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ORIGINAL ARTICLE

Diabetic Control among Type 2 Diabetes Mellitus (T2DM) Patients before and after the Implementation of Movement Control Order (MCO) due to COVID-19 Pandemic.

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Abstract

Background: The implementation of MCO had changed the routine appointments in clinics and hospital visits, which indirectly affect the management of diabetic patients. In addition, people with diabetes have been reported to have a higher risk of mortality due to COVID-19 infection. This study aims to assess the diabetic control among T2DM patients before and after the implementation of MCO due to the COVID-19 pandemic.
Methods: This was a retrospective study. Medical records from adult T2DM patients who had follow-up visits to Medical Outpatient Department (MOPD) clinic, Hospital Taiping from December 2019 until August 2020 were reviewed. The calculated sample size was 97 patients. Their weight, blood pressure (BP) and blood parameters before and after MCO were compared.
Results: Ninety-nine records were reviewed. The mean age of the patient was 56 years (SD 12.06). 54 (54.5%) were female. Majority were Malays; 71 (71.7%). There was no significant difference in mean BP and weight pre and post MCO. Most of the blood parameter results (FBS, Urea, Creatinine, Total Cholesterol, LDL and Triglycerides) showed no significant difference before and after the implementation of MCO. However, HDL showed significant difference in the result with pre MCO of 1.17mmol/L (SD 0.35) and post MCO of 1.22mmol/L (SD 0.34); p value 0.012. In addition, HbA1c also showed slight improvement with pre value of 8.89% (SD 2.35) and post value of 8.47% (SD 2.24), p value 0.020.
Conclusion: This study showed that the implementation of MCO had a slight impact on diabetic control of T2DM patients in our study population.

Keywords: *Diabetes Mellitus, Control, Movement Control Order.*

Introduction

According to the recent results from the 2019 National Health and Morbidity Survey, one in five adults or about 3.9 million people aged 18 years and above suffered from diabetes in Malaysia.[1] The trend showed an increase in the prevalence of diabetes from 11.2 % in 2011, 13.4% in 2015 and 18.3% in 2019.

A state wide study among Type 2 Diabetes Mellitus (T2DM) patients in Kedah demonstrated that approximately 85% of the patients suffered from uncontrolled T2DM, indicated by HbA1c level above 6.5%.[2] This was consistent with the findings from several other studies, which suggested that the glycaemic control of T2DM patients in Malaysia had been generally suboptimal.[3-5]

Uncontrolled diabetes has been linked to a wide range of complications. The common microvascular complications include nephropathy, retinopathy and neuropathy, while the common macrovascular complications include stroke, cardiovascular disease and peripheral artery disease.[6]

As the World Health Organization (WHO) declared COVID-19 as a global pandemic on 11 March 2020[7] and the increased number of reported positive COVID-19 cases in Malaysia, the government had implemented the Movement Control Order (MCO) in different phases starting from 18 March 2020. As a consequence, most hospitals and clinics had deployed their staffs to cater to COVID-19 screening and management. In order to prevent overcrowding and to ensure that social distancing can be practiced, clinic attendance has been reduced. Furthermore, patients' movement and travel have been restricted due to MCO. People were asked to stay at home and were only allowed to go out for specific reasons and during emergencies only.

The management of diabetic patients have been indirectly impacted by the implementation of MCO due to changes in normal clinic and hospital visits. In addition, people with diabetes have been reported to have higher risk of mortality due to COVID 19 infection.[8-10] This study aims to assess the diabetic control among T2DM patients in our hospital before and after the implementation of MCO due to the COVID-19 pandemic. It may provide insight into T2DM patient education during a pandemic with restricted access to healthcare facilities. Regular assessment and consistent health education for patients to ensure good glycaemic control, optimizing their treatment, and ensuring patients' adherence to treatment and management are essential in order to achieve the goals of treating diabetic patients.

Materials and methods

This was a retrospective study. Medical Outpatient Department (MOPD) cards/ medical records of T2DM patients who attended follow-up at the MOPD clinic, Hospital Taiping from December 2019 until August 2020 were retrospectively evaluated. . The data from the selected medical cards was extracted by the researcher to the data collection sheet. Data extracted from the medical records included socio-demographics (age, gender, race), other comorbidities, blood parameters (Fasting Blood Sugar [FBS], Renal Profile [RP], Fasting Lipid Profile [FLP], Haemoglobin A1c [HbA1c], weight and blood pressure (BP).

The researchers started collecting the data after getting the approval from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia. The data collection period was from 1 October 2020 to 31 December 2020. When collecting the data from the medical records, data on glycaemic control/blood parameters were divided into different time frames: before the MCO implementation (1 December 2019 - 17 March 2020) and after the MCO implementation (10 June - 31 August 2020, during the Recovery

MCO period). The results documented in the medical records were recorded on the data collection sheet as pre data (before the MCO implementation) and post data (after the MCO implementation).

