvastatin in human plasma samples.

Keywords: *Atorvastatin, Rosuvastatin, Determination, Human Plasma, LC-MS/MS, Validation.*

COMPARATIVE RELEASE STUDIES OF TRANSDERMAL PATCH PREPARED FROM SYNTHETIC, SEMISYNTHETIC AND NATURAL POLYMERS

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Transdermal patches offer greater potential in delivering the drugs through skin. In this project, transdermal patches of Diclofenac sodium were prepared by solvent casting method using various synthetic, semi-synthetic and natural polymers. Naturally, a purified finger millet floor was selected as a natural polymer. In contrast, acetylated and oxidized finger millet powder were semisynthetic polymers, and hydroxy propyl methyl cellulose (HPMC) and ethyl cellulose (EC) were synthetic polymers. Fifteen transdermal patches were prepared using the above polymers in 1%, 2 % and 3 % w/w concentrations. Glycerin and propylene glycol were selected as plasticizers, and oleic acid was used as a permeation enhancer. Patches were evaluated for organoleptic properties, weight uniformity, thickness, folding endurance, moisture content, tensile strength, pH, swelling properties & in vitro drug diffusion studies. Briefly, the results indicated that all the patches were having 0.1 to 0.4 mm thickness, pH was ranging from 6.8 to 7.8. Most of the stable patches were found to be forming at 1-2% concentration. Further, acetylated and oxidized polymers were showing relatively poor tensile strength and folding endurance when compared with natural polymers. In vitro release studies indicated that drug was maximum in semi-synthetic polymers when compared to the other polymers. FTIR studies indicated no significant interaction with drugs and polymers. In conclusion, transdermal patches can be effectively-prepared using natural and oxidized finger millet polymers.

Keywords: *Natural polymers, Transdermal patches, Oxidized finger millet polymers*

CHARACTERIZATION OF A NOVEL PROTEIN FROM *CURCUMA AROMATICA SALISB*

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Background: *Curcuma aromatica Salisb* is a rhizome found in the south Asian region, eastern Himalayas, and Western Ghats (India). It has a wide range of active constituents and is used in cosmetics and herbal medicine. **Objective:** The study is aimed to isolate and characterize a novel protein from *Curcuma aromatica S*. and investigate the protective effect of purified protein against tertiary butyl hydroperoxide (t-BOOH) induced DNA damage and free radical scavenging properties. **Methods**: The water-soluble protein was isolated from *Curcuma aromatica* and purified by column chromatography followed by RP-HPLC. The molecular weight of the novel protein is confirmed with SDS PAGE and MS MALDI. The antioxidant efficiency of the protein was evaluated by DPPH, Hydroxyl and superoxide radical scavenging activities. The DNA protectant activity of the protein was studied using t-BOOH in submarine agarose gel electrophoresis, where ascorbic acid was used as standard antioxidant. **Results**: The purification studies revealed that the protein isolated from *Curcuma aromatica* is 15.4 kDa. The protein showed single sharp peak in RP-HPLC with a retention time of 3.17 min. This protein scavenged DPPH radicals, free radical and superoxide radicals about 50-55%. Further novel protein prevents t-BOOH (144µM) induced DNA damage as evidenced by agarose gel electrophoresis. **Conclusion**: The above study and results indicate that the isolated protein from Curcuma aromatic S is effective as an excellent antioxidant.

Keywords: *Curcuma aromatica, Chromatography, Radicals, Tertiary butyl hydroperoxide (t-BOOH), Antioxidants.*

ANTIOXIDANT AND FREE RADICAL SCAVENGING ACTIVITIES OF POLYPHENOL-ENRICHED AGATHI LEAF (*SESBANIA GRANDIFLORA*) EXTRACTS

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Background: *Sesbania grandiflora* is a small loosely branching tree belonging to the family Fabaceae and genus Sesbania. Agathi flowers and leaves are loaded with a myriad of nutrients, including protein, minerals and vitamins. *Sesbania grandiflora* plant leaves are a good source of vitamin a, folate, thiamin, niacin, and vitamin c. flowers also render ample amounts of magnesium, phosphorus, potassium, and selenium. **Objective:** The study is aimed to investigate the *in vitro* antioxidant properties of different extracts (water, alcohol, alcohol:water, hexane or chloroform extract) of *Sesbania grandiflora* leaves using various assays. **Methods**: The above said different extracts are evaluated using various proximate analysis and antioxidant models like DPPH, superoxide, hydroxyl radical scavenging, ferric ion reduction and ferrous ion chelation activities. **Results:** The alcohol:water (1:1) extract of *Sesbania grandiflora* leaves showed that it is rich with polyphenols and highest antioxidant and free radical scavenging activity. It inhibited the DPPH radicals by 66%, at 50 µg/ml, scavenged 63% of superoxides at 200 µg/3 ml and scavenged approximately 70% of hydroxyl radicals at 4–5-fold lower concentrations compared to standard antioxidants. **Conclusion**: These results establish the antioxidant potential of *Sesbania grandiflora* leaves extract, which could be used as natural antioxidant source.

Keywords: *Sesbania grandiflora leaves, Radicals, DPPH, Hydroxyl, Superoxide, Antioxidants*

FORMULATION AND EVALUATION OF EFINACONAZOLE SOLID LIPID NANOPARTICLES LOADED TOPICAL GEL

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The purpose of this study was to prepare solid lipid nanoparticles (SLNs) of Efinaconazole, a novel triazole antifungal that inhibits the fungal cytochrome P450 enzyme. Efinaconazole-loaded SLNs were prepared by the emulsification-solvent diffusion method using glycerol monostearate and Poloxamer 188. Developed SLNs were evaluated for particle size, surface morphology and entrapment efficiency, whereas SLNs loaded gels were evaluated for pH, viscosity, spreadability and drug release profile. Two operating variables, Poloxamer 188 concentration and amount of lipid, were found to significantly affect the particle size and entrapment efficiency of the SLN. The maximum entrapment efficiency was found to be 98.87 %, with particle size of 290.90 nm. The scanning electron microscopy and potential zeta study showed formation of good SLN dispersion. The pH of gel formulations was in range of 5.8±0.21 to 6.5±0.47, which is compatible with skin pH. The F8 formulation had shown maximum entrapment up to 98.87 %.and sustained drug release for more than 12 hours. The slow release of the Efinaconazole from most prepared SLNs suggests homogeneous entrapment of the drug throughout the systems, and controlled drug release can be obtained when the drug is evenly dispersed in the lipid matrix. The drug release kinetic showed Higuchi release kinetic and found to follow Supercase II release mechanism. The stability study showed successful formation of stable SLNs. Thus, SLNs proved the potential for topical delivery of anti-fungal drugs over conventional formulations.

Keywords: *Efinaconazole, Solid lipid nanoparticles, Poloxamer 188, Topical delivery*

THE EFFECTIVENESS AND COST-EFFECTIVENESS OF BLOOD PRESSURE SELF-MONITORING IN HYPERTENSION: A SYSTEMATIC REVIEW

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Background: Hypertension is one of the diseases that can cause many complications. It leads to many other diseases if left untreated, such as cardiovascular diseases and kidney failure. Hence, self-monitoring blood pressure (SMBP) has been introduced to the management of hypertension. This method helps the patient to monitor their blood pressure outside the clinic or hospital independently. **Objective:** To systematically review the effectiveness and cost-effectiveness of blood-pressure self-monitoring in the management of hypertensive patients. **Methodology:** A systematic literature search was conducted in PubMed, Cochrane Library, Scopus and Gray literature by following the criteria of PICOS framework. Each author has screened for final articles, extracted relevant data and evaluated their quality using the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) and Risk of Bias 2.0 (RoB2) tool. Data were descriptively summarized. **Results:** Twelve published pharmacoeconomic studies were eligible to be included in this review. Based on the quality and risk of bias assessment, both RCT studies were identified to have high risk of bias, meanwhile, for the ten-cost-effectiveness analysis (CEAs) articles, only one was identified to have low quality. SMBP was found to be effective and cost-effective in all of the articles included in the review. **Conclusion:** In all studies included in the review, the implementation of SMBP in managing hypertensive patients was both shown to be effective and cost-effective. This strategy should be implemented in current clinical practices as it might help to reduce the comorbidities and mortality rates associated with hypertension that is happening all over the world.

Keywords: *Ambulatory blood pressure monitoring (ABPM), Cost-effectiveness, Effectiveness, Home blood pressure monitoring (HBPM), Hypertension, Self-blood pressure monitoring (SBPM), Telemonitoring*

WEIGHT PERCEPTION, WEIGHT STIGMA CONCERNS AND WEIGHT LOSS ATTEMPTS OF MALAYSIAN ADULT

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Background: Obese or overweight people have been subjected to discrimination in society. Therefore, many people have tried a variety of weight-loss methods in order to achieve ideal body weight. According to several studies, perceived weight status is more closely associated with weight loss attempts than assessed weight status. **Objective:** This study aims to investigate the association between the accuracy of body weight perception, weight stigma concern, and weight loss attempts in Malaysian adults. **Material and Methods:** This cross-sectional survey-based study targeted Malaysian adults aged 18-60 years. A validated questionnaire was disseminated online using Google form to collect respondent's socio-demographic characteristics, weight stigma concerns, body weight perception and weight loss attempts. SPSS for Windows version 23.0 software were used to perform all data analysis. Descriptive statistics, Chi-squared test, and Spearman's rho test were used to analyse the data. **Results:** A total of 224 respondents from 329 (68.1%) are female, and most are Malay (81.5%) aged 18-24 years (72.6%). Their body weight status is underweight (14.3%), normal weight (53.8%), overweight (15.2%) and obese (16.4%). Most of the respondents perceived their weight correctly (78.7%), while 9.7% underestimate and 11.6% overestimate it. More than half of respondent's concern about weight stigma (52.0%). The association between accuracy of weight perception with weight lost attempts is significant ($p<0.05$). Weight stigma concerns showed a weak correlation with weight loss attempts ($p<0.01;\ r=0.007$). **Conclusion:** Someone's motivation to achieve or maintain a healthy body weight may be affected by their accurate body weight perception and concern about weight stigma.

***Keywords*:** *Weight perception, Weight stigma concern, Weight loss attempts, Malaysian adults*

KNOWLEDGE, ATTITUDE AND SYMPTOM OF MENOPAUSE AMONG MIDLIFE WOMEN IN MALAYSIA

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Background: Some physical, emotional, social, and psychological changes occur during menopause; therefore, a better understanding of these symptoms is necessary to help women cope with these changes. **Objective:** The study aims to determine the knowledge, attitude and symptoms of menopause among midlife women in Malaysia. **Material and Methods:** This cross-sectional survey-based study targeted midlife women aged 40-60 years in Malaysia. The survey used a validated questionnaire that was provided in Google form and disseminated online. The study parameters were respondent's knowledge, attitude and symptoms of menopause. SPSS for Windows version 26.0 software were used to perform all data analysis. Demographic characteristics were analysed using descriptive statistic while the correlation between study parameters were assessed using Spearman's correlation test. **Results:** Out of 300 respondents, 72.5% are female, and most are Malay (82.4%) aged 55-60 years (79%). More than half of the participants have poor knowledge (52%) with negative attitude (54.7%) towards menopause. A total of 117 respondents (39%) has mild menopause problems, while the rest have moderate (35.7%), severe (12.0%) and complete problems (1.0%). Only 37 participants (12.3%) claimed that they have no menopause symptoms. A positive but weak correlation ($p<0.000;\ r=0.249$) was observed for the correlation between knowledge and attitude, while a negative but strong correlation ($p<0.05;\ r=-1.25$) was observed for correlation between symptoms and attitude of participants. **Conclusion:** Concerns regarding education about menopause knowledge should be addressed. It is important for women to be more prepared for the menopause period and also to accept the condition positively.

***Keywords*:** *Knowledge, Attitude, Symptoms, Menopause, Midlife woman, Malaysian adults.*

OPTIMISATION OF ARGININE INTAKE IN VERY PRETERM NEONATES ON NEONATAL PARENTERAL NUTRITION FORMULATION IN UK

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Background: Review of the literature resulted in a dose concentration graph that suggested a percentage content of about 14% and absolute arginine intake of about 600mg/kg/day to achieve target plasma arginine levels ≥ 80 micromoles/L. Previous studies have reported that VPNs dependent on PN have low plasma arginine levels and an oversupply of essential amino acids (EAAs). Modified PN formulations using two different base AA solutions containing 14% arginine were designed and manufactured in an aseptic setting. These formulations were tested in a stability testing study using common physical tests such as visual appearance, pH, optical rotation, UV absorbance, sub-visible particle count and AA assay. **Method:** A clinical study (PAINT-NH4) compared the plasma AA profiles of VPNs on standard PN formulation (containing 6% arginine) versus intervention PN formulation (containing 14% arginine). Blood samples were collected on Day 3 and Day 10 of life while studying PN formulation was given until Day 10 of life. **Results:** The findings suggested that on Day 3, plasma arginine levels were significantly different between the treatment groups. Whereas on Day 10, plasma arginine levels were not significantly different. The plasma AA profiles in the intervention group rebalanced to resemble the reference range values more closely. **Conclusion:** An increased arginine content while maintaining overall AA intake resulted in rebalancing of the profiles. Plasma arginine levels increased, whereas the oversupply of EAAs reduced. Future work has been proposed to test an 18% arginine content solution with current AA intakes to achieve target plasma arginine levels above 80micromoles/L.

Keywords: *Parenteral nutrition, Arginine, very preterm neonates*

ANTIOXIDANT AND SUN PROTECTION POTENTIAL OF FORMULATED SUNSCREEN CREAM COMPRISING FRUIT EXTRACT OF PHALERIA MACROCARPA

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Background: Exposure to ultraviolet light at the cellular level on our skin leads to sunburn and the formation of free radicals. Sunscreen formulations help reduce the risk of skin burn, skin cancer and prevent early signs of skin aging. Plant-based extracts have been widely used as a potential source of sunscreen formulations due to their high antioxidant and UV absorption properties. **Objective:** The objective of the study was to evaluate the antioxidant and sun protection factor (SPF) of formulated sunscreen cream from the fruit extract of *Phaleria macrocarpa.* **Materials and Methods:** The methanolic extract of the fruits was tested for its qualitative phytochemical screening, free radical scavenging activity using DPPH assay, and SPF determination of the extract and cream was calculated using spectrophotometric method in the wavelength range of 290 to 320 nm against titanium dioxide as standard. **Results:** Phytochemical screening confirms the presence of flavonoids, alkaloids, proteins, tannins, and phenolic compounds. Free radical scavenging activity of the methanolic fruits extract of *P. macrocarpa* exhibited IC_{50} at a concentration between 62.50 g/ml - 125 µg/mL and was compared against standard ascorbic acid. Sunscreen potential of the formulated cream was found to be 8.58. Furthermore, physicochemical evaluation of formulated cream showed good results in the following parameters like pH, dye test, homogeneity, appearance, after-feel effect, ease of removal, physical stability, and microbial limit test. **Conclusion:** The result of the study indicates fruit extract of *P. macrocarpa* can be used as a potential UV ray barrier due to its commendable antioxidant property and its acceptable sun protection factor.

Keywords: *Phaleria macrocarpa, Phytochemicals, Antioxidant, Sun Protection Factor, Cream.*

IN VITRO NEUROPROTECTIVE POTENTIAL OF ETHYLACETATE FRACTION FROM HYDROALCOHOLIC EXTRACT OF PHYLLANTHUS NIRURI

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Background: Alzheimer's disease (AD) is a neurodegenerative disease that manifests with loss of memory, mental and physical behavioural changes, and reduced quality of life for elderly patients. Acetylcholinesterase (AChE) has proven to be the most viable therapeutic target for symptomatic improvement in devastating diseases because the cholinergic deficit is a consistent finding in AD. Lipoxygenases (LOX) causes the progression of neuroinflammation. Studies revealed that inflammatory processes are playing a key role in mechanisms of neurodegeneration**. Objective:** This study is sought to assess in-vitro acetylcholinesterase activity and the anti-inflammatory actions of various fractions from the hydroalcoholic extract of the whole plant of *Phyllanthus niruri* (HAPN). **Materials and Methods**: Crude hydroalcoholic extract and four fractions (petroleum ether, n-butanol, ethyl acetate and water) were prepared from the whole plant of *Phyllanthus niruri* (PN). Acetylcholinesterase inhibition was measured by Ellman's method. Lipoxygenase inhibiting activity was evaluated using 96-well microplate-based ferric oxidation of xylenol orange (FOX) assay. **Results**: All fractions of extracts inhibited acetylcholinesterase in a dose-dependent manner. Among the different extracts tested, the ethyl acetate fraction exhibited the highest inhibition of AChE activity, with the IC_{50} value determined to be 158.87 µg/ml. The standard used was Donepezil. Lipoxygenase inhibition level of ethyl acetate fraction was observed in the range of 95.80% at the concentration 1000µg/ml compared to ibuprofen. The IC_{50} value was found to be 270.4 µg/ml. **Conclusion**: Our findings indicated that the ethyl acetate extract of HAPN suppresses AChE and LOXs, suggesting that it could be used to treat Alzheimer's disease.

Keywords: *Alzheimer's disease, Neuroinflammation, Acetylcholinesterase, Lipoxygenases, Phyllanthus Niruri.*

CENTELLA *ASIATICA* (L.) URBAN ATTENUATES HIPPOCAMPAL INJURY IN CHRONIC STRESS INDUCED WISTAR RATS

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Background: Stress is an organism's physiological and psychological reaction to external stimuli, and when it becomes chronic, it causes depression. The hyper-responsiveness of glucocorticoids leads to degeneration of hippocampal neurons resulting in depression. Anti-depressants have limitations, including causation of embryological defects. *Centella asiatica* (CA), an herb, has been used in traditional medicine for its neuroprotective properties and less toxicity. **Objective:** To examine the neuroprotective effects of crude extract of CA in chronic mild stress (CMS) induced male Wistar rats. **Materials and Methods**: Thirty-six Male Wistar rats aged 8 – 10 weeks were held in six groups. One group was a control. CMS was administered to the other groups by various stressors viz. restrain, forced swimming in cold water, overnight food and water deprivation, wet bedding, cage tilt at 45°, tail pinching, overcrowding of cages, and change of cage mates randomly for a period of 64 days. One of the stress-induced groups was retained as model group while others were administered with crude extracts of CA at the doses of 200, 400, 800 and fluoxetine (Flx) 10 mg/kg body weight. The rats were euthanised, and the brain tissue and blood samples were collected. The blood samples were estimated for cortisol levels, while the hippocampus was histologically analysed using Nissl's stain. **Results**: The rats receiving CA showed attenuated cortisol levels, and Nissl's staining revealed a higher number and density of viable neurons of hippocampus. **Conclusion**: CA effectively attenuates CMS induced increase in cortisol levels and reduces the loss of hippocampal neurons. CA could prove a useful agent in the long-term prevention of stress-induced neurologic damage and depression.

Keywords: *Chronic stress, Centella asiatica, Hippocampus, Nissl's stain, Fluoxetine.*

A NARRATIVE REVIEW ON ANTIBACTERIAL ACTIVITY OF *Nephelium lappaceum* L. EXTRACTS

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Background: *Nephelium lappaceum* L., locally known as 'rambutan', is an exotic tropical fruit under the Sapindaceae family. It has been used as traditional medicine to treat diseases/disorders such as diabetes, high blood pressure, diarrhoea and dysentery. Previous studies reported that rambutan possesses several bioactive compounds, including geraniin, phenolics, and flavonoids, claimed to have antibacterial properties. However, a comprehensive review of antibacterial activities of this plant is still lacking. **Objective:** The purpose of this review is to determine the antibacterial activity of *Nephelium lappaceum* L. extracts against Gram-positive and Gram-negative bacteria. **Materials and Methods**: The electronic databases (ProQuest, Wiley Online Library, Springer Link and PubMed) were used to gather the relevant information by using two specific keywords: "antibacterial activity" and "*Nephelium lappaceum* L." **Results**: Several studies reported the antibacterial activity of the methanol, ethanol, petroleum ether, chloroform and aqueous extracts of rambutan peel against Gram-positive and Gram-negative bacteria. The extract of other rambutan parts, including seed, leaves and flesh, also showed significant antibacterial activity against majority of tested bacterial species. **Conclusion**: This review demonstrated that rambutan had a promising antibacterial activity. More studies should be conducted, including in vivo studies, to understand mechanisms of action and its potential to develop new antibiotics.

Keywords: *Antibacterial, Nephelium lappaceum L., Rambutan*

KNOWLEDGE, AWARENESS AND PREVALENCE OF INSOMNIA AMONG PHYSIOTHERAPY STUDENTS

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Background: Substantial evidence shows that issues of insomnia and other sleep-related disorders are increasing. Modern-day, unhealthy lifestyle, unending competition, taking sleep for granted are common contributing factors. Poor quality sleep may impact cognitive abilities and academic performance. **Objective:** This study was conducted to determine knowledge, awareness, and prevalence of insomnia among physiotherapy students. **Method:** Descriptive cross-sectional study design has been used. A total of 208 physiotherapy students participated in this study, with a response rate of 95%. Self-designed questionnaire and Athens Insomnia Scale were used in this research to collect data. **Result:** The awareness of insomnia was up to a satisfactory level, but the knowledge of concepts of insomnia and practice of healthy sleep was inadequate. This study also explores other attributes such as acquiring 4 to 6 hours of sleep per day and using electronic devices that may impact sleep quality. A high prevalence of insomnia was recorded in this study, with 50% of the participants found to be insomniac according to Athens Insomnia Scale. **Conclusion:** There is an imperative need to improve awareness & knowledge of importance of sleep among the students. Initiatives such as running campaigns-programs, workshops, seminars & other educational program to increase awareness & knowledge of sleep can make the difference. Scope of physiotherapy in Sleep Medicine needs more scientific corroboration. Good quality sleep can increase immunity, cognitive functions & prevent issues associated with mental health. It may also contribute towards achieving SDG Goal 3 Good health & wellbeing.

Keywords: *Prevalence, Knowledge, Awareness, Insomnia*

THE IMPACT OF COVID-19 PANDEMIC ON BEHAVIOURAL AND EDUCATIONAL ASPECTS OF UNIKL ROYAL COLLEGE OF MEDICINE PERAK UNDERGRADUATES

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Background: During Covid-19 pandemic, which affected the people globally, the changes to normal life has impacted behavioural and educational aspects of higher education students due to discontinuation of physical T&L activities and replace with online mode. Some changes to normal behavioural are also observed among the students. **Objectives:** This study investigated the impact of Covid-19 pandemic on behavioural and educational aspects of UniKL RCMP undergraduates and identified the types of issues related to both study-parameters. **Methods**: This cross-sectional study was conducted using online Google-form survey distributed among undergraduate students of UniKL RCMP. Using convenience sampling, the participants received a set-of-questionnaire via a link. A content validation test was done, although the questionnaire was adapted from previously validated questions. To obtain 95%CI and 5% margin error with 2280 population, a total of 329 samples were required for the study. **Results**: A total of 372 students responded, most were B.Pharm. students (N=172), female (N=280) and age 21-23 years old (N=193). Almost 98% agreed having proper devices for online T&L, but 90% asserted pandemic has greatly affected their study activities, and 76% agreed that time spent on studying became less productive. The impact level on educational was moderate (59%) and high (35%). Respondents (88%) agreed to have frequently and extremely frequent washed hands, and 45% extremely frequent carried hand sanitizers. About 48% admitted feeling anxious. The impact level on behavioural was found to be high (58%) among them. **Conclusion**: The pandemic has impacted the students' behavioural and educational aspects moderately and highly in some ways, but knowing the issues related to it, will allow actions to be taken to improve the situations.

Keywords: *Covid-19 pandemic, Behavioural, Educational, Higher education*

MONO-USER AND DUAL-USER OF TOBACCO PRODUCTS AMONG SCHOOL GOING ADOLESCENTS IN MALAYSIA: THE FINDINGS FROM THE MALAYSIA GLOBAL SCHOOL HEALTH SURVEY (M-GSHS) 2017

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Background: Mono and dual tobacco use are common among youth globally. However, information on such domains is scarce in Malaysia. **Objectives:** This study examines the prevalence and factor(s) associated with mono and dual-user tobacco products among secondary school-going adolescents in Malaysia. **Materials and Methods**: We derived the data from Malaysia Global School Health Survey tobacco 2017(M-GSHS), which is a nationwide school-based study. Standard validated questionnaire was used to obtain the data from the respondents. Multiple logistic regression modelling was conducted to assess the factor(s) associated with mono and dual-tobacco user. **Results**: The prevalence of mono-user and dual-user tobacco products was 10.8% and 6.4%, respectively. Multivariable logistic regression (MLR) revealed that the likelihood of being mono or dual-tobacco users was significantly higher among males, upper secondary school students, Malays, Indians, natives of Sabah and Sarawak, students with lack of peer support and bonding with parents. The odds of being mono and dual user were almost similar for all independent variables except gender, in which the likelihood of dual users is higher among males. **Conclusion**: The prevalence of mono users is quite high among school-going adolescents in Malaysia. Proactive measures should be taken to reduce the incidence of tobacco use among youth in Malaysia by focusing on the factor(s) identified in this study.

Keywords: *Poly-tobacco user, School-going adolescents, Cigarette, e-Cigarette, TECMA study*

PREVALENCE OF SMOKING AMONG SCHOOL GOING ADOLESCENTS: THE FINDINGS FROM GLOBAL SCHOOL HEALTH SURVEY MALAYSIA (GSHS) 2012 AND 2017

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Background: Continuous monitoring of smoking prevalence is integral to monitor the effectiveness of anti-smoking policies/ measures implemented. **Objectives:** The aim(s) of the study is to measure the prevalence of current smokers among secondary school adolescents from two nationwide studies. **Materials and Methods:** We derived the GSHS 2012 and GSHS 2017 study data, which used a similar study design, sampling method, and instruments to measure the smoking prevalence among secondary school going adolescents in Malaysia. Complex sample design was used to analyze the data, and 95 percent confident interval was used to determine the significant level. **Results**: The study revealed that approximately 1 in 10 respondents smoked at least once in the last 30 days from both surveys (GSHS 2012, 11.2% (95 CI, 10.7-11.7): GSHS 2017, 10.5% (95 CI: 9.6-11.6)). Male, Malay, Bumiputra Sabah, Bumiputra Sarawak and other ethnicities, upper secondary youth showed significant higher proportion of smoking in both surveys. Study also revealed significant reduction of smoking among youth among Malay ethnics from (13.1% (95 CI 12.5-13.8) in 2012 to 10.7% (95 CI 9.7-11.9). However, prevalence of smoking among Indian youth increased almost two-fold for the last five years (6.2 % (95 CI 4.8-8.0) in 2012 to 11.3% (95 CI: 8.4-15.2) in 2017). **Conclusion**: No significant changes in smoking prevalence were observed in the last five years. More proactive measures (s) should be focused on the respondents with the higher prevalence of smoking and those with significantly higher increase of smoking prevalence.

Keywords*: Smoking, School-going adolescents, Global school health survey, Nationwide school study.*

DETECTION OF SOIL-TRANSMITTED HELMINTHS IN ENVIRONMENTAL SAMPLES FROM ABORIGINAL SETTLEMENT, SUNGAI TIANG, JERANTUT, PAHANG, MALAYSIA

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Background: Contamination of soil with soil-transmitted helminths (STH) is a potential infection route and contributes a risk to the public, especially young children who tend to spend more time playing outdoor activities. **Objective:** This study was conducted to determine the prevalence of soil samples contaminated with eggs or larvae from different areas favoured by aborigine children to play. **Materials and Methods**: Soil samples were obtained from the children's play areas such as house and school ground, playground and along the trail at the aboriginal settlement to examine the presence of helminths eggs or larvae using the modified formalin-ether sedimentation technique. **Results**: Overall, of the thirty soil samples, 7 samples (23.3%) were found to be contaminated with soil-transmitted helminths. The highest number of samples were contaminated with hookworm larvae (13.3%), followed by *Toxocara spp.* (6.67%) and *Trichuris trichiura* (3.33%). The area which has highest contamination rate was the playground (50%), followed by school compound (33.3%), house compound (16.7%) and along the trail (16.7%). **Conclusion**: The occurrence of hookworm larvae, *Trichuris trichiura* and *Toxocara spp*. in soil samples highlighted the need for the establishment of health programme regarding the importance of personal hygiene and preventive measures in reducing the transmission risk among the underprivileged community.

Keywords: *Soil-transmitted helminths, Soil samples, Trichuris trichiura, hookworm, Toxocara spp*

DETECTION OF IgG ANTIBODY TO *TOXOPLASMA GONDII* IN SERUM OF FEMALE MEDICAL LABORATORY TECHNOLOGY (MLT) STUDENTS IN UITM PUNCAK ALAM

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Background: *Toxoplasma gondii* (*T. gondii*) is a zoonotic obligate intracellular protozoan parasite widely distributed throughout the world. It causes severe congenital toxoplasmosis in infants and acute infection in immunosuppressed patients. **Objective:** The aim of this study was to evaluate the seroprevalence of *T. gondii* infection among MLT female students. **Materials and Methods**: Sixty serum samples were collected from female MLT students who have given consent to participate in this study. The samples were divided into 2 groups, pet cat owners and non-pet cat owners. The presence of IgG antibody to *T. gondii* in serum samples was detected using *T. gondii* IgG enzyme-linked immunosorbent assay (ELISA) test kit. Results were recorded and analyzed using the Chi-Square test. **Results**: The seroprevalence of T. gondii infection among pet owners was higher (30.4%) than non-pet owners (21.6%); however, there was no significant association between pet ownership and *T. gondii* infection (p-value > 0.05). **Conclusion**: The cat ownership is not a good indicator of the probability of being infected by *T. gondii*. Humans can get infected by indirect or direct contact with oocysts from infected cat faeces. The implementation of toxoplasmosis control is important to break the transmission cycle of the infection.

Keywords: *Toxoplasma gondii, Oocyst, Serum, Cat ownership, ELISA*

BIOTECHNOLOGY APPROACHES TO INSIGHT IN THE VETERINARY AND MEDICAL SECTORS

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The dependence of livestock industry on biotechnology is increasing to boost animal production. The ever-increasing studies regarding structure, metabolism, and function of DNA give rise to recombinant DNA technology dealing with DNA alteration to serve society in a better way. Awareness of animal genetics is a substantial approach to using biotechnology to enhance animal breeding. Genomics, bioinformatics and proteomics are also applied in animal biochemistry. Transgenic expertise enhances milk and meat production in form animals. Furthermore, biotechnology assists in xenotransplantation from animals to humans, cloning of animals, in-vitro cultured meat production and in the diagnostic and treatment of various animal diseases like swine fever, Avian Flu, and Bovine Spongiform Encephalopathy. The more biotechnology inventions include bioassays like DNA vaccine, RNA vaccine, and protein vaccine and gene therapy technology for animal diseases. The knowledge of molecular and cellular signals that control germ cells, along with the development of stable methods of gene delivery, will make these species indispensable tools for biotechnology applications.

Keywords: *Recombinant DNA, Transgenic Animals, Biotechnology, Biosensors, Proteomics*

INFLUENCE OF POPULATION ON COVID-19 CASES IN MALAYSIA

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Background: COVID-19, which was discovered in Wuhan, China, in December of 2019, has rapidly evolved into a global pandemic. Residents living in areas with high population density tend to have a higher probability of coming into close contact with each other therefore increasing risk of disease transmission. **Objective:** This study aims to investigate the correlation between absolute population and population density with COVID-19 cases in Malaysia. **Materials and Methods:** Local COVID-19 cases data was obtained from all districts in Malaysia from 20 September 2020 to 12 January 2021. Spearman's rank correlation was used for correlation analysis. **Results:** COVID-19 cases were significantly correlated with both absolute population (ρ=0.734) and population density (ρ=0.670) **Conclusion:** Higher population number and density appear to be precursor that increases the transmission and spread of COVID-19 infections. Therefore, more stringent control measures should be instituted to control the spread of the disease, especially in the highly populous and dense areas.

Keywords: *COVID-19, Local cases, Population density, Population*

TIME-SERIES MODELLING OF COVID-19 IN MALAYSIA

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Background: The novel coronavirus, also known as COVID-19, was declared a pandemic on 11 March 2020. Being a novel disease with high transmissibility, forecasting the disease will be able to assist health authorities in planning and implementing outbreak control strategies. **Objective:** This study aims to forecast COVID-19 cases during the third wave in Malaysia using ARIMA model from 15 February 2021 to 14 March 2021. **Materials and Methods**: The ARIMA model (0,1,1) was developed using SPSS software and different co-variates such as daily Selangor and Malaysia cases. **Results**: The forecast generated by the model provided an accurate trajectory of COVID-19 case trends during the forecast period. **Conclusion**: This study showed that ARIMA model can be used to forecast the daily COVID-19 cases.

Keywords: *COVID-19, Forecast, ARIMA, Malaysia*

RISK OF CAESAREAN SECTION AND PRETERM DELIVERIES IN MOTHERS WITH COMMUNITY ACQUIRED PNEUMONIA IN PREGNANCY: A 10-YEAR REVIEW

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Background: Pneumonia is the most common cause of fatal non-obstetric infections in pregnant women. We reviewed articles reported on pneumonia and pregnancy in the past 10 years to observe the effect on pregnancy and foetal outcomes. **Materials and Methods**: Due to heterogenous articles, a narrative review was done using databases such as ClinicalKey, MEDLINE, PubMed, ScienceDirect, Wiley Online Library, and ProQuest with appropriate keywords: "Pneumonia in pregnancy," "neonatal outcomes in pneumonia," and "viral pneumonia." The selection criteria were restricted to observational studies published in English between 2011 to April 2020. Articles (n=12) on pregnancy and perinatal outcomes were identified. **Results**: In most reviewed studies, it was found that mothers with community-acquired pneumonia have a higher risk of having LSCS and are noted to have OR of 1.7 in the largest review. Nine studies found a high risk for premature deliveries. **Conclusion**: Community-acquired pneumonia (CAP) and COVID-19 in pregnancy resulted in higher incidence of LSCS in mothers and posed a risk of prematurity for foetuses.

Keywords: *COVID-19, Pneumonia, Pregnancy outcome, LSCS, Prematurity*

POTENTIAL PHARMACOLOGICAL AGENTS FOR CLOZAPINE-INDUCED CARDIOTOXICITY: A SYSTEMATIC REVIEW

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Background: Myocarditis and cardiomyopathy are two cardiac adverse effects associated with clozapine use. Given the need for clozapine in treatment-resistant schizophrenia, concomitant use of pharmacological agents that could reverse cardiotoxicity effects of clozapine can potentially reduce these severe side effects of clozapine. **Objective:** This review aimed to determine potential cardioprotective agents for patients on clozapine. **Materials and Methods:** We retrieved articles from PubMed and Medline (via EBSCOhost). Two keywords of "clozapine" and "cardiomyocytes" were used. The articles were retrieved from inception to June 2021. We included only *in vitro* study that utilized any pharmacological agents with a combination of clozapine and English articles. *In vivo* study was excluded. **Results:** Initially, a total of 27 articles were retrieved. Twenty-four articles were excluded due to duplication and did not meet the eligibility criteria. Finally, three articles were included in the qualitative analysis. Three potential pharmacological treatments – ellagic acid, thymoquinone and kaempferol, were reported to affect various parameters significantly. The addition of these agents in cardiomyocytes treated with clozapine significantly increased cell viability and antioxidant (glutathione) levels. In contrast, other parameters including mitochondrial membrane potential collapse, lysosomal membrane damage, malondialdehyde and oxidized glutathione were reported to be significantly reduced. **Conclusion:** Ellagic acid, thymoquinone and kaempferol are potential add-on agents in clozapine treatment to reduce cardiotoxicity effects. However, given limited data, more data are required before these agents can be tested in clinical trials.

Keywords: *Antipsychotic, Cardiomyocytes, Cardiotoxicity, Clozapine, Ellagic acid, Kaempferol, Thymoquinone*

PRECLINICAL ACUTE TOXICITY ASSESSMENT OF A CRUDE POLYSACCHARIDE EXTRACT ISOLATED FROM *Solanum nigrum*: A PRELIMINARY ANALYSIS.

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Background. The polysaccharide extracted from *Solanum nigrum* was proven to possess an immunomodulatory effect and able to suppress the progression of tumor cells by proxy. However, data on the toxicity profile is still limited. **Objective**: The present preclinical study was conducted to investigate the toxicity potential of the crude polysaccharide sample. **Materials and methods**: The acute toxicity experimental design was adapted from OECD 423 guideline. Nine female BALB/c mice were randomly divided into 3 groups, 3 mice per group (n=3). Mice in group 1 (first step treatment) were orally administered with a single treatment of crude polysaccharide sample at concentration 2,000 mg/kg/bw (300 µL). Mice in group 2 (second step treatment) received the single treatment after 24 hours, depending on the observation of mice in group 1. Mice in group 3 received a single administration of 300 µL of normal saline (control). Mortality and clinical signs associated with toxicity were observed within 24 hours of treatment session and for the next 14 days to detect the delay-death. Mice body weight were recorded starting at day-0 until day-14 prior to sacrificing at day-15. Blood, liver, and kidney were harvested for toxicology assessment. **Results**: After the 24 hours treatment, 1 mouse in group 1 was found died, and no mortality and delay-death observed in groups 2 and 3. Referring to OECD 423, it was suggested that the LD_{50} of the treated sample was 2500–5000 mg/kg/bw. No significant (p<0.05) changes were detected in terms of body weight and organ weight index of the treated mice compared to control. The polysaccharide treatment also revealed no significant elevation in mice glucose serum levels. **Conclusion**: The present findings indicated that the treatment of crude polysaccharide sample exerted mild acute toxicity effect when orally administered at 2,000 mg/kg/bw, with no delay-death.

Keywords: *Solanum nigrum, Plant polysaccharide, Crude, Acute toxicity, LD_{50}, BALB/c mice*

THE EFFECTS OF FACE MASKS USAGE AMONG CLINICAL YEAR MBBS STUDENTS IN UNIKL RCMP DURING COVID-19 PANDEMIC

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Background: COVID-19 was declared by the World Health Organization (WHO) as a global pandemic. It is primarily transmitted via respiratory droplets, which is preventable by using a face mask. Clinical year students spend most of their time in hospital, which requires face mask usage for a prolonged period. **Objective:** To identify the effects of face mask usage among students and determine its association with several factors, including gender, BMI, bespectacled, type of face mask, changing frequency and duration of face mask usage. **Materials and Methods**: This cross-sectional study was conducted in UniKL Royal College of Medicine Perak from 18th October 2020 until 27th November 2020, among the MBBS students of Year 3, Year 4 and Year 5. The sampling was randomly selected. Questionnaires and consent letters were distributed through Google Form(online). All data were analysed using IBM® SPSS® Version 27. **Results**: The effects of face mask usage studied were nasal symptoms, stress-related problems and dermatological disorders, with the latter affecting students the most (30%). Two significant associations could be concluded; the association between gender and nasal symptoms (runny nose, shortness of breath and dry nose) with more females being affected and spectacles wearers were more likely linked to stress-related problems, especially foggy spectacles. **Conclusion**: Overall, face masks could cause effects like dermatological disorders, nasal symptoms in females and stress-related problems bespectacled. Thus, to reduce these effects and ensure adherence to SOP, better and upgraded masks should be made with relevant guidelines implied.

Keywords: *Effects, Face masks, Covid-19, Nasal symptoms, Dermatological disorders*

FABRICATION OF EMULSION LOADED WITH CYCLOSPORINE AND MORINGA OLEIFERA OIL POTENTIALLY FOR TOPICAL PSORIASIS TREATMENT

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Background: Psoriasis is a widespread autoimmune inflammatory dermatological disease treated with oral cyclosporine to reduce the uneasiness of psoriasis. However, systemic therapy of cyclosporine is associated with high risk of side effect that limit the usage in psoriasis treatment. Topical delivery of cyclosporine is believed could overcome cyclosporine related toxicity issues. **Objective:** In this study, a new carrier for topical cyclosporine was developed, which cooperated with Moringa oleifera oil that has been reported could enhance the moisture-retaining of the skin. **Materials and Methods:** Both high-shear homogenizer and overhead stirrer homogenizer were utilized in formulating a cyclosporine-loaded emulsion carrier. Three emulsions were prepared at different proportions of Moringa oleifera oil, water and surfactant (tween80:span80) based on the constructed ternary phase diagram. Samples with different formulation (E1 and E2) were subjected to several tests including the stability, rheological, colony and *invitro* release analysis. **Results:** E1 and E2 possessed good stability against phase separation for 1 month at different storage temperatures (4, 25 and 40℃), having pH values within the range of 4 to 5 as well as showing no mould and microbial growth after been incubated on nutrient agar plate at controlled conditions. Optimized formulations were found to be non-Newtonian and followed the pseudoplastic flow behaviour. Nonetheless, E2 exhibited highest permeation of cyclosporine (80.23%) through cellulose acetate membrane via Franz diffusion cell, which correspond to controlled release and best fitted to first order kinetic behaviour (R^2=0.9819). **Conclusion:** This preliminary study suggested that the formulated emulsion has a promising potential as topical medicament for psoriasis.

Keywords: *Topical formulation, Emulsion, Cyclosporine, Moringa oleifera oil, Psoriasis*

IN-HOUSE METHOD OF CELL VIABILITY DETERMINATION USING PROPIDIUM IODIDE ON ACCURI C6 FLOW CYTOMETER

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Background: Flow cytometry is a powerful method that provides rapid, reliable and accurate quantitative analysis of cells. Propidium iodide (PI) is highly fluorescent red dye impermeable to viable cells causing them to be non-fluorescent compared to the fluorescent dead cells. PI is excited at 488 nm and emits at a maximum wavelength of 617 nm, whereby fluorescence detector 3 (FL3) is used for measurements. **Objective:** To develop an in-house practical method of measuring cell viability using only PI dye on flow cytometer. **Materials and Methods**: Same volume of U937 cell samples (15 µL) were run through the flow cytometer. On the forward scatter (FSC) vs FL3 plot, an area indicating the debris was gated and excluded from the analysis. On the count vs FL3 plot, two horizontal bars were drawn side by side to differentiate between the dead and live cells. The percentage of viable and dead cells will be automatically calculated and displayed by Accuri C6 flow cytometer. **Results**: This method allows the determination and quantification of the percentage of dead and viable cells using a flow cytometer that could be carried out using only PI as the dye. Cell viability is reported as a percentage of the total number of cells in the control samples, excluding the debris. PI-positive cells are dead cells which are stained by the dye, whilst PI-negative cells are viable cells. **Conclusion**: Our in-house method provides a simple, practical, fast and cheap flow cytometric technique to determine cell viability using only PI dye.

Keywords: *Propidium iodide, Flow cytometry, Cell viability*

OXIDISED LOW-DENSITY LIPOPROTEIN (oxLDL) INDUCTION OF INTRACELLULAR OXIDANTS GENERATION IN U937 AND THP-1 CELLS

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Background: Studies have implicated oxLDL toxicity to caused death in variety of cells, but its mechanism of action is not completely understood. The involvement of oxidative stress and increased intracellular reactive oxygen species (ROS) generation have been revealed to play crucial roles in oxLDL-induced cell death. Thus, numerous studies were established to examine oxLDL-mediated ROS generation in various types of vascular cells. **Objective:** This study was conducted to determine and compare the effects of oxLDL in inducing intracellular ROS generation in U937 and THP-1 cells. **Materials and Methods**: U937 and THP-1 cells were treated with different concentrations of oxLDL for 3 hours. At the end of the treatment, the cells were incubated with dihydroethidium (DHE) fluoroprobe in the dark for 20 minutes. Intracellular ROS levels were then measured using flow cytometry. **Results**: Our findings showed that with increasing concentrations of oxLDL, DHE levels were also raised in both types of cells. This proved that oxLDL induced intracellular ROS production, which may contribute to oxidative stress. Nonetheless, the increase in DHE fluorescence was relatively low for THP-1 compared to U937 cells. Taken together, these reactions might suggest different responses of the cells to oxLDL insult. **Conclusion**: These findings indicate that oxLDL induced diverse responses in intracellular ROS productions in different types of cells. Therefore, choosing the appropriate type of cell for research is critical and must be done accordingly.

Keywords: *oxLDL, U937, THP-1, ROS, DHE*

THE POTENTIAL OF *TRICHODERMA VIRIDE* AND *ASPERGILLUS NIGER* FOR OMEGA-3 FATTY ACID PRODUCTION

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Background: Omega fatty acids, major importance in the prevention or treatment of a range of human diseases or disorders related to inflammation. Omega-3 fatty acids are found in transgenic plants, fungi, and animals and even in microorganisms, but in major amounts can be extracted from fatty fish. However, due to bioaccumulation of fat-soluble vitamins and high levels of saturated and omega-6 fatty acids, they may have deleterious health effects. It becomes necessary to search for novel and rich sources containing omega-3 fatty acids and one of the alternatives that include fungi. **Objective:** The present study deals with the production and purification of omega-3 fatty acids from *Trichoderma viride* and *Aspergillus niger*. One of the aims was to investigate the maximum lipid production through optimized conditions. **Materials and Methods:** The fungal cultures were maintained on potato dextrose agar slants, and the purified fungal extracts were undergone lipid quantification with optimized pH and temperature. Gas chromatographic analysis for fatty acid methyl esters (FAMEs) was performed. **Results:** The results clearly showed that *Trichoderma viride* was found to be the highest lipid producer, with lipid production at initial pH 6.0 and incubation temperature 40^0C. **Conclusion:** Omega-3 fatty acids have beneficial effects on cardiovascular health with more anti-inflammatory effects. Fungal species as single-cell oils is a sustainable alternative for PUFA-rich lipids.

Keywords*: Fungi, Fatty acids, pH, PUFA, Temperature*

VASCULAR PROTECTIVE EFFECT OF EPIGALLOCATECHIN-3-GALLATE (EGCG) IN HYPERTENSIVE MICE: AMELIORATION OF ENDOTHELIAL NITRIC OXIDE SYNTHASE

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Background: Epigallocatechin-3-gallate (EGCG), the major catechin found in green tea, has been demonstrated to exert an antihypertensive effect in hypertensive patients and animals. However, the mechanism on the vasculature that contributes to its antihypertensive effect is not well studied. **Objective:** The current study aims to investigate if the antihypertensive effect exerted by EGCG is due to the amelioration of endothelial nitric oxide synthase (eNOS) uncoupling in hypertensive animals. **Material and Methods:** Angiotensin II-infused hypertensive C57BL/6J mice (8-10 weeks old) were randomly divided to receive either EGCG (50mg/kg/day, oral gavage) drinking water for two weeks. Their average systolic blood pressure (SBP) was measured every three days, and their aorta were isolated at the end of the treatment for vascular function study. In addition, the reactive oxygen species (ROS) was determined by dihydroethidium (DHE) fluorescence, whereas the cyclic guanosine monophosphate (cGMP) and tetrabiopterin (BH_4) levels were determined using an assay kit. Western blotting was performed to determine the level of eNOS monomer in the mice. **Results:** The SBP of angiotensin II-infused hypertensive mice receiving EGCG was attenuated after two weeks of treatment. This was accompanied by an improvement in endothelium-dependent relaxation, an increase in their cGMP level and an attenuation in their ROS level. In line with this, there was a significant increase in their BH_4 level and eNOS monomer. **Conclusion:** In conclusion, EGCG improved the endothelium-dependent relaxation in angiotensin II-infused hypertensive mice by decreasing ROS and increasing BH_4 levels to ameliorate eNOS uncoupling, which may in part contribute to its antihypertensive effect.

