Access to Healthcare during Lockdown, and its Effect on Glycaemic and Blood Pressure Control in Patients with Type 2 Diabetes and Hypertension- A Cross-sectional Study

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ABSTRACT

Introduction: The Coronavirus Disease-2019 (COVID-19) pandemic had an impact on the health of patients with pre-existing co-morbidities due to increased risk of hospitalisation and mortality. This study looked at accessibility of healthcare and pharmacy services, preference for telemedicine and changes in the diet and lifestyle patterns of patients with type 2 diabetes and hypertension during lockdown.

Aim: To assess how the lockdown impacted the accessibility to healthcare, diet and lifestyle, and its overall impact on the glycaemic and blood pressure control of this population.

Materials and Methods: A descriptive, cross-sectional study was done at Father Muller Hospital, Thumbay (Dakshin Kannada district, Karnataka, India). It involved patients who had type 2 diabetes and/or hypertension and was done over a period of six months from May 31, 2020 (the day lockdown was lifted) to November 30, 2020. A questionnaire was administered. The questions related to proximity and accessibility of healthcare and pharmacy services, awareness, preference for telemedicine, availability of glucometer and blood pressure machines, and diet and lifestyle changes in lockdown were asked. The Body Mass Index(BMI), Glycated

Haemoglobin (HbA1c) levels, and blood pressure measurements, before and after the lockdown were compared. Data was tabulated on an excel worksheet and analysed by calculating frequency (n), percentages (%), mean±standard deviation and paired t-test.

Results: A total of 115 patients were interviewed (64 females, 51 males). A total of 74.8% of patients reported that their nearby health centres were open, but only 26.1% patients chose to visit. A 95.7% of patients had no difficulty in getting medications. Few (25.2%) were aware, and fewer (17.4%) had access to telemedicine during the lockdown. The percentage of 53% would prefer telemedicine, though how many used this facility was not assessed. Most (91.3% and 85.2%, respectively) were compliant with medication and the recommended diet. A 60.7% noted no change in levels of physical activity. Those who smoked or consumed alcohol did not report any increase in consumption. An insignificant increase was noted in the BMI, systolic blood pressure and the HbA1c levels after lockdown.

Conclusion: Despite reduced access to healthcare facilities, BMI, glycaemic and blood pressure control were not significantly affected. This was probably due to the easy availability of medications, and the relatively few changes in the diet and lifestyle of most patients.

INTRODUCTION

India announced a lockdown on the 24th of March, in an attempt to stem the spread of COVID-19 infection. The impact of the lockdown was felt across various sectors. The healthcare sector was directly and severely affected. Although emergency services in hospitals, pharmacies and other essential services were exempted, patients with chronic conditions such as diabetes, hypertension, cardiovascular and chronic kidney disease, may have opted to stay away from visiting hospitals as early evidence of increased risk of serious illness in this population was well observed [1].

India has a large population of patients with diabetes and hypertension. The prevalence of diabetes was 7.3% and 7.8% among women and men (>18 years), respectively. Hypertension prevalence was 23.6% among women and 27.4% among men (>18 years) as depicted by the data collected between 2012-2014 [2]. Diabetes and hypertension were among the top reasons (30%) for consultation at an urban health centre in South India (2011-2012) [3] and also globally (systematic reviews of 12 databases upto 2016) [4]. Patients with non communicable diseases are also at a higher risk of developing severe infection with COVID-19 [5].

Some studies have been done to assess the impact of natural disasters such as hurricanes and earthquakes on the glycaemic control of people with diabetes [6-8]. These studies noted a

worsening of glycaemic control among the population following the natural disasters. A simulation model using multivariate regression analysis was used to analyse the relationship between the duration of the nation-wide lockdown and the Glycated Haemoglobin (HbA1c) [9], it predicted an increment in HbA1c of 3.68% from baseline at the end of 45 days of lockdown. This model was created using glycaemic data from previous disasters (considering it equivalent to the lockdown). An online pilot survey done by Nachimuthu S et al., to study how people with diabetes were coping during the lockdown revealed that only 28% of the respondents were checking their blood glucose levels regularly [10].