The study population included adult T2DM patients aged more than 18 years, who have been diagnosed with T2DM for at least 1 year and on treatment with either insulin/oral hypoglycaemic drug or both. Exclusion criteria were gestational diabetes mothers (GDM), patient with cognitive impairment, terminal ill disease e.g. cancer or on regular renal replacement therapy. During the data collection period, the researchers screened the medical records for the above inclusion and exclusion criteria. Only the medical records of T2DM patients which fulfilled all the inclusion and exclusion criteria were included in this study.

The sample size calculation was done using PS (Power and Sample Size) program software. Based on power of 80% (β=0.2), alpha of 0.05, with SD of 3.3[11] and an expected mean difference of FBS of 2mmol/l between the timelines, the calculated sample size was 88 patients. Allowing for 10% incomplete data, the final sample size was 97 patients. The researchers conducted the data collection for 3 months with an average of 33 medical records reviewed per month. Based on the MOPD clinic census, there were an average of 236 T2DM patients' visits per month. The proportion of selected medical records from the monthly patients' visits was 1 in 7. Systematic random sampling was applied to select the patients from the list of clinic attendance.

All patients' information was kept anonymous. Descriptive data was expressed as mean and standard deviation (SD) or frequency with percentage for categorical data. Paired t- test was used for comparison of numerical variables. Categorical data was analysed using Mc Nemar test. A value of $P < 0.05$ is considered statistically significant.

This study was registered with the National Medical Research Register (NMRR-20-1515-55499). Ethical approval for this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia [reference no. KKM/NIHSEC/ P20-1555 (4)].

Results

A total of 99 patients were recruited. The sociodemographic characteristics are shown in Table 1. The mean age was 56 (SD 12.06) years. More than half of the patients were female (54.5%) and majority were Malay (71.7%). The commonest co-morbid among the diabetic patients was hypertension (72.7%).

The clinical and blood parameters before and after implementation of MCO were compared in Table 2. There were no significant differences in the readings of most of the parameters except for HbA1c and HDL. The HbA1c reading for the patients reduced from 8.89% (before MCO) to 8.47% (after MCO) with p value 0.020. However, both values were above the normal range for HbA1c. The HDL level increased from 1.17mmol/L to 1.22mmol/L before and after MCO respectively, with a p value of 0.012.

Further comparisons were done for FBS and HbA1c to assess the diabetic control among the patients before and after the implementation of MCO. Results showed that majority of the patients did not have good control of their diabetes before and after MCO as shown in Figure 1. Most of the patients did not achieve the normal reading for FBS and HbA1c pre and post MCO implementation. Nevertheless, there was a small reduction in the percentage of patients with FBS more than 6.1mmol/L (70.7% before MCO compared to 67.7% after MCO) and HbA1c more than 6.5% (83.8% before MCO versus 77.8% after MCO). Figure 2 also shows that 47.5% of the patients had a reduction in their FBS reading and 56.6% of the patients had lower HbA1c levels

after MCO implementation. However, there was no significant difference in the changes in blood sugar control before and after MCO when we conducted the Mc Nemar test with a p value of 0.720 for FBS and 0.146 for HbA1c (Table 3).

Discussion

The COVID-19 pandemic affected society both directly and indirectly. The direct effect is mainly related to the infection of the SARS-CoV-2 virus into the population. The indirect effect of the pandemic is mainly caused by the lockdown or MCO imposed by the government that has a huge impact on the economy, health and social life.

During MCO, people were forced to stay at home, which resulted in change in their physical activity, dietary pattern, health-seeking behaviour and psychological status. All of these may or may not have an impact on blood sugar control in diabetes patients. In this study we found out that, there was a significant difference in HbA1c level before and after MCO. Even though the mean HbA1c reading showed suboptimal level, the mean HbA1c level after MCO was lower than before MCO. Similar significant results were reported in studies done in Greece and India.[12,13] They reported that the HbA1c level among their T2DM patients before and after the lockdown reduced from 6.9% to 6.7%[12] and 7.8% to 7.4%.[13] The percentage of T2DM patients with good blood sugar control (FBS less than 6.1mmol/L or HbA1c less than 6.5%) after MCO was higher than before MCO. Even though it was not statistically significant, the result still conveyed a positive effect.