Keywords: *Hypertension, EGCG, Vascular biology, eNOS uncoupling*

REGENERATION OF CHITOSAN AND CHITOSAN-TRIPOLYPHOSPHATE BEADS USED IN THE ADSORPTION OF ERYTHROSINE DYE

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Background: This study explored the regeneration of chitosan (CB) and chitosan-tripolyphosphate (CTPP) beads used for the adsorption of erythrosine dye. This dye is a contributor to pollution generated by food and pharmaceutical industries as it forms lethal intermediates during the biodegradation process. Regeneration study allows the sustainability of the adsorbents and is considered cost-effective in the field of adsorption. **Objective:** The purpose of this study was to identify the best desorption agent and the recyclability of the adsorbents. **Materials and methods:** Varying concentrations of disodium ethylenediaminetetraacetic acid (EDTA), sulphuric acid (H_2SO_4), nitric acid (HNO_3), and sodium hydroxide (NaOH) were used as the desorption agents. The best desorption agent was then used in the adsorption-desorption cycle. **Results:** NaOH was found to be the best desorption agent for both adsorbents as it showed a good percentage of desorption, and the physical state of both adsorbents was still intact. The other desorption agents were found to be unsuitable due to the low desorption percentage and the swelling of both adsorbents in these agents. CB was recycled in two adsorption-desorption cycles using the 0.001 M of NaOH solution. The percentage of adsorption-desorption attained in both cycles was more than 50%. Meanwhile, CTTP beads were successfully recycled up to four adsorption-desorption cycles using the 0.1 M of NaOH solution without compromising the adsorption capacity of the beads. **Conclusion:** NaOH concentration at 0.001 M and 0.1 M were found to be the best desorption agents to regenerate and recycle the erythrosine dye loaded CB and CTTP beads, respectively.

Keywords: *Chitosan, Chitosan-tripolyphosphate, Erythrosine, Desorption, Regeneration*

DESIGN, SYNTHESIS, AND VALIDATION OF NOVEL, POTENTIAL, AND COST-EFFECTIVE 'DAPSONE-PHYTOCHEMICAL' HYBRID DRUG CANDIDATE AGAINST MYCOBACTERIUM LEPRAE

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Background: Leprosy, caused by the slow-growing acid-fast bacilli, Mycobacterium leprae, continues to be the belligerent public health hazard for the causation of high disability and eventual morbidity cases with stable prevalence rates, even with treatment by the ongoing multidrug therapy (MDT). Thus, the development of potential candidates against leprosy is the call of the day. Objective: In the present study, the first line antileprosy drug dapsone (DDS) was chemically hybridized with phytochemicals (dapsone-phytochemical conjugates or DPCs) and validated through computational and experimental methods. Materials and Methods: The proposed conjugates were verified molecular docking, molecular dynamics simulation and, another drug-ability verification program before chemical synthesis and spectral characterizations (HNMR, FTIR, UV, LC-MS, SEM). The in vivo antileprosy activity was monitored using the gold-standard 'mouse-foot-pad propagation method,' with a WHO-recommended concentration of 0.01% mg/kg for 12 weeks. Furthermore, the host-toxicity testing of the active DPC4 was seen in cultured-human-lymphocytes in vitro. Results: One-log bacilli cells in DDS-resistant infected mice footpads decreased by the DPC4 (dapsone-thymol), and no bacilli were found in the DDS-sensitive mice hind-pads. The in vitro host toxicity study confirmed that the DCP4 up to 5,000 mg/L level was safe for oral administration since it found a minor number of dead cells under a fluorescent microscope. Conclusion: The results indicated that the DPC4 could be used in place of DDS in MDT. Overall, this chemical conjugation may lead to re-active the existing clinically inactive drugs and utilization of a higher number of phytochemicals potentially in mainstream medicine.

Keywords: Mycobacterium leprae, *Dapsone-phytochemical conjugates*, *Molecular docking-simulation*, *Antileprosy activity, Cultured-human-lymphocytes.*

ANTIOXIDANT AND SCAVENGING ACTIVITIES OF *Cosmos caudatus* PLANT EXTRACT

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Background: Oxidative stress is responsible for various pathological diseases due to the overproduction of free radicals in the biological system. Plants and vegetables can be used as natural antioxidants. *Cosmos caudatus* can diminish the detrimental effect of free radicals due to various phytochemical constituents that exert antioxidant properties. **Objective:** The study aims to measure the antioxidant, and free radical scavenging activities of *Cosmos caudatus* leaves extract and to screen phytochemical constituents in the plant extract that possesses excellent antioxidant properties. **Materials and Methods**: Dried leaves of *Cosmos caudatus* were extracted with methanol (95%) through maceration. Antioxidant activity of *Cosmos caudatus* leaves extract was evaluated using 1,1-diphenyl-2-picrylhydrazyl radical (DPPH) scavenging activity assay, total phenolic content (TPC) was measured using Folin-Ciocalteu assay, and several qualitative phytochemical tests were studied. **Results**: The results show that the concentration of plant extracts positively influenced the percentage of radical scavenging activity, and the IC_{50} value of the plant extract was approximately 261.4 µg/ml. The total phenolic compounds were found to be 70.47 mg GAE/g. Several phytochemical constituents such as alkaloids, tannins, steroids and saponins were present in the leaves extract. **Conclusion**: The finding shows that the leaves are rich in important phytochemical compounds responsible for antioxidant properties. The present study can further develop *Cosmos caudatus* into nutraceuticals and medicinal preparation for future research.

Keywords: *Cosmos caudatus, Phytochemicals, Antioxidant, Total Phenolic Content*

EIGHT WEEKS CONSUMPTION OF A HIGH-FAT DIET PROMOTES SPRAGUE-DAWLEY RAT MESENTERIC FAT DEPOSITION WHEN COMPARED TO OTHER KINDS OF DIETS

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Background: Metabolic syndrome is a grouping of several medical conditions plaguing the modern world today. A sedentary lifestyle coupled with an environment of easily accessible food around the clock contributes to this menace. It was found that excessive visceral fat is strongly associated with abdominal obesity, which is one of the components leading to metabolic syndrome. In general, an unbalanced diet plays an important role in the proliferation of adipocytes. **Objective:** Our aim is to observe what kind of diet contributes to the deposition and proliferation of visceral fat, such as mesenteric fat. **Materials and Methods**: For eight weeks, thirty-five Sprague Dawley rats were divided into five groups and were fed five different types of diets ad libitum. The five diets are normal rat chow, high-sugar, high-starch, high-protein and high-fat rat feed formula. Besides the formularized rat feeds, the rats were given tap water ad libitum. **Results**: The result showed a high-fat diet promotes mesenteric fat proliferation compared to other rat feed formulas. **Conclusion**: It can be concluded that a high-fat diet induces metabolic syndrome via central obesity.

Keywords: *Metabolic syndrome, Central obesity, Mesenteric fat, Diet*

FORMULATION OF EMULSION CONTAINING CHLORAMPHENICOL AND CINNAMON ESSENTIAL OIL FOR TOPICAL USE

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Background: Methicillin-resistance *Staphylococcus Aureus* (MRSA) is a fatal pathogen that causes infections in various parts of the body due to high resistance towards wide antibiotics alternatives. The return of chloramphenicol is believed could overcome antibiotic-resistance issue of MRSA. **Objective:** In this study, chloramphenicol cooperated with cinnamon essential oil, in which the combination has been reported to be synergistically effective against MRSA. **Materials and Methods:** Emulsion carrier was formulated using both high-shear homogenizer and overhead stirrer homogenizer. Three emulsions were prepared at different compositions of cinnamon essential oil, water and surfactant based on the constructed ternary phase diagram. Samples with different formulations (F_1, F_2 and F_3) were subjected to several tests, including the stability, rheological, colony and *in vitro* release analysis. **Results:** F_1, F_2 and F_3 possessed good stability against phase separation for 1-month storage at temperature 4ºC and 25ºC. All the formulations had pH values within the range of 3 to 5 and showed no mould and microbial growth after being incubated on nutrient agar plate at controlled conditions. From the rheological aspect, non-Newtonian and pseudoplastic flow behaviour well suited an emulsion for topical used. Franz diffusion cell was used in permeation study where F1 resulted in up to 60.83 % of chloramphenicol permeation through cellulose acetate membrane. This corresponds to the control release mechanism and best fits zero-order kinetic behaviour (R^2 = 0.9937). **Conclusion:** Preliminary studies have proven that the formulated emulsion has a promising potential as topical medicament and could open up new possibilities for the production of pharmaceutical products.

Keywords: *Formulation, Topical, Emulsion, Chloramphenicol, Cinnamon essential oil, MRSA*

KNOWLEDGE, ATTITUDES AND PRACTICES OF STANDARD OPERATING PROCEDURES DURING COVID-19 OUTBREAK AMONG MALAYSIAN POPULATION. AN ONLINE SURVEY

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Background: In response to the Covid-19 Outbreak in March 2020, Malaysia, as well as most of the countries in the world, imposed a movement control order. The order was mainly under the Prevention and Control of Infectious Diseases Act 1988. **Objective:** This study asseses the knowledge, attitudes and practices of Standard Operating Procedures (SOPs) during Covid-19 outbreak among Malaysians. **Materials and Methods**: The cross-sectional study design was conducted using online Google forms that were distributed from 30th October 2020 to 18th November 2020. Forms were distributed through online to individuals via different social groups. All those who responded till the end date were included. **Results**: A total of 401 participants responded. The study found that 57.1% of Malaysians had high knowledge level towards SOPs of Covid-19 outbreak. Almost all the respondents showed positive attitude, while 69.8% followed a high practice level of SOPs. Knowledge level towards SOPs was found to be associated with gender, age and highest formal educational level. Attitudes towards the importance of SOPs was found to have an association with highest educational level and the current place of residence. Statistically, significant association was found between gender, place of residence and occupation with practice level of SOPs. **Conclusion**: Although the SOPs of Covid-19 are considered new to the Malaysian population, they have a good level of knowledge regarding it. The positive attitude was very high and is shown by a good practice level. More needs to be done to convert those whose practices may endanger others during this outbreak.

Keywords: ***Knowledge****, Attitude, Practice, Covid 19, Outbreak, Standard operating procedures (SOP), Malaysians*

ELECTRONIC ENTERTAINMENT DEVICES AND OBESITY AMONG 5-12 YEARS OLD CHILDREN IN IPOH

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Background: Childhood obesity is on the rise in this globalization and modernization era. The usage of electronic entertainment devices and sedentary lifestyles play a big role. In Malaysia, the prevalence of overweight and obesity among children aged 6 to 12 years old increased from 20.7% in 2002 to 26.4% in 2008. **Objective:** The main objective of the study was to determine if there was any association between obesity among children and a few risk factors like the usage of electronic entertainment devices. **Materials and Methods**: This was a case-control study that was conducted in Ipoh, Perak, from 19th March 2018 until 13th April 2018. The study population were children aged 5 to 12, and the total number of samples was 120, in which 40 children were obese, and 80 children had normal weight (case: control 1:2). A convenient sampling technique was followed. Ethical approval was obtained, and a consent form was given to the parents to sign. **Results**: The study found that using electronic devices more than 2 hours per day was a risk factor for obesity in children (OR 6.46, 95% CI 2.54 - 16.94). Playing computer games more than 2 hours per day was also found to be a risk factor (OR 5.76, 95% CI 2.46 -13.46). Watching TV more than 2 hours per day was shown to be another risk factor (OR 5.41, 95% CI 2.21 - 13.21). Children who watched TV more than 2 hours per day were found to be 5.41 times more likely to be obese. (95% CI 2.22 - 13.21). Last but not least, sleeping less than 8 hours per night was a risk for obesity in children (OR 3.75, 95% CI 1.139 – 12.345). **Conclusion**: The findings of this study will be used to support the existing work of literature suggesting a strong association between inactive lifestyle with usage of electronic devices for longer periods and obesity among children. Health education sessions and programs focused on the parents will be among the solutions to this rising health problem.

Keywords: *Electronic entertainment devices, Obesity, Children, Ipoh*

ANTIOXIDANT ACTIVITY IN KAFFIR LIME (*Citrus hystrix)* LEAVES ESSENTIAL OIL EXTRACTED BY HYDRO-DISTILLATION METHOD

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Background: Kaffir lime leaf is a herbal plant used widely in traditional and modern treatment due to its medicinal properties. An antioxidant is one of the major activities exerts by Kaffir lime leaves which play a role in terminating free radicals. These free radicals are highly unstable, constantly produced in the human body through metabolic processes or environmental exposure. Many researchers revealed that flavonoids and phenolic compounds in Kaffir lime leaves are the main components of antioxidant activity. **Objective:** The main objective was to determine the phytochemical constituents, and antioxidant activity in Kaffir lime leaves essential oil. **Materials and Methods:** Essential oil is a plant-based volatile oil extracted through a hydro-distillation method using the Clevenger apparatus. Total Flavonoid Content (TFC) was determined using a colourimetric method, and the Total Phenolic Content (TPC) was determined using the Folin-Ciocalteu reagent. For the determination of antioxidant activity, the DPPH (1,1-diphenyl-2-picryl hydrazyl) assay was used. **Results:** Results obtained for TFC was 6.0991 mg GAE/g while TPC was found at 53.788 mg QE/g. As a result of DPPH, the decolourization from purple to yellow colour solution has been observed, where the reduction of DPPH has occurred, which indicates antioxidant activity. The DPPH-IC_{50} of Kaffir lime leaf essential oil obtained was 142.767 µg/ml, which has lower antioxidant activity than standard ascorbic acid. **Conclusion:** Kaffir lime leaves essential oil has antioxidant activity with the presence of both flavonoids and phenolic compounds. The TPC value was higher than the TFC value, which contributes to a higher antioxidant activity.

Keywords: *Antioxidant, Phytochemicals, Hydro-distillation, Total Flavonoid Content, Total Phenolic Content, 1,1-diphenyl-2-picryl hydrazyl.*

EXTRACELLULAR SYNTHESIS OF IRON OXIDE NANOPARTICLES USING *PENICILLIUM* SPP. AND ITS ANTIBACTERIAL ACTIVITY AGAINST GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA

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Background: Fungus-derived synthesis of nanoparticles has been investigated broadly in biomedical applications because of their eco-friendly, biocompatible, and cost-effective advantages. **Objectives:** The current study focused on synthesizing iron oxide nanoparticles (IONPs) from the filamentous fungi *Penicillium* species isolated from the soil and their antibacterial activity. **Materials and methods:** The aqueous extract of the fungal extract was treated with 3 Mm iron chloride ($FeCl_3$). The characterization of synthesized IONPs was determined through UV-spectrophotometer, TEM, FTIR, SEM, EDX and zeta potential analysis. The antibacterial activity of IONPs was evaluated by Disk Diffusion Method. **Results:** The characterization of synthesized IONPs was determined through a UV-spectrophotometer that showed the absorption peak at 225 nm confirms the formation of IONPs. FTIR analysis revealed proteins are associated with nanoparticles. SEM analysis showed the surface topology of IONPs, while EDX confirms the elemental nature of iron. TEM analysis revealed IONPs are polydisperse with a mean diameter of 11.15±3.19 nm. Zeta potential analysis showed +35±0.21 Mv value confirms the stability of IONPs. The zone of inhibition exhibited by IONPs against gram-positive (*Staphylococcus aureus (11.0±0.6* mm) and gram-negative (*Escherichia coli* (11.5±0.6 mm), *Shigella sonnie* (11.5±0.6 mm), *Klebsiella pneumonia* (11.0±0.6 mm) and *Pseudomonas aeruginosa* (11.0±0.6 mm)) bacteria at 250 µg/ml. **Conclusion:** The biosynthesized IONPs showed good antibacterial activity against selected pathogens and were compared with positive control ciprofloxacin and gentamicin were studied.

Keywords: *Iron oxide nanoparticles, Penicillium spp., FTIR, TEM, Antibacterial activity*

ALPHA-GLUCOSIDASE INHIBITORY ACTIVITY OF *Bauhinia purpurea* LEAVES EXTRACTS

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Background*: Bauhinia purpurea (B. purpurea)* is a medicinal plant which is used to manage diabetes. The plant belongs to *the Febaceae family and is widely known as purple bauhinia while commonly called "tapak kuda" among Malaysians*. **Objective:** The present study aims to screen the antidiabetic property by evaluating the α-glucosidase inhibitory activity of variant *B. purpurea* leaves extracts. **Materials and Methods:** The leaves extracts were prepared using methanol (M), hexane (H), ethyl acetate (EA), ethyl acetate:hexane (EA:H) and ethyl acetate:methanol (EA:M) solvents and screened with α-glucosidase inhibitory assay. Quercetin served as a positive control. **Results:** The IC_{50} values of all the solvents except for methanol and hexane were not determined. The leaves extracts showed the IC_{50} value of H was 41.67 mcg/Ml while methanol was 65.67 mcg/Ml. The lower IC_{50} value of hexane indicated that the solvent exhibits better inhibitory activity. The inhibition percentage of the highest concentration (80 mcg/Ml) of H, M, EA, EA:H and EA:M extracts of *B. purpurea* leaves were 87.67 ± 4.15, 87.84 ± 4.60, 14.29 ± 0.68%, 9.35 ± 0.13% and 17.64 ± 5.95% respectively. The EA, EA:H and EA:M were found to be significantly different from quercetin which indicates that none of the extracts being active against the α-glucosidase enzyme. The possible factors of the extracts to be significantly lower than quercetin is due to the extraction of different parts of the plant, polarity of the solvents, extraction methods and geographical location. **Conclusion:** The findings suggested that methanol and hexane extracts could be used in the future to explore further the inhibitory effect of *B. purpurea* leaves.

Keywords: *Bauhinia purpurea, Leaves extracts, α-Glucosidase inhibitory activity, Quercetin*

IN VITRO ANTIDIABETIC ACTIVITY OF *Muntingia calabura* L. LEAVES EXTRACTS

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Background: The current antidiabetic agents that have been used in managing diabetes mellitus are associated with numerous side effects. Therefore, medicinal plants are developed as an alternative treatment for diabetes. *Muntingia calabura* L. (family *Muntingiaceae*) is one of the medicinal plants proven to exert various therapeutic effects. **Objective:** The current study aimed to screen antidiabetic activity of *M. calabura* leaves extracts using α-glucosidase inhibition assay. **Materials and Methods**: *M. calabura* leaves were collected around Ipoh from its natural habitat, and the leaves were extracted using solvents with varying polarity, which were methanol (M), ethyl acetate (EA), hexane (H), ethyl acetate: methanol (EA:M), and ethyl acetate: hexane (EA:H) (ratio of 1:1). The antidiabetic activities of these extracts were determined and evaluated using α-glucosidase inhibition assays. **Results**: From the study, it was found that at the highest concentration (80 µg/mL), all the extracts showed comparable α-glucosidase inhibitory activity to quercetin. Quercetin served as the positive control in this assay. The half-maximal inhibitory concentration (IC_{50}) of the extracts ranged from 20.60 ± 5.25 μg/mL to 39.13 ± 1.40 μg/mL. M extract recorded the lowest IC_{50} value (20.60 ± 5.25 μg/mL), as compared to quercetin (5.67 ± 0.37 μg/mL), followed by EA: M (30.61 ± 5.60 μg/mL), EA: H (35.13 ± 2.79 μg/mL), H (37.57 ± 0.95 μg/mL) and EA (39.13 ± 1.40 μg/mL). **Conclusion**: M extract of *M. calabura* leaves have excellent antidiabetic activity as it has the lowest IC_{50} value.

Keywords: *Antidiabetic, Muntingia calabura, Leaves extracts, α-Glucosidase inhibitory activity*

ANTIOXIDANT ACTIVITY OF VARIOUS EXTRACTS OF *Muntingia calabura* LEAVES

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Background: *Muntingia calabura (M. calabura),* known as "Jamaican cherry" throughout the world and "kerukup siam" in Malay, is a plant that contains various phytoconstituents and possess pharmacological effects such as antidiabetic, antioxidant, and anti-proliferative activities. **Objective:** The current study aims to investigate the antioxidant activity of various extracts of *M. calabura* leaves. **Materials and Methods**: *M. calabura* leaves were collected around Ipoh from its natural habitat, and the leaves were extracted using solvents with varying polarity, which were methanol (M), ethyl acetate (EA), ethyl acetate: methanol (EA:M), hexane (H) and ethyl acetate: hexane (EA:H) (ratio of 1:1). The antioxidant activity of these extracts was determined using 2,2-Diphenyl-1-Picrylhydrazyl (DPPH) radical scavenging and ferric reducing antioxidant power (FRAP) assays. Besides, the total phenolic content (TPC) present in the extract was also determined. **Results**: In the DPPH assay, H extract exhibited the highest scavenging activity, with 82.8% inhibition, followed by M extract with 75.7%. Ascorbic acid served as the positive control in this assay and recorded inhibition at 88.6%. Besides, M extract recorded the lowest IC_{50} value with 0.032 mg/ml among other extracts. In the FRAP assay, EA extract recorded the highest FRAP value, which was 248.53 AAE/g, followed by H extract with 247.27 mg GAE/g. Furthermore, M extract contained high amount of TPC, which was recorded at 335.59 mg GAE/g. **Conclusion**: *M. calabura* methanolic leaves extract has excellent radical scavenging activity and highest TPC value. The presence of phenolic compounds in the extract contributes to the significant antioxidant effect of the extract.

Keywords: *Muntingia calabura, Leaves extract, Antioxidant activity*, *Phenolic content*

3D FLOWER-LIKE NICKEL OXIDE (NIO) NANOSTRUCTURES FOR HYDROGEN GAS-SENSING APPLICATION

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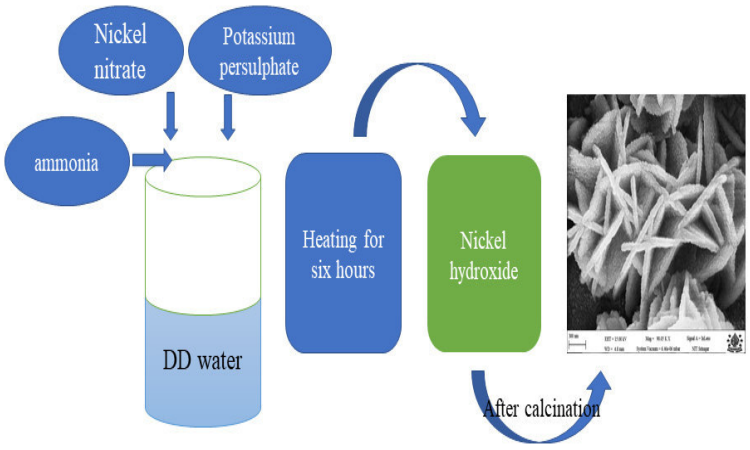
Abstract; In the present work, we report the fabrication of 3D flower-like surface morphology of nickel oxide nanostructures through hydrothermal. The FESEM study reveals the nanosheets are beneath these flowers like structures. Using Lorentz curve fitting, the diameter of fabricated nanoflowers is in the range of ~ 2 µm with an average length and width of these petals as ~ 68 and ~ 816 nm, respectively. The crystalline phase of fabricated nickel oxide nanoflowers was obtained by thermal decomposition of nickel hydroxide at 500 °C for 2h in air confirmed by X-Ray Diffractometer. The fabricated structure has shown a blue shift with a maximum increase in the bandgap of 3.81 eV confirmed by a UV-visible spectrophotometer. Here we indicate its application as gas sensor. The NiO flower-like morphology showed excellent performance to hydrogen gas. Such a unique morphology may further enhance the gas-sensing performance of NiO nanostructures for future sensor applications.



Keywords: *Nickel oxide, Nanostructures, Hydrogen gas*

DEVELOPMENT OF NEURITE OUTGROWTH FOLLOWING DIFFERENTIATION OF MOTOR NEURON-LIKE CELL LINE, NSC-34.

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Background: Glutamate excitotoxicity is one of the key causes of motor neuron degeneration. For the past decades, experimental model systems have been developed to elucidate the underlying mechanisms of tissue degeneration of the nervous system. A hybrid cell line called the spinal cord x neuroblastoma cell line (NSC-34) can be used to study the pathophysiology spinal motor neurons. **Objective:** To optimize the differentiation protocol for NSC-34 cells by using different concentrations of retinoic acid. **Materials and Methods:** NSC-34 cells were seeded onto a 12-well plate before differentiation media containing retinoic acid (1 or 10 µM) was added to the cells. Cells were incubated in a 37°C/5%CO_2 incubator for various days before being fixed in 4% paraformaldehyde. Cells were stained for Beta III tubulin and co-stained with 4′,6-diamidino-2-phenylindole (DAPI). Images were taken using phase-contrast microscopy and fluorescence microscopy. The lengths of neurites were measured by using ImageJ. **Results:** Results indicate an increment of neurite lengths when 1 µM of retinoic acid was added to the cells between 1 to 7 days, compared to the control (n=1). Furthermore, the length of neurite increases when higher concentration of retinoic acid (10 µM) was added to the cells. **Conclusion:** NSC-34 cells can be differentiated into neurons using 1 µM or 10 µM of retinoic acid for 7 days in-vitro. However, neurite outgrowth appears to be more extensive when 10 µM of retinoic acid was used.

Keywords: *NSC-34, Retinoic Acid, Cell culture, In-vitro model, Neurite development*

THE MODULATORY ROLE OF ALPHA-2 GIARDIN IN HYDROGEN PEROXIDE-TREATED *GIARDIA INTESTINALIS*

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Giardia intestinalis, a protozoan parasite that causes severe diarrhoea is capable of surviving in host intestine in the presence of both oxygen and reactive oxygen species (ROS). Annexin is known for its role in protecting cells from oxidative stress in both plants and mammals and has not been reported yet in parasites. Alpha giardins are annexin-like molecules in *G. intestinalis*. This study aims to examine the role of alpha giardins in the antioxidant defence system of *G. intestinalis*. H_2O_2 was used to induce oxidative stress. The level of intracellular oxidant with increasing H_2O_2 concentrations (0, 0.1, 1, 10, 100, 1000 mM) was determined using cellular ROS detection assay. The *in vitro* cytotoxicity of H_2O_2-induced *G. intestinalis* was investigated by MTT assay. Based on the percentage of cell viability, both IC_{50} and IC_{25} were determined. Total RNA of untreated and H_2O_2-treated *G. intestinalis* at IC_{50} and IC_{25} was extracted at different time-points (1, 4, 8, 24 hours) for gene expression study by real-time PCR. Increased concentrations of H_2O_2 showed higher cell death due to increased accumulation of ROS in *G. intestinalis*. The values of IC_{50} and IC_{25} were 0.6085 mM and 0.2028 mM, respectively. Gene expression analysis showed significant up-regulation of alpha-2 giardin in H_2O_2-treated *G. intestinalis* compared to those of untreated cells. In conclusion, the annexin-like molecules, alpha-giardins, play a significant role in regulating oxidative stress in *G. intestinalis*.

Keywords: *Giardia intestinalis, Alpha-Giardin, Giardiasis, Hydrogen peroxide, Oxidative stress*

KNOWLEDGE TOWARDS HPV INFECTION AND HPV VACCINATION ACCEPTABILITY AMONG MALE STUDENTS IN MALAYSIAN PRIVATE UNIVERSITY

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Background: Human Papillomavirus (HPV) infection can increase the risk of genital cancers in a man, although these cancers are not common. This study aims to access the knowledge towards HPV infection and acceptance of HPV vaccination among male students in Malaysian private universities. **Method:** A cross-sectional study was conducted among 267 male students at Malaysian Institute of Marine Technology, Universiti Kuala Lumpur, aged between 17 to 27 years old. Questionnaire was distributed to students, questions in regard to demographic profiling, knowledge and attitude related to HPV infection and vaccination were included. **Results**: The results showed that most respondents (61.4%) have good knowledge of HPV infection. Most men knew that HPV infection can cause genital warts in penis (73%), anus (59.6%) and penile cancer (65.9%). The findings showed a significant association between the year of study and the level of knowledge ($p<0.05$). Although HPV vaccination among men is not part of Malaysia routine immunization programme, more than 80% of respondents were willing to get the vaccination if available. Reasons for vaccine refusal were doubts about safety of the vaccine (35.58%) and not seeing the importance of getting vaccinated (12.73%). **Conclusion:** The level of knowledge in HPV infection and acceptance of HPV vaccination were good in this group of men. HPV vaccination should be included in the national immunization programme to reduce the prevalence of genital cancers.

Keywords: *HPV infection, HPV vaccination*

SYNTHESIS AND ANTIBIOFILM ACTIVITIES OF CIPROFLOXACIN CONJUGATED SILVER NANOPARTICLES

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Background: Pneumonia associated infection is the second leading cause of death in Malaysia in 2017. The infection is caused by the development of life-threatening biofilm, which is extremely resistant to various antibiotics. This study reported the synthesis and antibiofilm activity of a novel formulation of ciprofloxacin loaded silver nanoparticles**. Materials and Methods:** Silver nanoparticles with average size of 30 nm were synthesized via chemical reduction approach. Ciprofloxacin with varying concentrations were physically conjugated to 30 nm-silver nanoparticles. The successful conjugation of antibiotics to nanoparticles was determined based on the UV absorption peak at 420 nm. **Results:** The ciprofloxacin conjugated silver nanoparticle was more superior to eradicate the established mature biofilm of *Staphylococcus aureus* and *Escherichia coli* compared to ciprofloxacin and silver nanoparticle alone. In addition, it is also effective to inhibit the formation of biofilm. **Conclusion:** The study demonstrated that the ciprofloxacin conjugated silver nanoparticle was more effective against Gram-negative bacteria compared to Gram-positive bacteria, which could be due to the differences in the cell walls compositions between these two types of bacteria.

Keywords: *Staphylococcus aureus, Escherichia coli, Biofilm, Ciprofloxacin, Silver nanoparticles*

PHOTOELECTROCHEMICAL PERFORMANCE OF Ti^{3+} SELF-DOPED TiO_2 NANOTUBE ARRAYS

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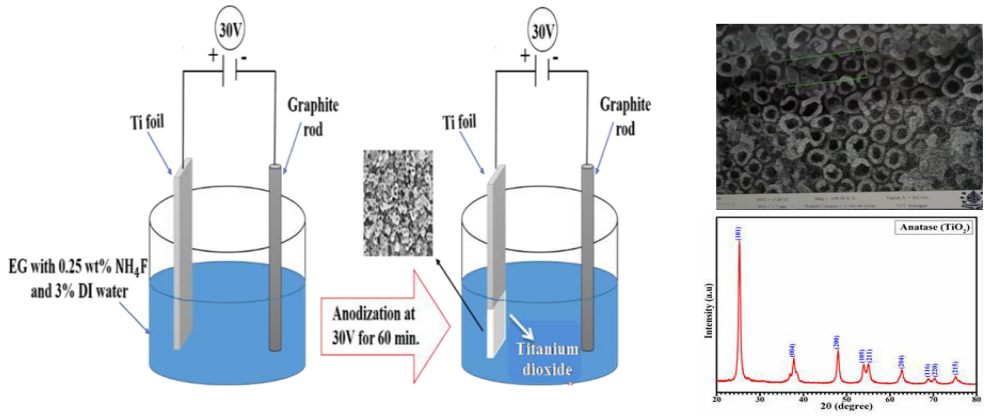
The introduction of oxygen vacancies in TiO_2 (Ti^{3+} self doped TiO_2) have been reported to have extended its photoelectrochemical performance from UV to visible region and hence increased its electrical and charge transfer properties. The surface oxygen vacancies prevent the recombination of photogenerated electron-hole pairs, thereby act as adsorption sites in addition to charge carrier traps. However, the bulk oxygen vacancies acting as charge carrier traps serve as recombination centers for electrons and holes. Herein we report the fabrication of Ti^{3+} self-doped TiO_2 nanotube arrays (TNTAs) via one-step anodization method subsequently followed by treatment with hydrazine hydrate. XRD and FESEM were carried out for the structural and morphological examination, respectively, which confirmed the formation of TNTAs. The sample is expected to exhibit enhanced photoelectrochemical performance.



Keywords: *Photoelectrochemical, Nanotube, TiO_2*

PHARMACEUTICAL QUALITY AND STABILITY ASSESSMENTS TOWARD O.T.C IBUPROFEN TABLETS TO DISPROVE COMMON PERCEPTIONS

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Background: Quality control in pharmaceutical industry is mandatory to guarantee the quality, efficacy, and safety of oral drug products. Common perceptions saying that expensive medications (in tablet dosage form) are better in terms of quality as compared to less expensive medication, and the usual thinking that keeping tablets in refrigerated ambience will retain its quality. **Objective:** This study aims to disprove the common perceptions by performing quality control assessment of ibuprofen tablets from two brands and to determine the stability of a selected ibuprofen brand at two different storage conditions. **Materials and Methods**: Two generic brands of ibuprofen tablets that have significant differences in terms of the selling price were purchased from a local pharmacy. Tablets were subjected to quality control tests, namely weight variation, thickness, hardness, friability, disintegration, and dissolution. For stability study, tablets from selected brand were kept at two different ambience conditions, in refrigerator (4°C±2°C) and at room temperature (25°C±2°C) for 30 days, followed with quality control assessments. Results were compared to the acceptance requirement set by British Pharmacopeia and United States Pharmacopeia guidelines. **Results**: Tablet from both brands showed no significant difference in terms of quality, as data projected within the acceptance level required by BP and USP guidelines. Results also revealed that there were no quality differences influenced by the storage condition. **Conclusion**: The present study suggested that low-priced generic tablets may have a similar quality to the expensive tablets and storing tablets in refrigerator is not a necessary option to maintain tablet stability and quality. The finding can be used to disprove the common patient's perceptions on medication quality.

Keywords: *Quality control, Ibuprofen, Disintegration, Dissolution, Oral dosage form*

AWARENESS OF RADIATION PROTECTION AND KNOWLEDGE ON DOSE LEVEL OF RADIOLOGICAL PROCEDURES AMONG MEDICAL AND MEDICAL IMAGING STUDENTS AT UNIVERSITI KUALA LUMPUR ROYAL COLLEGE OF MEDICINE PERAK

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Background: A complete and systematic assessment on the primary radiation protection knowledge is needed, especially for undergraduate students, such as medical students and medical imaging students, in an endeavour to gain insight about the recent status of radiation protection education among who will interpret, perform and request radiological procedures in their future career (Paolicchi et al., 2016). **Objective:** This study aims to assess the awareness of radiation protection issues and knowledge of dose levels on radiological procedures among medical students and medical imaging students of Universiti Kuala Lumpur Royal College of Medicine Perak. **Materials and Methods**: A survey was conducted to obtain the data for this cross-sectional study. Data were collected within one month from 1st April 2019 to 30th April 2019. The questionnaire was adopted from "Assessment of radiation protection awareness and knowledge about radiological examination doses among Italian radiographers" (Paolicchi et al., 2016). The total sample size of this survey was 114, were consisted of 61 medical students and 53 medical imaging students. Both medical and medical imaging students were in the final year of their study. Before the study, participants were informed that the results would be stored in a database and used for research purposes only. Participation in the survey was voluntary and anonymous. **Results**: This study found that 28.95% of the medical student respondents scored below adequate overall awareness of radiation protection compared to medical imaging students' respondents, 24.57%. This study also found that 50.81% of medical student respondents scored less than half of the total score for dose levels of radiological procedures compared to medical imaging students' respondents, which was only 30.59%. **Conclusion**: The findings of this study indicate that there were significant differences in awareness of radiation protection issues and knowledge on dose levels in radiological procedures among medical students and medical imaging students of Universiti Kuala Lumpur Royal College of Medicine Perak.

Keywords: *Awareness, Radiation Protection, Dose Levels, Radiological Procedures, Medical Students, Medical Imaging Students*

FABRICATION OF ABDOMINAL COMPUTED TOMOGRAPHY PHANTOM FOR SPECTRAL CT IMAGING

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Background: At present, there are a number of commercially homogeneous CT phantoms. These phantoms are expensive and limited in design. Therefore, there is a need to fabricate a cost-effective abdominal computed tomography phantom that contains multi-tissue mimicking materials for tissue characterisation and radiation dose measurement. **Objective**: To design and fabricate abdominal computed tomography phantom for spectral CT imaging application. **Material and Method:** An abdominal CT phantom was fabricated with 32.0 cm diameter using polymethyl methacrylate (PMMA). The height and the thickness of the phantom is 17 cm and 5.0 mm, respectively. The phantom has 6.0 cm diameter cylindrical tubes inserts for tissue-mimicking materials. The holes are distributed equally at 1.0 cm depth. The dosimeter inserts were designed to slot in the tissue-mimicking material tubes inserts. The tissue-mimicking materials used are sunflower oil, calcium chloride ($CaCl_2$), Ferric Nitrate ($Fe(NO_3)_3$) and water as fat, bone, blood and soft tissue, respectively. The scanning of the phantom was obtained by applying the abdominal protocol for DECT with 80 kV and 140 kV tube voltage, various slice thicknesses, 1.2 pitch, and tube current using CAREDose 4D software. The imaging parameter scanning without CAREDose4D using a 0.5 pitch tube current is 118 mAs and 270 mAs, with various slice thicknesses. Radiation dose was measured using thermoluminescent dosimeter (TLD). **Result:** The developed phantom was tested for spectral CT imaging. The phantom is well-performed to characterize different types of tissues. Thus, the phantom can be used for evaluating the image quality and radiation dose for research and Quality Control purposes.

Keywords: *Phantom, Spectral computed tomography, Radiation dose, Image quality*

EFFECT OF WOBBLE BOARD HIP STRENGTHENING VS CONVENTIONAL PHYSIOTHERAPY TREATMENT IN OSTEOARTHRITIS KNEE

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Background: Osteoarthrosis (OA) is defined as a degenerative condition of the synovial joints. Osteoarthritis of the knee is ranked as one of the most significant causes of disability among the elders. It is a common disorder of cartilage degradation, synovial inflammation, osteophyte formation, thinning of joint space and subchondral sclerosis. The National Institute for Clinical Excellence (NICE) report, in the 2014 guidelines, states that treatment for osteoarthrosis should take a holistic approach. Use of multidirectional wobble board hypothesized that improves balance and proprioception. So, pain, lower extremity muscle power and proprioception are clinically important for the participants' balance control. **Objective:** The objective of this research was to study that the weight-bearing exercise of hip abductors in various balance strategies, which may need to achieve joint position sense. **Materials and Methods**: 146 participants were allocated into two groups multidirectional wobble board lateral step-up exercise group (MD) and control group. All the participants' basic subjective data, clinical measurements, including the age, gender, body mass index (BMI) and joint position sense, were measured. Data were analyzed with a paired t-test, unpaired t-test and ANOVA. **Results**: This study shows multidirectional wobble board exercise group (MD) showed a better reduction in mean test angle of joint position sense in OA knee participants than the control group. The longer 4 weeks duration was more beneficial than shorter 2 weeks of weight-bearing wobble board protocol. **Conclusion**: This study proved that the multidirectional wobble board lateral step-up exercise is more beneficial than conventional physiotherapy exercise in OA Knee.

Keywords: *Osteoarthritis knee, Joint position sense, Physiotherapy, Multidirectional wobble board exercise, Hip strengthening*

A TALE OF TWO ORTHOSES: WHAT FACTORS ENFORCED THE DECISION?

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The increase in foot plantar pressure causes chronic diabetic foot ulcers, which are prone to infection to undergo a slow healing process and would eventually lead to severe consequences. Many methods were proposed to relieve pressure and promote successful wound healing. The objective of this clinical case report is to justify the selection of patellar tendon bearing ankle-foot orthosis (PTB AFO) over the *Aircast XP diabetic walker*. A 45-year-old lady with underlying diabetes mellitus, morbid obesity and stroke, presented with Charcot foot arthropathy. Features of this case are discussed together with the suitability of different orthoses which are available in Malaysia. Due to the complexity of the patient's problems, it is challenging to decide the most suitable orthosis for this patient. In conclusion, the treatment plan was to prescribe PTB AFO as it meets the functional and social requirements of the patient compared to *Aircast XP diabetic walker.*

Keywords: *Charcot foot, Diabetic foot ulcers, Aircast XP diabetic walker, Patellar tendon bearing ankle-foot orthosis*

KNOWLEDGE, ATTITUDE AND PRACTICE OF EMERGENCY CONTRACEPTION METHODS AMONG POST-SECONDARY SCHOOL YOUTHS AGED 18 TO 24 IN KINTA DISTRICT, PERAK

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Background: Emergency contraception (EC) methods are used to prevent pregnancy and used during the first five days after unprotected sexual intercourse. A newspaper in 2016 reported that there were 18,847 teenage pregnancies in Malaysia. Unwanted teenage pregnancies could lead to unsafe, illegal abortions, sexually transmitted diseases and increased maternal mortality and morbidity. **Objective:** To determine the knowledge, attitude and practice among post-secondary school youths aged 18 to 24 years in Kinta District, Perak, Malaysia. **Materials and Methods**: This cross-sectional study was conducted among 267 post-secondary school youths aged 18 to 24 years in Kinta District as part of student research project of year 4 students with approval from the Faculty of Medicine. A structured questionnaire was distributed online through WhatsApp, and printed questionnaires were distributed among youths in public places. An informed consent was obtained before data collection. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 23. Results: There were 270 respondents (221 female, 49 male). Majority were Malays (94 %) and studying for diploma/degree courses (93 %). The majority (97.4 %) had never used contraceptives, with only 7.4% stated they were sexually active. Almost 58% had heard of EC and knew that it could be obtained from pharmacies and medical personnel. Knowledge of EC was poor. Around 33 to 50 % of participants were having neutral attitude. **Conclusion:** 58 % of the respondents have heard about EC, but actual knowledge on EC was poor. Majority (97 %) never used contraceptives, while only 7.4 % were sexually active.

Keywords: *Emergency contraception, Youths*

COVID-19 VACCINATION TABOO: EARLY VACCINATION TO PREVENT SEVERE DISEASE IN THE ELDERLY A MYTH?

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Coronavirus disease 2019(COVID-19) outbreak has become a global pandemic infecting millions of people globally, causing disabilities and significant life loss, especially in the elderly population due to their greater susceptibility towards the debilitating infection further complications. Thus, the various vaccination program is underway to protect them against COVID-19. This case report of two elderly patients with comorbid who were infected with COVID-19 post-vaccination aims to showcase the importance of early vaccination to prevent severe disease and complications of COVID-19. Despite contracting the disease, both patients were asymptomatic and did not suffer any complications of COVID-19, providing evidence of the impact of early vaccination has on preventing complications in the elderly.

Keywords: *COVID-19, Vaccination, Elderly population*

EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF) ON CARDIOVASCULAR RESPONSES ON YOUNG ADULTS

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Background: Proprioceptive neuromuscular facilitation (PNF) is being a preferred method as one of the treatment plans to improve patient's well-being by several physiotherapists in Malaysia. PNF is a stretching technique that has been practiced in improving muscle elasticity, increasing muscle thickness, dynamic balance and producing positive effects on active and passive range of motions. **Objective:** The study aims to investigate the short-term effects of PNF stretching exercises on blood pressure & heart rate among young adults. **Method:** 50 subjects underwent the hold-relax PNF stretching exercise for upper limbs (biceps muscle) and lower limbs (hamstring muscle). All subjects were assigned to conduct 4 sets of a combination of passive movement, isometric contraction and passive stretching for both upper and lower limbs. Preliminary data (before exercise) and post-data (after exercise) for heart rate and blood pressure were measured and recorded. The data were statistically evaluated by Paired-samples t-test and Non-parametric Sign test at ($p<0.05$) level of confidence by using SPSS 23.0 tool. **Result:** A paired samples t-test was performed to compare lower limb pre-testing (SBP_LL_pretest) and post-testing (SBP_LL_posttest). The results showed that, there was a significant difference in the scores for SBP_LL_pretest (M=114.98, SD=8.714) and SBP_LL_posttest (M=118.86, SD=9.94); t (49) =-2.28, p=0.027. **Conclusion:** There was no significant difference in heart rate and diastolic blood pressure. However, significant changes were present in systolic blood pressure of the participants/subjects.

Keywords: *Proprioceptive Neuromuscular Facilitation (PNF), Cardiovascular, Heart Rate, Blood Pressure.*

THERAPEUTIC ARSENAL AGAINST COVID-19

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Coronavirus disease 2019 (COVID-19), caused by SARS-CoV-2, has created havoc throughout the globe since it started in Wuhan city of China in December 2019. The pandemic caused by this virus is unique and the most serious in the history of mankind. To date (14th July 2021), it has afflicted neary188 million human beings throughout the world, with a death toll of four million. All aspects of human development like health, education, tourism, trade and commerce have been affected by COVID-19, and the economy of a few developing countries has been completely shattered. Even the wealthiest countries like the USA, UK, European Union and Japan have not been spared. Despite the fact that vaccines have been developed, their insufficiency and doubtful efficacy against new variants coupled with the lack of other potential therapeutic options continue to create bottlenecks in the management of this horrendous disease. The global research community are focusing to re-purpose some established drugs like hydroxychloroquine, favipiravir, remdesivir, ivermectin, azithromycin, doxycycline, lopinavir-ritonavir, dexamethasone, tocilizumab etc. for the treatment of COVID-19. However, only a few of these drugs, like dexamethasone and tocilizumab, have been proven to be partially effective in counteracting cytokine storms in oxygen-dependent hospitalized patients and saving many lives. Many other prospective candidates are undergoing investigations in different parts of the world. Recently the USFDA and NIH panel have approved emergency use authorization (EUA) of SARS-CoV-2 monoclonal antibody combinations like casirivimab and imdevimab or bamlanivimab and etesivimab or sotrovimab in high-risk non-hospitalized patients. The sooner an effective antiviral drug for SARS-CoV-2 is developed, humanity will heave a sigh of relief.