A study of the relationship between changes in self-reported physical activity, sedentary behaviour and health during the COVID-19 pandemic in France and Switzerland, found an increase in time spent walking and moderate physical activity and an increase in sedentary behaviour [11]. Whether the nationwide lockdown in India in 2020 had a positive or negative effect on the large group of patients with diabetes and/or hypertension is not known. How the lockdown in 2020 impacted accessibility to healthcare, availability of medicines, changes in lifestyle and the overall impact it had on glycaemic and blood pressure control needs to be studied, especially in the current scenario where most healthcare facilities are under tremendous strain looking after COVID-19 affected patients.

The primary objective of the study was to measure and compare the blood pressure and glycaemic control of patients visiting the Outpatient Department (OPD) after lockdown to before the lockdown, and to see if accessibility to healthcare, pharmacy and telemedicine services along with changes in physical activity and lifestyle, played a role.

MATERIALS AND METHODS

This was a descriptive, cross-sectional study conducted at Father Mullers Hospital, Thumbay (Bantwal Taluk), Mangalore, in the state of Karnataka, India over a period of six months from 31st May 2020 (the day the lockdown was lifted) to 30th November 2020. Institutional Ethical Committee approval was taken (Reference no. FMIEC/CCM/450/2020). After taking due consent from the participants, the questionnaire was administered by the interviewer.

Sample size calculation: A sample size of 115 patients was included in the study. Calculation was based on the formula $n=Z^2*p*(1-p)/(MOE)^2$ at 95% confidence Interval with allowed Margin Of Error (MOE) of 10%, p=7.5% (crude prevalence of diabetes) and p=25.3% (crude prevalence of hypertension) based on the reference article by Geldsetzer P et al., [2].

Inclusion criteria: All adult (>18 years) patients with diabetes mellitus and/or hypertension with or without complications and other co-morbid illnesses (e.g., chronic kidney disease, cardiovascular disease, cerebrovascular disease), those on regular follow-up prior to the lockdown and patients with documented HbA1c levels and blood pressure recordings on multiple OPD visits, at least in the last six months prior to the lockdown were included in the study.

Exclusion criteria: The patients with newly or recently detected diabetes and/or hypertension, those on irregular follow-up prior to lockdown and those patients without documented HbA1c and blood pressure measurements prior to the lockdown.

Study Procedure

Total of 115 patients included in the study were interviewed after they resumed their follow-up for type 2 Diabetes and/or hypertension in the OPD after lockdown got over. Their hospital records were reviewed to document the HbA1c levels within six months prior to the lockdown. The average blood pressure reading from the last three out patient visits (before the lockdown) was recorded. The height (measured on the first out patient visit) and the weight which is recorded every visit, were used to calculate the BMI before the lockdown. Frequency of hospital visits prior to the lockdown were also noted to assess if patients had been on regular follow-up prior to the lockdown.

On the interview day, blood pressure (both arms, sitting position) along with the weight (for calculating BMI), were recorded. HbA1c was tested (if not done in the last three months). A questionnaire was framed by the authors [Annexure-1]. Its content and value were assessed by a scientific committee. It was administered by the interviewer in the out patient department. Questions with regard to accessibility to healthcare and pharmacy services, glucometer, blood pressure devices, and telemedicine, were asked.

STATISTICAL ANALYSIS

Data collected through interview and the observation of the BMI, blood pressure and HbA1c before and after lockdown was entered into Microsoft excel worksheet. Collected data was analysed by frequency, percentages, mean, standard deviation and paired t-test. Analysis was performed using the Statistical Package for Social Sciences (SPSS) version 23.0 software.

RESULTS

Total 115 patients were interviewed. Majority(55.7%) were females, 75.7% patients were in the age group between 41-70 years, 64.3% of the patients were only educated up to high school or less, and patients with both type 2 diabetes mellitus and hypertension numbered 47 (40.8%) [Table/Fig-1].