A systematic review reported that out of 8 studies done among T2DM patients, 4 (50%) studies showed worsening in glycaemic control, 2 (25%) studies showed stability or no change, while another 2 (25%) studies showed better control among the patients.[14] Several observational studies from different countries reported that lockdown generated no or even positive effect to the patients.[15,16] They were keeping themselves physically active in their houses and apartments since they were restricted to go outside during the lockdown period. It was revealed that 80% of the study population maintained their regular exercise and diet control.[10] Some of them practiced safe, simple and workable exercise at home, which included bodyweight exercise, jump rope and online lessons.[17]

More than half of our study subjects were aged below 60 years, which suggests that most of them are in the working age group. During MCO, most of them were required to practice work from home. While at home, there were higher chances that they would eat home-cooked meals, which permitted more healthy meals as compared to ready to eat food in restaurants which can sometimes be very sweet and high in fat. While busy at work, some of the workers even consumed fast food which can be easily delivered to their work places. Besides personal commitment to health, availability of time and family support plays a crucial role for T2DM patients to achieve good glycaemic control.

In contrast, several studies showed an increase in HbA1c after lockdown which indicate worsening in glycaemic control.[18,19] The study also reported that the increase in HbA1c correlated significantly with increase in weight. This might be due to lack of exercise and nonadherence to dietary guidelines during the lockdown.[14] However, this study showed that there were no significant changes in patients' body weight before and after the implementation of MCO. Another study showed that restrictions in physical activity, limited access to the treating doctors and insufficient supply of the anti-diabetic medications during lockdown might contribute to the poor glycaemic control among the patients.[20] In addition, it was shown that during the lockdown, T2DM patients were predisposed to increase in carbohydrate intake, reduced monitoring of blood sugar and widespread mental stress.[21]

Analysis in this study revealed that the HDL level was found to be significantly higher after MCO as compared to before MCO. As HDL is considered as "good" cholesterol, a higher level is better and is associated with a lower risk of heart disease. However, there were no significant differences noted in other lipid profiles (Total Cholesterol, LDL and Triglyceride). Another study reported a contrary result with significant differences shown in Total Cholesterol and LDL levels, while there were no significant differences observed in HDL and Triglyceride.[22] Nevertheless, as this was a retrospective study and review was done on the medical records, no information on any changes in the lipid lowering drug was captured during the data collection.

There were several limitations in this study. It involved only one centre and the results could not be generalized to the whole population. Nevertheless, we believe that this information is still valuable for the health care professionals involved in managing diabetic patients. Since we used secondary data from the medical records, we had limited information on lifestyle changes or behaviour of patients before and after the implementation of MCO that might contribute as reasons to the result obtained from this study. Yet, it still offers real-life data that describes the actual way patients adapt to a pandemic.

Conclusion

As a conclusion, generally the implementation of lockdown or MCO can affect the glycaemic control in T2DM patients either positively or negatively. In this study, it showed that the implementation of MCO had a slight impact on diabetic control among T2DM patients in our study population. The difference may be contributed by the divergence in culture, lifestyle, and geography, as well as the diabetes management between countries. Optimum glycaemic control is of the greatest importance and diabetes education on self-management should be empowered to patients. Self-blood sugar monitoring should be encouraged and the use of telehealth or teleconsultation should be enhanced during this pandemic era.

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Conflict of interest

None declared.

Table 1. Sociodemographic characteristics of patients (n=99)

Variables	Mean (SD)	Frequency (%)
Age (years)	56 (12.06)	
Age group		
- < 60 years		57 (57.6)
- 60 years or more		42 (42.4)
Sex		
- Male		45 (45.5)
- Female		54 (54.5)
Race		
- Malay		71 (71.7)
- Chinese		11 (11.1)
- Indian		17 (17.2)
Having co-morbid		
- Hypertension		72 (72.7)
- Heart disease		37 (37.4)
- Hyperlipidaemia		30 (30.3)

Table 2. Comparison of clinical and blood parameters before and after implementation of MCO (n=99)

Variables	Before MCO Mean (SD)	After MCO Mean (SD)	P value*
Weight (kg)	72.80 (14.54)	72.95 (14.48)	0.738
Systolic BP (mmHg)	140 (20.86)	144 (21.92)	0.067
Diastolic BP (mmHg)	80 (10.10)	80 (12.85)	0.659
FBS (mmol/L)	8.57 (4.35)	8.56 (4.66)	0.974
HbA1c (%)	8.89 (2.35)	8.47 (2.24)	0.020
Urea (mmol/L)	6.38 (4.11)	6.95 (10.29)	0.575
Creatinine (µmol/L)	131.29 (130.39)	135.94 (121.60)	0.414
Total cholesterol (mmol/L)	4.30 (1.12)	4.39 (1.01)	0.379
LDL (mmol/L)	2.43 (1.01)	2.45 (0.89)	0.806
HDL (mmol/L)	1.17 (0.35)	1.22 (0.34)	0.012
Triglyceride (mmol/L)	1.60 (0.78)	1.67 (1.31)	0.571

*paired *t* test

Table 3. Comparison of blood sugar control before and after implementation of MCO (n=99)