Keywords: *SARS-CoV-2, Antiviral, COVID-19*

CURRENT VIEW OF ARSENIC EXPOSURE-INDUCED ASTROCYTES DYSFUNCTION IN DEVELOPING BRAIN

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Ground water arsenic contamination has become a global problem while replacing surface water to prevent water-borne diseases. Malaysian recently exposed with arsenic in double concentration of drinkable limit from distributed water. Arsenic exposure leads to neurodevelopmental disabilities impacting millions of children globally. While arsenic passing through the immature blood-brain barrier of developing brain, the first brain cell encounter is astrocytes. Neurodevelopmental disorders, including autism spectrum disorders, are somewhat linked with astrocytic dysfunction. This paper reviewed the effect of arsenic exposure on various functions of astrocytes, including cell cycle alteration, proliferation, regulation of neurotransmitter release, structural integrity and viability. Arsenic exposure suppresses astrocytic proliferation and alters the cell cycle by inducing unscheduled mitotic S phase entry, followed by cell death rather than apoptosis. The Glial Fibrillary Acidic Protein (GFAP) expression of astrocytes, which is important to maintain structural integrity, was suppressed by arsenic and resulted in cell shrinking, detachment, and dendritic loss. Increasing peroxisome proliferator-activated receptor-gamma (PPARγ) mediates downregulation of GFAP and promotes apoptosis in rat astrocytes. Astrocytes optimize neuronal function and prevent glutamate excitotoxicity by taking up the glutamate in the synaptic cleft through glutamate transporters. Arsenic exposure deficient the glutamate uptake by suppressing the expression of excitatory amino acid transporter (EAAT) 1/ glutamate-aspartate transporter (GLAST). Arsenic disturbs the functional stability of astrocytes in developing brains impacting the cell population by altering cell cycle, structural integrity by suppressing cytoskeletal, and the preventive role of neuronal glutamate excitotoxicity.

Keywords: *Arsenic, Astrocytes, Neurotransmitter release, Structural integrity, Cell cycle*

ANTIBACTERIAL PROPERTIES FROM THE EXTRACTION OF ESSENTIAL OIL IN KAFFIR LIME (*Citrus hystrix*) PEEL

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Background: *Citrus hystrix (C. hystrix)*, locally known as 'limau purut', is Malaysia's major commercial fruit harvest. Besides being a common ingredient in Asian cuisines, the extracted essential oil has been used in diverse applications. The essential oil can be extracted from peels or leaves, which gives strong aromatic properties. **Objective:** The main purpose of this study is to evaluate the antibacterial activity of *C. hystrix* essential oil by using disc diffusion method. **Materials and Methods**: *C. hystrix* essential oil extracted from the peels using the Clevenger apparatus of hydrodistillation method. The antibacterial activity of essential oil was evaluated by agar disc diffusion method against four strains of bacteria: two gram-positive bacteria (*Staphylococcus aureus* and *Staphylococcus epidermidis*) and two gram-negative bacteria (*Escherichia coli* and *Shigella dysenteriae*). Each assay was done in triplicates. In this research, positive control of gentamycin and streptomycin were used as an indicator to improve the research's validity. **Results**: Gram-positive bacteria were more susceptible to essential oil than gram-negative bacteria, where the average diameter for gram-positive bacteria (*S. aureus* = 19.3 ± 1.5 mm, *S. epidermidis* = 19.3.0 ± 0.6 mm) and for gram-negative bacteria (*E. coli* = 8.3 ± 0.6 mm, *Shigella sp*. = 11.7 ± 0.6 mm). The gentamycin was recorded to have good inhibition zone diameter in all tested bacteria. However, only *S. epidermidis* showed resistance to streptomycin. **Conclusion**: *C. hystrix* essential oil was found to possess antibacterial activity. Thus, these findings manifested that *C. hystrix* essential oil can be developed as an antibacterial agent in various applications.

Keywords: *Citrus hystrix peel, Essential oil, Hydrodistillation, Antibacterial, Disc diffusion*

THE KNOWLEDGE AND ATTITUDE OF AIMST DENTAL STUDENTS TOWARDS COVID-19 PANDEMIC

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Background: Coronavirus disease (COVID-19) evolves rapidly, leading to public health emergencies. This has casted a great impact physically and mentally among dental students. **Objective:** Study aimed to measure the level of knowledge and attitude among Asian Institute of Medicine, Science and Technology (AIMST) University's dental students regarding COVID-19, as well as comparing mean knowledge and attitude scores between genders and years of study. **Materials and Methods**: Online questionnaire was distributed to 225 third to fifth year AIMST dental students in February 2021. Data obtained was analyzed using descriptive statistics, independent t-test and one-way analysis of variance (ANOVA) test. **Results**: Majority knew about incubation period (95%) and transmission route (96%) of COVID-19. 89.6% agreed that ultrasonic scaling has higher risk of infection, followed by endodontic access cavity (85.6%) and simple/complex filling using rotary instruments (73.6%). 76.6% were worried about getting infected while providing treatments. 51.2% felt comparatively incompetent in future due to insufficient experience during study. Mean scores were 10.9 (SD 1.48) for total knowledge and 5.2 (SD 1.32) for attitude. P values for differences in knowledge and attitude between genders were 0.206 and 0.846, respectively, whereas between batches were 0.034 and 0.024, respectively. **Conclusion**: This study showed that the level of knowledge and attitude of AIMST dental students towards COVID-19 was fairly good.

Keywords: *Knowledge and attitude, Dental students, COVID-19*

COVID-19 IN A PATIENT WITH CHRONIC KIDNEY DISEASE: A CASE OF COINCIDENCE IN INDONESIA

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Introduction: Chronic kidney disease (CKD) increases the risk of mortality during coronavirus disease 2019 (COVID-19) episodes. Patients with end-stage renal disease (ESRD) are highly vulnerable with multiple comorbidities that make them susceptible to adverse outcomes with COVID-19. There is limited data about patients with ESRD who also suffer from COVID-19. We discussed the case of a hemodialysis patient who had comorbidities and developed COVID-19 pneumonia in the clinical course. **Case descriptions:** A 40-year-old woman who had ESRD and was taking regular hemodialysis, admitted to hospital for presented intermittent fever, dyspnea, and fatigability. The patient had comorbidities, Hepatitis C, Human Immunodeficiency Virus (HIV), and Hypertension. The patient took continuous renal replacement therapy (CRRT) three times a week. She was diagnosed with COVID-2019 by the reverse-transcriptase polymerase chain reaction (RT-PCR) and his pharyngeal swab for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was positive. Chest X-ray showed bilateral pneumonia. She was intensively monitored and treated with antiviral drugs, oxygen, broad-spectrum antibiotics, steroids, nutrition, and other supporting drugs. After 24 days, an RT-PCR assay for SARS-CoV-2 was negative, and pulmonary involvement improved significantly. The patient was discharged on day 28 after recovering from a COVID-2019 infection. **Conclusion:** The disease courses and treatment options for the patient were significantly more complicated. The patient had a deteriorating illness and recovered after following treatment and CRRT. It is essential to ensure continuous dialysis and might be an important option for hemodialysis patients with COVID-19.

Keywords: *COVID-19, SARS-CoV-2, Chronic kidney disease, CRRT, Pneumonia*

UTILISING HEALTH BELIEF MODEL TO EVALUATE COVID-19 VACCINATION ACCEPTANCY, AND IMPROVEMENT FOR COVID-19 VACCINES EDUCATION MATERIALS

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Background: To enhance the health education and policy implementation in Malaysia, it's crucial to identify factors that are associated with the acceptance of COVID-19 vaccine. Utilising the Health Belief Model (HBM) would allow the researchers to justify the factors that influence COVID-19 vaccines acceptancy. **Objective:** To identify the level of acceptance, determine the association between the HBM constructs and the level of acceptance of COVID-19 vaccines, and to explore the probable enhancements for the COVID-19 vaccines educational materials. **Materials and Methods**: A convenience sampling method was adopted to conduct an online questionnaire to study each construct of HBM. All Malaysian aged ≥18 years were eligible. The questionnaire included sociodemographic details; self-report health conditions; and self-reported individual beliefs and actions. An in-depth-interview was then conducted to obtain suggestions to enhance the COVID-19 vaccines education materials. **Results**: The acceptability of COVID-19 vaccines was high with a mean score of 3.57 (SD=0.595). However, only 87.2% of the respondents have registered for the vaccines. Perceived susceptibility, perceived benefits, perceived barriers and cue to actions were all correlated to vaccines acceptancy. It was suggested to provide more information for pregnant ladies, to provide updated adverse-reaction data, to increase visibility of reliable resources, and to make the resources simpler to understand. **Conclusion**: It is important to look into the factors that may increase the individual's belief. More attention should also be focused on specific groups when designing the education material as a cue is an important factor that leads to the acceptance of the COVID-19 vaccines.

Keywords: *COVID-19, vaccine, acceptance, Health Belief Model, health education*

RETROSPECTIVE ANALYSIS OF RESPIRATORY MEDICATION THERAPY ADHERENCE CLINIC (RMTAC) IN THE MANAGEMENT OF PAEDIATRIC BRONCHIAL ASTHMA

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Background: Paediatric respiratory medication therapy adherence clinic (RMTAC) serves as an excellent platform for patient-centred care. In most healthcare settings, pharmacists and physicians often do not readily communicate because they work independently and in parallel rather than collaboratively. **Objective:** Our study aimed to focus on the roles of RMTAC to complement clinical paediatrics management of bronchial asthma on the provision of clinical assessment, counselling and monitoring. **Materials and Methods**: This retrospective study involved data retrieval of paediatric bronchial asthma patients seen by paediatric RMTAC clinic and those without RMTAC, from 1 January 2019 until 31 December 2020. The study variables of interest were collected, collated and compared, which include the demographic particulars (age, serial weight and height) and information on the assessment of therapy adherence and inhaler technique. **Results**: A total of 87 clinical records of paediatric bronchial asthma were retrieved for this study (40 with no RMTAC *vs.* 47 with RMTAC). At the first visit, the majority had well-controlled asthma (n=37, 42.5%) with low medication adherence (n=26, 29.9%). The assessment of metered-dose inhaler technique was significantly poor without RMTAC monitoring, χ^2=43.54, df=1, p<0.001. Univariate analysis determined that age (OR:1.16, 95% CI:1.0-1.3) and good MDI technique (OR:6.4, 95% CI:1.35-30.14) were significantly associated with good asthma control. **Conclusion**: Our paper highlights the importance of paediatric RMTAC to complement medical management of bronchial asthma. We highly recommend paediatric RMTAC service be strengthened and introduced throughout all healthcare facilities in Malaysia to improve healthcare delivery.

Keywords: *Pharmacists, Public health, Counseling, Pediatrics, Referral and consultation, Health care costs.*

PREVENTIVE MEASURE TOWARDS COVID-19 AMONG THE PUBLIC IN MALAYSIA

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Background: There has been a rise in COVID-19 in Malaysia, with a total of more than 500 000 cases reported over the last year. In addition to preventive measures such as physical distancing, face masks and hand cleaning, availability of COVID-19 vaccines may mitigate risk of transmission. **Objective:** To identify COVID-19 preventive measures practised among the public. **Methods:** Cross-sectional, questionnaire-based study assessing practices such as physical distancing, face mask, hand cleaning and COVID-19 vaccine confidence and hesitancy among Malaysians. **Results:** A total of 2558 respondents were assessed for preventive measures such as physical distancing, face masks and hand cleaning. Overall, 1456 (56.9%) always complied to the one-meter social distancing rule. A majority admitted that they wore masks at all times (n=2284, 89.3%), while approximately half (n=1325, 51.8%) only sometimes sanitized their hands. A total of 898 respondents were assessed for vaccination confidence and hesitancy. Of this, 603 (67.1%) respondents agreed to be vaccinated, while 47 (5.2%) refused. The remaining 248 (27.6%) remained unsure. Total public confidence score was an average of 11.28±2.88 (maximum possible score=15). Those who agreed to vaccinate showed increasing confidence compared to those that disagreed ($p<0.001$). Vaccine hesitancy score of the study population was an average of 32.78±4.17 (maximum possible score= 45). Respondents that accepted the COVID-19 vaccines had a lower hesitancy level compared to those that did not accept the COVID-19 vaccine ($p<0.001$). **Conclusion:** Further education of the public is required to ensure preventive measures are fully adhered to.

Keywords: *COVID-19, Vaccination, Virus, Infection*

CAREGIVER'S SELF-EFFICACY, DIABETES MANAGEMENT AND GLYCAEMIC CONTROL AMONG CHILDREN WITH TYPE 1 DIABETES MELLITUS

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Background: Achieving optimal glycaemic control is important to prevent diabetes-related complications. Caregivers play an important role in supervising and implementing management of children with type 1 diabetes mellitus (T1DM). **Objectives:** The objectives of this study were to determine the caregiver's self-efficacy in managing their child's T1DM and their adherence to its management, identify glycaemic control as well as determine factors associated with glycaemic control among children with T1DM. **Materials and Methods:** Caregivers of children with T1DM attending clinic follow-up at two tertiary care hospital settings in Kuala Lumpur, Malaysia, were contacted and invited to participate in this study. The questionnaire was administered via phone interview or online. Items in the questionnaire include sociodemographic and clinical data as well as the Parental Self-Efficacy Scale for Diabetes Management (PSESDM) and Diabetes Management Questionnaire (DMQ). **Results:** The caregivers' self-efficacy and adherence to diabetes management were found to be at a moderate level (mean ± SD = 28.56 ± 3.60, total score = 40 and 67.85 ± 14.75, total score = 100; respectively). Overall glycaemic control was suboptimal and only 22% of the patients achieved optimal glycaemic control with HbA1c of <7.5%. Caregivers' self-efficacy, adherence to diabetes management and duration of diabetes were significantly correlated with glycaemic control (r -0.405, p = 0.004; r -0.438, p = 0.001 and r 0.321, p = 0.023; respectively). **Conclusion:** Interventions to empower caregivers' self-efficacy and improve adherence to diabetes management can be planned for optimal glycaemic control in children with T1DM.

Keywords: *Children, Diabetes management, Glycaemic control, Self-Efficacy, Type 1 diabetes mellitus*

THE LEVEL OF KNOWLEDGE AND AWARENESS AMONG MALAYSIAN PHYSIOTHERAPIST ON PILATES IN BREAST CANCER REHABILITATION

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Background: Breast cancer is the most dominant cancer, which accounts for 33% of all cancer in Malaysia. Accordingly, there are several strategies has been implemented in the management of breast cancer. Pilates is one of the effective methods that focus on the rehabilitation of breast cancer survivors. However, there is paucity of evidence into insight of the pilates and its recognition. **Objective:** The aim of the study is to assess the knowledge and awareness of Pilates in improving female breast cancer patients' functional capacity and upper extremity functions among physiotherapists in Selangor, Malaysia. **Materials and Methods**: A cross-sectional study was conducted among 113 physiotherapists located in Selangor, Malaysia. A self-structured questionnaire was used to obtain data. The questionnaire was divided into four sections, namely demographic status, awareness and knowledge of Pilates on women's health and breast cancer, perception and interest in pursuing new knowledge on women's health and implementation of Pilates in women's health and breast cancer. **Results**: The result obtained showed that majority of the female therapists (68%) and only small percentage of male therapists (27%) are aware of Pilates. Majority of the participants (n=51, 45.13%) are unaware that musculoskeletal complications secondary to breast cancer can be treated using Pilates. **Conclusion**: Low-to-moderate level of knowledge and awareness about Pilates in female breast cancer rehabilitation among Malaysian physiotherapist in this study. Hence there is a need to escalate the level of awareness and knowledge among Physiotherapists in Malaysia.

***Keywords*:** *Pilates, Breast cancer, Physiotherapist, Awareness, Knowledge*

A THEMATIC ANALYSIS OF NON-PHARMACOLOGICAL INTERVENTION STRATEGIESIN THE MANAGEMENT OF DIABETIC PATIENTS IN MALAYSIA

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Background: Pharmacotherapy is one of the most effective treatments for the control of diabetics and preventing complications that could lead to increased healthcare burden. Nonetheless, its efficacy isoften limited by poor medication adherence among diabetic patients. The level of adherence to medication among diabetic Malaysians has been reported to be between 36% to 87% for oral antidiabetics and 54% to 81% for insulin injection. In order to increase the proportion of diabetic patients with good disease control and thus reducing complications of the disease, non-pharmacological strategies that are complementary to the drug treatment had also been studied. **Objective:** The objective of this research was to provide a synthesis of the themes for non-pharmacological interventions applied in the management of diabetic patients in Malaysia. **Materials and Methods**: A systematic electronic literature search for English articles in four databases (PubMed, SCOPUS, Web of Science, and OVID) was conducted using relevant search strings. Thematic analysis was conducted to review the non-pharmacological strategies used in the management of diabetic patients in Malaysia. **Results**: Twenty-two articles were included in the final analysis. Six themes of non-pharmacological intervention were identified. These are diabetes education programmes, patient empowerment programmes, adherence support programmes, lifestyle adjustment programmes, psychological intervention programmes, and shared decision-making. **Conclusion**: Further research is warranted to evaluate the impact of different non-pharmacological intervention strategies on patient's outcomes and preferences in Malaysia.

Keywords: *Diabetes mellitus, Interventions, Non-pharmacological, Thematic analysis, Patientmanagement*

DEVELOPMENT AND EVALUATION OF ORALLY DISINTEGRATING FILM CONTAINING AMLODIPINE BESLYATE

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Background: Amlodipine beslyate tablet is one of the most highly prescribed medicines to manage hypertension in geriatric populations. However, difficulty in swallowing tablets has been identified as one of the contributing factors to non-compliance of geriatrics due to problems like dysphagia, fear of choking and odynophagia. **Objectives:** The objective of this study was to develop and evaluate orally disintegrating film (ODF). Different formulations and methods are being used to produce ODF, and the most ideal formulation selected after undergoing validation tests such as thickness test, folding endurance, tensile strength, percentage of elongation, young's modulus, disintegration and dissolution test. **Materials and Methods:** Chemicals such as hydroxypropyl methyl cellulose (HPMC), carboxyl methyl cellulose (CMC), glycerin, mannitol, SLS, citric acid, peppermint oil and coloring agent being used to formulate ODF. In addition, ODF was prepared using solvent casting and spraying methods. **Results:** Increase in polymers concentration, formed ODF with greater mechanical strength. Comparison between HPMC and CMC as film-forming agents discovered HPMC to have greater mechanical film properties than CMC except for folding endurance. On top of it, HPMC was shown to have better disintegration time which was in the range of 30-90 s with drug release of 95-100%, while CMC disintegrates at 6–15 min with drug release of 60-75%. On the other hand, both solvent casting and spraying methods produced evenly matched ODF quality. **Conclusion:** ODF containing amlodipine beslyate was developed, characterized, and concluded to have great potential in the market and profound ability in reducing geriatric non-compliance to antihypertensive drugs.

Keywords: *Amlodipine besylate, HPMC, CMC, orally disintegrating film, Mechanical strength, Disintegration, Tensile strength, Dissolution*

FORMULATION OPTIMIZATION OF AMLODIPINE ORALLY DISINTEGRATING TABLETS

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Background: Oral drug delivery has been recognized as the most desirable method of drug administration among other drug delivery routes due to its ease of administration, long shelf life, and low production cost. Orally disintegrating tablets are tablets designed to disintegrate within seconds in the mouth without the need to drink water for swallowing. This unique feature of orally disintegrating tablets is favorable mainly to special populations such as the elderly, pediatric, and patients having difficulty swallowing. The optimization of tablet formulation plays a significant role to obtain the optimal combination of tablet constituents as the tablet composition is influential on dosage form characteristics. **Objectives:** This study aimed to formulate and evaluate orally disintegrating tablets with an optimal type and percentage of filler using amlodipine as the model drug. **Materials and methods:** Blank orally disintegrating tablets containing different fillers, namely, Sorbolac® 400, Granulac® 200, and CombiLac® with different percentages, were prepared using the wet granulation method and were evaluated based on the weight variation, hardness, thickness, friability, and disintegration time. **Results:** It was found that the formulation that consists of 25% Granulac® 200 as the filler showed the optimal result among all formulations with the fastest disintegration time (96.17 s ± 18.40) and sufficient tablet hardness (4.59 kg ± 0.70). Hence, the formulation with 25% Granulac® 200 was selected as the optimal formulation of orally disintegrating tablets and incorporated with amlodipine. **Conclusion:** From this study, it can be concluded that excipients have an essential role in determining the physical properties of orally disintegrating tablets.

Keywords: *Orally Disintegrating Tablet, Filler, Wet Granulation.*

KAP ASSESSMENT ON HALAL PHARMACEUTICALS AMONG PHARMACY STUDENTS IN MALAYSIAN PRIVATE UNIVERSITIES

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Background: Halal pharmaceuticals refer to medicines that are permitted by the Shariah Law. Some medicines may contain animal products or are derived from animals which may raise issues on its halal status. It is important for a pharmacist to have a good and right knowledge regarding halal pharmaceuticals to ensure effective patient counselling. **Objective:** This study aimed to assess the knowledge, attitude, and perception of fourth-year pharmacy students from private universities in Malaysia regarding halal pharmaceuticals. **Materials and Methods**: A cross-sectional study was carried out using structured, validated, and self-administered questionnaires among final year pharmacy students from 13 private universities accredited by the Pharmacy Board of Malaysia. Descriptive statistics with non-parametric tests were used to summarize the data. Chi-square and Fisher's exact test was applied to assess the association between demographic characteristics with knowledge, attitude and perception. **Results**: The mean score obtained for knowledge, attitude, and perception of 257 respondents were 11.37 ± 3.86, 32.9 ± 4.86 and 31.94 ± 4.39, respectively. There was a significant, positive, moderate correlation between knowledge and attitude ($p<0.001$, $r = 0.433$), and knowledge and perception ($p<0.001$, $r = 0.369$). A significant, positive, and strong correlation was found between attitude and perception ($p<0.001$, $r = 0.732$). **Conclusion**: Fourth-year pharmacy students from private universities have good knowledge, attitude, and perception towards halal pharmaceuticals. However, there was a small cohort of students who were unaware of the issue. Addition of relevant topics on the current pharmacy curriculum may be useful to ensure all future pharmacists are aware and have good knowledge regarding halal pharmaceuticals.

Keywords: *Knowledge, Attitude, Perception, Pharmacy students, Halal pharmaceuticals*

KAP ASSESSMENT ON HALAL PHARMACEUTICALS AMONG PHARMACY STUDENTS IN MALAYSIAN PUBLIC UNIVERSITIES

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Background: As the Muslim population increases, the need to provide halal products increases too. Therefore, it is necessary to explore the knowledge, attitude, and perception of future pharmacists in providing halal pharmaceutical products to Muslim consumers. **Objective:** This study is aimed to assess the knowledge, attitude, and perception (KAP) regarding halal pharmaceuticals among fourth-year pharmacy students from public universities in Malaysia. **Materials and Methods**: A cross-sectional study was carried out using structured, validated, and self-administered questionnaires among 230 final year students of UKM, USM, UIAM, UM, and UiTM. Description statistics and non-parametric tests were used to summarize the data. Chi-square test and Fisher's exact test were applied to assess the association between demographic characteristics with knowledge, attitude, and perception about halal pharmaceuticals. **Results**: Mean knowledge score out of maximum possible 16 scores were 12.4435 ± 2.93805. Mean attitude score out of maximum possible 40 scores were 34.82 ± 4.10. Mean perception score out of maximum possible 40 scores were 33.42 ± 3.70. The mean KAP score out of the maximum possible 96 scores were 80.68 ± 8.94. There was a significant, positive and moderate correlation between knowledge and attitude (r_s=0.444, $p<0.001$) and between knowledge and perception (r_s=0.414, $p<0.001$), while there was a significant, positive and high correlation between attitude and perception (r_s=0.717, $p<0.001$). **Conclusion**: The better knowledge the respondents have, the better their attitude and perception towards halal pharmaceuticals. Factors that may influence the knowledge of respondents are their religions and the presence of halal pharmaceuticals subject in the course.

Keywords: *Halal pharmaceuticals, Halal, Knowledge, Attitude, Perception, KAP*

DEVELOPMENT AND EVALUATION OF CO-PROCESSED EXCIPIENT FOR ORALLY DISINTEGRATING TABLET APPLICATION

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Background: Co-processed excipients were prepared by incorporating one excipient into the particle structure of another and a combination of two or more compendia or non-compendia excipients to physically modify their properties which cannot be achievable by simple physical mixing. The co-processed multicomponent-based excipients were introduced to achieve better characteristics and tableting properties. **Objective:** The objective of this study was to develop and evaluate a co-processed excipient for the orally disintegrating tablet (ODT) containing amlodipine. **Materials and methods:** The co-processed excipients were prepared by wet granulation with 5% of polyvinylpyrrolidone and croscarmellose sodium, five different percentages of microcrystalline cellulose and lactose monohydrate. After sieving and drying, the co-processed excipients were evaluated for angle of repose, Hausner ratio and Carr's Index. The co-processed excipients were mixed with the amlodipine powder, magnesium stearate and compressed into tablets. The amlodipine tablets were evaluated for weight variation, content uniformity, thickness, hardness, friability, disintegration and dissolution test. **Results:** 'Formulation 4' containing 20% of microcrystalline cellulose and 70% of lactose was chosen as optimum formulation because the results showed this formulation had the excellent flowability and compressibility of co-processed excipient. The amlodipine ODT showed uniform weight, content uniformity, thickness, hardness within the specific range which was 5.64 kg, 0.74% of weight loss below than 1%, 9.01 seconds of fast disintegration time and 10 seconds of 100% drug dissolved in dissolution test. **Conclusion:** In conclusion, the developed co-processed excipient can be used by the pharmaceutical industry in the future to produce amlodipine tablets in a fast, economical way and more effectively.

Keywords: *Co-processed excipient, Amlodipine, Polyvinylpyrrolidone, Croscarmellose sodium*

SOLUBILITY ENHANCEMENT OF AMLODIPINE BESYLATE USING SOLVENT EVAPORATION METHOD AND MICROEMULSION TECHNIQUE

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Background: Amlodipine besylate is a calcium channel blocker used in the treatment of hypertension. Amlodipine besylate is described as slightly soluble in water, and the experimental solubility is 0.38mg/ml. Due to its limited solubility, it may result in poor bioavailability. **Objective:** This study aims to enhance the solubility of amlodipine besylate using the solvent evaporation method and microemulsion technique. **Materials and method:** Solid dispersions (SD) of amlodipine besylate were prepared by employing solvent evaporation method. PEG6000 was the polymer of choice, and different drug: polymer ratios were used. The prepared SDs were evaluated for solubility studies, dissolution studies and scanning electron microscopy (SEM). As for microemulsion technique, the solubility of amlodipine besylate was firstly determined in various vehicles. Next, pseudoternary phase diagrams were constructed to identify the microemulsion existence region by using different ratios of surfactant:cosurfactant. The optimized microemulsion formulation was then characterized for solubility studies, dissolution studies and also transmission electron microscopy (TEM). **Results:** From the solubility and dissolution studies, it was seen that all SDs from the solvent evaporation method and microemulsions showed increased solubility compared to pure amlodipine besylate. In the solvent evaporation method, as the drug:polymer ratio increases, the solubility and dissolution rate increase. As for the microemulsion technique, the optimized microemulsion formulation containing amlodipine besylate, oleic acid (2%), Tween20 (20%), propylene glycol (10%) and distilled water showed highest *in vitro* drug release. **Conclusion:** The formulation of microemulsions and SDs by solvent evaporation method was found to significantly enhance the solubility of amlodipine besylate however, the microemulsions showed a better solubility profile.

Keywords: *Amlodipine Besylate, Solvent Evaporation Method, Microemulsion*

EFFECTS OF COORDINATION COMPOUNDS OF GERMANIUM ON THE LEVELS OF NICOTINAMIDE COENZYMES IN THE TISSUES OF EXPERIMENTAL ANIMALS

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Background. Although current data confirm the presence of different types of biological activity in metal complexes with different bioligands, the study of new types of pharmacological activity, their mechanisms of action and pharmacokinetic parameters remain relevant. **Objective.** To study the effects of niacin (NA), niacinamid (NAM), coordination compounds of germanium with niacin (MIGU-1) and niacinamide (MIGU-2) on the *in vivo* synthesis of NAD^+. **Materials and Methods**. Wistar rats were divided into 5 groups, which were injected with 0.9% NaCl (control); NA; NAM; MIGU-1 and MIGU-2 at a dose of 100 mg/kg. Six hours later, the levels of NAD^+ in the protein-free extracts of the brain, heart and liver were determined using an enzymatic method and statistically processed according to generally accepted methods. **Results**. The administration of NAM and MIGU-2 increased the levels of NAD^+ in all studied tissues. NA and NAM affected the levels of NAD^+ more significantly than the studied coordination compounds of germanium. In the liver, the effects of MIGU-1 were greater than that of MIGU-2, while in the brain, the effects of MIGU-2 were greater than that of MIGU-1. In the heart the levels of NAD+ were the same after the administration of both MIGU-1 and MIGU-2. **Conclusion.** The above suggests that MIGU-1 and MIGU-2 are stable compounds, and the mechanism of their action may be different from their use by the tissues in the synthesis of nicotinamide coenzymes. Further comprehensive studies of these compounds are still required.

Keywords*: Coordination compound of germanium, NAD, Niacin*

WEIGHT PERCEPTION, WEIGHT STIGMA CONCERNS AND OVEREATING TENDENCIES OF MALAYSIAN ADULTS

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Background: People who tend to overeat are more likely to be overweight or obese. Some studies have found that unhealthy eating habits were more likely observed in those who perceived themselves as overweight. Weight stigma in the community is supposed to motivate overweight and obese persons in reducing their weight, but ironically, it may negatively impact. **Objective:** The aim of this study was to investigate the correlation between weight perception and weight-stigma concern with overeating tendency in Malaysian adults. **Material and Methods:** This cross-sectional survey-based study targeted Malaysian adults aged 18-60 years. The survey was conducted online via Google Form using a validated questionnaire to assess the participants' weight perception, weight-stigma concern, and overeating tendencies. All data analyses were performed using SPSS 23.0. Chi-square and Spearman correlation tests were used to assess the correlation between study parameters. **Results:** Out of 324 respondents, 72.5% are female and mostly are Malay (82.4%) aged 18-24 years (79%). Most respondents (75%) perceive their weight correctly, while 10.8% underestimate and 14.2% overestimate it. More than half of the respondents (56.8%) are concern about weight stigma. High overeating tendency was found in 13.3% of respondents, while the rest are moderate (45.75%) and low (41%). The association between the accuracy of weight perception with overeating tendencies was significant ($p<0.05$). Weight stigma concerns showed a weak correlation with overeating tendencies ($p<0.01$; $r=0.147$). **Conclusion:** Wrong perception of one's body weight and weight stigma concern may also contribute to overeating tendency, which is commonly triggered by stress.

***Keywords*:** *Weight perception, Weight stigma concern, Overeating tendencies, Malaysian adults.*

THE OUTCOMES OF STREPTOKINASE VERSUS TENECTEPLASE IN ST-ELEVATION MYOCARDIAL INFARCTION (STEMI): A PROPENSITY-MATCHED RETROSPECTIVE ANALYSIS IN A MULTIRACIAL ASIAN COUNTRY

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Background Fibrinolysis using Streptokinase (SK) or Tenecteplase (TNK) is the current primary reperfusion strategy (>70%) in ST-elevation myocardial infarction (STEMI) management in Malaysia's public hospitals. The comparative outcomes of these fibrinolytic agents in the Asian population were unknown despite being widely used. ***Objective*** We aimed to assess and compare the outcomes of SK versus TNK in our multiracial STEMI patients. ***Materials and Methods*** This single-centre retrospective study analysed data on STEMI patients who received fibrinolytic therapy from 2016 to 2020 in a tertiary-care hospital. Total population sampling was used in this study. Based on the propensity score matching, 359 patients are receiving SK matched against 359 patients receiving TNK by incorporating 16 variables that potentially affect mortality. The primary outcome measures were 30-day all-cause mortality, stroke, and major bleeding. ***Results*** There was no significant difference in 30-day all-cause mortality between SK (n = 39, 11.2%) and TNK (n = 46, 13.2%) group (p = 0.418). The rates of ischemic strokes [SK (n = 1, 0.3%) versus TNK (n = 3, 0.9%), p = 0.624], intracranial haemorrhage [SK (n = 3, 0.9%) versus TNK (n = 1, 0.3%), p = 0.624] and major bleeding [SK (n = 4, 1.1%) versus TNK (n = 3, 0.9%), p = 0.624], were comparable for the two groups. The incidence of failed thrombolysis was significantly higher in the TNK arm. Hypotension and allergic reaction were significantly higher in the SK arm. ***Conclusion*** SK and TNK are fibrinolytic agents with similar efficacy and safety in STEMI reperfusion therapy for our multiracial Asian population.

Keywords: *STEMI, Tenecteplase, Streptokinase, Fibrinolysis, Thrombolysis*

"EXPLORATION OF THE EFFECTS OF SELECTIVE CALPAIN INHIBITOR A6185 IN THE MITIGATION OF ALZHEIMER'S DISEASE LIKE COGNITIVE DEFICITS INDUCED BY β-AMYLOID (25-35) IN MICE"

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Background: Calpains are cysteine proteinases that selectively cleave proteins in response to calcium signals. Exacerbated activation of calpain has been implicated in the signaling cascade that leads to Aβ production and tau hyperphosphorylation in Alzheimer's disease (AD). **Objective:** To explore the effects of selective calpain inhibitor A6185 in the mitigation of Alzheimer's disease induced by β-amyloid (25-35) in mice. **Materials and Methods:** β-amyloid (5 µL, injected intracerebroventricular (i.c.v), on both sides of the brain), was induced dementia in Swiss mice. Morris water maze (MWM) and step-down tests were performed to assess learning and memory of the animals. A battery of biochemical and histopathological studies was performed. **Results:** Aβ markedly declined MWM and step-down test performance of the animals. β-amyloidtreated mice exhibited accentuation of AChE activity, TBARS, and a fall in GSH and catalase levels. The stained micrographs of β-amyloid-treated mice indicated severe neurophilic infiltration and amyloid deposition. A6185 intraperitoneal (i.p) administration for 11 days significantly attenuated Aβ-induced memory deficits, biochemical and histopathological alterations. **Conclusion:** The findings demonstrate the potential of calpain inhibitor A6185 in memory dysfunctions which may be attributed to its anti-cholinesterase and anti-oxidative effects.

Keywords: *Calpains, amyloid-beta, Reduced glutathione, Brain acetylcholinesterase, Catalase, Neurophilic infiltration*

THE EFFECT OF PARTICLE SIZE ON THE FTIR SPECTRA AND CHEMOMETRIC MODELS FOR DETERMINING THE SOURCE OF GELATIN

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Background: Gelatin is one of the important raw materials that have multi-functional uses in the pharmaceutical industry. It is also known as one of the controversial excipients related to its halal status as gelatin can be sourced from bovine, porcine, vegetables and others. Several studies have been carried out to distinguish the sources of gelatin type using ATR-FTIR spectroscopy and chemometric analyses. However, the effect of some parameters of the raw materials like particle size, colour and physical form on the classification models were not carefully addressed. **Objective:** This study focused on the effect of particle size standardization on multivariate predictive models used to detect the source of gelatin. **Materials and Methods:** Two sets of samples were prepared 1) standardized set (particle size of 800 μm) and 2) non-standardized set (particle size > 800 μm). Comparison of both sets was done using PCA and PLS. Models accuracy were evaluated based on R^2 and RMSEP. **Results:** Absorbance intensity of spectral bands has explicit dependence on the particle size. As the particle size decreases, the intensity of the absorbance band increases. A fraction of the gelatin structure was affected by the grinding action, but no apparent disturbance in the chemical structure was observed. PCA score plot showed that both sets classified into their group with 61% of total variance explain the data. PLS analysis indicated the mean predicted R^2=0.9627 for standardized and 0.9172 for non-standardized with the RMSEP 0.0015 and 0.0018 for the respective sample set. This indicates the existence of size dependence in the discrimination of gelatin. **Conclusion: Standardization** of the particle size is important for classification model optimization.

Keywords: *Gelatin, FTIR, Chemometric, Size, Particle*

A STUDY ON DRUG UTILIZATION REVIEW ON ANTIMICROBIAL AGENTS IN ENT DEPARTMENT

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Background: Drug utilization studies are being considered as a possible technique for evaluating the healthcare system. Ear, nose, and throat diseases are relatively frequent in the general population and can cause significant disruption in daily living. **Aim:** To examine the antimicrobial drug consumption pattern in an ENT department and assess the rationale of antimicrobials used in ENT Departments. **Materials and method**: For three months, a prospective study was conducted in the Adichunchanagiri Hospital & Research Center's ENT outpatient department. All the patients in the ENT department who had been prescribed antimicrobials were included in the study. Kunins modified criteria were used to determine the rationality of antimicrobials. **Results:** A total of 225 prescriptions were studied. 51.5% were female, and 48.4% were male. The most common disease reported was Acute tonsillitis (23.9%), followed by Acute otitis media (15.3%). The most common antibiotics prescribed were Cefopodoxime/Clavulanic acid (36.57%), followed by Amoxicillin/clavulanic acid (19.45%). 94.4% of antimicrobial agents were prescribed by brand names. As per Kunin's modified criteria, 87.5% of antimicrobials were prescribed appropriately, and 12.4% of antimicrobials were prescribed inappropriately. **Conclusion:** The females are more susceptible than males to ENT infections. cefpodoxime/clavulanic acid was the most common antimicrobial prescribed, and acute tonsillitis was the most common disease identified. Study concludes that there is a scope of improvement in the case of medicines prescribed by generic name.

Keywords: *Drug Utilization, ENT, Antimicrobials, Rationality, Kunin's modified criteria*

DISCUSSING THE EFFICACY AND SAFETY OF COVID-19 VACCINES AVAILABLE IN INDIA – A MINI REVIEW

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Background: Many variants detected after Wuhan-Hu-1 reference which were able to develop the resistance against the neutralizing antibodies induced by vaccine and may cause false-negative results in the diagnostic test. Novel variant B1.617 was detected in India, and the Covid-19 cases hiked to its maximum; forcing the government towards approving a new vaccine for restricted use in an emergency situation to cover a maximum population. **Aims**: This review looks at the efficacy, safety, and economical aspects of vaccines that have been authorized in India. **Materials and methods:** Wide-ranging assessment and analysis of accessible resources on online database. **Results:** The rAd26-s & rAd5-s demonstrate high efficacy as well as safety, followed by BBV152 and AZD1222. Various combinations of the vaccines with different platforms or vectors may induce a wide range of immunity than a specific one. As per the economical aspect, AZD1222 is more economical than the other two currently approved in India. **Conclusion:** There is a lack of a clear endpoint to measure the efficacy of the vaccine, so epidemiological studies with a huge number of populations are required, which may predict the perfect endpoint for efficacy measurement. Until then, inoculation with locally accessible vaccines and self-awareness about disease transmission prevention are the main options for reducing fatalities, protecting the healthcare system, and eventually disease control.

Keywords: *Covid-19, Immunization, Vaccine Efficacy, Vaccine Safety*

A STUDY ON PATIENT RIGHTS, PATIENT SAFETY AND UTILIZATION OF NATIONAL HEALTH SCHEME IN RURAL PART OF MANDYA DISTRICT

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Background: The Government of India is striving very hard to provide health services to people across the nation, for which the government has implemented many programs like "Health for All" to achieve the target. **Aim:** To assess the knowledge of general people about patient's rights, patient's safety perception of health care providers and the utilization of National Rural Health Mission in the Rural parts of Mandya District, Karnataka, India. **Materials and method**: The study was a prospective, questionnaire-based, cross-sectional and community-based observational study where patients and healthcare providers were enrolled in the study. It was conducted in all health facilities, including sub-centre (SC), primary health centres (PHC), community health centres (CHC) and district hospitals (DH) of the Mandya district (rural part). **Results:** A total of 300 subjects were enrolled, the study reveals that awareness of patient rights was high in most of the cases. There was 71% awareness about patient rights. For the unit level safety culture dimension, the maximum composite score of positive responses was obtained for Organizational learning continuous improvement. Most of the people (63%) were aware about the different services under NRHM. **Conclusion:** The awareness and Utilization regarding National Rural Mission Services among people residing in rural areas of the Mandya district are inadequate. The study was vital in finding that most respondents were aware of patient rights. The perception standards of patient safety were fairly good in the present rural health care hospital.

Keywords: *Patient safety culture, Patient rights Awareness, Utilization, Health service*

IMPACT OF THE COMORBIDITIES AND MEDICATION USAGE ON PSYCHOSOCIAL WELL-BEING AND QUALITY-OF-LIFE AMONG THE ELDERLY WITH TYPE 2 DIABETES MELLITUS: PRELIMINARY FINDINGS

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Background: Medication adherence is pivotal for good glycaemic control among patients with type 2 diabetes mellitus (T2DM). Nonetheless, the impact of multiple medications usage in the elderly with T2DM is under-reported, particularly on the psychosocial well-being and quality-of-life (QoL). **Objectives:** This study aimed to investigate the (i) types of comorbidities and drug use among the elderly with T2DM; (ii) relationship between the number of comorbidities with psychosocial well-being and QoL; (iii) relationship between the number of medications with psychosocial well-being and QoL among elderly with T2DM. **Methods:** This study was part of the longitudinal ageing study in Malaysia known as "AGELESS". The data from cross-sectional survey over a 4-month period (September – December 2020) which consisted of the elderly with T2DM, were extracted from the AGELESS database for analysis using IBM SPSS, version 26. **Results:** A total of 188 patients with T2DM were recorded. The highest reported comorbidities were hypercholesterolaemia (75.8%) and hypertension (75.5%). The most frequent drugs used were biguanides (15.5%), statins (14.7%), and dihydropyridine calcium channel blockers (8.1%). A significant negative correlation was found between the number of comorbidities and QoL ($r = -0.194$, $p = 0.008$), whereas a significant positive correlation was observed between the number of medications with anxiety levels ($r = 0.17$, $p = 0.015$). **Conclusion:** The findings showed that elderly patients with T2DM are often comorbid with hypercholesterolaemia and hypertension. High number of comorbidities and medication use among the elderly with T2DM could have a profound impact on their QoL and psychosocial well-being, particularly on anxiety levels.

Keywords: *Type 2 diabetes mellitus, Elderly, Medications, Psychosocial, Quality-of-life*

EFFECTIVENESS OF PATIENT-CENTERED EDUCATION IN DYSLIPIDEMIA MANAGEMENT: A SYSTEMATIC REVIEW

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Background: Dyslipidemia management is crucial in reducing cardiovascular diseases' mortality and morbidity (CVD). Patients must be educated and empowered to manage their conditions whilst being guided by healthcare professionals. **Objective:** We aimed to review and examine the effectiveness of patient-centered education compared to the non-patient-centered educational approach. The primary outcome is the cholesterol level. Other measures such as psychosocial/cognitive, behavioural, cardiometabolic and other relevant outcomes were also extracted from the included studies. In addition, underlying theory and other contributing factors which may lead to the success of the intervention were also reviewed and discussed. **Materials and Methods:** The searches were conducted via PubMed, CINAHL, Scopus and Google Scholar from inception until April 2021. All randomized controlled trials studies were included. Study quality assessment was conducted using the Critical Appraisal Skill Programme Checklist (CASP) for the randomized controlled trial study. **Results**: The search identified 8847 records. Of these, 20 studies were eligible for inclusion. Interventions using a patient-centered educational approach successfully improved the cholesterol level, psychosocial/cognitive, behavioral, cardiometabolic, and other relevant outcomes. Positive contributing factors that were extracted from the included studies were underlying theories, instant reward system, dietary education, collaborative care, duration of intervention with systematic follow-ups, social support, adherence assessment method and the usage of e-health. **Conclusion:** Patient-centered education in dyslipidemia management has successfully impacted the desired outcomes in dyslipidemia management. Future studies may incorporate the elements of patient-centered education to improve the management of dyslipidemia either in a hospital or community setting.

Keywords: *Patient education, Patient empowerment, Dyslipidemia management, Patient-centered education.*

CENTELLA *ASIATICA* (L.) URBAN ATTENUATES HIPPOCAMPAL INJURY IN CHRONIC STRESS INDUCED WISTAR RATS

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Background: Stress is an organism's physiological and psychological reaction to an external stimuli and when it becomes chronic it causes depression. The hyper-responsiveness of glucocorticoids leads to degeneration of hippocampal neurons resulting in depression. Anti-depressants have limitations including causation of embryological defects. *Centella asiatica* (CA) an herb has been used in traditional medicine for its neuroprotective properties and less toxicity. **Objective:** To examine the neuroprotective effects of crude extract of CA in chronic mild stress (CMS) induced male Wistar rats. **Materials and Methods**: Thirty-six Male Wistar rats aged 8 – 10 weeks were held in six groups. One group was a control. CMS was administered to the other groups by various stressors viz. restrain, forced swimming in cold water, overnight food and water deprivation, wet bedding, cage tilt at 45°, tail pinching, overcrowding the cages and change of cage mates randomly for a period of 64 days. One of the stress induced groups was retained as model group while others were administered with crude extracts of CA at the doses of 200, 400, 800 and fluoxetine (Flx) 10 mg/kg body weight. After 64 days, the rats were euthanised and the brain tissue and blood samples collected. The blood samples were estimated for cortisol levels while the hippocampus was histologically analysed using Nissl's stain. **Results**: The rats receiving CA showed attenuated cortisol levels and Nissl's staining revealed a higher number and density of viable neurons of hippocampus. **Conclusion**: CA effectively attenuates CMS induced increase in cortisol levels and reduces the loss of hippocampal neurons. CA could prove as useful agent in the long term prevention of stress induced neurologic damage and depression.

Keywords: *Chronic stress, Centella asiatica, Hippocampus, Nissl's stain, Fluoxetine.*

SYNTHESIS OF BIVALENT β-CARBOLINE DERIVATIVES AS POTENTIAL CHEMOTHERAPEUTIC AGENTS

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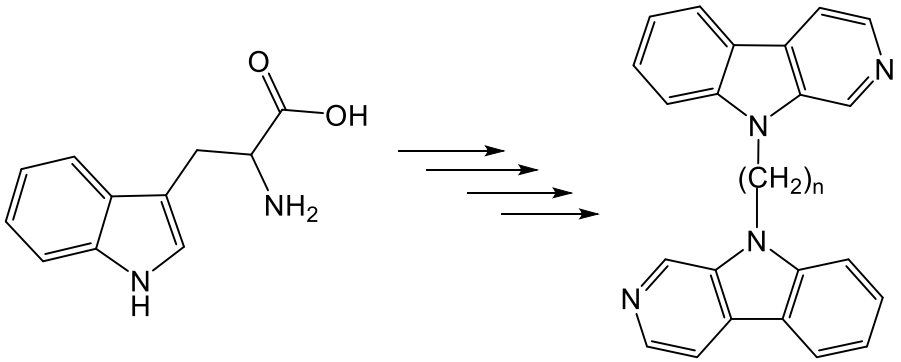
Background: Current conventional chemotherapeutic agents in cancer therapy have several drawbacks that limit their effectiveness, such as multidrug resistance of tumour cells and toxicity to the normal cells. Recently, many studies had shown great interest in β-carboline derivatives as they have been reported to demonstrate excellent anticancer activities. B-carboline is known as an indole alkaloid with an indole structure fused to a pyridine ring. **Objective:** This study aimed to synthesize various new bivalent β-carboline derivatives with different lengths of dibromoalkane in four steps method with good to moderate yields. **Materials and Methods:** A new method was established to synthesize bivalent β-carboline derivatives from L-tryptophan using Pictet-Spengler condensation. **Results:** The new bivalent β-carboline derivatives were structurally elucidated using ^{1}H-NMR and APT-NMR. **Conclusion:** The synthesized β-carboline derivatives are expected to elicit good anticancer activity, which suggested their potential to be developed as chemotherapeutic agents in the future.



Keywords: *Chemotherapeutic, Anticancer, Bivalent β-carboline, Pictet-Spengler*

NEUROPROTECTIVE EFFECT OF ENVIRONMENTAL ENRICHMENT EXPOSURE AGAINST HIGH FAT AND HIGH SUCROSE DIET-INDUCED COGNITIVE IMPAIRMENT IN RATS

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Background: High fat and high sucrose (HFS) diet, a.k.a Western-style diet, is associated with an elevated risk of cognitive impairment. Previous studies proposed that enriched social, physical, and cognitive activities reduced the risk of cognitive impairment. In this regard, the effects of social, physical and cognitive stimulation on the brain and behaviour are modelled in animal studies using a paradigm called environmental enrichment (EE). EE refers to a laboratory housing procedure consisted of a broad living area and various stimulators**.** **Objective:** This study aimed to verify whether EE can mitigate HFS diet-induced cognitive impairment in rats. **Materials and Methods**: Rats were randomly divided into three groups: C group (standard diet), D group (HFS diet), and DE group (HFS diet + EE). At the end of the 42 weeks of study, serum brain-derived neurotrophic factor (BDNF), T-maze tasks, histomorphometric analysis and several gene expressions of hippocampal tissues were evaluated. **Results**: Serum BDNF level was significantly increased in the DE group compared to the D group. The DE group exhibited higher T-maze scores than the D group. The histomorphometric analysis revealed a significant decrease in hippocampal damage in the DE group compared to the D group. Interestingly, *Bdnf*, *Irs1*, *Pik3ca*, and *Bcl2* gene expressions in the DE group were significantly upregulated, whereas *Gsk3b* gene expression was significantly downregulated compared to the D group. **Conclusion**: These findings indicate that EE alleviates HFS diet-induced cognitive impairment in rats. Overall, our study emphasizes the importance of social, physical and cognitive stimulations in reducing cognitive impairment.

Keywords: *High fat and high sucrose diet, cognitive impairment, environmental enrichment, brain-derived neurotrophic factor*

PREDICTORS OF PROLONGED HOSPITAL STAY AMONG PATIENTS WITH DENGUE INFECTION IN A TEACHING HOSPITAL IN KUALA LUMPUR, MALAYSIA

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Background: Dengue infection is one of the most important vector-borne diseases with high morbidity and mortality. High incidence of dengue resulted in increased hospital admission. Prolonged hospital stay may affect the patients and families in terms of economic loss and psychological impact. **Objective:** This study aims to determine the predictors of prolonged hospital stay among dengue patients in Malaysia. **Materials and Methods**: In this cross-sectional study, retrospective data were randomly selected from Hospital Canselor Tuanku Muhriz (HCTM), Universiti Kebangsaan Malaysia Medical Centre (UKMMC), Kuala Lumpur. Patients aged 15 years and above who were admitted to the hospital from 1 January 2014 to 30 November 2017 due to dengue fever were included in the study. **Results**: A total of 513 dengue patients were included in the analysis. The median age of the patients was 34 years, and the median length of stay was four days. More than one-third of the patients had prolonged hospital stays. Factors associated with prolonged hospital stay included fever less than three days (odds ratio (OR) 19.60, 95% confidence interval (CI) 7.92-48.548), had four or more warning signs (OR 3.52, 95% CI 1.77-6.97), severe dengue (OR 12.39, 95% CI 4.30-35.69), acute kidney injury (OR 3.77, 95% CI 1.05-13.48), and secondary bacterial infection (OR 7.02, 95% CI 1.19-41.36). **Conclusion**: Days of fever on admission, warning signs, dengue severity, and medical complications may predict hospital stay among dengue patients. Early recognition of factors identified in this study can potentially improve patients' outcomes and prevent prolonged hospital stay.

Keywords: *Dengue fever, Dengue haemorrhagic fever, Severe dengue, Hospital stay*

SCREENING OF CHEMICAL COMPOUNDS FROM *ARECA CATECHU* L. NUT EXTRACT FOR ITS TOXICITY TEST ON GUPPY FISH (*POECILIA RETIULATA*) AND ITS POTENTIAL FOR *AEDES* LARVICIDAL

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Background: The most prevalent mosquito-borne diseases are caused by the dengue virus that consists of DENV 1-4. Two main types of dengue mosquitoes that transmit viruses are known as *Aedes aegypti* and *Aedes albopictus*. The excessive use of chemical insecticides has led to resistance problems in both types of *Aedes* mosquitoes. Bio-insecticides have been considered as an alternative method to replace chemical insecticides to overcome resistant problems. The *Areca catechu* nuts have the potential to replace the chemical insecticide and fight against disease vectors. **Objective:** This study aims to screen the chemical compounds from *Areca catechu L.* nut for their potentials for the *Aedes* species on larvicidal activity and elucidate the toxicity concentration against Guppy fish, *Poecilia reticulata*. **Materials and Methods**: The extraction protocols using Soxhlet extraction and further analysis with Gas chromatography mass-spectrometry (GC-MS) analyzer. The crude extracts were used to test toxicity using protocols of non-target organism tests. **Results**: There are a total of 10 biochemical compounds found in the GC-MS analysis, but only 6 bioactive compounds are related to the studies, such as Carbon anhydride, 2-Aminononadecane, (2-Aziridinylethyl) amine, ethyne, fluoro- ,2-Pentamamine and Phenol,4-[2-(methylamino)ethyl]. These chemical compounds have been patented for pesticide formulations due to their biodegradable properties and their ability to enhance the effectiveness of pesticides. The highest compound found is 2-Aminononadecane that is used for antifungal and antimicrobial. The *Poecilia reticulata* is used as non-targeted organisms to test the toxicity of the *Areca catechu* L. In the experiments, the fishes were able to survive even at the highest concentration. **Conclusion**: It can be concluded as *Areca catechu* is not toxic towards the guppies, and it possesses potential biochemical compounds for larvicidal activities of *Aedes aegypti* and *Aedes albopictus.*

Keywords: *Aedes aegypti, Aedes albopictus, Areca catechu, Poecilia reticulata*

IN VITRO MODELLING FOR STUDYING SCHWANN CELL MYELINATION

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Background: Neuronal – Schwann cell co-culture is a useful experimental model in neuroscience research. The co-culture model is more straightforward than the complex *in vivo* model and has a robust ethical justification that aligns with the animal ethics principles of the 3R (Replacement, Reduction, and Refinement). Establishing an *in vitro* myelination model using neuronal-Schwann cell co-culture can become a valuable tool for studying myelin biology and demyelinating diseases. **Objective:** The study aims to develop an *in vitro* myelination model using neuronal – Schwann cell co-culture by inducing myelination using adenylyl cyclase agonists and ascorbic acid. **Materials and Methods:** Sensory neurons and Schwann cells were dissociated from Wistar rat and co-cultured in a co-culture medium on a 24-well culture plate. The established co-culture was treated with adenylyl cyclase agonists (forskolin and CPT-cAMP) and ascorbic acid for 24 days to induce myelination. The induced co-culture was then analyzed using immunofluorescence and fluorescent microscopy techniques for myelin biomarkers (Krox-20 and Myelin Basic Protein (MBP)). **Results:** Immunofluorescence analysis revealed that Schwann cells align the axon of neurons in the control group and myelination induce group. Schwann cells in the treated group also exhibited a positive Krox-20 expression but a negative MBP expression which was similarly observed in the control group. **Conclusion:** The study demonstrated that adenylyl cyclase agonists and ascorbic acid treatment did not induce myelination in neuronal-Schwann cell co-culture. Interestingly, Schwann cells assumed a pro-myelinating phenotype after long-term culture even without the treatment.

Keywords: *Schwann cell, Co-culture, Myelination, Krox-20, MBP, Adenylyl Cyclase, Ascorbic Acid*

DEVELOPMENT OF NON-IMMERSIVE VIRTUAL REALITY OF GENERAL X-RAY QUALITY CONTROL

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Background: Physical attendance at the lab or hospital has been halted due to the current scenario imposed by the COVID-19 pandemic. Non-immersive virtual reality appears to be one of the alternative learning methods in this situation. It allowed users to interact with a computer-generated x-ray room environment without the need for head-mounted displays. **Objective:** The objective of this study was to design and develop a quality control (QC) x-ray training virtual reality (VR) tool (app) for undergraduate students to understand and practice QC procedures. **Materials and Methods**: A three-dimensional virtual practice platform was developed using the Unity-3D platform, while Blender was used to create the 3D objects in the VR simulation. Users are required to perform five quality control tests on the x-ray machine through a virtual world. **Results**: This VR tool (app) not only helps the students in understanding the theory of each QC test but also allows them to virtually experience what it is like to perform the test. **Conclusion**: This technology has the potential to support learning in medical imaging education.

Keywords: *Virtual Reality, Quality Control, General x-ray, non-immersive virtual environment, Simulation*

FULL TEXT

ORIGINAL ARTICLE

RETROSPECTIVE ANALYSIS OF RESPIRATORY MEDICATION THERAPY ADHERENCE CLINIC (RMTAC) IN THE MANAGEMENT OF PAEDIATRIC BRONCHIAL ASTHMA.

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Abstract
Background: Paediatric respiratory medication therapy adherence clinic (RMTAC) serves as an excellent platform for patient-centred care. In most healthcare settings, pharmacists and physicians often do not readily communicate because they work independently and in parallel, rather than collaboratively.
Objective: The present study aimed to focus on the roles of RMTAC to complement clinical paediatrics management of bronchial asthma on the provision of clinical assessment, counselling and monitoring.
Methods: This retrospective study involved data retrieval of paediatric bronchial asthma patients seen by paediatric RMTAC clinic and those without RMTAC, from 1 January 2019 until 31 December 2020. The study variables of interest were collected, collated and compared, which include the demographic particulars (age, serial weight and height) and information on the assessment of therapy adherence and inhaler technique.
Results: A total of 87 clinical records of paediatric bronchial asthma were retrieved for this study (40 with no RMTAC *vs.* 47 with RMTAC). At the first visit, majority had well controlled asthma (n=37, 42.5%) with low medication adherence (n=26, 29.9%). The assessment of metered-dose inhaler technique was significantly poor without RMTAC monitoring, χ^2=43.54, df=1, p<0.001. Univariate analysis determined that age (OR=1.16, 95% CI=1.0-1.3) and good MDI technique (OR=6.4, 95% CI=1.35-30.14) were significantly associated with good asthma control.
Conclusion: Our paper highlights the importance of paediatric RMTAC to complement medical management of bronchial asthma. We highly recommend paediatric RMTAC service to be strengthened and introduced throughout all healthcare facilities in Malaysia to improve healthcare delivery.
Keywords: Pharmacists, public health, counseling, pediatrics, referral and consultation, health care costs.

Introduction

In Malaysia, medication therapy adherence clinics (MTACs) are established for pharmacists to monitor patients' medication regimes, educate patients, and address medication adherence-related problems.[1-4] Patients are mainly provided with disease and medication counselling during MTAC sessions.[3] Evaluation of the impact of MTAC has shown improvement in patients' adherence.[5-10] Furthermore, there is evidence of cost-effectiveness in pharmacist-run clinics for the management of chronic illness as compared to the usual medical clinics.[9-11]

As the MTAC setting provides a good platform for pharmacists to interact with patients, especially those with chronic illness, it offers opportunities for patient-centred care to be practised and studied. In most healthcare settings, pharmacists and physicians often do not communicate well because they largely work independently and in parallel with each other, rather than collaboratively. Furthermore, there can be challenges in communication due to differences of opinion on interprofessional role, reluctance to challenge the other profession, different work schedules, and different information priorities. Therefore, it is important that physicians and pharmacists have good rapport and communication as it is essential to move beyond transactional interactions to safeguard optimal therapeutic outcomes for patients.

This research aimed to foundationally understand how pharmacists and physicians independently manage outpatient paediatric bronchial asthma and assess their interprofession reciprocity. The findings from this study may potentially improve the deficiency identified within the system, hence improve healthcare delivery and eventual patients' health outcome.

Methodology

This retrospective cohort analysis involved primary and secondary data retrieval from *(i)* paediatric respiratory medication therapy adherence clinic (PRMTAC) records and *(ii)* medical paediatric records of outpatient bronchial asthma seen from 1 January 2019 until 31 December 2020 in Hospital Tuanku Fauziah, Perlis, Malaysia. A universal sampling was employed for PRMTAC records, whereas convenient sampling was used in the selection of medical paediatric records.

Data of interest were collected and collated to compare between specific variables of interest between outpatient paediatric bronchial asthma who underwent PRMTAC assessment *vs.* without PRMTAC assessment (i.e. those who only underwent medical paediatric follow-up during the study period). Data collected include the patients' demographic profile (i.e. age, serial weight and height, serial peak expiratory flow rate readings), type of medication used, and the nature and extend of assessments and counselling performed by PRMTAC *vs.* medical paediatrics at each clinic visit throughout a year-long follow-up.

The items included in the review for assessment include: assessment of therapy adherence, assessment of inhaler technique, and assessment of interval symptoms. Presence of any particular assessment during clinic visit was given a numerical rating of either 0 (absence) or 1 (present). The cumulative mark was subsequently derived from the total number of specific assessment item or counselling item, divided by the total number of consultations received throughout the year. Therefore, a cumulative score of 1 (one) indicates extremely good assessment or counselling of that particular item, whereas a score of 0 (zero*)* indicates the reverse.

Ethical clearance

The study was registered with the National Medical Research Register of the Ministry of

Health Malaysia (NMRR-21-129-58358) and received ethical clearance from the Medical Research and Ethics Committee of the Ministry of Health, Malaysia (KKM/NIHSEC/P21-341(4).

Results

There was a total of 87 medical records retrieved for the study; 40 (46.0%) records were of medical outpatient paediatric bronchial asthma without PRMTAC service *vs.* 47 (54.0%) patient records with ongoing PRMTAC service. Gender distribution was relatively balanced with 45 (51.7%) male, and 42 (48.3%) female. Malay was the commonest ethnic at 83 (95.4%), followed by Chinese (*n*=2, 2.3%) and Siamese 2 (2.3%).

The patients' mean age was 7.2 ± 3.07 years old while the mean age at which the diagnosis of bronchial asthma was made was at 5.7 ± 2.85 years old. The commonest device used among outpatient paediatric bronchial asthma was MDI/Aerochamber at 47 (54.0%), followed by MDI alone without spacer (33, 37.9%), and MDI/Optichamber and Turbuhaler at *n*=1 (1.1%), respectively. The commonest medication used was Budesonide/Salbutamol combination (66, 75.8%), followed by Salbutamol only (13, 14.9%), Fluticasone/Salbutamol (6, 6.9%) and Symbicort (1, 1.1%). On average, patients with bronchial asthma underwent 2.1 ± 1.18 outpatient medical visits yearly.

At the first medical visit (regardless of PRMTAC status), majority had well controlled asthma (37, 42.5%), followed by partially controlled (32, 36.8%) and poorly controlled (13, 14.9%). Majority were categorised with low adherence to prophylactic corticosteroid (26, 29.9%), followed by high adherence (21, 24.1%) and medium adherence (5, 5.7%). Table 1 below describes the distribution of assessment of adherence and metered-dose inhaler (MDI) technique during routine follow-up visits. We have also performed logistic regression to determine significant factors associated with good asthma control by the last clinic visit of the year.

Detailed assessment throughout a year-long follow-up visits between patients undergoing paediatric PRMTAC *vs.* no PRMTAC were performed. We found that the comparative scores for the assessment of interval symptoms and counselling were significantly lower for patients who were not subjected to PRMTAC service (Table 3).

With regards to MDI technique assessment, a vast majority of patients were not properly assessed during routine outpatient medical paediatric visit (not receiving PRMTAC service) (Table 4).

Discussion

PRMTAC service displayed significantly better scores in terms of the provision of assessment of asthma control and intervals symptoms than the non-PRMTAC counterpart. Specific criteria need to be fulfilled when assessing patients with bronchial asthma including the childhood asthma control test (C-ACT), asthma symptoms control, peak expiratory flow rate and inhaler technique. We found that these clinical assessment were inadequately assessed by the medical paediatric team during routine outpatient appointments as compared to the more inclusive assessment carried out by PRMTAC service. Previous research on severe asthma, especially in children, suggests a structured and systematic approach to evaluate the disease control and therapy adherence.[12]

Lack of proper assessment of adherence and inhaler technique, particularly among non-PRMTAC patients may result in poor technique and inadequate therapeutic relief. On the other hand, correct administration would significantly improve drug delivery to the targeted organ and produce the required effects. A study by Thanimalai, Shafie, Hassali, and Sinnadurai (2018)[11] found that the odds of good asthma

control was three times more likely with pharmacist intervention than without. Therefore, this highlights the important role played by PRMTAC service in the monitoring, counselling and assessment of paediatric bronchial asthma.

We found that good inhaler technique, older age and PRMTAC status were predictive of good asthma control at the final clinic visit. Patients with correct inhaler technique were six times more likely to attain good asthma control as compared to patients with poor technique. The result was well supported by a study that assessed the effect of correct inhaler use and adherence on asthma control.[13] Similarly, another study conducted among asthmatic patients attending Sultan Qaboos University Hospital in Oman reported that 93.5% of patients with correct inhaler technique and good compliance to medication demonstrated superior levels of asthma control.[14]

Our study showed that an increase in age by every one year had 1.2 times higher odds for good asthma control. This is in line with a study that investigated the age-related differences in asthma control among 572 children aged 4 to 16 years old.[15] They reported that the level of asthma control was statistically satisfactory in older children, by 44%, 56% and 66% for children aged 7-9, 10-12 and 13-16 years respectively. Poor asthma control in younger children may be attributed to the high incidence of symptomatic viral infection which interferes with treatment.

The present study found that good asthma control was achieved in patients who were not recruited into PRMTAC service. This can be explained by the nature of medical referral to PRMTAC that constitutes problematic patients. Patients with deemed good asthma control were not eligible to be enrolled into PRMTAC service.[16] Patients were referred to PRMTAC if they fulfilled at least one of the following criteria: C-ACT score of less than 19, patients with uncontrolled asthma according to GINA protocol, patients with frequent asthma exacerbation according to GINA protocol, poor technique or low medication adherence. PRMTAC services offer extra monitoring as the pharmacists will provide appropriate education and counselling, as well as assessing inhaler technique and adherence to help patients attain better clinical outcome.[2]

Multivariate analysis demonstrated that good inhaler technique is the only factor significantly associated with good asthma control after adjusting for age, adherence and the presence of PRMTAC service. This showed that improper inhaler technique negatively affects asthma control due to inadequate drug delivery that results in poor drug efficacy, hence frequent hospitalization.[17-19] This finding was supported by a study among 330 Egyptian asthmatic children aged 2-12 years old that found better asthma control to be significantly observed among patients with correct inhalation technique.[20] Similarly, Giraud *et al.* reported that training with pharmacists improved the optimal inhalation technique from 24% to 79%.[21] Thus, pharmacists are positioned to train and assess inhaler technique, provide asthma education and improve adherence to ensure optimal clinical outcome is achieved.

Conclusion

Therefore, PRMTAC service is definitely essential in the outpatient management of paediatric bronchial asthma, particularly among those with partially controlled and poorly controlled illness. We strongly advocate that healthcare providers to move beyond task-based work towards a more collaborative approach and support interprofessional shared decision-making to improve patient care.

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Table 1. Distribution of assessment of adherence and MDI technique during outpatient visit for paediatric bronchial asthma.

	PRMTAC *n* (%)	**No PRMTAC** *n* (%)	χ^2	***df***	***p*-value**
Assessment MDI technique			43.54	1	<0.001*
Not assessed	6 (15.4)	33 (84.6)			
Assessed	40 (87.0)	6 (13.0)			
Assessment of prophylactic adherence			0.002	1	0.962
No	16 (57.1)	12 (42.9)			
Yes	30 (57.7)	22 (42.3)			

Note: Pearson chi-square test.
Abbreviation: PRMTAC=Paediatric respiratory medication therapy adherence clinic.
**Statistically significant*

Table 2. Simple and multiple logistic regression to determine associated factors to good asthma control.

Variable(s)	Poorly controlled		Good control		Crude OR (95% CI)	*p*-value[a]	Adj. OR (95% CI)	*p*-value[b]
	Mean (SD)	*n* (%)	Mean (SD)	*n* (%)				
Age	6.5 (3.32)		7.9 (2.90)		1.2 (1.0, 1.3)	0.045*	-	-
Age at diagnosis	5.7 (3.13)		6.0 (2.70)		1.1 (0.90, 1.22)	0.575	-	-
BMI (kgm^{-2})	17.9 (7.17)		18.5 (13.57)		1.0 (0.96, 1.05)	0.803	-	-
Adherence						0.138	-	-
Low		20 (71.4)		8 (28.6)	1.0 (Ref.)			
Medium		5 (62.5)		3 (37.5)	1.5 (0.29, 7.81)			
High		9 (42.9)		12 (57.1)	3.33 (1.01, 10.97)			
Device						0.696	-	-
MDI		18 54.5)		15 (45.5)	1.0 (Ref.)			
MDI/chamber		21 (50.0)		21 (50.0)	1.2 (0.48, 2.99)			
MDI technique						0.005*		0.045*
Not assessed		15 (36.6)		26 (63.4)	9.8 (2.47, 39.13)		13.0 (1.49, 113.25)	
Poor		17 (85.0)		3 (15.0)	1.0 (Ref.)		1.0 (Ref.)	
Good		8 (47.1)		9 (52.9)	6.4 (1.35, 30.14)		17.3 (1.75, 171.66)	
PRMTAC service						0.037*	-	-
Yes		29 (61.7)		18 (38.3)	1.0 (Ref.)			
No		12 (37.5)		20 (62.5)	2.7 (1.06, 6.78)			

Note: [a]Simple logistic regression; [b]Multiple logistic regression (Forward LR)
**Statistically significant*

Table 3. Comparison of cumulative scores for the assessment of therapy adherence, counselling and interval symptoms between patients undergoing PRMTAC *vs.* no RMTAC.

Assessment cumulative score	PRMTAC Mean (SD)	No PRMTAC Mean (SD)	*t*	*df*	*p*-value[a]
Medication adherence	0.73 (0.40)	0.67 (0.40)	-0.679	72	0.499
Counselling	0.35 (0.17)	0.19 (0.08)	-5.765	64	<0.001*
Interval symptoms	1.00 (0.00)	0.71 (0.50)	-	-	<0.001*[b]

Note: [a]Independent *t*-test; [b]Mann Whitney *U* test (presented as median and interquartile range).
Cumulative score is determined by either presence (1 mark) or absence (0 mark) of each assessment item on each follow-up visit divided by the total number of follow-up visit for the year.
**Statistically significant*

Table 4. Majority of patients were not assessed on MDI technique during routine outpatient medical paediatric visit without PRMTAC service.

Assessment of MDI technique	PRMTAC *n* (%)	No PRMTAC *n* (%)	Total no. of visit
Not assessed	10 (0.33)	83 (0.58)	93
Assessed	20 (0.67)	60 (0.42)	80
Total no. of visit	30 (100.0)	143 (100.0)	173

References

1. MOH Pharmaceutical Services Division. Perkhidmatan Medication Therapy Adherance Clinic. 2013. Available at: http://www.pharmacy.gov.my/v2/ms/entri/perkhidmatan-medication-therapy320 adherance-clinic-mtac.html.
2. Respiratory Medication Therapy Adherence Clinic Protocol: Asthma/COPD (Adult & Paediatric) 2nd edn. Pharmaceutical Services Division, Ministry of Health Malaysia; 2015. Available at: http://www.pharmacy.gov.my/v2/sites/default/files/document-upload/book.-protocol-respiratory-2.6-fa.pdf. Accessed 7 May 2021.
3. Mohamad N. Clinical Pharmacy in Malaysia: Past, Present and Future. Available at http://mps.org.my/view_file.cfm?fileid¼1572. Accessed 10 March 2021.
4. Alrasheedy AA, Hassali MA, Wong ZY, Saleem F. Pharmacist-managed medication therapy adherence clinics: the Malaysian experience. Res. Social Adm. Pharm. 2017;13(4):885-886.
5. Lim PC, Lim K. Evaluation of a pharmacist-managed diabetes medication therapy adherence clinic. Pharm. Pract. (Granada). 2010;8(4):250-254.
6. Alias AN, Yahaya NA, Karim NA, Fadzillah SA, Ali SF, Yusoff W. The impact of implementing WMTAC towards anticoagulation treatment in Dungun Hospital. Malaysian J. Pharmacy. 2019;5(1):11-19.
7. Alison C, Anselm S. The effectiveness of diabetes medication therapy adherence clinic to improve glycaemic control among patients with type 2 diabetes mellitus: a randomised controlled trial. Med. J. Malaysia. 2020;75(3):246-253.
8. Aidit S, Soh YC, Yap CS, Khan TM, Neoh CF, Shaharuddin S, Kassab YW, Patel RP, Ming LC. Effect of standardized warfarin treatment protocol on anticoagulant effect: comparison of a warfarin medication therapy adherence clinic with usual medical care. Front. Pharmacol. 2017;8:637.
9. Yong YV, Shafie AA. Using a dynamic adherence Markov model to assess the efficiency of Respiratory Medication Therapy Adherence Clinic (RMTAC) on asthma patients in Malaysia. Cost Eff. Resour. Alloc. 2018;16:36.
10. Chiew SY, Ibrahim H, Choon CJ, Yap LS, Chang PN, Lee MY, Ismail I, Wong WY, Rasid AF, Ibrahim F. Cost-effectiveness of respiratory medication therapy adherence clinic (RMTAC) among government health clinics in Kuala Lumpur & Putrajaya. ePerak Med. J. 2019;1(1);20.
11. Thanimalai S, Shafie AA, Hassali MA, Sinnadurai J. Cost-effectiveness of warfarin medication therapy adherence clinic versus usual medical clinic at Kuala Lumpur Hospital. Value Health Reg. 2018;15:34-41.
12. Guilbert TW, Bacharier LB, Fitzpatrick AM. Severe asthma in children. J. Allergy Clin. Immunol. 2014;2(5):489-500.

13. Capanoglu M, Dibek Misirlioglu E, Toyran M, Civelek E, Kocabas C. Evaluation of inhaler technique, adherence to therapy and their effect on disease control among children with asthma using metered dose or dry powder inhalers. J. Asthma. 2015:52(8);838-845.
14. Baddar S, Nair J, Al-Rawas O. Asthma control: Importance of compliance and inhaler technique assessments. J. Asthma. 2013:51(4);429-434.
15. Kuehni C, Frey U. Age-related differences in perceived asthma control in childhood: guidelines and reality. Eur. Respir. J. 2002:20(4);880-889.
16. Caminati M, Cegolon L, Bacchini M. The potential role of local pharmacies to assess asthma control: An Italian cross-sectional study. BMC Public Health. 2021;21(19):1-8.
17. Aydemir J. Misuse of inhalation devices-effective parameters and the role of education. Eurasian J. Pulmonol. 2013:15(1);32-38.
18. Konevic S, Djonovic N, Djuric D, Vasic D. Impact of educational intervention for correct inhaler technique on the quality of life of children with asthma. Vojnosanit Pregl. 2020:77(8):859-865.
19. Melani A, Bonavia M, Cilenti V, Cinti C, Lodi M, Martucci P, Neri M. Inhaler mishandling remains common in real life and is associated with reduced disease control. Respir. Med. 2011:105(6);930-938.
20. El Rifai N, Rizk H. Effect of health education about proper inhaler technique among asthmatic children/caregiver. Alex. J. Pediatr. 2019:32(1);6-11.
21. Giraud V, Allaert F, Roche N. Inhaler technique and asthma: Feasibility and acceptability of training by pharmacist. Respir. Med. 2011:105(12);1815-1822.

ORIGINAL ARTICLE

KNOWLEDGE AND AWARENESS OF PILATES IN BREAST CANCER REHABILITATION AMONG MALAYSIAN PHYSIOTHERAPISTS.

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Abstract
Background: Breast cancer is the most dominant cancer, accounting for 33% of all cancer in Malaysia. Accordingly, there are several strategies have been implemented in the management of breast cancer. Pilates is one of the effective methods that focus on the rehabilitation of breast cancer survivors. However, there is a paucity of evidence into the insight of Pilates and its recognition.
Objective: The study aims to determine the knowledge and awareness of Pilates in breast cancer rehabilitation among physiotherapists in Malaysia.
Methods: A cross-sectional study was conducted among 113 physiotherapists located in Selangor, Malaysia. A self-structured questionnaire was used to obtain data. The questionnaire was divided into four sections namely demographic status, awareness and knowledge of Pilates on women's health and breast cancer, perception and interest in pursuing new knowledge on women's health and implementation of Pilates in women's health and breast cancer.
Results: The result obtained showed that the majority of the female therapists (68%) and only a small percentage of male therapists (27%) are aware of Pilates. The majority of the participants (n=51, 45.13%) are unaware that musculoskeletal complications secondary to breast cancer can be treated using Pilates.
Conclusion: Low-to-moderate level of knowledge and awareness about Pilates in female breast cancer rehabilitation was identified among Malaysian physiotherapists in this study. Hence there is a need to escalate the level of awareness and knowledge of Pilates among Physiotherapists in Malaysia.

Keywords: Pilates, breast cancer, physiotherapist, awareness, knowledge

Introduction

Breast cancer is the most common disease among women in Malaysia, with one in every 30 women being diagnosed in their lifetime; nevertheless, most women do not frequently inspect their breasts for abnormalities or attend yearly screenings after the age of 40.[1] Men, on the other hand, are becoming more likely to have breast cancer. According to one study, male breast cancer incidence increased by 26% between 1973 and 1998, whereas female cancer incidence surged by 52%.[2] Female breast cancer is more frequent than male breast cancer. Therefore, the public and healthcare professionals are more aware of it. Male breast cancer, contrarily, remains notably unknown to the public and healthcare professionals.[3]

The prevalence of breast cancer is projected to rise as the populace ages, and factors associated with lifestyle choices such as a high-fat diet, alcohol consumption, and restricted breastfeeding.[4] Malaysian women are diagnosed with breast cancer at a younger age than those in Western nations.[5] Younger generation in Malaysia have more high-risk lifestyles, which increase the risk of breast cancer, whereas older generations have lower-risk lifestyle factors, such as more breast-feeding and lower urbanization, and this trend lowers the effect risk of postmenopausal breast cancer.[5]

Breast cancer treatment options include surgery, radiation, and systemic therapy.[6] Despite the expanded survival rates reported by breast cancer patients, the treatment sequel has adverse effects such as decreased functional ability, fatigue, depression, upper limb lymphedema, and impairments in upper extremity strength and range of motion. Such negative effects eventually contribute to reductions in health-related quality of life.[7] Many initiatives have been put in place to enhance breast health.[5] The Patients quality of life and emotional state has been enhanced by physical exercise.[8] Implementing various exercise models, group work, social activities, including Pilates have been beneficial for breast cancer patients.[9] Despite a lack of scientific evidence, Pilates has been endorsed for the rehabilitation of breast cancer survivors.[9]

Pilates is a low-impact workout that aims to develop muscles while additionally enhancing posture stability and flexibility. The primary objective of Pilates is to strengthen the core. Still patients should expect to notice an increase in muscle bulk in their arms and legs as a result of using their extremities to regulate the core, which can be beneficial in female breast cancer patients.[10] A previous study by Zengin et al., (2017) has highlighted that rehabilitation of breast cancer therapy utilizing Pilates exercise, specifically targeting upper extremity functions, has excellent positive benefits such as range of motion than a home exercise program.[11] Similarly, another study has demonstrated the improvement in range of motion following Pilates treatment.[12] Pilates is swiftly gaining recognition as a fitness approach across the world.[13] However, there remained a lack of breast cancer awareness and understanding, in addition to many fallacies concerning etiology, risk factors, and breast cancer management.[14] Hence, this study is focusing on determining the knowledge and awareness of Pilates in breast cancer rehabilitation among physiotherapists in Malaysia.

Methodology

A cross-sectional study design was used, using convenience sampling. A total of 113 physiotherapists have completed the survey in this study. The study includes (i) certified Malaysian Physiotherapists with working experience of more than 5 years (ii) between the age of 20 to 55 years. Meanwhile, physiotherapist who aren't treating cancer patients were excluded from this study. All participants were informed on the study purpose and procedures before data collection, and written informed consent was taken. Participants were assured of anonymity. This study was approved by the Research and

Ethics Committee of INTI International University.

A structured questionnaire on the knowledge and awareness of Pilates was distributed to all the participants. Before that, the content validity of the questionnaire was established by distributing it to the three experts in this area. After validation, the questionnaire is designated into Google form to convenient the participants and the researchers. All the questions were formed based on the simplicity and previous studies. The questionnaire comprises four sections, with the (i) personal information, socio-demographic information, years of clinical experience, and clinical field specialty, (ii) the knowledge on the Pilates (iii) awareness on the application of Pilates in the rehabilitation of cancer patients, and (iv) implementation of Pilates in treatment of breast cancer patients. The questionnaire was distributed in English.

Data were analyzed by using the statistical software package SPSS (Version 24.0). Descriptive statistics were used to report the awareness and knowledge level of Physiotherapists in using Pilates as a treatment for breast cancer patients.

Results

Demographic characteristics

A total of 113 were recruited after screening for eligibility. Among 113 study participants, 66.37% and 32.74% of study participants were female and male, whereas half of the participants were 26-30 years. More than half of the participants had a bachelor degree in physiotherapy. Only a small portion of the participants,12.39% have practice on women's health, whilst the majority of the physiotherapist are involved in treating musculoskeletal problems. Moreover, ha lf of the participants possess a cumulative working experience of 2 to 4 years and 35.40% worked as junior physiotherapist.

Awareness of Pilates in breast cancer rehabilitation

Table 2 shows that 46% of females are aware of Pilates, while only 8.85% of males are aware of Pilates. However, most of the participants (45.1%) are unaware that Pilates can manage breast cancer-related symptoms. When questioned about the experiences in treating breast cancer patients using Pilates, most of the participants (81.4%) did not experience treating breast cancer patient using Pilates. Only 14 participants (12.4%) had treated breast cancer patients using Pilates.

Knowledge of Pilates

Interestingly, 68.14%, stated that endurance is not one of the core principles of the Pilates method. Besides, 69.03% knew that Pilates takes as little as 10 minutes a day to perform. Over 67% of the participants believed that the advantages of doing Pilates on a reformer, allows users to advance and provides intensive strength training compared to mat constantly. In addition, over 76% of them know that herniated disk and pregnancy are not contraindications for Pilates. However, more than half of the participants, 61.95%, are conscious that unstable blood pressure is contraindicated to perform Pilates. Only a tiny proportion recognized the following contraindications: risk of blood clots 39.8% and severe osteoporosis 46.0% (Table 3).

Implementation of Pilates in women's health and breast cancer

Results from Table 4 showed that 36.3% strongly agreed that Pilates should be implemented in hospitals or clinics to manage breast cancer-related musculoskeletal problems. However, very small proportion of 1.8% was strongly disagreed with the statement mentioned above. Still, over 40% agreed that it is vital to provide courses or education to improve physiotherapist's awareness of Pilates in women's health, while only 1.8% of participants strongly disagree. Although a substantial number of participants 77%, are interested in pursuing Pilates workshop in the near future, majority 89.4% of them selected manual therapy and lifestyle education 71.7% as a treatment option for breast

cancer in approaching period time, while hardly 14.2% of participants opted dry needling as a treatment for breast cancer.

Discussion

This study aims to determine the awareness and knowledge of Pilates in improving female breast cancer patients' functional capacity and upper extremity functions among the physiotherapists in Malaysia. Our study result demonstrates that nearly half of the participants (45.13%) are unaware that breast cancer musculoskeletal problems can be treated using Pilates. The response rate in this survey was 113 participants in one month period of time, which is relatively a good response compared to an earlier study conducted on 'Knowledge, attitudes, and barriers towards evidence-based practice among physiotherapists in Malaysia' with the reply of 102 participants in 2 months period.[15]

In this study, 59.29% of respondents mentioned that they had assessed, and treated problems related to breast cancer, such as pre-mastectomy and post-mastectomy. Knowledge about risk factors of breast cancer was further investigated. The results revealed participants have a low-to-moderate understanding of risk factors of breast cancer. Most of the participants (94.7%) recognized family history as a risk factor. The finding of this survey is similar to that of a previous study in India accounts for 93.9%.[16] Surprisingly most of the participants in the present study are not aware of certain risk factors like high-fat diet, working-class women, larger breasts and lack of breastfeeding. This report also coincides with the previous study, in which most of the women were not sure whether high fat/low consumption of fruit and vegetables could increase the risk of breast cancer.[17] The proportion of knowledge about smoking and alcohol consumption as a risk factor for breast cancer was 53.1% and 29.2% in this study, and the figure was significantly high at 68% and 56% in a survey conducted among female students in Malaysia 2016.[18] 59.3% of participants are aware that aging is one of the contributing risk factors for breast cancer. Nonetheless, there is a disparity in figure 65.4% in the prior study in Malaysia.[19] Although only 25 percent of interviewees in the study conducted in Australia identified growing age as a risk factor for breast cancer, general practitioners had limited knowledge of some aspects of risk factors for breast cancer.[20] It has been noted that healthcare practitioners, including nurses, are not adequately trained about risk factors, risk assessment and prevention of cancer, despite rigorous efforts to strengthen medical education in developing countries.[21] Apart from the above reports, the knowledge on risk factors of breast cancer was found be very minimal . Only 3% are familiar with risk factors among female health care workers in Nigeria.[22]

In an earlier study, 97.8% of participants attest that a lump in the armpit or breast is the most common breast cancer sign and symptoms.[18] However, this percentage is observed lower 81.4% in the current study. In contrast, numerous participants (more than 80%) among university students in Angola shared the misconception that lumps in cancerous breasts are painful.[23] Discharge, pain or soreness, changes in the shape of the breast and lymphedema were well recognized 77% by the participants in this study. A divergent and contrary report was noted in the past study with poor knowledge on early signs of breast cancer among medical students was identified in Pakistan. However, the massive percentage of 90% of medical students were aware of the presence of lump as a sign of breast cancer.[24] Furthermore, the greater proportion of participants in the present study were known about lymphedema as one of the primary symptoms of breast cancer. This finding is homogenous with the past research in 2014 in which 82.5% of participants were aware that they might develop lymphedema.[25] Meanwhile, minorities of the participants recognized sudden weight loss, limited upper limb range of motion,

decreased functional capacity and reduced upper limb strength as signs and symptoms of breast cancer. Given the increased rates of survival for women diagnosed with breast cancer, several of these conditions are usually identified as a side effect of breast cancer, which can include one or more impairments. [26,27]

The majority of females in this study are aware of Pilates in breast cancer rehabilitation, while only a minority of males are aware. This is because more female instructors could have made Pilates more appealing to female students. Thus, these variables also contributed to the naive assumption that Pilates is only targeted at a female audience, but there is nothing in Pilates that makes it more for women than for men and not gender-based in its benefits.[28] Whereas Joseph Pilates, the founder of the method, actually initially started his work with men.[29] Nowadays, in fitness, the Pilates technique has been well known as cross-training and is practiced by athletes and celebrities including Lebron James, Tiger Woods and Kobe Bryant to retain core strength, flexibility and function.[30]Despite Pilates is widely used in dancers it is gaining its popularity in physiotherapy rehabilitation.[31]

Participants who heard about Pilates were quizzed about Pilates and it's shown that the results revealed a low-to-moderate understanding about Pilates. In this study, 76.11% of physiotherapist reported that pregnancy is not contraindicated for Pilates, which corroborates the findings from a past study that physiotherapist is conscious in modifying the technique that suits for the patients with different medical problems. This matched with the guidelines from The American College of Obstetricians and Gynecologists.[32] Furthermore, the therapist in the current study realized that Pilates is beneficial in strengthening the muscle groups. Strengthening the gluteus muscle can reduce the symptoms in low back pain was acknowledged is in line with the present study.[33] This result also supports that the therapist level of knowledge on Pilates 77.8% was adequate in managing the disc lesions. Another researcher recommended that future studies are needed to allow various exercises, populations and ages to understand the effects of the Pilates principles.[34]

A large number of participants (77.88%) are interested in implementing Pilates to help breast cancer patients. 64.60% of them are eager to gain more knowledge and application of new techniques. This finding was consistent with a previous study in which the initiative to aim for improved learning and a greater standard of success was demonstrated by UKM Physiotherapy graduates from a study in Malaysia.[35] This indicated that fresh graduated Malaysian physiotherapists learn new things by updating their own expertise and drawing on their own experience. Another result showed that Malaysian physiotherapy students worked hard to look for possibilities to apply their skills during clinical placement.[36] The awareness result shows that the majority of the participants are unaware that breast cancer musculoskeletal problems can be treated using Pilates. Therefore, low awareness among Malaysian physiotherapists regarding Pilates (38.94%) and not being familiar with Pilates related to women's health (38.05%) are causing participants to lose interest in pursuing Pilates's knowledge. This report coincides with the past study on knowledge of effects of Pilates among physiotherapist and occupational therapist revealed that both the professionals have less comprehension of only 33% on the impacts of Pilates.[37]

The study found that 36.3% of participants are strongly agreed to the impression that Malaysian physiotherapists working in hospitals or clinics should be encouraged to execute Pilates in managing musculoskeletal problems arise from breast cancer. Nearly half of participants, 42.5% agreed to bring forth courses or education to create awareness regarding Pilates

in women's health and breast cancer. Researchers found that their assessment indicated that the design of the workshop assisted participants in the development of skills and built trust to adopt the observed program of practice.[38] Additionally, more than 40% of participants are reported a lack of interest in Pilates because of insufficient knowledge and unfamiliar with the techniques. The probable reason could be a paucity of workshops and courses in the field. An interactive workshop with the real patient model will aid to overcome the issue and promote the clinical psychomotor skills.[39]

Conclusion

Current study results reflect a lack of knowledge and awareness on Pilates as a rehabilitation tool for breast cancer among physiotherapists in Malaysia. We contend that these findings further highlight the need to establish a knowledge transfer session with the physiotherapist. We also believe that this study results may provide valuable data to the contemporary Pilates practitioner to broaden the scope of practice.

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Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest.