Variables	After MCO Frequency		P value*
Before MCO	FBS		
FBS	<6.1 mmol/L	≥6.1 mmol/L	
<6.1 mmol/L	15	14	0.720
≥6.1 mmol/L	17	53	
	HbA1c		
HbA1c	<6.5%	≥6.5%	
<6.5%	13	3	0.146
≥6.5%	9	74	

*McNemar test

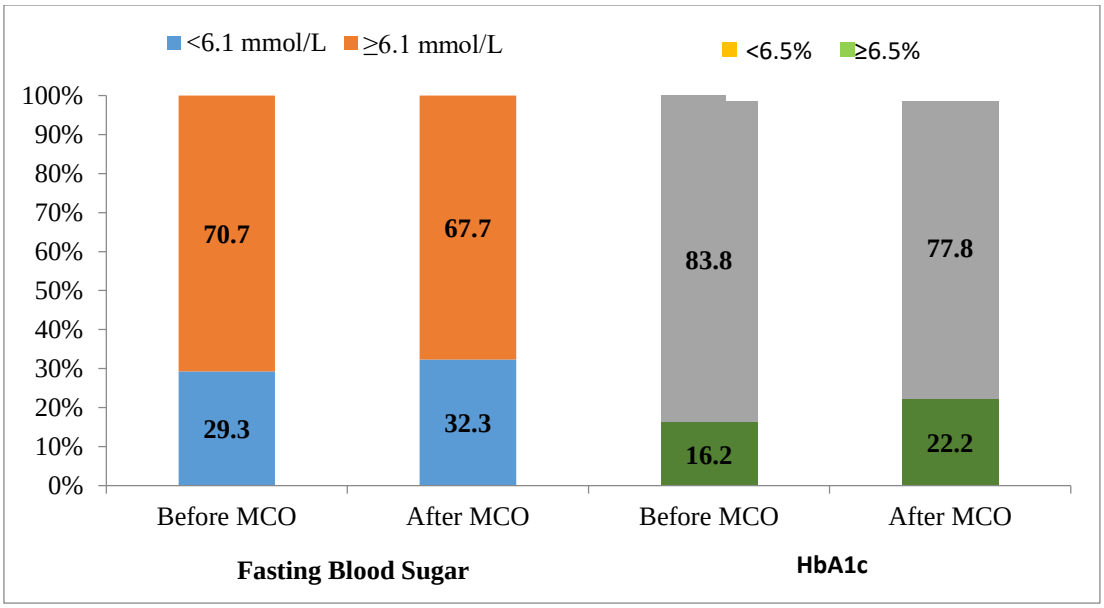

Figure 1. Fasting Blood Sugar and HbA1c level before and after implementation of MCO (n=99)

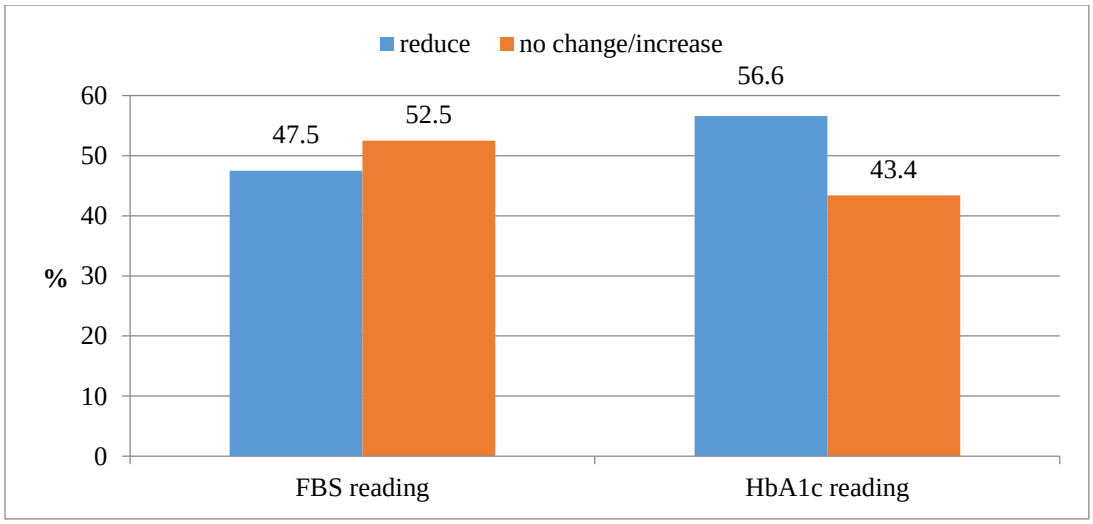

Figure 2. Changes in blood sugar level before and after implementation of MCO (n=99)

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