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Table 1. Socio-demographic Characteristics of the Participants (n=113)

Characteristic	N	%
Gender		
Female	75	66.3
Male	37	32.7
Age group (years)		
<20	2	1.77
21 – 25	23	20.3
26 – 30	57	50.4
31 – 35	18	15.9
36 – 40	10	8.85
>41	3	2.65
Highest education qualification attained		
Diploma certificate	15	13.2
Bachelor's degree	88	77.8
Master's degree	6	5.31
Area(s) of practice		
Sports	39	34.5
Musculoskeletal	67	59.2
Neurological	33	29.2
Cardiorespiratory	16	14.1
Geriatrics	28	24.7
Paediatrics	13	11.5
Women Health	14	12.3
Working experiences(years)		
2 – 4	59	52.2
5 – 9	33	29.2
10 – 14	10	8.85
15 – 20	8	7.08
>20	3	2.65
Position in the workplace		
Founder / Co-Founder	12	10.6
Director / Manager / Head of Department	14	12.3
Senior Physiotherapist	39	34.51
Junior Physiotherapist	40	35.4
Assistant Physiotherapist	3	2.65

Table 2. Awareness of Pilates in breast cancer rehabilitation (n=113)

Variables	N (%)
Awareness of Pilates	
Not aware at all	51 (45.1)
Slightly aware	24 (21.2)
Moderately aware	13 (11.5)
Strongly aware	12 (10.6)
Extremely aware	13(11.5)
Awareness on breast cancer symptoms can be treated using Pilates	
Not aware at all	51 (45.1)
Slightly aware	24 (21.2)
Moderately aware	13 (11.5)
Strongly aware	12 (10.6)
Extremely aware	13 (11.5)

Table 3. General Knowledge of Pilates (n=113)

Statements	Correct response N (%)
Endurance is not a core principle of the Pilates method	77 (68.1)
Pilates takes as little as 10 minutes a day	78 (69.0)
Advantages of doing Pilates on a reformer compared to mat	
More exercise available	76 (67.2)
Allows users to constantly advance	76 (67.2)
Provide intensive strength training	76 (67.2)
Contraindication(s) for Pilates	
Unstable blood pressure	70 (61.9)
Risk of blood clots	45 (39.8)
Severe osteoporosis	52 (46.0)
A herniated disk is not contraindication	88 (77.8)
Pregnancy is not contraindication for Pilates	86 (76.11)

Table 4. Implementation of Pilates in Women's Health and Breast Cancer

Statements	
Pilates should be enforced to perform in hospital or clinic?	
Strongly Agree	41 (36.3)
Agree	35 (31.0)
Neutral	31 (27.4)
Disagree	4 (3.5)
Strongly disagree	2 (1.8)
It is important to provide courses or education to create awareness	
Strongly Agree	46 (40.7)
Agree	48 (42.5)
Neutral	16 (14.2)
Disagree	1 (0.9)
Strongly disagree	2 (1.8)
Interest in pursuing future Pilates workshop?	
Strongly interested	46 (40.7)
Interested	41 (36.3)
Neutral	17 (15.0)
Not interested	9 (8.0)
Treatment options would you include in treating breast cancer in future?	
Manual Therapy (e.g.: joint mobilization, soft tissue release)	101 (89.4)
Pilates	71 (62.8)
Lifestyle Education	81 (71.7)
Dry Needling	16 (14.2)
Postural Training	62 (54.9)
Others	5 (4.4)

References

1. Indramalar S. 1 in 30 Malaysian women will have breast cancer, so get checked now. The Star 2019. https://www.thestar.com.my/lifestyle/family/2019/10/16/breast-cancer-2/.
2. Giordano SH, Cohen DS, Buzdar AU, Perkins G, Hortobagyi GN. Breast carcinoma in men: a population-based study. Cancer: Interdisciplinary International Journal of the American Cancer Society. 2004;101(1):51-7.
3. Al-Naggar RA, Al-Naggar DH. Perceptions and opinions about male breast cancer and male breast self-examination: a qualitative study. Asian Pacific Journal of Cancer Prevention. 2012;13(1):243-6.
4. Yip CH, Taib NA, Mohamed I. Epidemiology of breast cancer in Malaysia. Asian Pacific Journal of Cancer Prevention. 2006;7(3):369.
5. Dahlui M, Ramli S, Bulgiba AM. Breast cancer prevention and control programs in Malaysia. Asian Pacific Journal of Cancer Prevention. 2011;12(6):1631-164.
6. Radice D, Redaelli A. Breast cancer management. Pharmacoeconomics. 2003; 21(6):383-396.
7. Eyigor S, Karapolat H, Yesil H, Uslu R, Durmaz B. Effects of pilates exercises on functional capacity, flexibility, fatigue, depression and quality of life in female breast cancer patients: a randomized controlled study. Eur J Phys Rehabil Med. 2010;1;46(4):481-487.
8. Şener HÖ, Malkoç M, Ergin G, Karadibak D, Yavuzşen T. Effects of clinical Pilates exercises on patients developing lymphedema after breast cancer treatment: a randomized clinical trial. The journal of breast health. 2017;13(1):16.
9. Schmitz K. Physical activity and breast cancer survivorship. Physical Activity and Cancer. 2010;189-215.
10. Owsley A. An introduction to clinical Pilates. International Journal of Athletic Therapy and Training. 2005;1;10(4):19-25.
11. Zengin Alpozgen A, Razak Ozdincler A, Karanlik H, Yaman Agaoglu F, Narin AN. Effectiveness of Pilates-based exercises on upper extremity disorders related with breast cancer treatment. European journal of cancer care. 2017;26(6): e12532.
12. Şener HÖ, Malkoç M, Ergin G, Karadibak D, Yavuzşen T. Effects of clinical Pilates exercises on patients developing lymphedema after breast cancer treatment: a randomized clinical trial. The journal of breast health. 2017;13(1):16.
13. Stan DL, Kathleen Sundt RN, Cheville AL, Youdas JW, Krause DA, Boughey JC. *et al*., Pilates for breast cancer survivors: Impact on physical parameters and quality of life after mastectomy. Clinical journal of oncology nursing. 2012;1;16(2):131.
14. McMenamin M, Barry H, Lennon AM, Purcell H, Baum M, Keegan D. *et al*., A survey of breast cancer awareness and knowledge in a Western population: lots of light but little illumination. European Journal of Cancer. 2005;41(3):393-397.
15. Yahui HC, Swaminathan N. Knowledge, attitudes, and barriers towards evidence-based practice among physiotherapists in Malaysia. Hong Kong Physiotherapy Journal. 2017;37:10-18.
16. Fotedar V, Seam RK, Gupta MK, Gupta M, Vats S. Verma S. Knowledge of risk factors & early detection methods and practices towards breast cancer among nurses in Indira Gandhi Medical College, Shimla, Himachal Pradesh, India. Asian Pacific Journal of Cancer Prevention. 2013; 14(1), pp.117-120.
17. Parsa P, Kandiah M. Breast cancer knowledge, perception and breast self-examination practices among Iranian women. Int Med J. 2005;4(2):17-24.

18. Samah AA, Ahmadian M, Latiff LA. Insufficient knowledge of breast cancer risk factors among Malaysian female university students. Global journal of health science. 2016;8(1):277.
19. Akhtari-Zavare M, Latiff LA, Juni MH, Said SM, Ismail IZ. Knowledge of female undergraduate students on breast cancer and breast self-examination in Klang Valley, Malaysia. Asian Pacific Journal of Cancer Prevention. 2015;16(15):6231-6235
20. Cockburn J, Irwig L, Turnbull D, Simpson JM, Mock P, Tattersall M. Encouraging attendance at screening mammography: knowledge, attitudes and intentions of general practitioners. Medical journal of Australia. 1989;151(7):391-396.
21. Mahon, S. M. Cancer risk assessment: conceptual considerations for clinical practice. In Oncology nursing forum 1998; 25:1535
22. Ibrahim NA, Odusanya OO. Knowledge of risk factors, beliefs and practices of female healthcare professionals towards breast cancer in a tertiary institution in Lagos, Nigeria. BMC cancer. 2009 ;9(1):1-8.
23. Sambanje MN, Mafuvadze B. Breast cancer knowledge and awareness among university students in Angola. Pan African Medical Journal. 2012;11(1).
24. Noreen M, Murad S, Furqan M, Sultan A, Bloodsworth P. Knowledge and awareness about breast cancer and its early symptoms among medical and non-medical students of Southern Punjab, Pakistan. Asian Pacific Journal of Cancer Prevention. 2015;16(3):979-984.
25. Lee Y, Mak S, Tse S, Chan S. Lymphoedema care of breast cancer patients in a breast care clinic: a survey of knowledge and health practice. Supportive care in cancer. 2001;9(8):634-641.
26. McNeely ML, Campbell K, Ospina M, Rowe BH, Dabbs K, Klassen TP. *et al*., Exercise interventions for upper-limb dysfunction due to breast cancer treatment. Cochrane Database of Systematic Reviews. 2010;6.
27. Eyigor S, Karapolat H, Yesil H, Uslu R, Durmaz B. Effects of pilates exercises on functional capacity, flexibility, fatigue, depression and quality of life in female breast cancer patients: a randomized controlled study. Eur J Phys Rehabil Med. 2010;46(4):481-487.
28. Embody Movement Pilates Studio. What Pilates is …not. 2018
29. Owsley A. An introduction to clinical Pilates. International Journal of Athletic Therapy and Training. 2005;1;10(4):19-25.
30. Lee, S. Pilates Can Be a Basketball Player's Secret Weapon. 2019.
31. Stolarsky LB. The Pilates method in physical therapy for dancer. Ortop Phys Ther Pract 1993; 5:8-9
32. American College of Obstetricians and Gynecologists. Physical Activity and Exercise During Pregnancy and the Postpartum Period. Committee Opinion No. 650. Obstetrics & Gynecology, 2017;126:135–142.
33. Cooper NA, Scavo KM, Strickland KJ, Tipayamongkol N, Nicholson JD, Bewyer DC. *et al*., Prevalence of gluteus medius weakness in people with chronic low back pain compared to healthy controls. European Spine Journal. 2016; 1;25(4):1258-65.
34. Andrade LS, Mochizuki L, Pires FO, da Silva RA, Mota YL. Application of Pilates principles increases paraspinal muscle activation. Journal of bodywork and movement therapies. 2015; 1;19(1):62-6.
35. Ramli A, Nawawi R, Chun MP. Employees' perception of employability skills needed in todays workforce among physiotherapy graduates. Procedia-Social and Behavioral Sciences. 2010; 7:455-63.

36. Ayiesah Ramli LJ, Lee SW. Learning pathways during clinical placement of physiotherapy students: a Malaysian experience of using learning contracts and reflective diaries. Journal of Educational Evaluation for Health Professions. 2013;10.
37. Nam TG, Lee JW, Lee JH. Recognizable Investigation of Physical and Occupational Therapist on the Pilates. Journal of Korean Physical Therapy Science. 2008;15(4):43-50.
38. Morley M, Smith J, Petty N. Advancing reflective practice: an evaluation of an observed practice workshop for occupational therapists and physiotherapists. British journal of occupational therapy. 2011;74(4):181-184.
39. Khadivzadeh T, Seighalani MA, Mirzaii K, Mazloum SR. The Effect of Interactive Educational Workshops with or Without Standardized Patients on the Clinical Skills of Midwifery Students in Providing Sexual Health Counseling. Simulation in Healthcare. 2020;1;15(4):234-242.

ORIGINAL ARTICLE

EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF) ON CARDIOVASCULAR RESPONSES ON YOUNG ADULTS.

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Abstract

Background: Proprioceptive neuromuscular facilitation (PNF) is being a preferred method as one of the treatment plans to improve patient's well-being by several physiotherapist in Malaysia. PNF is a stretching technique that has been practiced in improving the muscle elasticity, increasing the muscle thickness, dynamic balance and producing positive effects on active and passive range of motions.
Objective: The present study aimed to investigate the short-term effects of PNF stretching exercises on blood pressure & heart rate among young adults.
Methods: 50 subjects underwent the hold-relax PNF stretching exercise for upper limbs (biceps muscle) and lower limbs (hamstring muscle). All subjects were assigned to conduct 4 sets of a combination of passive movement, isometric contraction and passive stretching for both upper and lower limbs. Preliminary data (before exercise) and post-data (after exercise) for heart rate and blood pressure were measured and recorded.
Results: A paired samples t-test was performed to compare lower limb pre-testing (SBP_LL_pretest) and post-testing (SBP_LL_posttest). The results showed that, there was a significant difference in the scores for SBP_LL_pretest (M=114.98, SD=8.714) and SBP_LL_posttest (M=118.86, SD=9.94); t (49) =-2.28, p=0.027.
Conclusion: There was no significant difference for heart rate and diastolic blood pressure. However, significant changes present in systolic blood pressure of the participants/subjects.

Keywords: Proprioceptive Neuromuscular Facilitation (PNF), Cardiovascular, Heart Rate, Blood Pressure.

Introduction

Rehabilitation is one of the therapy forms for the chronic stroke patients who had suffered muscle tightness. Some researchers claimed that the exaggerated reflexes of spasticity in chronic stroke patients lead to muscle contracture.[1] [2] Several physiotherapists in Malaysia used proprioceptive neuromuscular facilitation (PNF) as one of their treatment plans to improve patient's well-being. There are many different rehabilitation approaches used to treat this condition such as proprioceptive neuromuscular facilitation (PNF) and strengthening exercises that have been developed to re-educate the muscles and spasticity especially for stroke patient.[3]

Proprioceptive neuromuscular facilitation (PNF) and strengthening exercises are the major therapeutic approaches that aimed at improving the important feature which is necessary for the functional ambulation of hemiplegic patient, such as muscular tone, strength, and flexibility.[4] PNF stretching exercise is widely believed may resulted in increased range of motion compared to static stretching acquired from increased inhibition of the targeted muscle. In a recent research in determining the effectiveness between proprioceptive neuromuscular facilitation and static stretching for increasing hamstring muscle extensibility in an active population, it was shown that there is no significant difference in regard to the effectiveness between PNF stretching exercises and static stretching exercises.[5]

Hold-relax technique is one of the PNF stretching exercises that is commonly used for the purpose of increasing muscular extensibility and range of motion. Unlike static stretching, hold-relax technique consists of passive movement to the specific position, isometric contraction of the target muscles and passive stretching technique performed in the specific time to complete one set of hold-relax exercise. The term isometric contraction has been used to describe the development of a pressure overload caused by pulsatile contraction resulting a significant increase in muscle blood flow on cardiovascular system.[6] A strong relationship between isometric contraction with heart rate, systolic blood pressure and diastolic blood pressure has been reported in this literature.

Proprioceptive Neuromuscular Facilitation (PNF) is a stretching technique that has been shown to improve muscle elasticity, muscle thickness, dynamic balance, and to have a positive effect on active and passive range of motion. This PNF method is effective for the rehabilitation of the upper limbs in stroke patients.[7] However, there are few studies that correlate between the PNF techniques in the stroke rehabilitation with the cardiovascular function. Therefore, the main objective of this study is to determine the effects of PNF stretching on cardiovascular responses among normal young adults.

Methodology

Participants

The sample population for this study is 50 Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP) students aged between 18 - 25 years old. They agreed to be involved for this study based on their normal BMI and they had undergone PNF stretching exercises. The participants who have history of any injuries of upper and lower limbs, history of cardiovascular diseases, respiration pathology and Active smoker are excluded from this study.

Procedure

All participants' blood pressure and heart rates are recorded once as pre-data prior to the study. The participants took part in hold-relax PNF stretching exercises in the first session of the study, and the post data for blood pressure and heart rate are recorded immediately after 4 sets of PNF stretching exercises are completed. Then the participants were rested for 2 weeks (14 days) to

make sure their muscles are fully recovered and relaxed. After 14 days of rest interval, they were asked to put through the PNF stretching exercises for the lower limbs and the post data for blood pressure and heart rate are recorded immediately after 4 sets of PNF stretching exercises are completed.

Hold-relax PNF stretching protocol for upper limb

The hold-relax PNF stretching exercise for left biceps muscle was performed in sitting position with the left arm fully supported on the plinth. The therapist then instructed the participants to perform elbow flexion against the therapist's resistance. For one set of hold relax procedure, the technique requires the participants to hold in 90° elbow flexion with 15 seconds isometric contraction and later, the therapist asked the participants to relax (no contraction for the biceps muscle). Afterward, the therapist performed the gentle passive stretching for full elbow flexion for 15 seconds. The participants will be given 5 seconds rest interval between the sets of exercises. The participants went through 4 sets of these exercises per limb.

Hold-relax PNF stretching protocol for lower limb

The hold-relax PNF stretching exercise for left hamstring muscle was performed in supine area with the participant's leg in 90° hip flexion and 0° knee extension, supported on the therapist's shoulder. The therapist instructed the participant to perform hip extension and knee flexion against the therapist's resistance. For one set of hold relax procedure, the technique requires the participants to hold in 90° hip extension and 0° knee extension with 15 seconds isometric contraction and later, the therapist asked the participants to relax (no contraction for the hamstring muscle). Afterward, the therapist performed the gentle passive stretching for full hip extension and knee extension for 15 seconds. The participant will be given 5 seconds rest interval between the sets of exercises. The participants went through 4 sets of the exercise per limb.

Heart rate and blood pressure measurements

The sphygmomanometer was used to measure blood pressure. The measurements of SBP and DBP were performed at rest, and at the end of the exercise series. In the exercises, the values were measured in the left arm, and after the fourth repetitions, the device was turned on for the parameters immediately at the end of the series. In data collection tool, ECQ machine (Kenz 108 single channel) is used to identify heart rate (RR interval) and ECG data.

Statistical analysis

After test of normality analysis was conducted, the data were statistically evaluated by Paired-samples t test and Non-parametric Sign test at ($p<0.05$) level of confidence by using SPSS 23.0 tool.

Results

Heart rate

These graphs illustrate the differences in heart rate responses before and after PNF stretching exercises for upper limb (Figure 1) and lower limb (Figure 2). It records the changes in heart rate for 50 respondents with negative correlation. A paired samples t-test was conducted to compare upper limb pre-testing (HR_UL_pretest), post-testing (HR_UL_posttest), and lower limb pre-testing (HR_LL_pretest) and post-testing (HR_LL_posttest). There is no significant difference in the scores for HR_UL_pretest (M=76.64, SD=13.189) and HR_UL_posttest (M=75.36, SD=12.262); t (49) =1.00, p=0.322. There is no significant difference in the scores for HR_LL_pretest (M=76.76, SD=12.923) and HR_LL_posttest (M=76.58, SD=12.12); t (49) =0.146, p=0.885. These results suggest that a lower limb PNF stretching exercises really does not have any effect to the heart rate.

Systolic blood pressure

These graphs illustrate the differences in systolic blood pressure (SBP) responses before and after PNF stretching exercises for upper limb (Figure 3) and lower limb (Figure 4). It records the changes in systolic blood pressure for 50 respondents with negative correlation. A paired samples t-test was conducted to compare upper limb pre-testing (SBP_UL_pretest) and post-testing (SBP_UL_posttest) and lower limb pre-testing (SBP_LL_pretest) and post-testing (SBP_LL_posttest). There is a significant difference in the scores for SBP_UL_pretest (M=155.12, SD=8.698) and SBP_UL_posttest (M=119.30, SD=13.686); t (49) =-2.174, p=0.035. There is a significant difference in the scores for SBP_LL_pretest (M=114.98, SD=8.714) and SBP_LL_posttest (M=118.86, SD=9.94); t (49) =-2.28, p=0.027. These results suggest that a lower limb PNF stretching exercises really does have an effect to systolic blood pressure.

Diastolic blood pressure

These graphs illustrate the differences in diastolic blood pressure (DBP) responses before and after PNF stretching exercises for upper limb (Figure 1) and lower limb (Figure 2). It records the changes in diastolic blood pressure for 50 respondents with negative correlation. A paired samples t-test was conducted to compare upper limb pre-testing (DBP_UL_pretest) and post-testing (DBP_UL_posttest) and compare lower limb pre-testing (DBP_LL_pretest) and post-testing (DBP_LL_posttest). There is no significant difference in the scores for DBP_UL_pretest (M=76.12, SD=7.88) and DBP_UL_posttest (M=77.56, SD=11.14); t (49) =-0.876, p=0.385. There is no significant difference in the scores for DBP_LL_pretest (M=76.64, SD=7.564) and DBP_LL_posttest (M=74.22, SD=8.125); t (49) =1.887, p=0.065. These results suggest that a lower limb PNF stretching exercises does not have any effect to diastolic blood pressure.

Discussion

The present study did not find evidence of increased heart rate immediately after hold-relax PNF stretching exercise for both upper and lower limb. Based on our findings, the heart rate for upper limb and lower limb are p=0.322 and p=0.885 respectively. Since the value of p>0.05, hence, there is no significant difference on the effects of proprioceptive neuromuscular facilitation on heart rate. This implies that after several sets of hold-relax PNF stretching exercises, the heart rate remains unchanged drastically and the exercises are safe for the young adult patient.

All articles that were reviewed address the effects of PNF stretching exercises on heart rate. The reviewed literature demonstrates that the PNF stretching exercises does not significantly change the heart rate after several sets. The researcher evaluated heart rate during and after passive stretching for ischio-tibialis muscles and gastrocnemius muscles of 22 healthy male subjects.[7] Based on their study, it was found that there is no significant changes occurred on the subjects' heart rate (p>0.05). They suggested that the heart rate remained stable throughout the sets even though it was significantly greater than the resting (pre-test) measurement.

When comparing the studies in this critically appraised topic, there is some literature which suggested significant increase of heart rate in their study. The study recent researcher stated that, there is an increase of the heart rate and peripheral vascular resistance with a consequent increase in mean arterial pressure caused by isometric exercise.[6] The mechanical activity of the muscle increases the intramuscular pressure that compresses the blood vessels and inhibits the production of metabolites released during isometric exercises. The accumulation of mechanical action activates metaboreceptors of the muscle, contributing to an increase in the heart rate.

The primary finding of this study was the systolic blood pressure (SBP) that showed a significant difference with $p<0.05$ after the participants underwent 4 sets of hold-relax PNF stretching exercise. But for diastolic blood pressure, with $p>0.05$ no significant changes were recorded between the pre and post measurement. The finding was consistent with some previous studies. In 1995, some researchers investigated the acute systolic (SBP) and diastolic (DBP) blood pressure responses within passive and modified PNF stretching techniques in three trials. By using arterial blood pressure which is taken from the contralateral third finger with a Finapres finger cuff, it was found there were no increase blood pressure values above baseline levels for first and second trial. However, in the third trial there were no significant differences even though the blood pressure is increased.[8]

Mounting prospective evidence suggests that isometric exercise training in normotensive and hypertensive (medicated and non-medicated) cohorts of young and old participants may produce similar, if not greater, reductions in BP, with meta-analyses reporting mean reductions of between 10 and 13 mmHg systolic, and 6 and 8 mmHg diastolic. Although the mechanisms responsible for these adaptations remain to be fully clarified, improvements in conduit and resistance vessel endothelium-dependent dilation, oxidative stress, and autonomic regulation of heart rate and BP have been reported. [9] However, one study found that static exercise causes a greater increase in arterial blood pressure than dynamic exercise. This is due to the combination of an increase in cardiac output and in total systemic vascular resistance because of increase sympathetic outflow and mechanical compression of the vessels in the active muscles. During exercise, increases in cardiac stroke volume and heart rate raise cardiac output, which coupled with a transient increase in systemic vascular resistance, elevate mean arterial blood pressure. [10]

Similar suggestion was made some colleagues that the reduction in BP was significant regardless of the participant's initial BP level, gender, physical activity level, antihypertensive drug intake, type of BP measurement, time of day in which the BP was measured, type of exercise performed, and exercise training program ($p < 0.05$ for all). ANOVA tests revealed that BP reductions were greater if participants were males, not receiving antihypertensive medication, physically active, and if the exercise performed was jogging. A significant inverse correlation was found between age and BP, body mass index (BMI) and SBP, duration of the exercise's session and SBP, and between the number of sets performed in the resistance exercise program and SBP ($p < 0.05$). Regardless of the characteristics of the participants and exercise, there was a reduction in BP in the hours following an exercise session. However, the hypotensive effect was greater when the exercise was performed as a preventive strategy in those physically active and without antihypertensive medication.[11]

The previous study by some researcher found that the PNF protocol used in this study did not statistically change the HR, SBP and DBP values among 12 normotensive female swimmers. In this study, the subjects in the PNF group rested for 10 min before having the HR, SBP and DBP and SPO2 measured two times. During data collection process, they conducted two sets of PNF hold relax procedure for the pectorals and biceps muscles. It starts with 6 seconds isometric contraction and followed by 24 sec of sustained stretching. There is 15 seconds rest interval between sets. Immediately after two sets, the HR, SBP and DBP values were measured and recorded two times. The researchers identified that there is no evidence found of increased HR immediately after PNF stretching exercises and there are not significant increases in BP even though there is slight elevation in the mean values of SBP and DBP were observed after PNF stretching. They conjecture that the short duration (2 sets with 30 seconds) of the sustained

stretching technique was inadequate to cause an acute increase in the involvement of sympathetic branch from the autonomic nervous system. They suggested the involvement different samples, use another muscle group (upper limb and lower limb), measurement techniques and stretching methods for further studies. [12]

On the question of the effects of PNF on heart rate, systolic blood pressure and diastolic blood pressure, a study was conducted on 40 young healthy adults; found that there was significant increase in heart rate, systolic blood pressure and diastolic blood pressure with Valsalva Maneuver (VM) immediately after the exercise session. The researcher also observed notable increase in responses between hamstring stretching group (lower extremity) and pectorals stretching group (upper extremity). [13] This study performed three sets of PNF stretching exercises, with 6 seconds of isometric contraction each and followed by 24 seconds of sustained stretching, unlike the previous study conducted two sets of PNF stretching. [12] However, this study has its limitation such as, the researcher measured heart rate manually and the force applied during isometric contraction in the PNF stretching technique was not measured. They also suggested that future study need to increase the number of sample size and can be conducted among cardiac patient to see the effects.

Prior to this study, it was found that there is a hemodynamic relationship between the increase of heart rate and blood pressure with cardiac outputs that affects the finding for upper extremity and lower extremity exercises. The increased of cardiac output resulted from the vasodilatation occurs in the active muscles because of the accumulation of metabolites produced by the contracting muscles. This study shown that the upper extremity exercise has greater heart rate and blood pressure compared to lower extremity at the similar exercises.[14]

In 2015, some researcher in their study of hemodynamic responses during and after multiple sets of stretching exercises, assigned 15 subjects performed stretching protocols comprising 10 sets of maximal passive unilateral hip flexion with 30 seconds hold for each set. The result of this study shown multiple sets of the passive stretching of unilateral hip flexion exercise performed for 30 seconds significantly increased the heart rate, blood pressure and rate pressure product. However, the paper fails to offer an adequate explanation on how the muscular activity is controlled by means of electromyography monitoring, which is used to detect involuntary muscle contraction. [15]

In a previous study, the researchers question the extent to which the effect of passive muscle stretches of heart rate responses at the onset of muscle contraction. The researcher conducted two studies in their article; 1) the time course of heart rate and blood pressure changes were tested for various intensities of voluntary isometric triceps muscle contraction and 2) the cardiovascular changes in response to the passive muscle stretch of the triceps muscle. From their finding, a significant increase in heart rate but no significant changes in blood pressure was caused by a sustained passive stretch of the triceps for one minute. They suggested that there is an increase for the mean arterial blood pressure at the onset of stretch and then it decrease to a similar value during rest for the remainder stretch duration. The findings strongly suggest that the effect on heart rate is mediated by muscle mechanoreceptors as activation of these receptors by prolonged passive muscle stretch decreases parasympathetic activity and increases heart rate. [16]

In a more current study was concluded that there was a significant change in heart rate, diastolic blood pressure and mean arterial pressure (MAP) except for systolic blood pressure due to sustained isometric contraction and a positive significant correlation of body mass index (BMI) with DBP

and MAP. They believed that during isometric contraction, as in any muscular work, the active muscle increased the metabolic demands. Due to the mechanical constriction of blood vessels caused by a high intramuscular tension during static contraction, blood flow to the target muscles is restricted. Static exercise causes a build-up of local metabolic by-products due to the reduction in muscle blood supply. These metabolic by-products excite sensory nerve endings, resulting in a pressure reflex that raises diastolic and mean arterial pressure. [17]

There are several limitations that have impacted the current findings. The first limitation is the data just focused on pre and post data measurement of heart rate, blood pressure and ECG reading. It would provide more meaningful data if this study included the data during the hold-relax PNF stretching exercises especially during isometric contraction, so that the muscle forces can be examined. During PNF stretching exercises, no muscle activity is recorded. It is recommended that an electromyography test be performed on the target muscle during PNF stretching so that the researcher can determine when the highest intramuscular tension occurs. Next, the subjects are healthy young adult who does not have any flexibility problem such as muscle tightness.

Conclusion

The present study is the post-test measurement performed immediately after the hold-relax PNF stretching exercises protocols, therefore, our study only focused on the immediate physiological responses to PNF stretching, which is of great scientific importance. There is significant difference for SBP but there are no significant differences for HR and DBP. Even without consistent evidence to support the use of hold-relax PNF stretching exercise, there appears to be little to no risks for physiotherapist to make their own personal decision on the PNF stretching exercise application. Future researchers are recommended to perform data collection before (pre-test), during and after (post-test) hold-relax PNF stretching exercises especially during isometric exercises. Other than that, future researchers can use electromyography (EMG) to investigate effects of PNF stretching exercise on muscle activities together with cardiovascular responses.

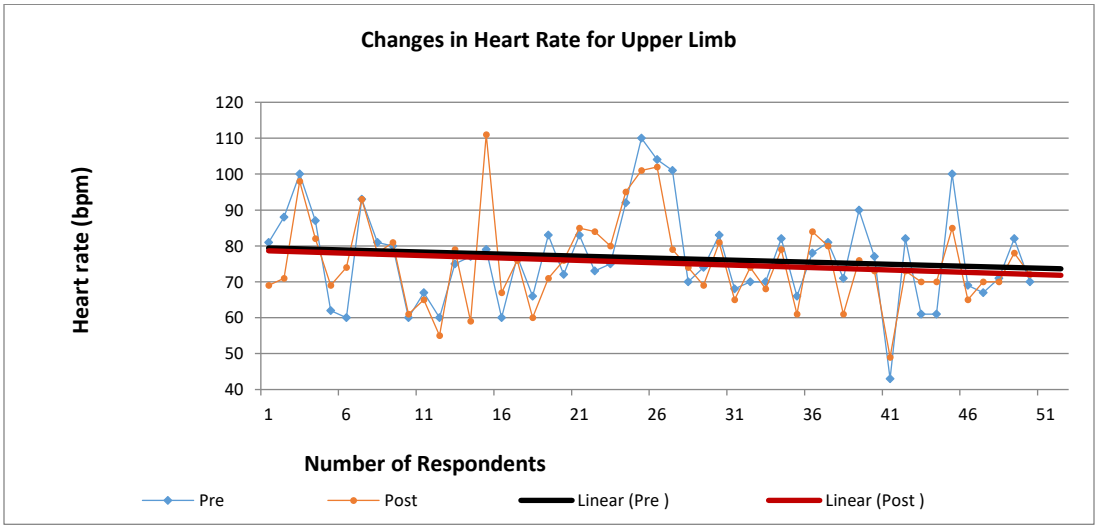

Figure 1: The difference in heart rate before and after PNF stretching exercises for upper limb.

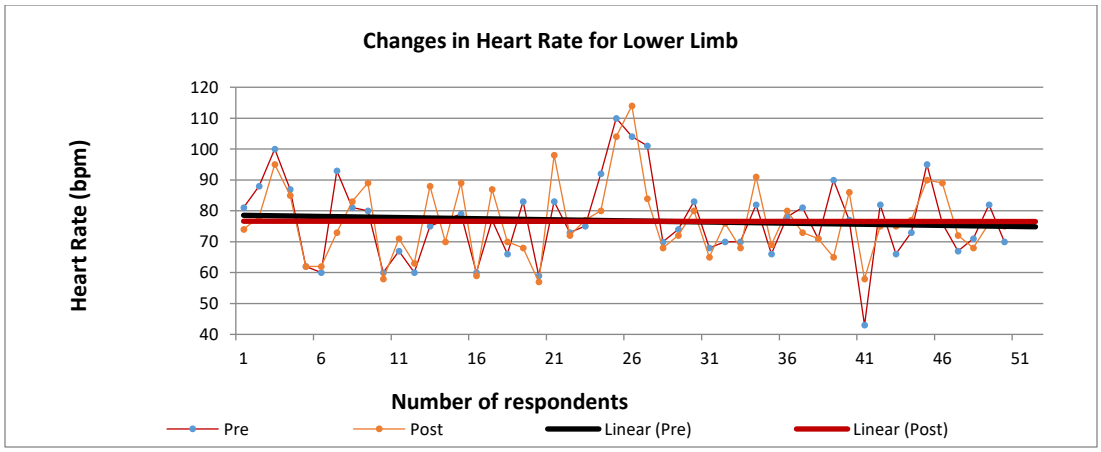

Figure 2: The difference in heart rate before and after PNF stretching exercises for lower limb.

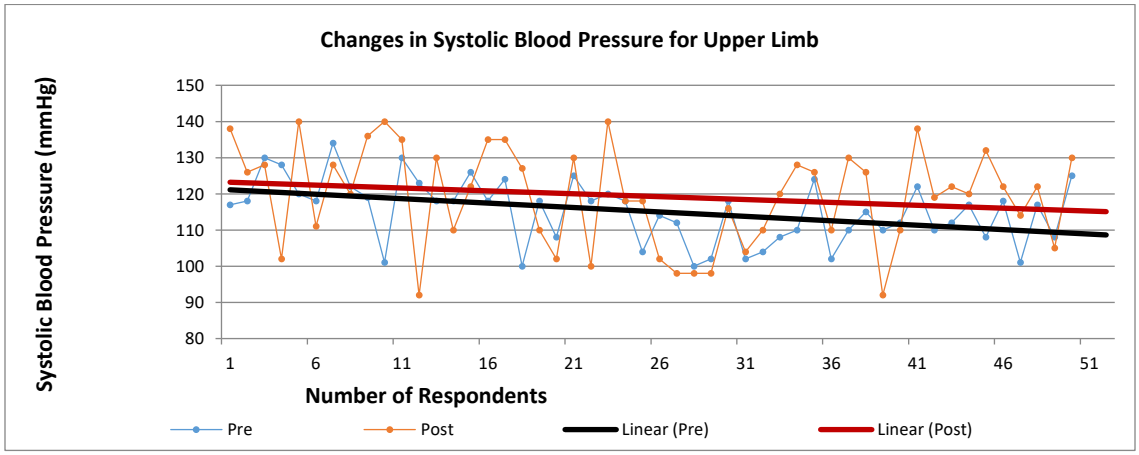

Figure 3: The difference in systolic blood pressure before and after PNF stretching exercises for upper limb.

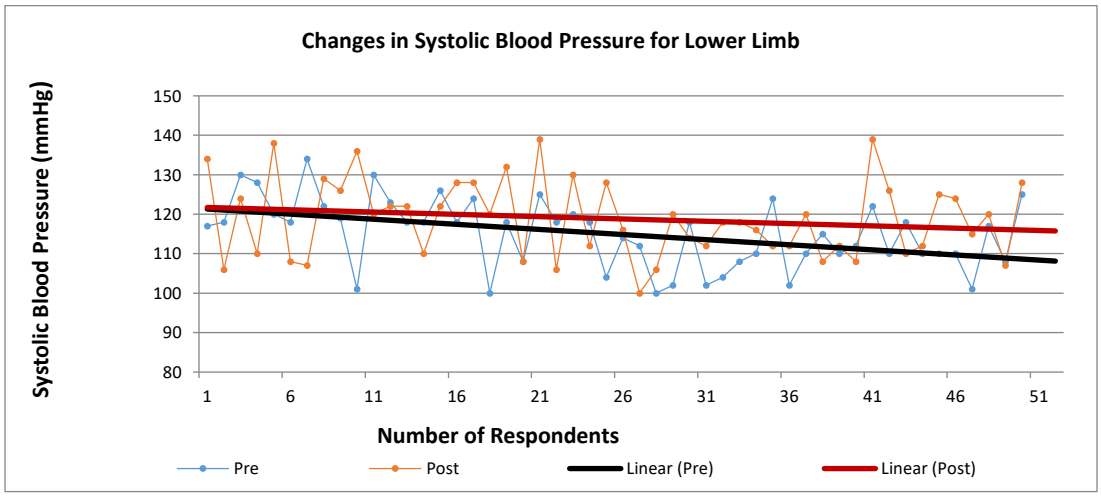

Figure 4: The difference in systolic blood pressure before and after PNF stretching exercises for lower limb.

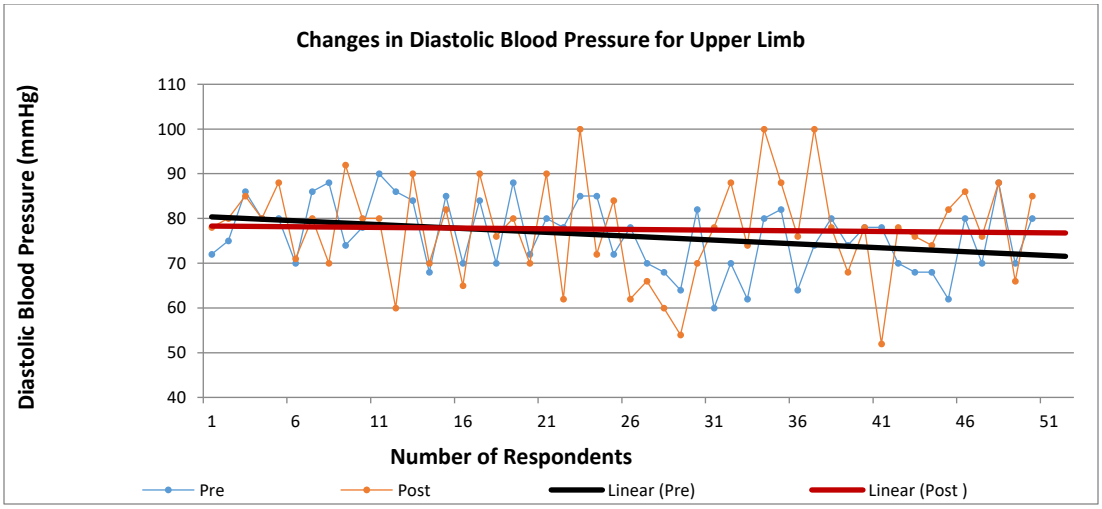

Figure 5: The difference in diastolic blood pressure before and after PNF stretching exercises for upper limb.

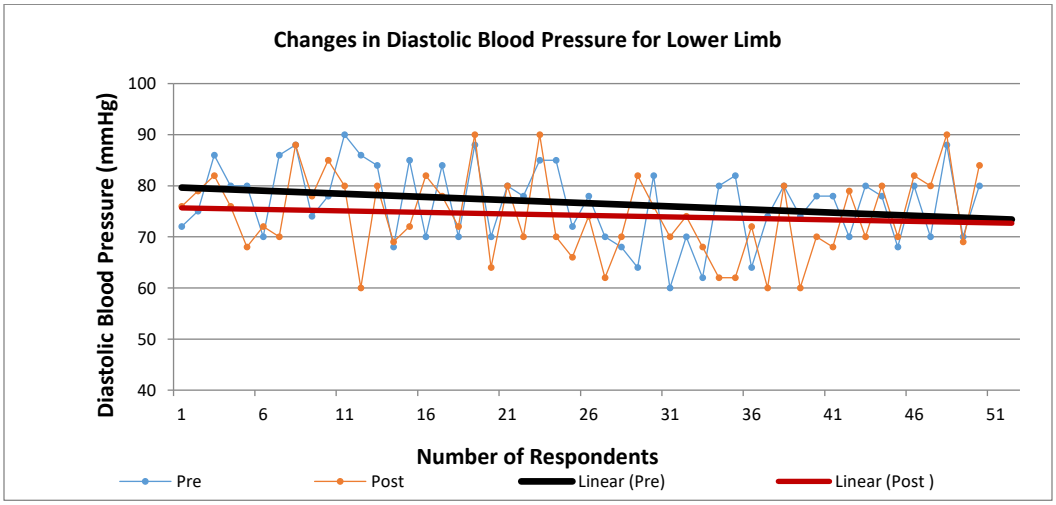

Figure 6: The difference in diastolic blood pressure before and after PNF stretching exercises for lower limb.

References

1. Bhimani R, Anderson L. Clinical understanding of spasticity: implications for practice. Rehabilitation Research and Practice. 2014;2014: 1-10.

2. Li S. Spasticity, motor recovery and neural plasticity after stroke. Front. Neurol. 2017; 8.

3. Hindle KB, Whitcomb TJ, Briggs WO, Hong J. Proprioceptive neuromuscular facilitation (PNF): Its mechanism and effects on range of motion and muscular function. J. Hum. Kinet. 2012;31: 105-13.

4. Akosile CA. Effects of proprioceptive neuromuscular facilitation technique on the functional ambulation of stroke survivors. J. Nig. Soc. Phys. Sci. 2011;18:22-27.

5. Lempke L, Wilkinson R, Murray C, Stanek J. The effectiveness of PNF versus static stretching on increasing hip flexion range of motion. J. Sport Rehabil. 2018;27:289-294.

6. Santos-Antonio AM, Cardoso MA, Amaral JAT, Carlos de Abreu L, Valenti VE. Cardiac autonomic modulation adjustments in isometric exercises. MedicalaExpress. 2015; pp 1-6.

7. Farinatti PTV, Brandao C, Soares PPS, Duarte AFA. Acute effects of stretching exercise on the heart rate variability in subjects with low flexibility levels. J. Strength Cond. Res. 2011;25:1579-1589.

8. Cornelius WL, Jensen RL, Odell ME. Effects of PNF stretching on acute arterial blood pressure. Can. J. Appl. Physiol. 1995;20: 222-229.

9. Shepherd JT. Circulatory response to exercise in health. Circulation 1987;76:3-10.

10. Millar PJ, McGowan CL, Cornelissen VA, Araujo CG & Swaine IL. Evidence for the role of isometric exercise training on reducing blood pressure: potential mechanism and future directions. Sports Med. 2014;44:345-356.

11. Carpio-Rivera E, Moncada-Jimenez, J, Salazar-Rojas, W & Solera-Herrera A. Acute effects of exercises on blood pressure: A meta-analytic investigation. Arq. Bras. Cardiol. 2016;106:422-433.

12. Costa e Silva G, Di Masi F, Paixao A, Bentes CM, Sa M, Miranda H, et al. Effects of proprioceptive neuromuscular facilitation stretching and static stretching on cardiovascular responses. JEPOnline 2013;16:117-125.

13. Krima T, Falak O. Comparison of cardiovascular responses with proprioceptive neuromuscular facilitation stretching on pectorals and hamstring with valsalva maneuver in young adults. Int. Arch. of Intergr. Med. 2016; 3: 42-48.

14. Miles DS, Sawka MN, Hanpeter DE, Foster JE, Doerr BM, & Frey MA. Central hemodynamics during progressive upper- and lower-body exercise and recovery. J. Appl. Physiol. 1984; 57: 366 - 370.

15. Lima TP, Farinatti PT, Rubini EC, Silva EB & Monteiro WD. (2015) Hemodynamic responses during and after multiple sets of stretching exercises performed with and without the Valsalva maneuver. *Clinics 2015; 7*0: 333 – 338.

16. Gladwell VF & Coote JH. Heart Rate at the onset of muscle contraction and during passive muscle stretch in human: A role for mechanoreceptors. J. Physiol. 2002; 540: 1095 - 1102.

17. Khandelwal Y, Yadav A, Sankla M, & Gaur K. Cardiovascular responses to sustained isometric contraction: an interventional study. Int. J. Med. Sci. Educ. 2016; 3: 242 – 249.

CASE REPORT

COVID-19 VACCINATION TABOO: EARLY VACCINATION TO PREVENT SEVERE DISEASE IN THE ELDERLY A MYTH?

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Abstract

The Coronavirus disease 2019 (COVID-19) outbreak has become a global pandemic infecting millions of people globally, causing disabilities and significant loss of life, especially in the elderly population due to their greater susceptibility towards the debilitating infection leading to further complications. Thus, various vaccination program is underway to protect them against COVID-19. This case report of two elderly patients with comorbid who were infected with COVID-19 post-vaccination aims to showcase the importance of early vaccination to prevent severe disease and complications of COVID-19. Despite contracting the disease, both patients were asymptomatic and did not suffer any complications of COVID-19, providing evidence of the impact of early vaccination has on preventing complications in the elderly.

Keywords: COVID-19, vaccination, elderly population

Background

Coronavirus disease 2019(COVID-19) is a debilitating disease which has infected more than 180 million people around the world. As of June 2021, the death toll has amounted to 3,788,966 individuals. Many among the survivors were forced to retire early or suffered from reduced capacity and function in their daily activities or professional work due to long COVID complications. Various immunization programmes are being rolled out throughout the world by the respective nations to create herd immunity and reduce transmission. Even as these efforts to increase the vaccination are underway, many vaccination programs have received mixed reactions from the public due to misinformation regarding the vaccines. A study carried out in the U.S. showed that ~67% of respondents said they would accept a COVID-19 vaccine if it is recommended for them, with unemployed participants having lower acceptance compared to those employed or retired.[1] The concerns of the Malaysian public with regards to the COVID-19 vaccine share similarities to other nation, such as: incompatibility with religious beliefs, long term effects, side effects, potentially unknown future impacts on health as well as lack of trust in the manufacturing process, countries producing the vaccines, vaccine technology, the pharmaceutical industry, local government, and public health bodies. Other notable concerns include fertility, pregnancy, breastfeeding, experience with other vaccines (e.g. influenza) and belief in conspiracy theories (e.g. Covid-19 not being real, vaccines modifying DNA, etc.[2] This is a matter of concern with history having proven that vaccine hesitancy leading to a decline in vaccine uptake has resulted in increased prevalence of vaccine-preventable diseases.[3]

Malaysia has started its own immunisation programme since February 2021 with three types of vaccines, namely mRNA, inactivated virus, and viral vector vaccines. The COVID-19 National Immunisation Programme was rolled out in three phases across 500 vaccination centers in Malaysia in which phase 1 involves vaccinating high risk personnel comprised of frontliners including healthcare worker and personnel in defence and security systems. In phase 2, high risk group such as senior citizens more than 60 year old with chronic illness such as heart disease, obesity, chronic kidney disease etc are targeted whereas in phase 3, adults aged more than 18 years old will be vaccinated. The novel messenger RNA (mRNA) vaccine, Pfizer, reported the earliest Phase III result suggesting efficacies in excess of 90%.[4] This vaccine is widely used in Malaysia across all age groups and is planned to be used to vaccinate 50% of the population. While the other 50% of the population will receive inactivated virus and viral vector vaccine.[5] It is worth noting that the elderly with co-morbidities and frailty has been largely excluded in phase III studies and there are no published data on safety and efficacy in this group.[4]

As of the 12th of June 2021, the vaccine uptake in Malaysia stands at 4% of the population,[6] with the Malaysian government still taking active steps to encourage and increase vaccine uptake via multiple media platforms.

The objective of this case reports is to demonstrate the importance of early vaccination to prevent severe disease in the elderly.

Case Description

Case 1

An 84-year-old Chinese man with underlying ischemic heart disease was admitted into Hospital for positive COVID-19 nasopharyngeal swab PCR, following screening for being close contact with COVID-19 infected son. The patient was asymptomatic upon presentation to the hospital, however, considering the patient's premorbid and old age, he was admitted to hospital for close observation. Despite his age, the patient was independent and was able to perform basic daily activity without assistance. The patient was enrolled in the national Covid-19 Vaccination program and was fully vaccinated with an mRNA

vaccine, receiving his first dose on the 10th May 2021 with the second dose administered on the 31st May 2021. A COVID-19 PCR nasopharyngeal and oropharyngeal swab was taken, and the patient was confirmed to be COVID-19 positive on 2nd June 2021 (24 days after first dose of vaccination, 2 days after the second dose). Swab PCR SARS-CoV-2 RdRp cycle threshold value upon diagnosis was 16.30. The patient was well throughout admission.

Laboratory investigations showed normal full blood count results: white cell count of 5.4 x10^9/L; haemoglobin level of 13.5 X 10^{12}/L; with lymphocyte count of 22.6 percent. C reactive protein level was slightly elevated upon admission at 23.2 mg/L, with a repeated laboratory investigation showing C reactive protein level 5.2 mg/L at day 7 of illness. Beyond which, there was no evidence of any organ damage. A chest X-ray (figure 1) performed showed fairly clear lung fields. The patient's daily vital signs were stable and did not require any oxygen supplementation throughout the 11 days of hospital stay. Lungs auscultation was clear with no abnormality detected. The patient was discharged well without any complications on day 11 of illness.

Figure 1: Chest x-ray showed clear lung field. No consolidation or ground glass appearance seen.

Case 2

A 79-year-old patient with underlying ischemic heart disease and hypertension with previous history of admission due to gastric ulcer was diagnosed with Covid-19. Upon presentation to hospital, the patient was asymptomatic and was admitted for close observation due to the presence of multiple high risk factors and underwent a COVID-19 nasopharyngeal and oropharyngeal swab prior to an elective oesophagogastroduodenoscopy in hospital. He tested positive for COVID-19 on 13/6/2021 with SARS-CoV-2 RdRp cycle threshold of 31. The patient had been vaccinated with an mRNA vaccine as part of the mass vaccination programme rolled out in Malaysia, with 1st dose on 26/4/2021 and later second dose on 17/5/2021(Testing positive 27 days after the second dose of vaccination). The patient was well throughout hospitalisation and did not deteriorate further.

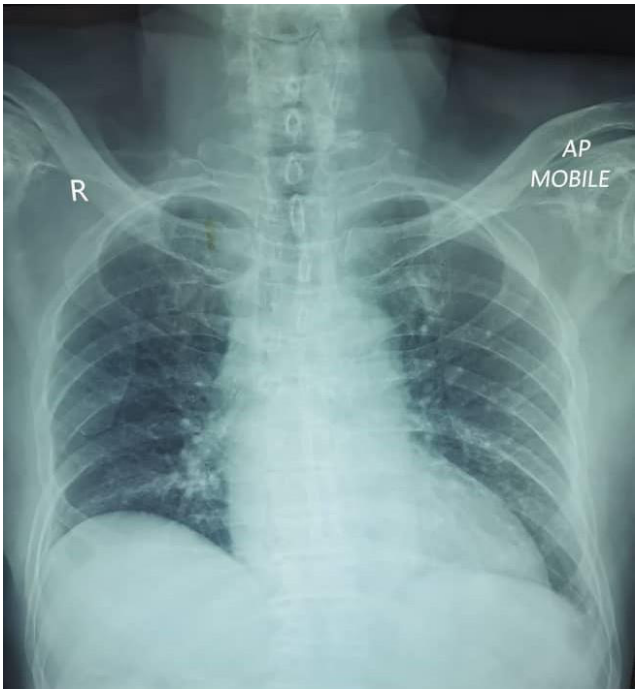

Figure 2: Chest X ray does not show any ground glass appearance or opacity

Laboratory investigations showed normal full blood count results: white cell count of 7.6 x10^9/L; haemoglobin level of 12.8 X 10^{12}/L; lymphocyte count of 21.6 percent; C-reactive protein level of 0.4 mg/L. A chest X-ray (figure 2) showed clear lung fields. The patient's daily vital signs were stable throughout the 11 days of hospital stay. Auscultation of lungs was normal. The patient did not develop any complications of Covid-19 and was discharged well.

Discussion

Both patients were able to maintain their premorbid function despite their old age after onset of Covid-19 infection. Both patients were able to ambulate independently and carry out basic activities of daily living such as toileting, grooming and bathing. In contrast, most elderly patients who survived and discharged from Covid-19 hospitalization have significant deterioration and limited functional ability that require assistance in basic activities of daily living. These disabilities caused increased prevalence of hospitalisation, increased health care burden and resources significantly and eventually lead to higher mortality rates.[7]

Cumulative results in studies on those receiving one dose of mRNA vaccines have shown its effectiveness in reducing events from 14 days after vaccination. It is more effective in reducing the severity of symptoms than preventing infection and can reduce emergency hospital admission by up to 50%.[8] COVID-19 patients commonly present with fever, cough, and shortness of breath. The elderly population, especially those with underlying medical problems like chronic bronchitis, emphysema, heart failure, or diabetes, are more likely to develop serious illness.[9] Some may even present with neurological symptoms manifested as acute stroke (6%), consciousness impairment (15%), and skeletal muscle injury (19%).[10] A notable case study had found an elderly patient to be encephalopathic, nonverbal, and unable to follow any commands with the onset acute infection.[11] In contrast, both elderly patients presented in this case study were found to be asymptomatic.

Cytokine storm is a common complication of COVID-19, which would cause acute impairment of respiratory function as well as increasing the risk of secondary and opportunistic infections, especially in elderly individuals and critically ill patients.[12] However, both patients had remained stable throughout hospitalisation and had not developed any signs of infection or acute respiratory failure as evident by their laboratory results that showed low CRP level, low white cell count level with normal lymphocyte percentage and did not require oxygen supplementation during their hospitalisations.

Chest X-rays of moderate to severe COVID 19 patients commonly demonstrate multifocal opacities and ground-glass opacities which is characteristic of COVID-19 infections.[11] With another case report showing an elderly patient with COVID-19 infection developing ARDS that required prolonged ventilation, complicated with organizing pneumonia and subsequently required long duration of oxygen supplementation and rehabilitation. [13] On the contrary, the chest x-rays of both patients in this study showed fairly clear lung fields. Better outcomes are rare in patients of a similar age group, where most will develop serious complications such as organizing pneumonia or pulmonary embolism which may lead to higher morbidity or long-term oxygen requirement.

This study is limited in its assessment of cardiovascular status and lung function after COVID- 19 infection due to limited access to equipment required to carry out those assessment in isolation. Another limitation in this study is that there are only small number of patients reported in this article. While there is clear indication that vaccination has a key role in reducing severity and complication of the disease especially in elderly patients, further study with larger sample sizes will be required to validate the findings of the case study and to produce statistically significant results.

Conclusion

It can be concluded that early vaccination has a key role in reducing COVID complications, in particular for elderly patients. Elderly patients (who tend to already be on medications) with better long-term outcomes after COVID-19 infection would not require as many medications to treat complications and therefore reduce the incidence of polypharmacy. This case study supports the evidence that vaccination is helpful to prevent severe disease and complications from COVID-19 in the elderly. Reinforcing the importance that COVID-19 vaccination continues with an emphasis on the elderly. Greater efforts may also be required in education to combat misinformation to ensure smooth and rapid vaccination of the elderly population.

References

1. Malik AA, McFadden S.M, Elharake J, Omer S.B. Determinants of COVID-19 vaccine acceptance in the US. EClinicalMedicine. 2020;26:100495.
2. Razai M.S, Chaudhry UAR, Doerholt K, Bauld L, Majeed A. Covid-19 vaccination hesitancy. BMJ 2021; 373:n1138
3. Dube E, Vivion M, MacDonald NE. Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: influence, impact and implications. Expert review of vaccines. 2015;14(1):99-117.
4. Roy LS, Chiara S, Emma CT, Efficacy and safety of COVID-19 vaccines in older people, Age and Ageing, 2021;50:279-283
5. The Special Committee for Ensuring Access to COVID-19 Vaccine Supply (JKAV). National COVID-19 Immunisation Programme. 2021.
6. Ritchie H, Ortiz-Ospina, E.Beltekian, D. Mathieu, E. Hasell, J.Macdonald, et al. Coronavirus Pandemic (COVID-19) - Statistics and Research. Our World in Data. 2020; Adapted from: https://ourworldindata.org/coronavirus. (Accessed July 2021)
7. Torres-Castro R, Solis-Navarro L, Sitjà-Rabert M, Vilaró J. Functional Limitations Post-COVID-19: A Comprehensive Assessment Strategy. Archivos de Bronconeumologia. 2021;57:7–8.
8. Mason T, Whitston M, Hodgson J, Watkinson R, Lau Y, Abdulrazeg O, et al. Effects of BNT162b2 mRNA vaccine on Covid-19 infection and hospitalisation among older people: matched case control study for England. BMJ, 2021;374:n1943
9. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical Characteristics of Coronavirus Disease 2019 in China: NEJM. New England Journal of Medicine, 2020; 382:1859-1862
10. Mao L, Wang M, Chen S, He Q, Chang J, Hong C, et al. Neurological Manifestations of Hospitalized Patients with COVID-19 in Wuhan, China: a retrospective case series study. JAMA Neurol. 2020;77(6):683-690
11. Filatov A, Sharma P, Hindi F, Espinosa PS. Neurological Complications of Coronavirus Disease (COVID-19): Encephalopathy. Cureus. 2020;12(3):e7352.
12. Mohamadi M, Goodarzi A, Aryannejad A, et al. Geriatric challenges in the new coronavirus disease-19 (COVID-19) pandemic: A systematic review. Med J Islam Repub Iran. 2020;34:123.
13. Vadász I, Husain-Syed F, Dorfmüller P, Roller FC, Tello K, Hecker M, et al. Severe organising pneumonia following COVID-19. Thorax 2021;76:201-204.

CASE REPORT

A TALE OF TWO ORTHOSES: WHAT FACTORS ENFORCED THE DECISION?

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Abstract

The increase in foot plantar pressure causes chronic diabetic foot ulcers, which are prone to infection to undergo a slow healing process and would eventually lead to severe consequences. Many methods were proposed to relieve pressure and promote successful wound healing. The objective of this clinical case report is to justify the selection of patellar tendon bearing ankle-foot orthosis (PTB AFO) over the Aircast XP diabetic walker. A 45-year-old lady with underlying diabetes mellitus, morbid obesity and stroke, presented with Charcot foot arthropathy. Features of this case are discussed together with the suitability of different orthoses which are available in Malaysia. Due to the complexity of the patient's problems, it is challenging to decide the most suitable orthosis for this patient. In conclusion, the treatment plan was to prescribe PTB AFO as it meets the functional and social requirements of the patient compared to Aircast XP diabetic walker.

Keywords: Charcot foot, diabetic foot ulcers, aircast XP diabetic walker, patellar tendon bearing ankle-foot orthosis

Background

Effective offloading to promote successful wound healing is required in patients with chronic foot ulcers.[1] There are some common examples of orthoses to offload diabetic wounds which include removable cast walkers (RCW) and total contact cast (TCC).[2] However, due to the restrictive nature of TCC, it is not popular among patients. A study by the U. S. Wound Registry indicated that only 3.7% of patients who can benefit from TCC receive it.[3] Some factors responsible for the low usage of TCC include lack of clinical expertise and patient's commitment to treatment as well as application procedure complexities. Moreover, the application of TCC is time consuming and requires well-trained clinicians.[4] Some clinicians are reluctant to prescribe TCC due to its long wear time as TCC cannot be removed for 7 days post-cast.

On the other hand, earlier return to full weight bearing and daily activities after using the RCW is 43 to 73%.[5] A study done by Egol *et al* (2000) reported that mean time taken to return to work after surgery is 50% lower after using the RCW.[6] Thus due to its practicality, RCW remains the preferred choice of orthosis. There are two models that are frequently used by the Rehabilitation Medicine Specialist Clinic in Hospital Raja Permaisuri Bainun Ipoh which are the *Aircast XP diabetic walker* with four air cells and patellar tendon bearing ankle foot orthosis - anterior closing shell (PTB AFO). The *Aircast XP diabetic walker* has key elements which include a semi-rigid plastic shell surrounding the limb, a removable front panel, four individual internal air cells requiring inflation with manometer at 20–30mmHg to hold the limb, a rocker sole for improved off-loading, and a dual-density insole with option of creating holes for offloading.[7] While the PTB AFO has a removable anterior panel and a posterior shell both made of polypropylene technology complimented by a layer of EVA under the foot plate with varying thickness for different levels of offloading.[8] Both functions in reducing weight bearing pressure on the foot in chronic diabetic ulcers or Charcot arthropathies.[9,10,11]

Description of case

A 45-year-old obese Malay lady with underlying diabetes suffers from Charcot arthropathy with chronic diabetic wound measuring 3cm over plantar aspect of right foot. She weighs 120kg with body mass index of 46.9kg/m^2. Her condition and functional capacity is further limited by an ischemic stroke sustained in February 2021 resulting in right hemiparesis. Her main goal is to be able to return to work as a nurse which requires walking, standing and driving to work and including achieving domestic and community functional independence.

Figure 1: Patient's wound on right foot

Previously, she was prescribed with diabetic shoes with total contact insoles. However, the wound healing progress was slow due to inadequate offloading effect. We subsequently prescribed a PTB AFO (anterior closing shell). The main objective was to promote wound healing and also offloading of pressure on the Charcot foot. The PTB AFO was designed where it can be worn with her nursing shoes. This is vital to ensure infection control and safety while at

work. Our patient was educated on the importance and compliance of wearing the PTB AFO in order to prevent complications such as micro fractures due to weight loading of the foot.

Figure 2: Upclose photo of the wound

Discussion

This case is challenging due to the complexity of the issues posed by the multiple comorbids namely ischemic stroke with right hemiparesis, diabetes mellitus with diabetic neuropathy and peripheral arterial disease resulting in chronic diabetic wound over right foot with right Charcot arthropathy. These issues are compounded by the patient being morbidly obese (class III).

PTB AFO is the preferred orthosis as this removable orthosis benefits the patient especially to enable patient to drive, return to work and perform her daily activities. Although the *Aircast XP diabetic walker* gives similar effects in providing offloading and ankle stabilization, PTB AFO is lighter in weight, thus requires less energy expenditure for this hemiparetic patient which in turn leads to higher compliance of wearing orthosis.

Figure 3: Aircast XP diabetic walker's lateral view (left), front view (right)

Figure 4: Patient's PTB AFO

Table 1: Similarities and differences between PTB AFO and Aircast XP diabetic walker

Similarities
• Effective in offloading. • Helps in ankle stabilization. • Removable. • Suitable for patients who requires mobility.
Differences
• PTB AFO is lighter in weight and less bulky. • PTB AFO can be fitted into shoes for working purposes. • *Aircast XP diabetic walker* is not suitable for obese patients with large calves. • *Aircast XP diabetic walker* requires proper training and donning to prevent over- or under inflation. • PTB AFO can be cleaned, therefore better hygiene and sustainability.

The treatment plan was to prescribe PTB AFO as it meets the functional and social requirements of this patient compared to *Aircast XP diabetic walker*. However, the success of this orthosis depends strongly on the personal experience of the patient. The patient might requires some adaptation time for effective usage of the PTB AFO. To get positive effects of orthosis, the patient needs to be evaluated and educated on the purpose and benefits of the orthosis. Both the PTB AFO and *Aircast XP diabetic walker* have their advantages and disadvantages but both orthoses successfully provide offloading which in turn leads to faster wound healing. Therefore, the prescription of PTB AFO and *Aircast XP diabetic walker* depends on the requirements of patients.

Our patient had a stroke and this affects her gait, balance and weight distribution over bilateral lower limbs compounded by the right Charcot arthropathy. The *Aircast XP* has a rocker bottom sole that is difficult to use on uneven surfaces and individuals often require a walking aid to mobilise. We would be further impairing her job scope as a nurse if the orthosis used required an additional walking aid for ambulation. Having her hands free and her posture stable during work was essential to ensure she was able to fulfil her duties effectively.

Conclusion

Decision making on prescription of orthosis requires knowledge, experience and most importantly consideration of an individual's needs. It must serve the purpose of improving function in all aspects. Discussing the pros and cons of each device with the patient will ensure good compliance in the end.

References

1. Morona JK, Buckley ES, Jones S, Reddin EA, Merlin TL. Comparison of the clinical effectiveness of different off-loading devices for the treatment of neuropathic foot ulcers in patients with diabetes: a systematic review and meta-analysis. Diabetes Metab Res Rev. 2013;29(3):183-93.

2. Snyder RJ, Frykberg RG, Rogers LC, Applewhite AJ, Bell D, Bohn G. *et al.* The management of diabetic foot ulcers through optimal off-loading: building consensus guidelines and practical recommendations to improve outcomes. J Am Podiatr Med Assoc. 2014 Nov;104(6):555-67.

3. Fife CE, Carter MJ, Walker D, Thomson B, Eckert KA. Diabetic foot ulcer off-loading: The gap between evidence and practice. Data from the US Wound Registry. Adv Skin Wound Care. 2014;27(7):310–316.

4. Fife CE, Carter MJ, Walker D. Why is it so hard to do the right thing in wound care? Wound Repair Regen. 2010;18(2):154-8.

5. Simanski C. J. P., Maegele M. G., Lefering R., et al. Functional treatment and early weightbearing after an ankle fracture: a prospective study. Journal of Orthopaedic Trauma. 2006;20(2):108–114.

6. Egol KA, Dolan R, Koval KJ. Functional outcome of surgery for fractures of the ankle. A prospective, randomised comparison of management in a cast or a functional brace. J Bone Joint Surg Br. 2000;82(2):246–249

7. Caravaggi C, Sganzaroli A, Fabbi M, Cavaiani P, Pogliaghi I, Ferraresi R. *et al*. Non windowed non removable fiberglass off-loading cast versus removable pneumatic cast (AircastXP Diabetic Walker) in the treatment of neuropathic non infected plantar ulcers: a randomized prospective trial. Diabetes Care. 2007 ;30(10):2577-8.

8. International Committee of the Red Cross. Manufacturing guidelines patellar tendon-bearing orthosis: Physical Rehabilitation Programme. 2006. Adapted from: https://www.icrc.org/en/doc/assets/files/other/eng-ptbo.pdf.

9. Saltzman CL, Johnson KA, Goldstein RH, Donnelly RE. The patellar tendon-bearing brace as treatment for neurotrophic arthropathy: a dynamic force monitoring study. Foot Ankle. 1992;13(1):14-21.

10. Aita D, Bhave A, Herzenberg JE, Paley D, Cannada L. The load applied to the foot in a patellar ligament-bearing cast. J Bone Joint Surg Am. 1998;80(11):1597-602.

11. Health Quality Ontario. Fibreglass Total Contact Casting, Removable Cast Walkers, and Irremovable Cast Walkers to Treat Diabetic Neuropathic Foot Ulcers: A Health Technology Assessment. Ont Health Technol Assess Ser. 2017;17(12):1-124.

ORIGINAL ARTICLE

ADVERSE DRUG REACTIONS REPORTING: KNOWLEDGE, ATTITUDE AND PRACTICE AMONG HEALTHCARE PROVIDERS AT A TERTIARY HOSPITAL IN NORTHERN REGION OF MALAYSIA.

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Abstract
Background: Adverse drug reaction (ADRs) underreporting is an excellent challenge to pharmacovigilance worldwide. Spontaneous and voluntary was the utilized system of ADRs reporting in Malaysia.
Objective: This study aimed to identify the healthcare provider's knowledge, attitude, practice, and factors associated with Malaysia's ADR reporting system.
Methods: A cross-sectional study was conducted using self-administered questionnaires among healthcare providers in Hospital Sultan Abdul Halim, Kedah. Descriptive statistics are utilized for selected variables.
Results: A total of 332 study questionnaires were distributed, and 269 participants were duly filled, giving a response rate of 81.0%. There were 40.9% (n=110) pharmacists, 39.0% (n=105) doctors and 20.1% (n=54) nurses. Almost half of the participants knew how to define pharmacovigilance (n=137, 50.9%) and ADR (n=131, 48.7%). The majority of participants are aware of ADR reporting procedures (n=174, 64.7%) and ADR reporting center in Malaysia (n=207, 77.0%). Most of the participants agreed that reporting ADR is necessary (n=260, 96.6%), should be mandatory (n=252, 93.7%), and reporting ADR will increase patient safety (n=264, 98.1%). Among the participants who had reported an ADR, only 39.1% (n=45) reported all types of ADR. The most important factor that encouraged participants to report ADR was the seriousness of ADR (n=155, 57.6%). In contrast, a lack of knowledge on reporting ADR might discourage them from reporting ADRs (n=136, 50.6%).
Conclusion: This study reveals that most participants have good knowledge, a positive attitude, and good practice towards ADR reporting in Malaysia. The continuous education and updates regarding ADRs, including the reporting procedures, were essential for improving ADR reporting and monitoring in enhancing medication safety.

Keywords: Knowledge, Attitude, Practice, Adverse Drug Reactions Reporting, Healthcare Providers

Introduction

Under-reporting of adverse drug reactions (ADRs) is an excellent pharmacovigilance challenge. There are various definitions of adverse drug reaction (ADR). According to the World Health Organization (WHO), an ADR is "a response to a medicine which is noxious and unintended, and which occurs at doses normally used in man for the prophylaxis, diagnosis or therapy of disease, or the modification of physiological function" [1]. Another commonly used definition for an ADR was put forward by Edwards and Aronson (2000), who defines an ADR as "an appreciably harmful or unpleasant reaction, resulting from an intervention related to the use of a medicinal product, which predicts hazard from future administration and warrants prevention or specific treatment, or alteration of the dosage regimen or withdrawal of the product" [2]. Without the ability to recognize ADR, it becomes meaningless to define ADR. Sometimes ADR may act through the same physiological and pathological pathways as the disease being treated as there is no exact cutting point to recognize ADR.

In Malaysia, the Malaysian Adverse Drug Reactions Advisory Committee (MADRAC) under National Pharmaceutical Regulatory Agency (NPRA) performs the function of monitoring safety profiles of registered drugs for use in Malaysia which was established under the Drug Control Authority (DCA). The role of MADRAC is to screen all the received ADR reports before it is proposed to the World Health Organization's Collaborating Centre for Drug Safety Program in Uppsala, Sweden, for inclusion in its ADR database. Then, MADRAC also provides information and advice to the DCA, so that regulatory action can be taken based on the ADRs received in Malaysia. Besides, MADRAC also plays a vital characteristic in promoting ADR reporting in Malaysia. Internationally, MADRAC renders information to doctors, pharmacists, nurses, and other healthcare providers on ADRs. However, this reporting system is spontaneous and voluntary and is frequently plagued by low reporting rates [3]. The latest info from NPRA website shows that between 1990 to 2019 got 135,513 (0.6%) ADRs were reviewed and entered into both Malaysian and WHO international databases (22 million ADRs reported worldwide from 1967 to 2019).

It is now clear that low reporting rates in Malaysia cause signals not to be produced and are often late, even if generated. Therefore, from Malaysia, limited information has been quoted. Usually, Malaysian data are scanty, and studies of pharmacovigilance are mostly underpowered to be cited. It should be remembered that, since 1990, Malaysia has been a member of the WHO Program for International Drug Monitoring. Malaysia's contribution to the program, however, could at best be graded as moderate. While there are currently 118 member countries contributing to the program, it is generally accepted that most of the program's contributions come from a few countries, mainly the United States, Europe, and Japan. Instead, we rely on US and European alerts and precautionary statements, which is a flaw that needs to be looked into further and not ignored. Medicines sold in Malaysia, our community, our culture, and most importantly, our prescribers are incredibly different from the US and Europe. A disadvantage that is sadly difficult to overcome is the reliance on signals from countries with many differences. The alerts may not impact Malaysia as the drug may not even be sold here or react differently to an Asian community. The contrary is even more worrisome. ADR occurs typically here but is not detected because no US or European signals are produced.

A study in 2018 found that the seriousness of ADR, uncommonness of response, new drug involvement, and confidence in evaluating ADR are the key factors that prevent respondents from reporting an ADR. In contrast, lack of information about where and how to report ADR, lack of access to ADR reporting form, the

managing patient is more important than reporting ADR legal liability concerns were the significant factors that discourage respondents from reporting ADR [4]. Besides, a study was conducted in Wuhan, China, showed that only 2.7 percent of healthcare professionals having a correct understanding of the concept of ADR, but 89.2% of them had encountered ADRs, whereas 94% of them were aware of the need to report these to the ADR monitoring center [5].

Malaysia's reporting of ADR to MADRAC gradually increased for the past ten years, from 7,079 reports in 2010 to 29,983 reports in 2019 as described in Figure 1 [6]. In 2015, the MADRAC Newsletter statistics showed that a majority of total ADRs reported by the Ministry of Health (MOH) staff (n=10,544, 83.8%). In contrast, MOH Pharmacist contributes the majority of ADR reports (n=6914, 65.5%), followed by MOH doctors (n=2409, 22.8%) and MOH nurses (n=16, 11.6%), while 13.7% (n=1729) of total ADR reports received from product registration holders, 1.4% (n=182) from private sector hospitals and general practitioners as well as another 1.1% (n=148) from others [7].

Previously, in 2009, a survey on the knowledge and perception of ADR reporting and its system among the general population of Penang, Malaysia, found that the majority of respondents (65.6%, n = 219) reported unawareness of the presence of the ADR center set up by the Ministry of Health and that the respondents [8] expressed insufficient knowledge of ADR reporting. Additionally, a study depicted that many respondents acknowledged that ADR reporting is necessary and would motivate others to report ADRs, but many had never reported an ADR [9]. The other study also inquired about the involvement of healthcare providers in the ADR reporting system in Malaysia [10]. Besides that, the immediate reporting of adverse drug reactions is a crucial method to improve the effectiveness and safety of medications, and healthcare providers are essential elements. In direct response to these survey discrepancies, this study evaluates the healthcare provider's knowledge, attitude and practice, and factors associated with the ADR reporting systems in Malaysia.

Methodology

Study design and settings

A cross-sectional study was undertaken using self-administered questionnaires among doctors, pharmacists, and nurses. This study was conducted for four months between 1 December 2019 and 31 March 2020 in Hospital Sultan Abdul Halim (HSAH), Kedah, Malaysia. Kedah is the eighth largest state by land area in Malaysia, and Kuala Muda District holds the most significant population in Kedah. The HSAH is the only public hospital in Kuala Muda District. Meanwhile, due to the ADRs report through Madrac Bulletin 2015 & 2016, Kedah was the lowest states who sent ADR reports to NPRA in Malaysia [7,11].

Study participants and Sampling

Sample size estimation was calculated using the population proportion formula [12] by assuming the population size of 850 and an expected study prevalence of 50%. With an additional 20% dropout rate, the sample size of 332 was calculated for this study. All participants were surveyed individually using a non-probability convenience sampling technique based on the proportion derived from the population of the healthcare providers in HSAH. Participants were approached to join this study by a verbal invitation directly or through phone communications without compulsion. The participants chosen fulfilled the inclusion criteria, i.e., pharmacists, doctors, and nurses who were able to read and write in English and well enough to comprehend and complete the questionnaire and be willing to provide written informed consent to participate in this study.

Study Instrument

Data were collected using a questionnaire which was adapted from previous survey that has been validated and piloted among healthcare professionals in secondary and tertiary public hospitals in Pakistan [4] as it is the latest and most suitable with this study setting and then was compared with the study done among the general public in Cheras, Malaysia for the current situation in Malaysia [9]. Permission for using or adopting the questionnaires in this study was obtained from the corresponding authors appropriately. Respondents were assessed for their knowledge, attitude, and practice relevant to Malaysia's ADR monitoring system. The questionnaire comprised five sections. The first section has five questions, where it is about participants' demographic data. The second section has twelve questions that were used to evaluate the expertise of ADR, reporting-related healthcare providers. The third section consisted of four questions that were analysed with the aid of participants' attitudes towards ADR documentation. The fourth section contained nine questions used to assess ADR reporting practice for public hospital healthcare providers. Finally, the fifth section was limited to two questions by variables that motivated and prevented pharmacists, doctors, and nurses from disclosing ADR.

Data collection

The study investigators conducted this study in English as most of the participants were fluent in the English language. The investigators gave hard copies or email or used phone communications by distributing the Google sheet questionnaire, informed consent form, and participant information sheet to the participants, depending on their preferred technique. Participants need to complete the questionnaire, which takes about fifteen to twenty minutes, together with signing an informed consent form after agreeing to participate in this study and understand the participant information sheet. The participants have three days to consider their participation in this study by completing all documents provided either by hard copy or email, or phone communications and submit to the investigators.

Data analysis

Data analysis was done by using the Statistical Package for Social Sciences Program (SPSS) version 23.0. Descriptive statistics were utilized for selected variables. Pearson's Chi-square test for Independence was used to study the association between categorical data and categorical data, while Fisher's exact test was used if assumptions of Pearson's Chi-square test for Independence were not met. All probability values were two-sided, and a level of significance of less than 0.05 ($p<0.05$) was considered as statistically significant [13].

Participants' knowledge scoring was analysed using twelve questions that involved ten questions with a score of one or zero (correct response had a score of one and wrong response had a score of zero). One question depends on the number of choices correctly chosen. Multiple responses were allowed. Each correctly chosen choice had a score of one, and each wrongly chosen had a score of zero. However, the score for another one more question was graded on a 4-point Likert scale, an agreement score ranging from one for strongly agree, two for agree, three for disagree, and four for strongly disagree.

Participants' attitude scoring was analysed using four questions that were graded on a 4-point Likert scale. The values for the options start with "strongly disagree" at one point, "disagree" at two points, "agree" at three points, and "strongly agree" at four points. Reverse scoring was done for the negatively phrased question.

Meanwhile, the participants' practice scoring was analysed using nine questions with a score of one or zero (correct response had a score of one and wrong or did not know response had a score of zero).

Then, the percentage of knowledge, attitude, and practice score was calculated for each participant and were categorized using previous study cut-off point, as good or positive if the score was 50% to 100% and poor or negative if the score was less than 50% [4].

Ethical approval

Ethical approval was obtained from the Medical Research & Ethical Committee (MREC) of the Ministry of Health Malaysia (reference: NMRR-19-2911-51232).

Results

Demographic characteristics

Out of 332 study questionnaires were distributed among doctors, pharmacists, and nurses in the hospital, 269 participants were duly filled, giving a response rate of 81.0%. 74.7% (n=201) of the participants were female and 25.3% (n=68) were male. The median age of the participants was 30.00 (IQR 13.00). Most of the participants were Malay (n=174, 64.7%), followed by Indian (n=57, 21.2%) and Chinese (n=38, 14.1%). Among the healthcare providers who were surveyed, 40.9% (n=110) were pharmacists, 39.0% (n=105) were doctors and 20.1% (n=54) were nurses. This study was involved in most areas available in the hospital, as shown in Figure 2.

Healthcare provider's knowledge of ADR reporting

Table 1 represents the knowledge of the participants regarding ADR reporting. Almost half of the participants knew how to define pharmacovigilance (n=137, 50.9%) and ADR (n=131, 48.7%). This study identified that more than half of the participants were unaware of any formal reporting system available in other countries (n=248, 92.2%) and any drug banned in the world due to ADR (n=158, 58.7%). However, the majority of the participants were aware of ADR reporting procedures (n=174, 64.7%) and ADR reporting center in Malaysia (n=207, 77.0%) as well as said that all ADRs, including adverse events to old and new medications, should be reported (n=262, 97.4%). Nevertheless, only a minority of the participants agreed that the drugs marketed are safe (n=232, 86.2%).

Healthcare provider's attitude towards ADR reporting

Interestingly, most of the participants agreed that reporting ADR is necessary (n=260, 96.6%), should be mandatory (n=252, 93.7%), and reporting ADR will increase patient safety (n=264, 98.1%). However, more than half of these study participants agreed that reporting ADR is time-consuming (n=177, 65.8%). A Chi-square test for independence indicated that healthcare providers' agreement regarding time-consuming in reporting ADR was significantly different, p=0.020. Therefore, there is a significant association between this attitude and the healthcare providers' categories, as summarised in Table 2.

Healthcare provider's practice towards ADR reporting

Moreover, this study has shown that 81.8% (n=220) of the participants know about the ADR reporting system available in their workplaces and 74.7% (n=201) mentioned that they have free access to ADR reporting forms. Most participants stated that their workplaces encourage them to practice/report ADR (n=234, 87.0%) and provide useful information regarding ADR reporting (n=217, 80.7%). More than half of the participants agreed that they received training regarding ADR reporting (n=154, 57.2%). However, this study showed that only 115 (42.8%) participants had reported an ADR, whereas another 154 (57.2%) did not experience it. Among the participants who had reported an ADR, only 39.1% (n=45) reported all types of ADR, whereas 53.0% (n=61) reported only moderate ADR, and 7.8% (n=9) reported only when attended or received severe ADR. As shown in Table 3, a Chi-square test for independence indicated that the prevalence of participants who had reported an ADR between

the pharmacists, doctors, and nurses was significantly different, p<0.001.

Knowledge, attitude, and practice scoring regarding ADR

Interestingly, this study showed that the majority of the participants have good knowledge (n=194, 72.1%), positive attitude (n=267, 99.3%), and good practice (n=176, 65.4%) regarding ADR reporting, as shown in Figure 3.

There is a comparison of demographic characteristics between participants with good knowledge and poor knowledge, between participants with a positive attitude and negative attitude, and between participants with good practice and poor practice in Table 4. Participants with good knowledge were highest among the participants in age between 21 and 30 (n=109, 56.2%, p=0.036), female (n=144, 74.2%, p=0.764), Malay (n=119, 61.3%, p=0.167), and Pharmacists (n=101, 52.1%, p<0.001).

Figure 4 shows the association of participants' knowledge, attitude, and practice (KAP) scoring between the participants who have been reported ADR and those who have not experienced it. Participants who experienced reporting ADR in their workplaces were significantly higher among participants who had good knowledge (n=98, 50.5%, p<0.001) and good practice (n=105, 59.7%, p<0.001) but oppositely amongst the participants who had a positive attitude (n=114, 42.7%, p=0.673).

Factors encouraging and discouraging participants from reporting ADR

As can be seen from the figure 5, seriousness of the ADR was most important while deciding to report an ADR (n=155, 57.6%, p<0.001) neither among pharmacists (n=67, 60.9%), doctors (n=63, 60.0%) nor nurses (n=25, 46.3%).

Meanwhile, the most popular factor that discouraged the pharmacists (n=33, 30.0%), doctors (n=67, 63.8%) or nurses (n=36, 66.7%) to report an ADR was due to lacking in the knowledge on how to report ADR (n=136, 50.6%, p<0.001). Other factors that are related to discouraging ADR in this study are summarised in Table 5.

Participants also mentioned some factors that contribute to the practice of ADR reporting, including "lacking knowledge about ADRs or adverse event or side effects of the medications, tedious and time-consuming, not in direct contact with patients, as well as the incompetence of the available ADR reporting system".

Discussion

This study was done among pharmacists, doctors, and nurses with similar percentages in their contribution to the ADR reporting system in Malaysia [3,7]. Although there have been studies on ADR reporting in Malaysia [8–10,14,15], this is the first study involving healthcare providers in the public hospital in Northern Malaysia.

This study has found that most of the participants had good knowledge about ADR reporting, which is similar to a study among private healthcare providers in Malaysia [14] but in contrast to the results of another study done among the general public in Northern Malaysia [8,10]. This result showed the success of awareness regarding ADR reporting systems in Malaysia to the healthcare providers. However, the message still needs to expand to the general public to understand the importance of reporting ADRs. This study showed that most pharmacists and doctors among the study participants significantly knew about the meaning of ADR compared to nurses. Many of the study participants are aware of the ADR procedure and ADR center available in Malaysia but opposite regarding the formal reporting system available in other countries and about the drug that has been banned. A study revealed that most of the fatal ADRs in Malaysia were associated with medication rather than vaccination, and 32 (0.28%) fatal ADRs were

reported during their study period, which is lower than the benchmark of developed countries [3].

Interestingly, despite the participants' right attitude, most of them still significantly think that reporting ADR is time-consuming. The other studies were found in Asian or Western countries [10,16–18]. So, this factor might affect the motivation of healthcare providers to do ADR reporting. However, this finding contrasted the previous study's predictor of under-reporting of ADRs in Malaysia [9] and Japan [19].

ADR reporting in Malaysia was successful among public healthcare providers compared to the private sector, as reported in a nationwide study in Malaysia [3]. Meanwhile, this study proved more about the success of the ADR reporting system in Malaysia, especially among pharmacists compared to doctors and nurses. Occasionally, this might be due to the Malaysian Pharmaceutical Services Programme's initiative regarding incorporating ADR reporting in the pharmacist training modules that is compulsory to be fulfilled to complete their one-year provisional pharmacist before becoming and practicing as a full registered pharmacist in Malaysia. Besides that, ADR reporting is currently one of the leading key performance indicators in the public pharmaceutical services to promote ADR reporting in Malaysia [3].

Therefore, these might be related to the study finding a significant difference between the participants' knowledge of ADR reporting and job designation or participant's age. The job designation also had a significant relationship with the practice of ADRs among the participants. The study participants' aware of ADR reporting center and the reporting procedure in Malaysia and noted that all adverse drug reactions, including adverse events to old and new medications should be reported, they still thinking that lacking in knowledge on how to report ADR was the significant factor that discourages healthcare providers from reporting an ADR which are also have been reported in other Asia Pacific region [19–21]. Moreover, the seriousness of ADR was the principal and significant factor which encouraged most of the pharmacists, doctors, and nurses in this study to report ADRs.

Study limitations

Even if the small sample size from one hospital setting might make it hard to extrapolate conclusions from this study, different healthcare professionals' inclusion does make it valuable. As the study used self-administered questionnaires, recall, and personal bias could have affected the data obtained.

Conclusion

This study reveals that many pharmacists, doctors, and nurses have not ever experienced reporting an ADR, which should not be underestimated. However, most participants have good knowledge, a positive attitude, and good practice towards the ADR reporting system in Malaysia. The continuous education and updates regarding ADRs, including the reporting procedures, were essential for improving ADR reporting and monitoring in enhancing medication safety.

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Author declaration

As the sole author for this study, I hereby declare that the submitted manuscript is original and assume responsibility for the accuracy and integrity of the data.

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Conflicts of interest
The author has no conflict of interest.

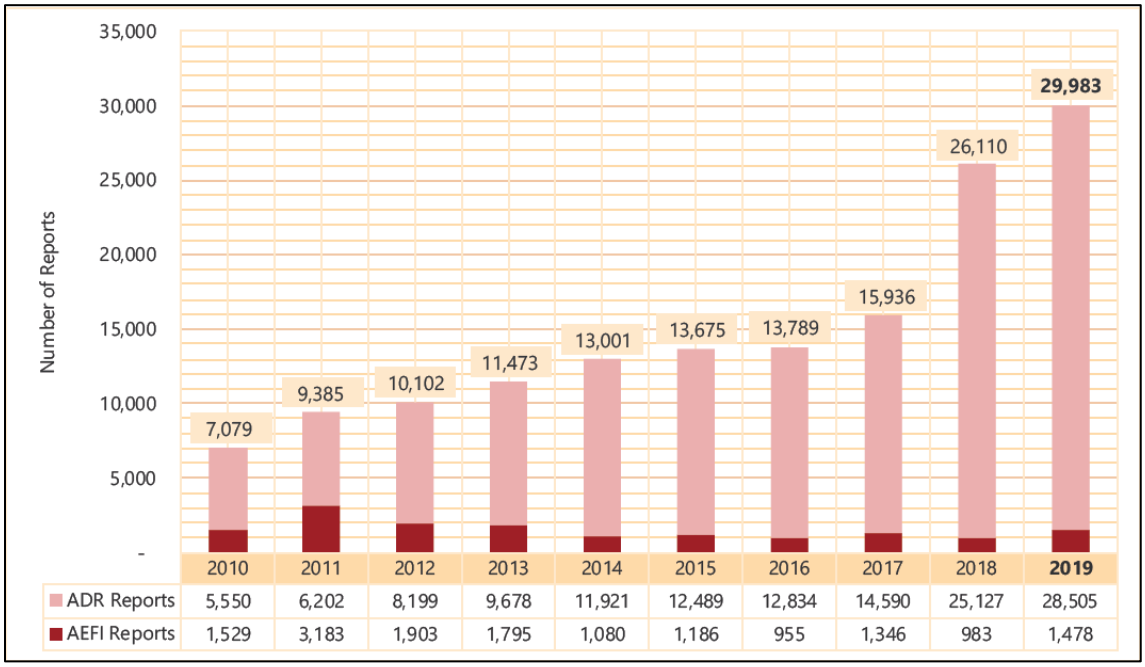

Figure 1: The total reports received by NPRA for 2010 - 2019
Source: https://www.npra.gov.my/index.php/en/health-professionals/newsletter-madrac-bulletin.html

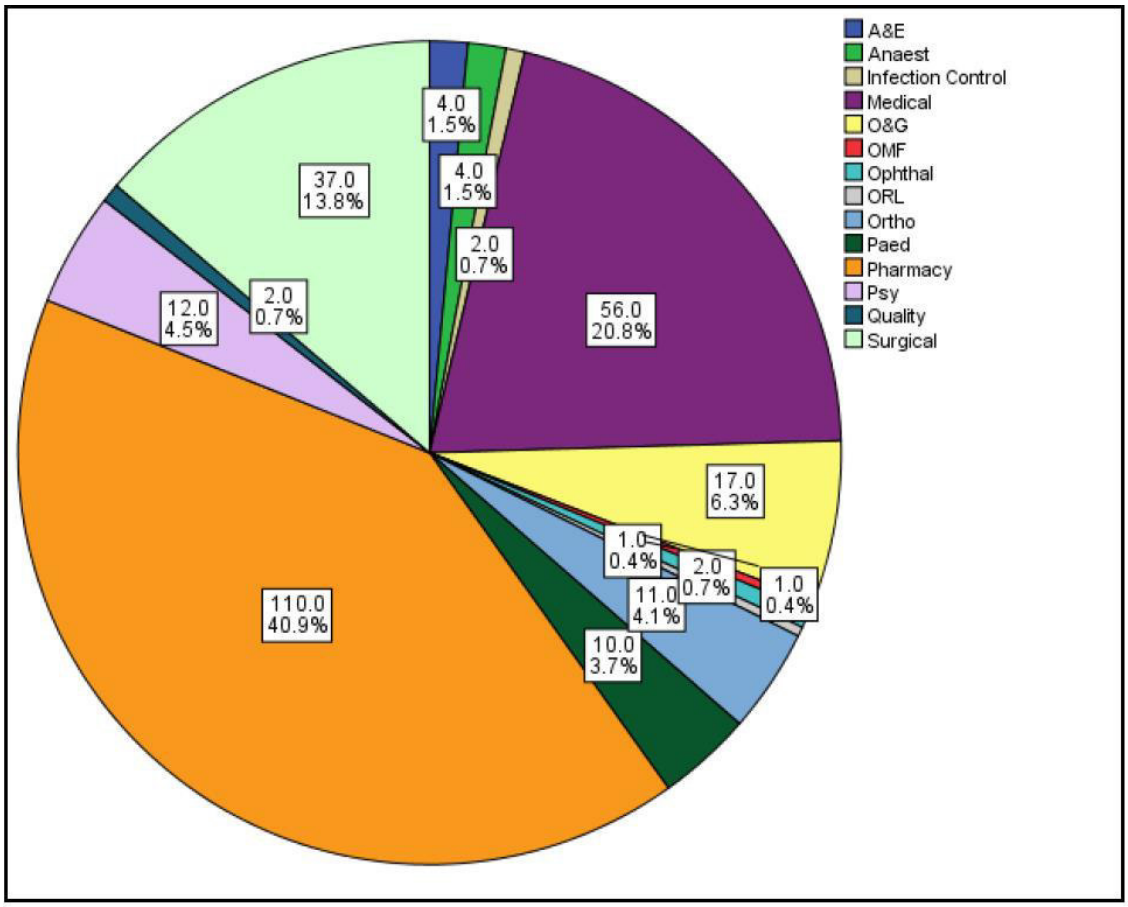

Figure 2: Participant's working area

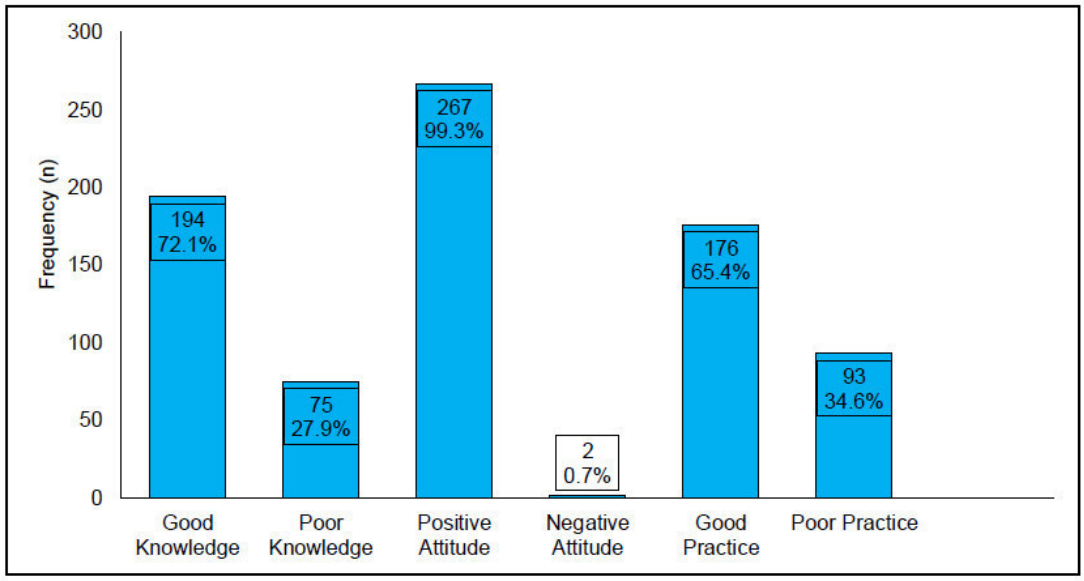

Figure 3: Knowledge, attitude and practice scoring among healthcare providers

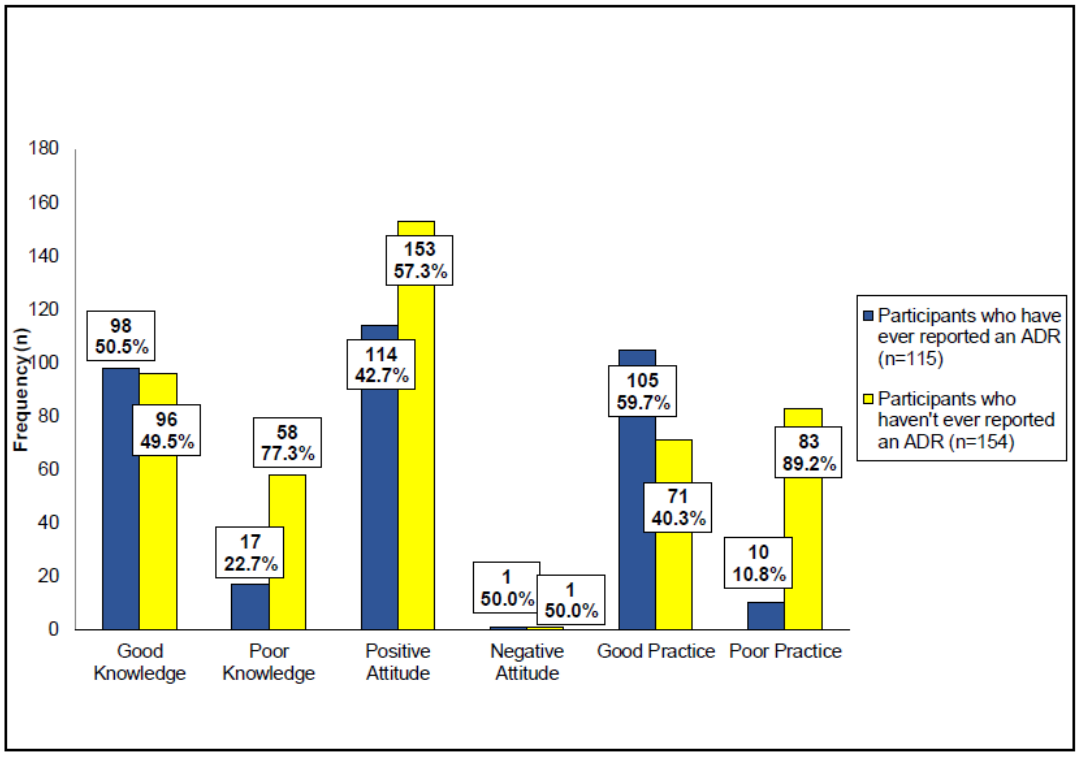

Figure 4: KAP scoring among participants who have ever reported an ADR

Table 1. Participants' knowledge regarding ADR

Knowledge of healthcare providers related to ADR Reporting	Frequency, n (%)
1. Define pharmacovigilance?	
(a) The science of monitoring ADR's happening in a hospital	19 (7.1)
(b) The process of improving the safety of drugs	30 (11.2)
(c) The detection, assessment, understanding and prevention of adverse effects	137 (50.9)
(d) The science detecting the type and incidence of ADR after the drug is marketed	66 (24.5)
(e) Don't know	17 (6.3)
2. Define ADR?	
(a) Noxious and unintended response to drug and occurs at doses normally used in man or animal for prophylaxis, diagnosis or therapy of disease	71 (26.4)
(b) Noxious and unintended response to drug and occurs at doses normally used in man for prophylaxis, diagnosis and therapy of disease	131 (48.7)
(c) Any untoward medical occurrence that may present during treatment with a medicine but which does not necessarily have a causal relationship with this treatment	35 (13.0)
(d) Any adverse reaction identified in regulatory documents such as investigators brochures or product monograph occurring within the expected frequency	22 (8.2)
(e) Don't know	10 (3.7)
3. Are you aware of any drug that has been banned in the world due to ADR?	
(a) Yes	111 (41.3)
(b) No	158 (58.7)
4. Are you aware of any formal reporting system available in other countries?	
(a) Yes	21 (7.8)
(b) No	248 (92.2)
5. Are you aware of ADR reporting centre in Malaysia?	
(a) Yes	207 (77.0)
(b) No	62 (23.0)
6. In case an ADR is observed in this hospital is observed where it should be reported?	
(a) Malaysian Medical Association	2 (0.7)
(b) Malaysian Pharmaceutical Society	13 (4.8)
(c) National Pharmaceutical Registration Agency (NPRA), Ministry of Health Malaysia	232 (86.2)
(d) No center for reporting	3 (1.1)
(e) Don't know	19 (7.1)
7. Are you aware of ADR reporting procedures in Malaysia?	
(a) Yes	174 (64.7)
(b) No	95 (35.3)
8. Have you ever shared information about ADRs with anyone?	
(a) Yes	70 (26.0)
(b) No	199 (74.0)
9. Do you think all the drugs marketed are safe?	
(a) Yes	37 (13.8)
(b) No	232 (86.2)

Note: *Some participants reported using more than one type of source of information about ADRs; thus, total percentage may not be 100%.

Table 2. Association between the agreement regarding time consuming in reporting ADR and categories of healthcare providers

Variable	n (%)	Pharmacist, n (%)	Doctor, n (%)	Nurse, n (%)	X^2 statistic (df)	p-value[a]
Reporting ADR is time consuming?					14.95 (6)	0.020
Strongly agree	26 (9.7)	10 (9.1)	9 (8.6)	7 (13.0)		
Agree	151 (56.1)	51 (46.4)	61 (58.1)	39 (72.2)		
Disagree	75 (27.9)	41 (37.3)	28 (26.7)	6 (11.1)		
Strongly disagree	7 (6.3)	8 (7.1)	7 (6.7)	2 (3.7)		

Note: [a]Chi-square test for independence
df = Degrees of Freedom

Table 3. Association between the participant who had reported an ADR and categories of healthcare providers

Variable	n (%)	Pharmacist, n (%)	Doctor, n (%)	Nurse, n (%)	X^2 statistic (df)	p-value[a]
Have you ever reported an ADR?					59.22 (2)	<0.001
Yes	115 (42.8)	77 (70.0)	30 (28.6)	8 (14.8)		
No	154 (57.2)	33 (30.0)	75 (71.4)	46 (85.2)		

Note: [a]Chi-square test for independence
df = Degrees of Freedom

Table 4. Comparison of demographic characteristics between participants' KAP scoring

Demographic	Good knowledge, n (%)	p-value	Positive attitude, n (%)	p-value	Good practice, n (%)	p-value
Age		**0.036[a]**		0.254[b]		0.092[a]
21 - 30	109 (56.2)		147 (55.1)		95 (54.0)	
31 - 40	50 (25.8)		66 (24.7)		51 (29.0)	
41 - 50	24 (12.4)		42 (15.7)		24 (13.6)	
51 - 60	11 (5.7)		12 (4.5)		6 (3.4)	
Gender		0.764[a]		1.000[b]		0.238[a]
Male	50 (25.8)		68 (25.5)		40 (22.7)	
Female	144 (74.2)		199 (74.5)		136 (77.3)	
Race		0.167[a]		1.000[b]		0.183[a]
Malay	119 (61.3)		172 (64.4)		116 (65.9)	
Chinese	29 (14.9)		38 (14.2)		20 (11.4)	
Indian	46 (23.7)		57 (21.3)		40 (22.7)	
Job designation		**<0.001[a]**		0.191[b]		**<0.001[a]**
Doctor	61 (31.4)		103 (38.6)		45 (25.6)	
Pharmacist	101 (52.1)		110 (41.2)		105 (59.7)	
Nurse	32 (16.5)		54 (20.2)		26 (14.8)	

Note: [a]Chi-square test for independence
[b]Fisher's exact test
There is significant association if p-value <0.05

References

1. World Health Organization. Quality Assurance and Safety of Medicines Team. ((2002 . Safety of medicines: a guide to detecting and reporting adverse drug reactions: why health professionals need to take action. World Health Organization. https://apps.who.int/iris/handle/10665/67378
2. Edwards IR, Aronson JK. Adverse drug reactions: definitions, diagnosis, and management. Lancet. 2000;356(9237):1255-9.
3. Rosli R, Ming LC, Abd Aziz N, Manan MM (2016) A Retrospective Analysis of Spontaneous Adverse Drug Reactions Reports Relating to Paediatric Patients. PLoS ONE 11(6): e0155385.
4. Nisa ZU, Zafar A, Sher F. Assessment of knowledge, attitude and practice of adverse drug reaction reporting among healthcare professionals in secondary and tertiary hospitals in the capital of Pakistan. Saudi Pharm J. 2018;26(4):453-461.
5. Li Q, Zhang SM, Chen HT, Fang SP, Yu X, Liu D, et al. Awareness and attitudes of healthcare professionals in Wuhan, China to the reporting of adverse drug reactions. Chin Med J (Engl). 2004 Jun;117(6):856-61. PMID: 15198887.
6. National Pharmaceutical Regulatory Agency, Ministry of Health Malaysia. Malaysian Adverse Drug Reactions Advisory Committee Bulletin. 2020;31. Available from:

https://www.npra.gov.my/easyarticles/images/users/1108/MADRAC%20Bulletin/MADRAC-Bulletin-01-2020.pdf
7. National Pharmaceutical Regulatory Agency, Ministry of Health Malaysia. Malaysian Adverse Drug Reactions Advisory Committee Newsletter. 2016;20. Available from: https://www.npra.gov.my/images/Publications/Newsletter_MADRAC_Bulletin/2017/Bulletin_MADRAC_August_2016.pdf
8. Elkalmi R, Hassali MA, Al-Lela OQ, Awadh AI, Al-Shami AK, Jamshed SQ. Adverse drug reactions reporting: knowledge and opinion of general public in Penang, Malaysia. J Pharm Bioallied Sci. 2013;5(3):224.
9. Aziz Z, Siang TC, Badarudin NS. Reporting of adverse drug reactions: predictors of under-reporting in Malaysia. Pharmacoepidemiol Drug Saf. 2007;16(2):223-8.
10. Mohammad A, Bheemavarapu H, Khan MU, Khan A, Ahmad A, Hassali MAA, et al. A cross-sectional survey to assess the knowledge, attitudes and common barriers to the reporting of adverse drug reactions by the general public in Malaysia. J Pharm Pract Res. 2018;48(4):348–55.
11. National Pharmaceutical Regulatory Agency, Ministry of Health Malaysia. Malaysian Adverse Drug Reactions Advisory Committee Newsletter, 2015. Available from: https://www.npra.gov.my/images/Publications/Newsletter_MADRAC_Bulletin/Bulletin_MADRAC_April_2015.pdf
12. Lemeshow S, Hosmer DW, Klar J, Lwanga SK, World Health Organization. Adequacy of sample size in health studies. Chichester: Wiley; 1990.
13. Lang TA, Secic M. How to report statistics: Annotated guidelines for authors, editors, and reviewers (2nd edition). Philadelphia, US: American College of Physician; 2006.
14. Daher AM, Ismail NM, Agarwal R. Knowledge, practices and attitudes towards adverse drug reaction reporting by private practitioners from Klang Valley in Malaysia. Malaysian J Med Sci. 2013;20(2):53–62.
15. Rosli R, Dali AF, Aziz NA, Ming LC, Manan MM. Reported adverse drug reactions in infants: A nationwide analysis in Malaysia. Front Pharmacol. 2017;8:30.
16. Le TT, Nguyen TTH, Nguyen C, Tran NH, Tran LA, Nguyen TB, et al. Factors associated with spontaneous adverse drug reaction reporting among healthcare professionals in Vietnam. J Clin Pharm Ther. 2020;45(1):122–7.
17. Lopez-Gonzalez E, Herdeiro MT, Figueiras A. Determinants of under-reporting of adverse drug reactions. Drug saf. 2009;32(1):19-31.
18. Patsuree A, Krska J, Jarernsiripornkul N. Experiences relating to adverse drug reactions in the community: A cross-sectional survey among patients and the general public in Thailand. Expert Opin Drug Saf. 2016;15(3):287–95.
19. Kobayashi T, Noda A, Obara T, Tsuchiya M, Akasaka K, Yoshida M, et al. Knowledge, Attitudes, and Practice of Hospital Pharmacists Regarding Pharmacovigilance and Adverse Drug Reaction Reporting in Japan. Hosp Pharm. 2019;1–10.
20. Bahekar S, Patil S. Evaluation of knowledge, attitude, and practice of adverse drug reactions reporting among doctors and nursing staff of a rural tertiary care teaching hospital of Maharashtra. J Med Sci Res. 2018;1(3):145.
21. Dorji C, Tragulpiankit P, Riewpaiboon A, Tobgay T. Knowledge of Adverse Drug Reaction Reporting Among Healthcare Professionals in Bhutan: A Cross-Sectional Survey. Drug Saf. 2016;39(12):1239–50.

ORIGINAL ARTICLE

PREVALENCE AND ASSOCIATED RISK FACTORS OF NECK PAIN AMONG UNIVERSITY STUDENTS IN KUANTAN, PAHANG DURING COVID-19 PANDEMIC.

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Abstract

Background: COVID-19 pandemic created a shift in academic learning. Majority university students are required to stay at home and continue their studies through online platform which predisposes to various musculoskeletal disorder. Among the various musculoskeletal disorder, neck pain is prominent and affect function, productivity and overall quality of life.
Objective: To determine the prevalence of neck pain and its associated risk factors among university students in Kuantan, Pahang.
Methods: A cross sectional study with a total of 121 eligible university students in Kuantan, Pahang. Online self-administered questionnaire with section A; demographic data, section B; standardized Nordic musculoskeletal questionnaire, section C; general risk factors and section D; ergonomic risk factors were administered. Results were analyzed using SPSS version 26.
Results: Overall neck pain prevalence among university students in Kuantan, Pahang during last 12-months is 58.7%. Prolonged sitting (p<0.001), uncomfortable posture (p<0.001), repetitive arm and hands movements (p<0.001), prolonged sustaining of same posture (p=0.001), neck bending or prolonged forward head position (p<0.01), elbow in 90 degrees angle when using laptop (p=0.035) are the associated risk factors of neck pain.
Conclusion: University students in Kuantan, Pahang have high prevalence of neck pain during COVID-19 pandemic. Habitual and ergonomic risk factors significantly associated with neck pain.

Keywords: Neck pain, risk factors, university student

Introduction

It is estimated that 22-70% of the population will have neck pain sometimes in their lives. [1] At any given time, 10-20% of the population reporting neck problems with 54% of individuals experienced increases with age and especially women. [2] A previous study reported new neck pain episodes during college years and even continue after graduation. [3] However, most previous studies focused only on healthcare students and revealed high neck pain prevalence. High prevalence of neck pain among healthcare students maybe contributed by manual handling of patients during their clinical placements, [4] long training hours, [5] and even discipline-related stress as observed in nursing students.[6] In a recent study [7] in International Islamic University Malaysia (IIUM), Kuantan, neck pain prevalence of clinical students for the past week was 36.2%. 50.7% of clinical students claimed to have had neck pain for the past 12 months but this study only includes clinical students as the sample population in their study with a small sample size. Similarly, dentists spend the majority of working time bending their heads down causing severe spastic painful neck. [8]

Another study [9] evaluated the prevalence and risk factors of neck pain among healthcare students in a private university and concluded healthcare students are prone to neck pain. However, the study [9] focuses on healthcare students, and the lecture methods of each faculty of each university are different. Further, the current study focuses mainly on the COVID-19 pandemic which is suitable considering the shift from traditional face-to-face to online mode. While it is conceivable that students of different undergraduate programs may have a different prevalence of neck pain due to unique program-specific exposures (e.g. overhead work, or prolonged usage of computers), no research has determined the prevalence of neck pain and the related risk factors among undergraduates in both healthcare and non-health-related disciplines. Different programs in the university might cause different musculoskeletal pain due to the nature of the program and university students may exhibit different musculoskeletal disorder presentations.

Academic learning had shifted to online learning mode with students devoting more hours to electronic gadgets for learning purposes, social and entertainment. These may have increased the prevalence of musculoskeletal pain, especially on the neck with various risk factors as a contributing factor. The burden or consequences of neck pain include reducing neck movement, affecting the performance of daily tasks such as reaching and head-turning, poor concentration on the study, neck injury, psychological problems, and so on. Many studies focus on healthcare students and to the best of our knowledge, there is no study that evaluated prevalence and associated risk factors of university students from various faculties in Kuantan, Pahang. Hence, the objective of current study is to determine the prevalence and associated risk factors of neck pain among university students in Kuantan, Pahang.

Methodology

This was a quantitative cross sectional study using structured and validated self-administrative questionnaire conducted in Kuantan, Pahang. The self-administrative questionnaire consisted of four sections; section A; demographic data, section B; standardized Nordic musculoskeletal questionnaire, section C; general risk factors and section D; ergonomic risk factors. The questionnaire was distributed through online platforms such as Facebook, WhatsApp, Instagram, Messenger and Telegram. Participants who were 18-40 years old, university students from Kuantan, Pahang were included in this study. Participants with neck related injury/ surgery before such as whiplash, cervical spondylosis or had seek medical attentions with issues related from neck and unwilling to provide informed consent were excluded from the study. The

sample size of the study was determined using unknown sample size calculation formula as the exact number of students in Kuantan, Pahang was not able to be obtained. However, this study was only able to recruit 121 participants. The data collected (prevalence and risk factors of neck pain among university students in Kuantan, Pahang) were analyzed using descriptive statistics. Current study was conducted after ethical approval was obtained from Ethical Committee of INTI International University. Prior to the commencement of the study, information sheet was distributed and informed consent was obtained from the participants. Respondents were informed on their rights to withdraw themselves from this study at any time during this research.

Frequency distribution of the demographic data, prevalence of neck pain and various risk factors were presented in a table form as descriptive statistics accordingly. Standard deviation was used as a measure of dispersion using Statistical Package for Social Sciences (SPSS) version 26. Chi-Square Test was used to determine the association between 12 months' prevalence of neck pain with general and student characteristic of participants and for association between 12-months prevalence of neck pain with ergonomic risk factors.

Results

One hundred and twenty one participants met the inclusion criteria and were recruited in this study. Table 1 shows demographic data of participants. The mean age range of participants in this study was 22.45±1.18years with highest response rates from participants aged 23 years old. Most participants were female (59.5%) with normal Body Mass Index (BMI) (67.8%). Table 2 reports the general characteristics of participants. Majority participants were full time students (90.1%), undergraduates (88.4%) in Year 3 (40.5%), undergoing lecture hours of 11-20 hours per week (53.8%) and spend at least 9-12 hours per day (42.1%) on computers and smartphones. Most students were from Faculty of Engineering and Quantity Surveying (23.1%), Faculty of Health and Life Sciences (20.7%), Faculty of Accounting, Economics, Finance and Banking (18.2%), Faculty of Business, Communication and Law (16.5%). Prevalence of neck pain during the last 12-months and 7-days among the university students in Kuantan, Pahang were 58.7% and 16.5% respectively as shown in Table 3. 13.2% of the students were prevented from carrying out normal daily activities due to neck pain and 5.8% of them had seen by a physician, physiotherapist or other healthcare profession due to neck trouble in the past year.

Based on Table 4, study or work in uncomfortable posture is an associated risk factor of neck pain $\chi 2\ (1, N= 121) = 14.004, p<0.001$. The chi-square test was also statistically significant for maintaining same posture for prolonged period, $\chi 2\ (1, N= 121) = 10.753, p=0.001$ and for prolonged sitting specifically $\chi 2\ (1, N= 121) = 22.068, p<0.001$. Repetitive movement with arms or hands also are the associated risk factors of neck pain $\chi 2= (1, N= 121) = 11.983, p<0.001$. Majority participants bend or hold neck in a forward position for prolonged period and this is an associated risk factor of neck pain $\chi 2\ (1, N= 121) = 6.755, p=0.009$. Majority participants with neck pain also do not maintain elbow in 90 degrees when using laptop, and is also an associated risk factor of neck pain $\chi 2\ (1, N=121) = 4.440, p= 0.035$. Chi Square test was done to examine the association of 12-months neck pain prevalence and BMI, smoking status, carrying bag packs, lecture hours and physical activity and the results shows not significant, $p>0.05$.

Discussion

Most of the previous studies reported prevalence of neck pain among university students. [5], [9], [10] However, the current study investigated the prevalence and risk factors of neck pain among university students of various faculties in Kuantan, Pahang. Mean age of the students in the

current study were 22.45 years. This is similar to a study reporting prevalence of neck pain among the students were 41.8% where the participants mean age was 20.3 years. [5] Another study by Gerr (2002) [11] however, reported older computer users (age more than 40 years) were more likely to develop neck or shoulder disorders than younger population.

The findings of the current study revealed prevalence of neck pain among female undergraduate students as 33.8% while male undergraduate students as 19.8%. This shows female students suffered neck pain more than male as many other studies shares similar result [3], [4], [5] This may be due to female willing to report pain more than male or female has a lower pain tolerance threshold. [12] Besides, the effect of hormones such as estrogen and testosterone will affect the central nervous system, which is responsible for perceiving and transmitting sensation of pain. [12] BMI and smoking history was not associated with 12 months' neck pain prevalence in current study and similar to a previous study. [13] On contrary, another study reported BMI to be a risk factor for musculoskeletal pain. [14]

A recent study [7] stated that 36.2% of clinical students had prevalence of neck pain in the past 7 days and 50.7% of the students had prevalence of neck pain in the past 12-months. Compared to the current study, the prevalence of neck pain during the last 12-months has a similar result which is 58.7% whereas the prevalence of neck pain during the last 7-days was only 16.5%. Results of current study shows most of the students did not seek medical help when they have neck pain. Only 5.8% of the participants in this study seek medical help and the result is almost similar with the previous study. [10]

Furthermore, the finding of the study revealed that students from faculty of engineering and quantity surveying (14.1%) reported the highest prevalence of neck pain in the last 12-months compared to other programme of study. On contrary, personnel in healthcare field usually sustain in an awkward position for a long period and often have to lift/ transfer heavy patients during their posting which causes high prevalence of neck pain. [15], [16]

Carrying bag packs with musculoskeletal pain was established as a musculoskeletal risk factor among both medical and non-medical groups. [13] Strain at the neck and poor posture of the neck and lower back might be caused by often carrying a heavy laptop bag. However, current study reported no significant association between neck pain and carry a heavy laptop bag. Surprisingly, this study showed that physical activity level has no relationship with neck pain.

A study by Cote and co researchers (2008) [17] reported prolonged sitting and maintaining neck in forward flexion are the risk predictors for neck pain. Neck flexion position will cause extra gravitational load to the cervical extensor and might cause strain on the neck extensor as well. [18] Previous studies are also in agreement as maintaining or holding neck in a static posture for a long period during computer usage, reading and writing will increase the risk of neck pain among undergraduate students. [4], [9], [19], [20] Students are prone to elevate the shoulders during laptop usage which shortens the length of trapezius and levator scapulae muscles. This may cause some muscles to be overactive causing neck pain. [21] A study conducted in Thailand [20] reported 50.8% of participants did not position the computer screen at a level horizontal with eyes and it showed significant association with neck pain *($p= 0.008$).* Nevertheless, the result of the current study showed 68.6% of the participants did not position their computer screen at a level horizontal with eyes and is not significantly associated with neck pain.

There are some limitations in the current study. Firstly, the self-administered online questionnaire received low response rates via social media and

hence only 121 eligible participants were recruited. Future study can include larger population and other population. Outcome measures for neck such as Neck Disability Index (NDI), numerical rating scale (NRS) and Pain Catastrophizing Scale (PCS) can be used for upcoming research.

Conclusion

This study concludes high prevalence of neck pain among university students in Kuantan, Pahang. Many participants lack appropriate ergonomic and although many students developed neck pain, only a few seek medical help. The awareness of maintaining a proper ergonomic and seeking help from healthcare professionals among university students in Kuantan, Pahang is relatively low. Therefore, some educational programe, exercises related with neck pain and awareness should be spread out through social media by the effort of healthcare professionals.

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Criteria for inclusion in the authors'/contributors' list

Data collection and analysis, manuscript draft writing (Tan Yea Huey), Supervision and manuscript writing (Sharmila Gopala Krishna Pillai).

Disclaimer

Manuscript has been read and approved by all the authors, that the requirements for authorship as stated earlier in this document have been met, and that each author believes that the manuscript represents honest work.

Table 1. Frequency distribution of general characteristic of the participants

Variables	Frequency (N=121)	Percentage (%)
Age (years)		
19	2	1.8
20	5	4.1
21	21	17.4
22	17	14.0
23	66	54.5
24	5	4.1
25	5	4.1
Gender		
Female	72	59.5
Male	49	40.5
BMI (kg/m^2)		
Underweight	27	22.3
Normal	82	67.8
Overweight	8	6.6
Obese	4	3.3
Other medical condition		
Yes	5	4.1
No	116	95.9

Table 2. Frequency distribution of student characteristics of the participants

Variables	Frequency (N=121)	Percentage (%)
Current Educational Level		
Foundation/ A-level/ equivalent	2	1.7
Diploma	8	6.6
Degree	107	88.4
Masters	4	3.3
Year of Study		
Year 1	20	16.5
Year 2	11	9.1
Year 3	49	40.5
Year 4	34	28.1
Others	7	5.8
Smoking		
Yes	3	2.5
No	118	97.5
Self-perceived stress level		
Low stress	33	27.3
Moderate stress	80	66.1
High stress	8	6.6
Often carry heavy laptop/school bag		
Yes	20	16.5
No	101	83.5
Part/full time student		
Part time	12	9.9
Full time	109	90.1
Total number of lecture hours per week (hours)		
1-10	30	24.8
11-20	65	53.8
21-30	17	14.0
31-40	8	6.6
41-50	1	0.8
Hours of computer and smartphone usage per day		
1-4	8	6.6
5-8	41	33.9
9-12	51	42.1
13-16	19	15.7
17-20	2	1.7

Table 3 Prevalence of neck pain during last 12-months and last 7-days

Variables	Frequency (N=121)	Percentage (%)
12-months neck pain		
Yes	71	58.7
No	50	41.3
Prevented from carry out normal activities during last 12-months		
Yes	16	13.2
No	105	86.8
Seen a physician during last 12-months		
Yes	7	5.8
No	114	94.2
7-days neck pain		
Yes	20	16.5
No	101	83.5

Table 4 Association between 12-months prevalence of neck pain with various factors

	12 months prevalence of neck pain			
Variables	Yes (%)	No (%)	$\chi 2$	*p*
Gender			3.194	.074
Male	24(19.8%)	25(20.7%)		
Female	47(38.8%)	25(20.7%)		
Self-perceived stress level			1.944	.378
Low stress	16(13.2%)	17(14.0%)		
Moderate stress	50(41.3%)	30(24.8%)		
High stress	5(4.1%)	3(2.5%)		
Hours of computer and smartphone usage per day			4.114	.391
1-4	4(3.3%)	4(3.3%)		
5-8	24(19.8%)	17(14.0%)		
9-12	27(22.3%)	24(19.8%)		
13-16	14(11.6%)	5(4.1%)		
17-20	2(1.7%)	0(0.0%)		
Sit for a long period			22.068	< .001*
Yes	62(51.2%)	24(19.8%)		
No	9(7.4%)	26(21.5%)		
Study/work in uncomfortable posture			14.004	< .001*
Yes	65(53.7%)	32(26.4%)		
No	6(5.0%)	18(14.9%)		
Maintain same posture for a long period			10.753	.001*
Yes	64(52.9%)	33(27.3%)		
No	7(5.8%)	17(14.0%)		
Doing repetitive movements with arms/hands			11.983	< .001*
Yes	31(25.6%)	7(5.8%)		
No	40(33.1%)	43(35.5%)		
Position that you often have to (can select more than 1 option):				
Bend your neck forward or hold your neck in a forward position for long period	44(36.4%)	19(15.7%)	6.755	.009*
Bend your neck backward or hold your neck in a backward position for long period	8(6.6%)	5(4.1%)	.049	.825
Twist your neck or hold your neck in a twisted posture for a long period	16(13.2%)	6(5.0%)	2.189	.139
None of the above	17(14.0%)	23(19.0%)	-	-
Elbows remain 90 degrees when using laptop			4.440	.035*
Yes	17(14.0%)	21(17.4%)		
No	54(44.6%)	29(24.0%)		
Adjustable desk and chair			3.723	.054
Yes	18(14.9%)	21(17.4%)		
No	53(43.8%)	29(24.0%)		
Position computer screen at eye level			1.856	.173
Yes	20(16.5%)	20(16.5%)		
No	51(42.1%)	30(24.8%)		
Wrist in a neutral position when using mouse			.262	.609
Yes	51(42.1%)	38(31.4%)		
No	20(16.5%)	12(9.9%)		

%=percentage $\chi 2$=chi square *p*=*p*-value *=statistically significant

References

1. Blanpied PR, Gross AR, Elliott JM. Neck Pain: Revision. Journal of Orthopaedic & Sports Physical Therapy. 2017;47(7):A1-A8
2. Childs JD, Cleland JA, Elliott, JM. Neck pain: Clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association. The Journal of Orthopedic and Sports Physical Therapy. 2008;38(9): A1-A34.
3. Croft PR, Lewis M, Papageorgiou AC. Risk factors for neck pain: a longitudinal study in the general population. Pain. 2001;93(3):317-325
4. Bialocerkowski AE, Grimmer KA, Nyland LJ. Prevalence of and Risk Factors Associated with Neck Problems in Undergraduate Physiotherapy Students. Physiotherapy Canada 2005;57(4):293-304.
5. Alshagga MA, Nimer AR, Yan LP. Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian Medical College. BMC research notes. 2013;1(6):244.
6. Joslin LE, Davis CR, Dolan P, Clark, EM. Quality of life and neck pain in nurses. International journal of occupational medicine and environmental health. 2014;27(2):236-242.
7. Mohd Nasir WAB, Mohamad MYB. View of Association of sleep deprivation and neck pain among International Islamic University Malaysia (IIUM) clinical year Students. International Journal of Allied Health Sciences. 2020;4(4):1619-1625.
8. Varmazyar, Sakineh. Ergonomic evaluation of work conditions in Qazvin Dentists by REBA method and its association with musculoskeletal disorders in 2008. The Journal of Islamic Dental Association of IRAN (JIDA). 2012;24:229237.
9. How TY, Nadamurni NUB, Pui SW. Prevalence and risk factors of neck pain among medical and health sciences undergraduate students in University Tunku Abdul Rahman (UTAR): A cross sectional study. Final Year Project, UTAR. 2013. http://eprints.utar.edu.my/1709/1/UTAR_Final_Research_Project.pdf.
10. Ayanniyi O, Mbada CE, Iroko OP. Neck Pain Occurrence and Characteristics in Nigerian University Undergraduates. TAF Preventive Medicine Bulletin. 2010;1:9(3).
11. Gerr F, Marcus M, Ensor C, Kleinbaum D, Cohen S, Edwards A, et al. A prospective study of computer users: I. Study design and incidence of musculoskeletal symptoms and disorders. American journal of industrial medicine. 2002;41(4):221-235.
12. Fillingim RB, King CD, Ribeiro-Dasilva MC, Rahim-Williams B, Riley III JL. Sex, gender, and pain: a review of recent clinical and experimental findings. The journal of pain. 2009;10(5): 447-485.
13. Hasan MM, Yaqoob U, Ali SS, Siddiqui AA. Frequency of musculoskeletal pain and associated factors among undergraduate students. Case Reports in Clinical Medicine. 2018;7(2):131-145.
14. Butterworth PA, Landorf KB, Smith SE, Menz HB. The association between body mass index and musculoskeletal foot disorders: a systematic review. Obesity reviews. 2012;13(7):630-642.
15. Cromie JE, Robertson VJ, Best MO. Work-related musculoskeletal disorders in physical therapists: prevalence, severity, risks, and responses. Physical therapy. 2000;80(4):336-351.

16. Salik Y, Özcan A. Work-related musculoskeletal disorders: a survey of physical therapists in Izmir-Turkey. BMC musculoskeletal disorders. 2004;5(1):1-7.
17. Côté P, van der Velde G, Cassidy JD, Carroll LJ, Hogg-Johnson S, Holm LW, Carragee EJ, Haldeman S, Nordin M, Hurwitz EL, Guzman J. The burden and determinants of neck pain in workers: results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. Journal of manipulative and physiological therapeutics. 2008;32(2):S70-86.
18. Straker LM, O'Sullivan PB, Smith AJ, Perry MC. Relationships between prolonged neck/shoulder pain and sitting spinal posture in male and female adolescents. Manual therapy. 2009;14(3):321-329.
19. Hakala PT, Rimpelä AH, Saarni LA, Salminen JJ. Frequent computer-related activities increase the risk of neck–shoulder and low back pain in adolescents. The European Journal of Public Health. 2006;16(5):536-541.
20. Kanchanomai S, Janwantanakul P, Pensri P, Jiamjarasrangsi W. Risk factors for the onset and persistence of neck pain in undergraduate students: 1-year prospective cohort study. BMC public health. 2011;11(1):1-8.
21. Andersen JH, Kaergaard A, Mikkelsen S, Jensen UF, Frost P, Bonde JP, Fallentin N, Thomsen JF. Risk factors in the onset of neck/shoulder pain in a prospective study of workers in industrial and service companies. Occupational and environmental medicine. 2003;60(9):649-654.

ORIGINAL ARTICLE

DEVELOPMENT OF NEURITE OUTGROWTH FOLLOWING DIFFERENTIATION OF MOTOR NEURON-LIKE CELL LINE, NSC-34 BY DIFFERENT CONCENTRATIONS OF RETINOIC ACID.

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Abstract
Background: Glutamate excitotoxicity is one of the critical causes of motor neuron degeneration, a common hallmark in movement-related disorders. For the past decades, experimental model systems have been focusing on using animal models to elucidate the pathophysiology of neurodegeneration. However, the usage of animals is costly, time-consuming, and has ethical implications. Cell culture models such as the NSC-34 cell line, a mouse motor neuron-like hybrid cell, can serve as an alternative study system to overcome these limitations. NSC-34 cell line can be differentiated to express motor neuron properties using simple chemical treatments. The study reports on optimizing the differentiation protocol for NSC-34 cells using retinoic acid treatment.
Methods: NSC-34 cells were seeded onto a 12-well plate and grown in retinoic acid-containing media (1µM or 10µM). Cells were incubated for seven days in a humidified atmosphere with 5% CO_2 at 37°C. Cells were analyzed using an immunocytochemical technique for Beta-III tubulin (neuronal biomarker) and DAPI (nuclei marker). Cells were imaged were using phase-contrast microscopy and fluorescence microscopy.
Results: Neurite outgrowth was evident in both retinoic acid concentration groups. However, after seven days in culture, the projection of neurites in the 10µM retinoic acid group was more extensive than the 1µM group.
Conclusion: The present study supports the use of retinoic acid treatment at 10µM concentration as an efficient differentiation of NSC-34 cells into motor neurons. This method sees its application in experimentation for studying axonal transport and electrical impulse conductivity.

Keywords: NSC-34, retinoic acid, differentiation, in-vitro model, neurite development.

Introduction

Glutamate excitotoxicity is one of the critical causes of motor neuron degeneration in spinal cord injury. The secondary damage progression following the initial impact on the spinal cord involves the abnormal elevation of glutamate release, causing glutamate-mediated excitotoxicity.[1,2,3] Importantly, the excessive level of extracellular glutamate creates a cytotoxic environment at the site of injury, triggering a cascade of cell death processes.[1,4,5] The cascade of events associated with glutamate excitotoxicity include failure in calcium homeostasis, mitochondrial dysfunction, the release of reactive oxygen species and reactive nitrogen species, and high generation of oxidative stress, which eventually trigger cell death through apoptosis.[3,6,7]

For the past decades, in-vitro model systems have been developed and used to elucidate underlying mechanisms of neuropathies. One of the commonly used models for nerve injury and regeneration study is the primary neuron culture.[3,8,9] Primary neurons can be extracted from the animals such as rats and mice. Primary neurons can replicate the morphological and physiological properties of the native cells, making them more reliable as an experimental model system.[9,10,11] However, primary neuron culture has significant limitations like low cell yield during isolation, low cell purity, and inability to expand.[9,12]

NSC-34 cell line, a hybrid cell line generated by the fusion of mouse spinal cord neurons and mouse neuroblastoma, can be used to study the pathophysiology of motor neurons. With the capabilities to proliferate and produce clonally uniform cells and the easy availability of the cell line, the use of NSC-34 could overcome many challenges associated with isolating primary neurons from animals.[13,14,15] NSC-34 consists of two cells populations; (i) small undifferentiated cells derived from murine spinal motor neurons and; (ii) large multinucleated neuroblastoma cells with the capacity to proliferate and go through cell division.[16] Upon differentiation with the aids of differentiation agent, NSC-34 may exhibit the unique properties of mature motor neurons in the spinal cord, including the formation of long neurites and expression of neuronal markers such as Beta-III tubulin and choline acetyltransferase (ChAT).[15] Differentiation of NSC-34 requires modification of the culture media with the low serum concentration and enriched with differentiation agents such as retinoic acid (RA). Several studies have supported the use of RA to differentiate NSC-34 into motor neuron-like phenotypes.[12,15,17,18] However, the RA concentration used for NSC-34 differentiation differs from one study to another. Classically, 1µM of RA is commonly used to differentiate NSC-34 cells for seven days in-vitro.[15,18,19] However, recent studies have been increasing the concentration of retinoic acid to 10µM, differentiating the cells for a similar number of days. Therefore, this study compares the neurite outgrowth of differentiated NSC-34 cells using two different concentrations of RA, 1µM and 10µM.

Methodology

Differentiation of NSC-34

NSC-34 cell line was purchased from Cedarlane Laboratories. The cell line was cultured in a T75 flask containing Dulbecco's modified Eagle's medium-F12 (DMEM-F12; Thermo Fisher Scientific, USA) supplemented with 10% (v/v) fetal bovine serum (FBS; Thermo Fisher Scientific, USA) and 1% of penicillin-streptomycin (Thermo Fisher Scientific, USA). The cultures were incubated in an incubator at 5% CO_2 and 37°C. The media were replenished every 2-3 days and sub-cultured once it reached 70-80% confluency. Before the differentiation of NSC-34, the cultures were treated with trypsin-EDTA (Sigma-Aldrich, USA) to detach the cells from the flask. Approximately 6 x 10^4 NSC-34 cells per well were seeded into a 12 well-plate containing

the pre-treated coverslips for differentiation. The coverslips were pre-coated with poly-L-lysine (Sigma-Aldrich, USA). The differentiation media compose DMEM-F12, 1% of FBS, 1% of penicillin-streptomycin, 1% non-essential amino acid (NEAA; Sigma-Aldrich, USA), and trans-retinoic acid (RA; Merck, Germany), either 1µM and 10µM. Undifferentiated culture without RA was prepared as a control group.

Immunofluorescence staining with neuronal marker, Beta-III tubulin

NSC-34 cells were fixed in 4% of paraformaldehyde (PFA) on either day 1, day 3, day 5, or day 7 post-treatment to prepare for immunofluorescence (IF) staining. The cells were blocked and permeabilized in phosphate buffer saline (PBS; Thermo Fisher Scientific, USA) containing 0.3% Triton X-100 and 3% bovine serum albumin (BSA; Sigma-Aldrich, USA). Cells were stained with anti-Beta-III tubulin (Promega, USA) diluted in PBS containing 1% BSA (1:1000 dilution) for 24 hours at 4°C. After cells were washed with PBS, the cells were incubated with FITC-conjugated secondary antibody (1: 200 dilution; Jackson ImmunoResearch, USA) and 1% horse serum (Thermo Fisher Scientific, USA) in PBS. The cultures were then co-stained with DAPI (1:200; Thermo Fisher Scientific, USA) for 10 minutes. After removing DAPI, the cultures were stored in PBS.

Image acquisition

Images were captured using phase-contrast microscopy (Olympus, CKX31SF) and fluorescence microscopy (Leica, DM IL).

Results

Morphological differentiation of NSC-34 using different concentrations of retinoic acid

NSC-34 cells were treated under low serum conditions with 1µM or 10µM of retinoic acid (RA). The development of neurites in differentiated NSC-34 was observed for seven days. There were two types of cells present in the untreated sample; large cells with short neurites and small circular cells (Figure 1A). Upon treatment with 1µM of RA, neurites outgrowth appeared to be longer and more sprouts of neurite branches were observed (Figure 1B – E). Neurite outgrowth appeared to be more extensive when treated with a high RA concentration than cells under low RA concentration (1µM) (Figure 2A and Figure 2B).

Expression of Beta-III tubulin, a neuronal marker in differentiated NSC-34

To confirm the presence of neurons and to detect neurite outgrowth in the culture, NSC-34 cells were differentiated for 1, 3, 5, and 7 days in-vitro before being stained with anti-Beta-III tubulin antibody. Immunofluorescence analysis demonstrated that both undifferentiated and differentiated NSC-34 cells exhibited positive Beta-III tubulin expression (Figure 3 and Figure 4). The number of sprouting neurites increased, and the neurites became more elongated as the period of differentiation increases. Interestingly, when cells were differentiated with 10µM of RA for seven days in-vitro, Beta-III tubulin-positive cells appear to be larger, with large extension bodies protruding from the cell bodies.

Discussion

Loss of motor neurons is commonly found in progressive neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease.[6,20,21] Animal models and primary neuronal cultures are commonly used to unravel the complex pathogenesis of these diseases. A hybrid cell line NSC-34, a fusion of murine motor neuron-enriched spinal cord with neuroblastoma cells, has been used in the physiological study of motor neurons and their degeneration [12,13,18].To induce the characteristic of motor neurons, the NSC-34 cells are subjected to differentiation process.[15,18,22] Differentiated NSC-34 exhibits unique neuron characteristics such as neurite

extension, and the expression of a neuronal marker, Beta-III tubulin.[12, 15,18, 23] The differentiation of cell lines often requires modification of the culture medium by culturing in a low serum condition with differentiation agents such as retinoic acid (RA). RA has the property to decelerate proliferation, promote neurite outgrowth and differentiate NSC-34 cell lines into motor neuron-like cells.[15,17]

Many studies have reported the use of 1µM of RA to differentiate NSC-34 cells.[15,18] However, 10µM of RA is an ideal concentration commonly used to differentiate a different cell line, called human neuroblastoma, SH-SY5Y, into mature neurons.[24,25] Therefore, this study aimed to optimize the differentiation protocol of motor neuron-like cell line, NSC-34, by comparing two different concentrations of RA, 1 µM and 10 µM. Results from phase-contrast microscopy demonstrate that at 1µM of RA, development of neurites was observed starting from one day post-differentiation. The length of neurites increases, and more neurite protrusions were observed as the period of differentiation increases. Similarly, when 10µM of RA was used, the NSC-34 cells developed more extended neurites.

Another indicator to identify neurons is through the expression of a neuronal marker, Beta-III tubulin. Beta-III tubulin is a cytoskeletal protein that is commonly used for neuronal identification.[15,17] Results show positive-Beta-III tubulin staining in undifferentiated and differentiated NSC-34 cells at 1, 3, 5, and 7 days post-differentiation. Beta-III tubulin expression in undifferentiated cells is expected as the protein is essential for neuronal functions, including neurite outgrowth.[26,27] Interestingly, when 10µM of RA was used, the length and number of the neurites appeared to be increased. This observation may indicate rapid neuronal development to become mature neurons.

Conclusion

Retinoic acid (RA) treatment at 10µM concentration promotes an efficient differentiation of NSC-34 cells into mature neurons compared to 1µM. Extensive neurite sprouting and longer neurite length indicate better neuronal maturation when using 10µM RA concentration. The study supports the use of 10µM RA treatment for NSC-34 differentiation into motor neuron-like cells, which can be helpful to generate a suitable model for electrophysiology studies and studies involving axonal transport.

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Conflict of Interest

The authors declare no conflict of interest in the publication of this article.

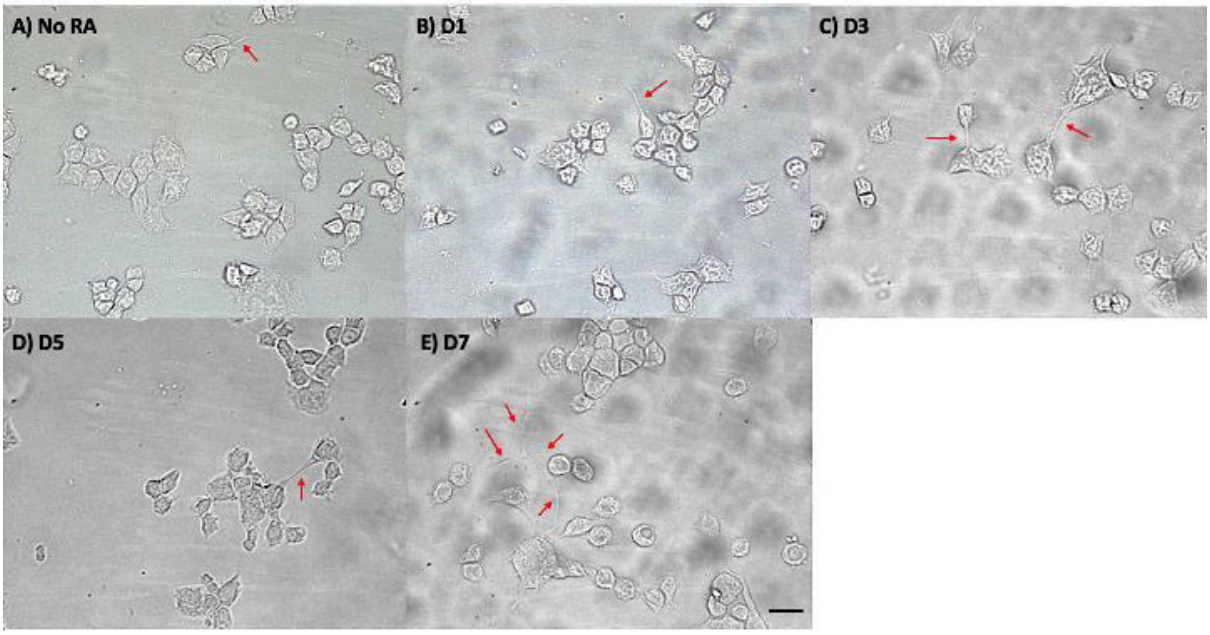

Figure 1: Morphological differentiation of NSC-34 cells at 1µM of retinoic acid. Cells were observed under phase-contrast microscopy at 20x magnification. Undifferentiated cells served as a negative control (A). For the treated group, cells were differentiated for 1(B), 3 (C), 5(D), and 7 (E) days in-vitro. The red arrow represents neurites. Scale bar represents 50µm. Abbreviations: Day (D); Retinoic acid (RA).

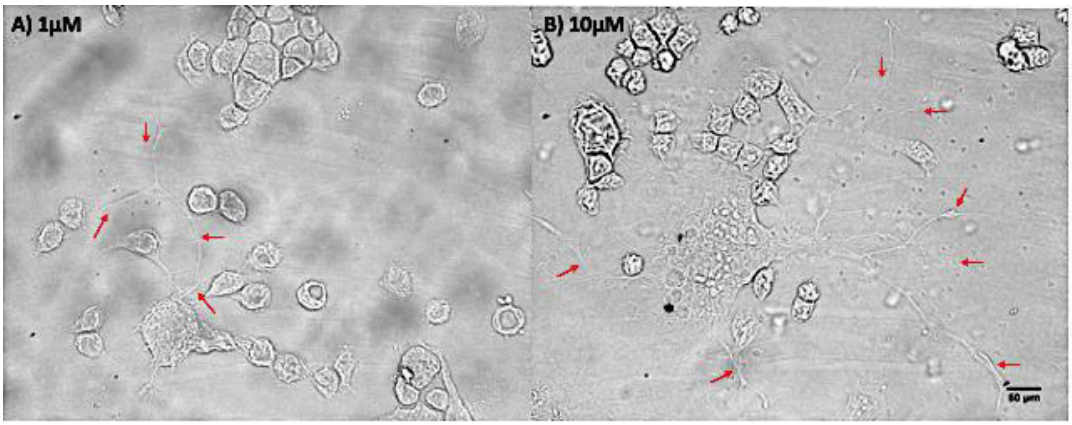

Figure 2: Comparison of differentiated NSC-34 cells when 1µM and 10µM of retinoic acid (RA) were added. Cells were observed under phase-contrast microscopy at 20x magnification. Cells were differentiated for seven days in-vitro. The red arrow represents neurites. Scale bar represents 50µm.

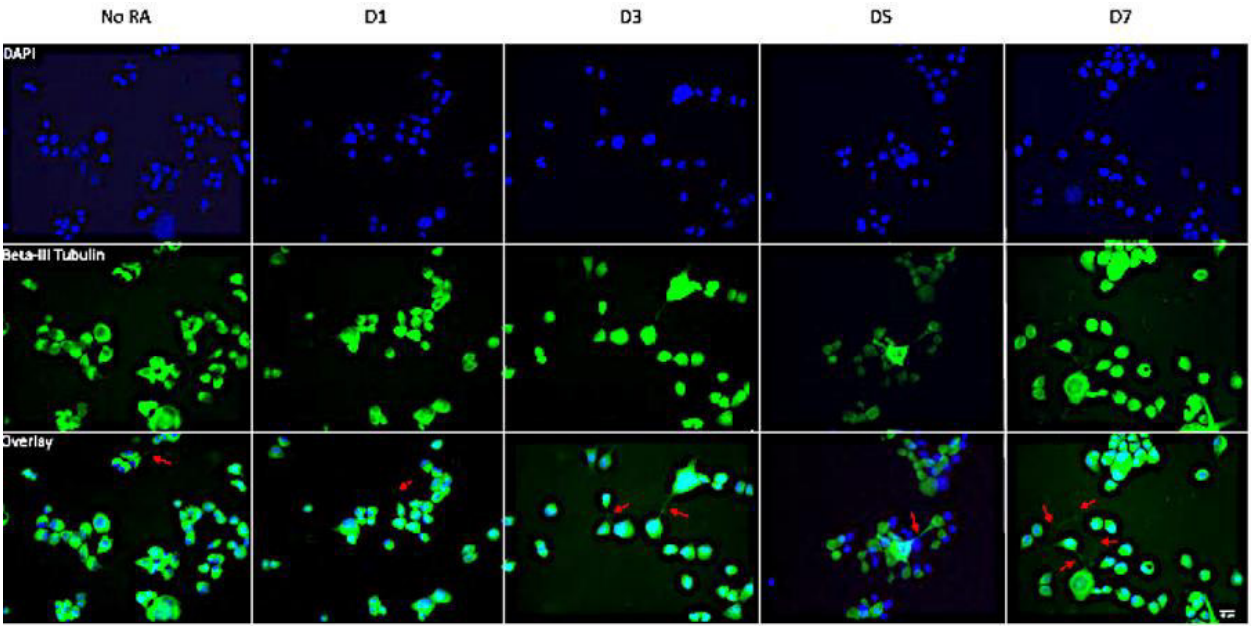

Figure 3: Observation of differentiated cells stained with Beta-III tubulin.

A) 1µM of retinoic acid was added to the cells. Cells were observed under fluorescence microscopy on day 1, 3, 5, and 7. Cells were observed under fluorescence microscopy on day seven. Cells were fixed in 4% PFA before being stained with Beta-III tubulin (green) and DAPI (blue). The cells were observed under 40x magnifications. Scale bar represents 20µm. The red arrow represents neurite. Abbreviation: Retinoic acid (RA).

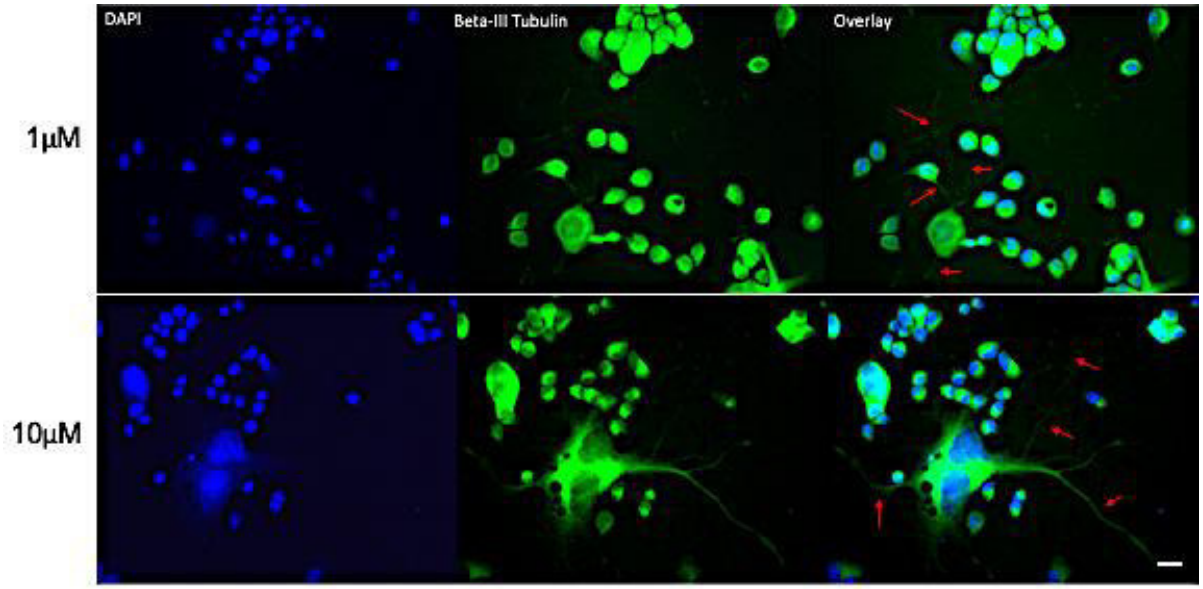

Figure 4: Detection of Beta-III tubulin expression in cells differentiated with 1µM or 10µM of retinoic acid. Cells were observed under fluorescence microscopy on day seven. Cells were fixed in 4% PFA before being stained with Beta-III tubulin (green) and DAPI (blue). The cells were observed under 40x magnifications. Scale bar represents 20µm. The red arrow represents neurite. Abbreviation: Retinoic acid (RA).

References

1. Alizadeh A, Dyck SM, Karimi-Abdolrezaee S. Traumatic Spinal Cord Injury: An Overview of Pathophysiology, Models and Acute Injury Mechanisms. Front Neurol. 2019;10:282. doi.org/10.3389/fneur.2019.00282.
2. Lewerenz J, Maher P. Chronic glutamate toxicity in neurodegenerative diseases-What is the evidence? Front Neurosci. 2015;9:469. doi.org/10.3389/fnins.2015.00469.
3. Yin HZ, Park DD, Lindsay AD, Weiss JH. Spinal cord neurons are vulnerable to rapidly triggered kainate neurotoxicity in vitro. Brain Res. 1995;689(2),265–70. doi.org/10.1016/0006-8993(95)00532-u.
4. McEwen ML, Springer JE. A mapping study of caspase-3 activation following acute spinal cord contusion in rats. J Histochem Cytochem. 2005;53(7),809–819. doi.org/10.1369/jhc.4A6467.2005.
5. Zimmer J, Kristensen BW, Jakobsen B, Noraberg J. Excitatory amino acid neurotoxicity and modulation of glutamate receptor expression in organotypic brain slice cultures. Amino Acids. 2000;19(1),7–21. doi.org/10.1007/s007260070029.
6. Dong XX, Wang Y, Qin ZH. Molecular mechanisms of excitotoxicity and their relevance to pathogenesis of neurodegenerative diseases. Acta Pharmacol Sin. 2009;30(4), 379–87. doi.org/10.1038/aps.2009.24.
7. Wang Q, Yu S, Simonyi A, Sun GY, Sun AY. Kainic acid-mediated excitotoxicity as a model for neurodegeneration. Mol Neurobiol. 2005;31(1–3), 3–16. doi.org/10.1385/mn:31:1-3:003.
8. Abu-Rub M, McMahon S, Zeugolis DI, Windebank A, Pandit A. Spinal cord injury in vitro: Modelling axon growth inhibition. Drug Discov Today. 2010;15(11–12),436–443. doi.org/10.1016/j.drudis.2010.03.008.
9. Slovinska L, Blasko J, Nagyova M, Szekiova E, Cizkova D. In Vitro Models of Spinal Cord Injury. In: Fuller H and Gates M, editors. Recovery of Motor Function Following Spinal Cord Injury. InTech; 2016. doi.org/10.5772/63459.
10. Kung LH, Gong K, Adedoyin M, Ng J, Bhargava A, Ohara PT. *et al*. Evidence for Glutamate as a Neuroglial Transmitter within Sensory Ganglia. PLoS ONE. 2013;8(7):e68312. doi.org/10.1371/journal.pone.0068312.
11. Wen SY, Li AM, Mi KQ, Wang RZ, Li H, Liu HX, Xing Y. In vitro neuroprotective effects of ciliary neurotrophic factor on dorsal root ganglion neurons with glutamate-induced neurotoxicity. Neural Regen Res. 2017;12(10),1716–1723. doi.org/10.4103/1673-5374.217352.
12. Nango H, Kosuge Y, Sato M, Shibukawa Y, Aono Y, Saigusa T. Ito Y, Ishige K. Highly Efficient Conversion of Motor Neuron-Like NSC-34 Cells into Functional Motor Neurons by Prostaglandin E_2. Cells. 2020;9(7):1741. doi:10.3390/cells9071741.
13. Gill AL, Wang MZ, Levine B, Premasiri A, Vieira FG. Primary neurons and differentiated NSC-34 cells are more susceptible to arginine-rich ALS dipeptide repeat protein-associated toxicity than non-differentiated NSC-34 and CHO cells. Int J Mol Sci. 2019;20(24):6238. doi.org/10.3390/ijms20246238.
14. He BP, Wen W, Strong MJ. Activated microglia (BV-2) facilitation of TNF-α-mediated motor neuron death in vitro. J Neuroimmunol. 2002;128(1–2):31–8. doi.org/10.1016/S0165-5728(02)00141-8.
15. Maier O, Böhm J, Dahm M, Brück S, Beyer C, Johann S. Differentiated NSC-34 motoneuron-like cells as experimental model for cholinergic neurodegeneration. Neurochem Int. 2013;62(8),1029–38. doi.org/10.1016/j.neuint.2013.03.008.

16. Hiroi A, Yamamoto T, Shibata N, Osawa M, Kobayashi M. Roles of fukutin, the gene responsible for Fukuyama-type congenital muscular dystrophy, in neurons: Possible involvement in synaptic function and neuronal migration. Acta Histochem Cytochem. 2011; 44(2):91–101. doi.org/10.1267/ahc.10045.
17. Murillo JR, Goto-Silva L, Sánchez A, Nogueira FCS, Domont GB, Junqueira M. Quantitative proteomic analysis identifies proteins and pathways related to neuronal development in differentiated SH-SY5Y neuroblastoma cells. EuPA Open Proteom. 2017;16:1–11. doi.org/10.1016/j.euprot.2017.06.001.
18. Hounoum BM, Vourc'h P, Felix R, Corcia P, Patin F, Guéguinou M, Potier-Cartereau M, Vandier C, Raoul C, Andres CR, Mavel S, Blasco H. NSC-34 motor neuron-like cells are unsuitable as experimental model for glutamate-mediated excitotoxicity. Front Cell Neurosci. 2016;10:118. doi.org/10.3389/fncel.2016.00118.
19. Johann S, Dahm M, Kipp M, Zahn U, Beyer C. Regulation of choline acetyltransferase expression by 17 β-oestradiol in NSC-34 cells and in the spinal cord. J Neuroendocrinol. 2011;23(9),839–48. doi: 10.1111/j.1365-2826.2011. 02192.x.
20. Miguel-Hidalgo JJ, Alvarez XA, Cacabelos R, Quack G. Neuroprotection by memantine against neurodegeneration induced by ß-amyloid1–40. Brain Res. 2002;958(1):210–21. doi:10.1016/s0006-8993(02)03731-9.
21. Helton TD, Otsuka T, Lee MC, Mu YY, Ehlers MD. Pruning and loss of excitatory synapses by the Parkin ubiquitin ligase. Proc Natl Acad Sci USA. 2008;105(49):19492–7. doi: 10.1073/pnas.0802280105.
22. Regan RF. The vulnerability of spinal cord neurons to excitotoxic injury: Comparison with cortical neurons. Neurosci Lett. 1996;213(1),9–12. doi.org/10.1016/0304-3940(96)12823-8.
23. Cashman NR, Durham HD, Blusztajn JK, Oda K, Tabira T, Shaw IT, Dahrouge S, Antel JP. Neuroblastoma × spinal cord (NSC) hybrid cell lines resemble developing motor neurons. Dev Dyn. 1992;194(3),209–21. doi.org/10.1002/aja.1001940306.
24. Shipley MM, Mangold CA, Szpara ML. Differentiation of the SH-SY5Y Human Neuroblastoma Cell Line. J Vis Exp. 2016;(108):53193. doi:10.3791/53193.
25. Cheung YT, Lau WK, Yu MS, Lai CS, Yeung SC, So KF, Chang RC. Effects of all-trans-retinoic acid on human SH-SY5Y neuroblastoma as in vitro model in neurotoxicity research. Neurotoxicology. 2009;30(1):127-35. doi:10.1016/j.neuro.2008.11.001.
26. Ferreira A, Caceres A. Expression of the class III beta-tubulin isotype in developing neurons in culture. J Neurosci Res. 1992;32(4):516-29. doi: 10.1002/jnr.490320407.
27. Latremoliere A, Cheng L, DeLisle M, Wu C, Chew S, Hutchinson EB, Sheridan A, Alexandre C, Latremoliere F, Sheu SH, Golidy S, Omura T, Huebner EA, Fan Y, Whitman MC, Nguyen E, Hermawan C, Pierpaoli C, Tischfield MA, Woolf CJ, Engle EC. Neuronal-Specific TUBB3 Is Not Required for Normal Neuronal Function but Is Essential for Timely Axon Regeneration. Cell Rep. 2018;24(7):1865-1879.e9. doi:10.1016/j.celrep.2018.07.029.

CASE REPORT

COVID-19 IN A PATIENT WITH CHRONIC KIDNEY DISEASE: A CASE OF COINCIDENCE IN INDONESIA.

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Abstract

Background: Chronic kidney disease (CKD) increases the risk of mortality during coronavirus disease 2019 (COVID-19) episodes. Patients with end-stage renal disease (ESRD) are highly vulnerable with the multiple comorbidities that make them susceptible to adverse outcomes with COVID-19. There is limited data about patients with ESRD who also suffer from COVID-19. We discuss the case of a hemodialysis patient who had comorbidities and developed COVID-19 pneumonia in the clinical course.

Case descriptions: A 40-year-old woman who had ESRD on regular hemodialysis, admitted to hospital for presented intermittent fever, dyspnea, and fatigability. The patient had comorbidities, Hepatitis C, Human Immunodefisiency Virus (HIV), and Hypertension. Patient had continuous renal replacement therapy (CRRT) three times a week. She was diagnosed with COVID-19 by the reverse-transcriptase polymerase chain reaction (RT-PCR), and her pharyngeal swab for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was positive. Chest X-ray showed bilateral pneumonia. She was intensively monitored and treated with antiviral drugs, oxygen, broadspectrum antibiotics, steroids, nutrition, and other supporting drugs. After 24 days, an RT-PCR assay for SARS-CoV-2 was negative, and pulmonary involvement improved significantly. The patient was discharged on day 28 after recovering from COVID-19 infection.

Conclusion: The disease courses and treatment options for the patient were significantly more complicated. The patient had through the deteriorating illness and recovered after following treatment and CRRT. It is essential to ensure the continuous of dialysis, and might be an important option for hemodialysis patients with COVID-19.

Keywords: COVID-19, SARS-CoV-2, Chronic kidney disease, CRRT, Pneumonia

Background

Coronavirus disease 2019 (COVID-19) has caused significant morbidity and mortality worldwide, and has been declared a global pandemic by WHO.[1] Chronic kidney disease (CKD) increases the risk of mortality during COVID-19 episodes. Patients with end-stage renal disease (ESRD) are highly vulnerable with the multiple comorbidities that make them susceptible to adverse outcomes with COVID-19. There is limited data about patients with ESRD who also suffer from COVID-19.[2] Therefore, we discuss the case of a hemodialysis patient who had comorbidities and developed COVID-19 pneumonia in the clinical course.

Case Presentation

A 40-year-old woman who had ESRD on regular hemodialysis, admitted to hospital for presented intermittent fever, dyspnea, fatigability and loss of appetite. The patient had comorbidities, Hepatitis C, Human Immunodefisiency Virus (HIV), and hypertension, and had been treated with antiretroviral regimen (abacavir-lamivudin-raltegravir) and amlodipin 5 mg once daily. She had never left the country and no history of smoking, alcohol or drug abuse. The patient took continuous renal replacement therapy (CRRT) three times a week. Her physical examination was general weakness on admission, heart rate was 112 per minute (pm), respiratory rate 26 pm, O2 Sat 98% (with non-rebreathing oxygen mask (NRM)), temperature 38.3°C, and blood pressure was 140/70 mmHg. Clinical examination in our Internal Medicine Emergency Department revealed the patient had bilateral crackles in both lungs. She was diagnosed with COVID-2019 by the reverse-transcriptase polymerase chain reaction (RT-PCR), and her pharyngeal swab for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was positive.

Investigations

Laboratory data at the time of admission showed hemoglobin 7.8 g/dL; leukocytes 6260/µL; platelets 298000/µL; MCV 80.2; MCH 24.5; Albumin 2.81 g/L; SGOT 46 IU/L; SGPT 47 IU/L; HBsAg non-reactive; Anti-HCV reactive, Anti-HIV reactive, urea 132.02 mg/dL; Creatinin 12.69 mg/dL; Na 131 mmol/L; K 5.0 mmol/L; Cl 98 mmol/L; blood glucose 92 mg/dl; CRP 53 mg/L. Urinalysis test showed no specific finding. Blood gas analysis showed pH 7.40; PO2 36.4 mmHg; PCO2 17.5 mmHg; HCO3 15.9 mmol/L; O2 saturation 81.8%; BE -5.8 mmol/L. D-dimer 1010 ng/mL FEU, PT 11.3 second; APTT 36 second. Chest X-ray showed bilateral pneumonia (Fig. 1). Electrocardiography showed no significant abnormality.

Diagnosis

Based on these findings in the Emergency Department, the diagnosis was CKD stage V on dialysis, COVID-19 with pulmonary involvement, Hepatitis C, HIV, and hypertension. The patient was immediately placed on maximum isolation precautions (negative pressure room, with anyone entering the room required to wear an N95 respirator, face shield, disposable gown, and gloves).

Treatment

During hospitalisation, patient referred to isolation intensive care ward because the deteriorating of clinical condition, and also the nasopharyngeal swab which was sent for COVID-19 testing, reported positive (Table 1).

Based on these findings, as the patient met the diagnostic, she was initially treated with oxygen 12 liter per minute, azithromycin 1x250 mg, cotrimoxazole 1x960 mg, packed red cell tranfusion, heparin injection, furosemide 40 mg three times a day by injection, proton pump inhibitor, antipiretic, antiviral remdesivir 100 mg once daily (for 10 days), folic acid, albumin transfusion, enteral and parenteral nutrition,

amlodipin 5 mg once daily. She was intensively monitored and treated in the intensive isolation ward. The patient also continued to undergo CRRT three times a week during hospitalization.

Outcome and Follow-up

During the course of the disease, the patient showed slow improvement and fluctuation of deteriorating condition. At day 15th, the chest X-ray evaluation showed improvement and the clinical condition of patient began recovered. Dyspnoea, fever, and fatigability substantially resolved after the second week of treatment along with all other symptoms. The laboratory findings were initially less than good, gradually improved. As the results of the patient's nasofasing swab PCR tested positive on first week, became negative after 3 weeks. The patient was discharged from the hospital and went home on forth week in well condition. One month after the discharge in follow up, the patient showed no recurrence of signs and symptoms, and continued CRRT when outpatient.

Discussion

Treatment of COVID-19 among patients with CKD or ESRD requires special pharmacotherapy considerations. CRRT provided benefits for this patient by removing potentially damaging toxins and stabilizing metabolic and hemodynamic status.[2,3] Fluid therapy, CRRT, and anticoagulant prophylaxis/treatment need special attention in CKD patients with COVID-19. CKD patients with COVID-19 are treated as other patients, with some dose modifications if needed.[3,4] Patients with moderate or severe COVID-19 can receive treatment of remdesivir duration of up to 5 days, which can be extended for up to 10 days if patients do not demonstrate clinical improvement.[5] Many novel treatments for COVID-19 are under investigation, and although some of these options are already being used in clinical practice (as in our patient), none are currently approved for routine use. Many centres have started incorporating treatment with hydroxychloroquine and azithromycin based on a small study by Gautret *et al*., that the combination decreased the duration of viral shedding and increased elimination of the virus. Several drugs such as hydroxychloroquine, remdesivir, and favipiravir are the treatment options for COVID-19 therapy but further research is still being done on their effects.[6]

Host and virus factors play a role in SARS-CoV-2 infection. Port d'entry of SARS-CoV-2 into human cells begins with the fusion of the viral membrane to the plasma membrane of the cell. Effect of the virus and its ability to conquer the immune response determine the severity of the infection. Immune system dysregulation caused in tissue damage in SARS-CoV-2 infection. An inadequate immune response results in viral replication and tissue destruction. Besides that, an excessive immune response also cause tissue damage. When the virus enters the human cell, the viral antigen will be presented to antigen presentation cells. The presentation of viral antigens is known to depend on the major histocompatibility complex (MHC) class I molecules. The presentation of these antigens will cause the body's humoral and cellular immune response mediated by T cells and B cells that are specific to the virus. In the humoral immune response, IgM and IgG will be formed against SARS-CoV-2. IgM against SAR-CoV-2 is lost by the end of week 12 and IgG can persist for a longer period of time.[7] The lung is the main organ affected, which can result in respiratory failure. The disease can also present with atypical symptoms in all patients, such as nausea, vomiting and diarrhoea.[8]

Management guidelines for coincidence of COVID-19 vary from country to country. WHO guidelines recommend the management of symptoms, in general the management of COVID-19 is to treat symptoms (antipyretics for fever, oxygen therapy for respiratory distress). WHO also recommends that in severe, co-

infected, superinfected, and immunocompromised cases, empiric antibiotic therapy with mechanical ventilation should be given depending on the clinical condition of the patients. Nutrition, antibiotic, antiviral, antipyretic, and fluid management was given to the COVID-19 patients for improved response.[9]

This case is a 40-year-old patient who had ESRD and comorbidities, and developed COVID-19 pneumonia in the clinical course. The patient had Chest X-ray showed bilateral pneumonia. The PCR of COVID-19 was positive, which showed coincidence together COVID-19 with CKD on CRRT. Our patient showed slow improvement in the first two weeks of treatment, but gradually improved after the second week.

Conclusion

In conclusion, we report a case of an Indonesian female patient diagnosed as CKD on dialysis and COVID-19. The disease courses and treatment options for the patient were significantly more complicated. The patient had through the deteriorating illness and recovered after following treatment. It is essential to ensure special attention, drug modification, and the continuous of dialysis, which could be important options for hemodialysis patients with COVID-19.

Highlights

- Early recognition of COVID-19 coincidence and options of appropriate treatment is crucial in order to decrease the risk of severity and fatality.
- Many novel treatments for COVID-19 are under investigation, and some of these options are already being tried to use in clinical practice.
- Treatment of COVID-19 among patients with CKD or ESRD requires special pharmacotherapy considerations.

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Disclosures

The authors declare that they have no relevant financial interests and no conflict of interest.

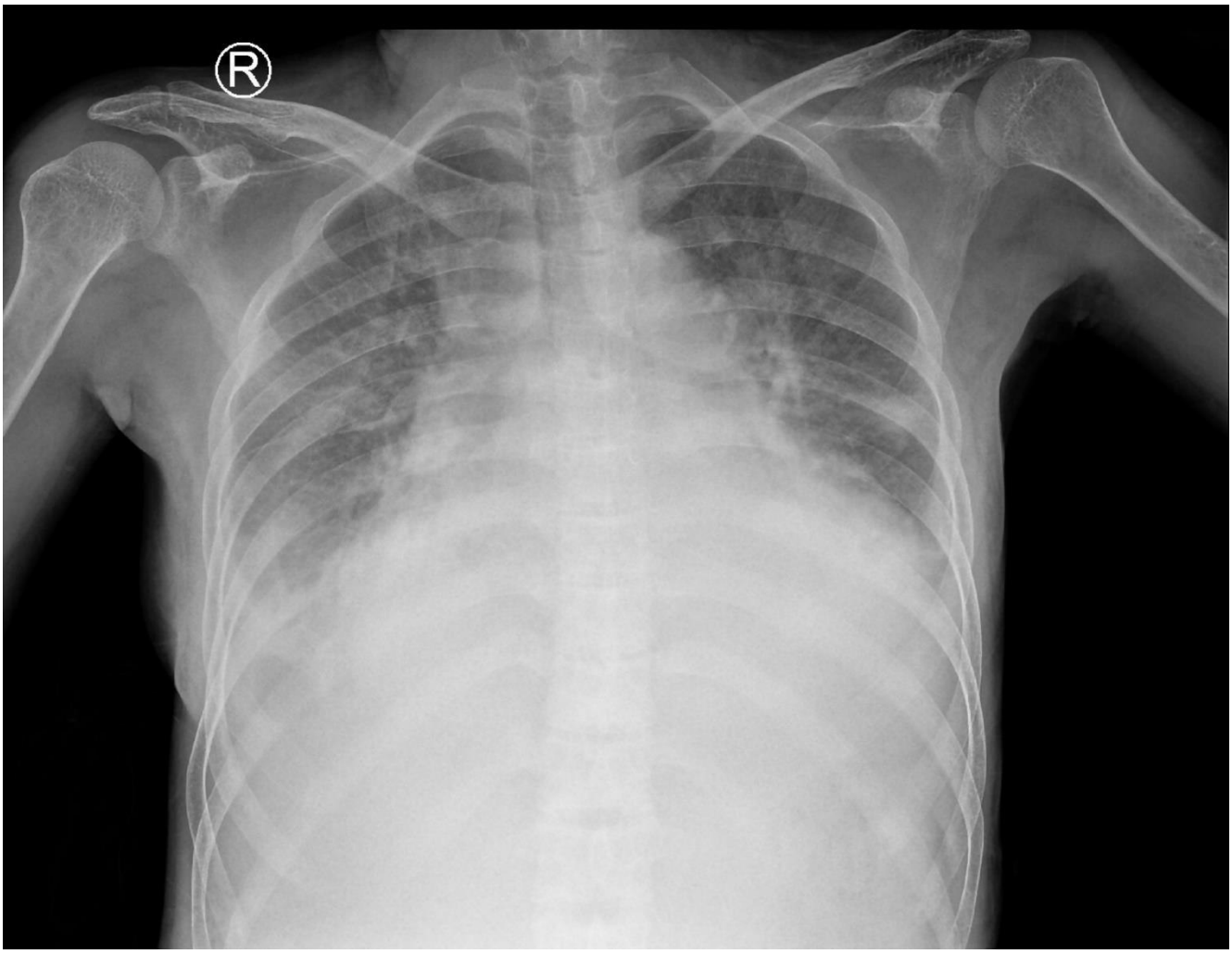

Figure 1. Chest X-ray of the patient showed bilateral pneumonia.

Table 1. Laboratory findings in a case of coincidence.

Parameter	Result	Reference
Hemoglobin	7.8 g/dL	11.7 – 15.5 g/dL
Leukocytes	6260/uL	3600 – 11000/uL
Hematocrit	26%	35 – 47%
Platelets	298000/uL	150000 – 440000/uL
PT	11.3 second	9.9 - 11.8 second
APTT	36 second	26.4 - 37.5 second
Sodium	131 mEq/L	134 – 146 mEq/L
Potassium	5.0 mEq/dL	3.4 - 4.5 mEq/dL
Urea	132.02 mg/dL	15.00 – 40.00 mg/dL
Creatinine	12.69 mg/dL	0.6 – 1.20 mg/dL
Blood Glucose	92 mg/dL	< 140 mg/dL
HBSAG	Non reactive	Non reactive
CRP	53 mg/L	<5 mg/L
Albumin	2.81 g/dL	3.5-5.2 g/dL
D-dimer	1010 ng/mL FEU	<500 ng/mL FEU
Anti HCV	Reactive	Non reactive
Anti HIV	Reactive	Non reactive
PCR SARS-CoV-2	Positive	Negative

References

1. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, *et al.,* Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395(10223):507-513.
2. Fu D, Yang B, Xu J, Mao Z, Zhou C, Xue C. COVID-19 Infection in a Patient with End-Stage Kidney Disease. Nephron. 2020;144(5):245-247.
3. Dashti-Khavidaki S, Khalili H, Nourian A. Pharmacotherapy Considerations in CKD Patients With COVID-19, A Narrative Review. Iran J Kidney Dis. 2020;14(4):247-255.
4. Rafiullah M, Siddiqui K. Corticosteroid use in viral pneumonia: experience so far and the dexamethasone breakthrough in coronavirus disease-2019. J Comp Eff Res. 2020;9(18):1247-1254.
5. Aleissa MM, Silverman EA, Paredes Acosta LM, Nutt CT, Richterman A, Marty FM. New Perspectives on Antimicrobial Agents: Remdesivir Treatment for COVID-19. Antimicrob Agents Chemother. 2020;65(1):e01814-20.
6. Gautret P, Lagier JC, Parola P, Hoang VT, Meddeb L, Mailhe M, *et al*., Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. Int J Antimicrob Agents. 2020;56(1):105949.
7. Susilo A, Rumende CM, Pitoyo CW, Santoso WD, Yulianti M, Herikurniawan H, *et al*., Coronavirus Disease 2019: Tinjauan Literatur Terkini. J Penyakit Dalam Indones. 2020; 7(1):47-49.

8. Smyk W, Janik MK, Portincasa P, Milkiewicz P, Lammert F, Krawczyk M. COVID-19: Focus on the lungs but do not forget the gastrointestinal tract. Eur J Clin Invest. 2020;50(9):e13276.
9. Tobaiqy M, Qashqary M, Al-Dahery S, Mujallad A, Hershan AA, Kamal MA, *et al*., Therapeutic management of patients with COVID-19: a systematic review. Infect Prev Pract. 2020;2(3):100061.

ORIGINAL ARTICLE

DEVELOPMENT AND VALIDATION OF AN LC-MS/MS METHOD FOR DETERMINATION OF ATORVASTATIN IN HUMAN PLASMA.

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Abstract
Background: A novel method for the estimation of Atorvastatin in human plasma by using LC-MS/MS and the analyte is Atorvastatin and internal standard is Rosuvastatin have extracted with the tertbutyl methyl ether: n-hexane (70:30, v/v) from human plasma.
Methods: The chromatographic severance was attained of the peak using Agilent Zorbax Eclipse XDB-C_8, (100 mm X 4.6 mm, 3.5 µm) column with a run time is 2.5 min. Atorvastatin and Rosuvastatin were recorded at the total ion current of their relevant multiple reaction monitoring. The LC-MS/MS system composed an Agilent 1100 infinity combined with an AB Sciex Qtrap4000 Thermo Finnigan TSQ quantum discovery triple quadrupole mass spectrometer. All of the parameters must be validated like selectivity, accuracy, precision, linearity, lower limit of quantification, matrix effect, recovery reached the acceptance criteria under the following ICH guidelines.
Results: Atorvastatin has checked the various stability studies like short-term stability at 25 ºC, long-term stability for 55 days at -70ºC, wet extract stability for 54 hours, autosampler stability for 63 hours, benchtop stability for 14 hours and, freeze-thaw stability at -60 ºC. Hence, it can be used for routine drug analysis and bioequivalence studies of Atorvastatin in human plasma samples.
Conclusion: The proposed LC-MS/MS method was simple, rapid, precise and accurate for the determination of Atorvastatin in human plasma. The developed LC-MS/MS method can apply for the bioequivalence and pharmacokinetic studies of Atorvastatin in human plasma samples.

Keywords: Atorvastatin, rosuvastatin, estimation, human plasma, LC-MS/MS and validation.

Introduction

Atorvastatin selectively and competitively inhibits the hepatic enzyme HMG-CoA reductase and it is chemically called as 2-(4-fluorophenyl)-β,δ-dihydroxy-5-(1-methylethyl)-3-phenyl-4-[(phenylamino)carbonyl]-1*H*-pyrrole-1-heptanoic acid, calcium salt (2:1) trihydrate. Atorvastatin is designated for asthma, nasal polyposis and Crohn's disease[1] and it was used for long-term management of asthma and chronic obstructive pulmonary disease with the help of inhaled corticosteroid therapy[2]. A relevant number of studies for estimation of Atorvastatin have been reported, the methods employed include UV spectroscopy[3,4], HPLC[5-7] and LC-MS[8-10]. Pharmacokinetics and pharmacodynamics of Atorvastatin have been measured in healthy volunteers[11,12] and primary biliary cirrhosis patients[13]. However, no studies regarding the estimation of Atorvastatin in human plasma by using LC-MS/MS have been published so far. The goal of the present study was the estimation of Atorvastatin in human plasma by using LC-MS/MS. Besides, until now, no studies have been reported in the scientific literature regarding the data of full bio-analytical validation of estimation of Atorvastatin in human plasma by using LC-MS/MS. This paper reports the simple, sensitive, rapid, precise and accurate method for the estimation of Atorvastatin in human plasma by using LC-MS/MS. Based on the data obtained the LC-MS/MS method has been applied for analysis of commercial and bioequivalence studies of Atorvastatin samples.

Methodology

Materials

Atorvastatin was procured from Aarti Industries Limited (Mumbai, India). Rosuvastatin was procured from Clearssynth Labs (Mumbai, India). Acetonitrile and methanol, tert butyl methyl ether of HPLC grade were purchased from J.T. Baker (Philipsburg, USA). Formic acid, analytical grade, n-hexane and water, both HPLC grade, were purchased from Merck Limited (Mumbai, India).

Instrument

The LC-MS/MS system composed an Agilent 1100 infinity combined with an AB Sciex Qtrap 4000 Thermo Finnigan TSQ quantum discovery triple quadrupole mass spectrometer and the control was done by the Analyst software version 1.4.2. Ultrapure water (18 MΩ/cm) was produced using the ULTRA-CLEAR system (Richfield, USA). The pH of the buffer solution was measured using a pH/mv-meter Consort P501 (Turnhout-Belgium), provided with a combined pH electrode. UV-vis spectra were recorded on Jasco V-530 spectrophotometer (Tokyo, Japan), in 10 mm quartz cells.

Solutions of LC-MS/MS

A stock solution of Atorvastatin containing 200 µg/ml was prepared in a 10 ml volumetric flask, by dissolving 0.0020 gm of Atorvastatin in methanol (HPLC grade). The flask was filled up to the mark with the same solvent. A stock solution of Rosuvastatin (internal standard) containing 200 µg/ml was prepared in a 10 ml volumetric flask, by dissolving 0.0020 gm Rosuvastatin (internal standard) in acetonitrile and water (50:50, v/v) as diluent. The flask was filled up to the mark with the same solvent. Working solutions containing all of the analytes were prepared in the range 0.100 ng/ml to 3.00 ng/ml using (acetonitrile: water, 50:50, v/v) as diluting the solvent. All the analytes solutions were prepared daily and kept at 2-8°C before and between injections to prevent sample degradation. An ammonium formate buffer solution pH 4.20 was prepared by mixing 0.1578 g of ammonium formate in 500 ml of ultra-pure water. If necessary the pH could be adjusted to pH 4.20 with 0.1% formic acid solution.

Sample collection and preparation

Blood samples were collected into blank tubes and centrifuged for 5 minutes at approximately 4000 rpm at 4°C. The plasma samples (supernatant) were separated and stored at -20°C until analysis. Atorvastatin was extracted from the plasma samples where with protein precipitation. Concisely, 200 µl of plasma sample was extracted in 4 ml of extraction solvent (tert butyl methyl ether:n-hexane, 70:30, v/v) including the internal standard (Rosuvastatin at 200 ng/ml). The mixture was vortexed for 20 min and centrifuged at 4000 rpm, for 5 min at 4°C. 3 ml supernatant layer was separated and evaporated under a gentle stream of nitrogen gas at 45°C up to dryness. Then the residue was reconstituted with 500 µl mobile phase (acetonitrile:5Mm ammonium formate buffer in 0.1% formic acid, 60:40, v/v) and loaded into a pre-labeled autosampler vial.

Chromatographic and mass spectrometric conditions

Chromatographic studies were performed using an Agilent Zorabax Eclipase XDB-C_8 purchsed from Thermo Electron corporation, USA, with the dimentions 150 mm X 4.6 mm and 3.5 µm particle size and the injection volume was 5 µl. The mass spectrometer was operated under positive ionization mode and the detection of the analytes was based on multiple reaction monitoring of m/z 431.3/323.1 and 313.40/245.30 for Atorvastatin and Rosuvastatin, respectively. The ion spray voltage, the source temperature, declustering potential, collision cell exit potential, entrance potential and dwell time sets at 5000V, 500°C, 90V, 11V, 10V and 200ms, respectively.

Validation of the method

The method was validated according to the ICH guidelines[14].

Software

Calculating the molecular mass of analyte and internal standard by using version 1.4.2 for Analystsoftware.

Results

Method development

Atorvastatin and all of the compounds enclosed in this study ionize according to the pH mobile phase. The development of the new LC-MS/MS method is based on the behavior of ionizable compounds that have retention closely related to the pH of the mobile phase. The results were shown in Figure 1 and Figure 2. As shown in Figure 1, Atorvastatin exists molecular mass: parent peak molecular massis 413.5 m/z and daughtier peak molecular mass is 323.1 m/z, respectively.

Method validation

The final developed method (as described in the Experimental section) was validated, checking for linearity, precision, accuracy, matrix effect and stability studies.

Linearity

Linearity has been checked directly for each compound studied in this paper by dilution of a standard stock solution. The slope and y-intercept were provided as equations to there with the correlation coefficient to demonstrate the linearity of the method. Linearity was established for a working solution containing a concentration between 0.103-3.010 ng/ml for Atorvastatin. The equation was obtained y= 0.101+0.00158 (r^2=0.9989) shown in Figure 2.

Precision and accuracy

The precision was estimated by both with-in batch precision and between batch precision. According to the international rules of validation of with-in batch, precision was checked on four different concentrations like HQC, MQC, LQC and, LLOQ QC. Between batch, precision was established on another day, by a different investigator using the percent coefficient of

variation. The obtained values for %CV are below 15% (of HQC, MQC and LQC) and below 20% (LLOQ QC) showing a good precision of the method. The results are present in Table 1.

Accuracy was determined by calculating the recovery of each analyte at three different concentration levels like HQC, MQC and LQC. The obtained values for the recoveries were in the range of 72.48-81.48%. The results are present in Table 2.

Matrix effect

It is a combined effect of all components of the sample other than the analyte. The matrix effect was checked by three different concentration levels, these are HQC, MQC and LQC. The %CV values below 15% showing a good matrix effect of the method. The results are presented in Table 3.

Stability studies

Stabilities were estimated at low and high concentrations of the sample of Atorvastatin in plasma. Checking the stabilities like short term stability at -20^0C, long term stability for 55 days at -70^0C, wet extract stability for 54 hours, autosampler stability for 63 hours, benchtop stability for 14 hours and freeze and thaw stability (3) cycles at -70^0C, respectively. The %CV values below 15% showing a good stability effect of the method. The results are shown in Table 4.

Conclusion

The proposed LC-MS/MS method was simple, rapid, precise and accurate for the determination of Atorvastatin in human plasma. Sample preparation showed high recovery for the quantitative estimation of Atorvastatin in human plasma and this method allows higher sample throughout put due to the short chromatography time (3.5 min) and simple sample preparation. Thus, the developed LC-MS/MS method can apply for the bioequivalence and pharmacokinetic studies of Atorvastatin in human plasma samples.

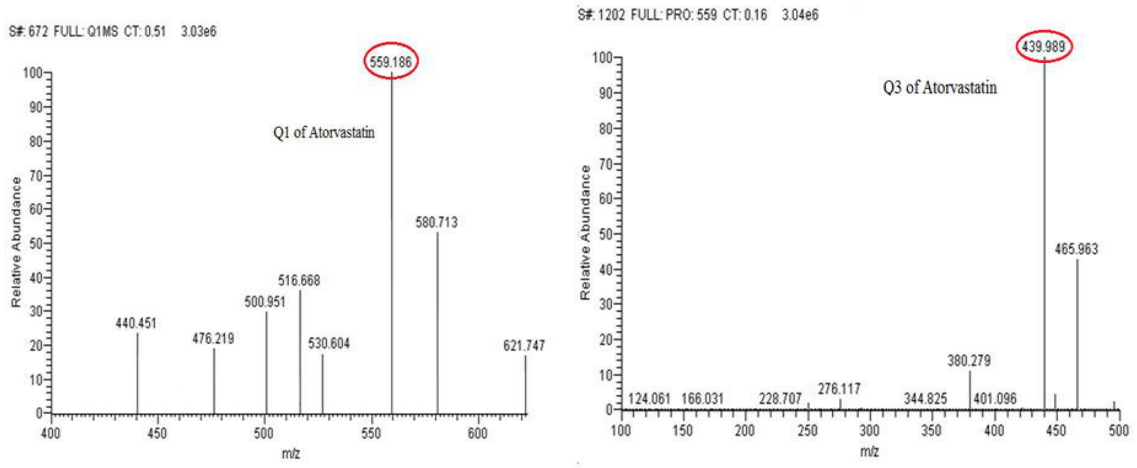

Figure 1. Product ion spectra of Atorvastatin

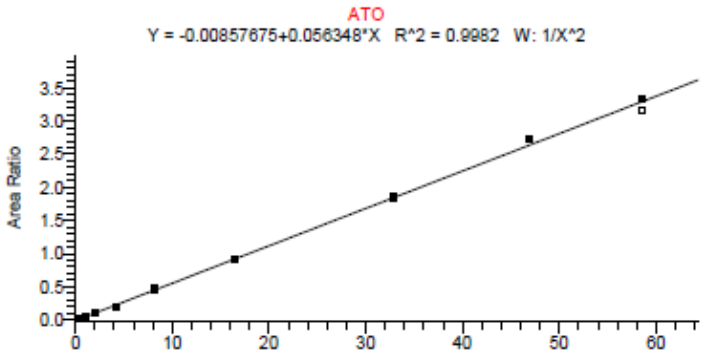

Figure 2. Linearity plot of Atorvastatin

Table 1. Precision data of Atorvastatin

Within-batch precision (n=6) for Atorvastatin			
Sample ID	**Concentration found (mean±SD, n=6; µg/ml)**	**Precision (%)**	**Accuracy (%)**
HQC	2.633± 0.155	5.26	105.58
MQC	1.570±0.073	4.65	99.61
LQC	0.268±0.010	3.86	103.40
LLOQ QC	0.114±0.010	9.19	107.17
Between batch precision for Atorvastatin			
HQC	2.843± 1.94	6.85	107.98
MQC	0.543±0.033	6.26	104.47
LQC	0.266±0.017	6.73	102.33
LLOQ QC	0.113±0.008	7.81	105.86

Note: S.D. = standard deviation; %CV = percent coefficient of variation

Table 2. Accuracy data of Atorvastatin

Parameter	**LQC**	**MQC**	**HQC**
% Recovery	76.43	72.48	81.48
% CV	2.92	6.71	4.54

Table 3. Matrix effect data of Atorvastatin

Parameter	**HQC**	**MQC**
%Accuracy	100.12	99.89
S.D(+/-)	0.002	0.065
%CV	0.95	2.50

Table 4. Stability studies data of Atorvastatin

Parameter	Results	
	HQC	**LQC**
Short term stability(-20^{0}C)	105.16%	103.27%
Long term stability(-70^{0}C) 55 days	105.55%	105.38%
Wet extract stability(54 hours)	104.51%	99.87%
Autosampler stability(63 hours)	99.00%	98.21%
Bench-top stability(14 hours)	93.56%	95.71%
Freeze & thaw stability(3)cycles at -60^{0}C	107.80%	100.32%

References

1. Tripathi KD. Essentials of medical pharmacology. JP Brothers Medical Publishers Pvt. Ltd. 2013.
2. Ewing's, Analytical Instrumentation Handbook. edited by Cazes J, Marcel Dekker, New York. 3rd ed. 2005.
3. Jeffery GH, Basset J, Mendham J and, Denney RC. Vogel's textbook of quantitative chemical analysis. Longman Publication, England. 5th ed., ,1996.
4. Rezk NL, Tidwell RR, Kashuba AD. Simultaneous determination of six HIV nucleoside analog reverses transcriptase inhibitors and nevirapine by liquid chromatography with ultraviolet absorbance detection. J. Chromatogr. B Biomed. Appl. 2003;791(1-2) :137-147.
5. Geetha R, Hemanthkumar AK, Kumaraswami V, SoumyaS. A Simple and rapid liquid chromatography method for simultaneous determination of atorvastatin & its metabolites in plasma. J. Chromatogr. B Biomed. Appl. 2006;843(2):339-344.
6. Dailly E, Thomas L, Kergueris MF, Jolliet P, Bourin M. High-performance liquid chromatographic assay to determine the plasma levels of atorvastatin & its metabolites. J. Chromatogr. B Biomed. Appl.2001;758(1):129-135.
7. Summer RL, Catherine AW, Michael GB. Simultaneous determination of atorvastatin & its metabolites from rat tissues using HPLC with ultraviolet detection. J. Chromatogr. B Biomed. Appl.2007;850(1):45-52.
8. Bin F, James TS. Determination of atorvastatin & its metabolites in human plasma using ion-pair HPLC. J. Pharm. Biomed. Anal.2002;28(2):903-908.
9. Namita K, SateeshK, Ramesh P. Simultaneous determination of atorvastatin& its metabolites in dose combinations by high-performance liquid chromatography. Anal. Chim. Acta. 2006;570(4):41-45.
10. Hollandersa RMF, Van EWJ., Ewijk BK, Burgera DM, Wuisa EW, Koopmans PP, Hekster YA, et. al. Determination of atorvastatin& its metabolites in human plasma by reversed-phase high-performance liquid chromatography. J. Chromatogr. B Biomed. Appl. 2000;744(4):65-71.

11. Emilia M, Luisa V, Roberta P, Manuela P, Gianna T, Piergiorgio Z. Simultaneous Determination of atorvastatin & its metabolites in human plasma by RP-LC. J. Pharm. Biomed. Anal. 2002;29(4):1081-1088.
12. Sunil J, Nath MS, Moorthy US. HPLC method development and validation for simultaneous estimation of artemether and lumefantrine in pharmaceutical dosage forms. Int. J. Pharm. Pharm. Sci. 2010;2(4):93-96.
13. Eswarudu MM, Chary TN, Junapudi S, Sushma M. RP-HPLC method development and validation for simultaneous estimation of irbesartanand hydrochlorothiazide in a pharmaceutical dosage form. Asian J. Chem. 2012;5(4):472-476.
14. Hiren NM, Arvind G. Jangid, Ashutosh P, Noel G, Mallika S, Pranav S, et.al. High throughput LC-MS/MS method for simultaneous quantification of atorvastatin & its metabolites in human plasma. J. Chromatogr. B Biomed. Appl. 2007;853(3):320-332.

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