Variables studied	N (%)
Sex	
Male	51 (44.3%)
Female	64 (55.7%)
Age (Years)	
30-40	11 (9.6%)
41-50	27 (23.5%)
51-60	20 (17.4%)
61-70	40 (34.8%)
>70	17 (14.8%)
Educational status	
High school and below	74 (64.3%)
Upto preuniversity	12 (10.4%)
Graduate and above	19 (16.5%)
Illiterate	10 (8.7%)
Health status	
Type 2 DM	68 (59.1%)
Hypertension	94 (81.7%)
Type 2 DM+Hypertension	47 (40.8%)

[Table/Fig-1]: Demographic data and clinical data.
DM: Diabetes mellitus

An 86 (74.8%) patients reported that their nearby health facility was open during lockdown as against 16 (13.9%), with the rest not sure (11.3%). Most patients were able to stick to the recommended diet and were compliant with medicines. A total of six patients reported smoking and 16 patients reported alcohol consumption. None of the patients reported an increase in alcohol consumption or smoking, with 50% actually reporting a drop in most patients (82.6%) had no difficulty accessing their nearby health centres or obtaining medications from their nearby chemist (95.7%). Only 25.2% of patients were aware of telemedicine, and an even smaller percentage (17.4%) had means to access it. A 53% of patients interviewed were willing to use telemedicine during the pandemic. Most patients were able to stick to the recommended diet and were compliant with medicines. None of the patients reported an increase in alcohol consumption or smoking, with 50% actually reporting a drop in alcohol intake [Table/Fig-2].

			Questionnaire parts and the responses of subjects			
			Accessibility to healthcare facility			
Response	**No. of patients who reported their health facility was open**	**No. of Patients who visited health care facility during lockdown**	**No. of patients with difficulty accessing nearby health facility/ pharmacy during lockdown**	**Availability of medications for diabetes and/or hypertension in pharmacy**	**Glucometer (for personal use)**	**Blood pressure apparatus (for personal use)**
Yes	86 (74.8%)	30 (26.1%)	20 (17.4%)	110 (95.7%)	29 (39.2%)	24 (22.6%)
No	16 (13.9%)	85 (73.9%)	95 (82.6%)	5 (4.3%)	45 (60.8%)	82 (77.4%)
Not sure	13 (11.3%)					
Total	115	115	115	115	74	106

Awareness, access and preference for telemedicine			
Response	No. of patients aware of telemedicine	No. of Patients with access to telemedicine	No. of patients willing to use telemedicine during lockdown
Yes	29 (25.2%)	20 (17.4%)	61 (53%)
No	86 (74.8%)	95 (82.6%)	54 (47%)
Total	115	115	115
Compliance with medication and dietary advice			
Response	No. of patients compliant with medication during lockdown	No. of patients able to follow recommended diet during lockdown	
Yes	105 (91.3%)	98 (85.2%)	
No	10 (8.7%)	17 (14.8%)	
Total	115	115	
Change in physical activity, smoking and alcohol consumption pattern during lockdown			
Response	Change in physical activity during lockdown	Change in smoking pattern during lockdown	Change in alcohol consumption during lockdown
Increased	9 (7.8%)	0 (0%)	0 (0%)
Decreased	36 (31.3%)	2 (33.7%)	8 (50%)
Remained same	70 (60.9%)	4 (66.7%)	8 (50%)
Total	115	6	16

[Table/Fig-2]: Access to healthcare facility and pharmacy, availability of medications, glucometer, and blood pressure apparatus.

Clinical details of subjects		Total (N)	Mean	Standard deviation	Paired t-test (p-value)
BMI	Before lockdown	115	26.9165	5.76183	0.709
	After lockdown	115	26.9553	5.49196	
SBP	Before lockdown	115	139.77	18.778	0.155
	After lockdown	115	142.61	21.118	
DBP	Before lockdown	115	86.37	9.677	0.538
	After lockdown	115	85.74	10.238	
Glycated haemoglobin (HbA1c)	Before lockdown	68	8.980	2.6392	0.659
	After lockdown	68	9.151	2.6167	

[Table/Fig-3]: Comparison of the Body Mass Index (BMI), blood pressure Systolic (SBP) and Diastolic (DBP) and HbA1c (Glycated Haemoglobin) before and after lockdown.

A marginal increase in the BMI, systolic blood pressure and the HbA1c was noted after the lockdown [Table/Fig-3].

DISCUSSION

The COVID-19 has had an enormous impact on the lives of people around the world. The lockdown announced in several countries as a measure to stem the spread of infection has been a disruptor, more so, for patients with chronic diseases such as diabetes and hypertension. It was assumed that the lockdown and the various challenges associated with it such as difficulty getting medication and access to health facility, changes in dietary patterns and physical activity would adversely impact these patients. This study showed that most patients chose to stay away from the hospital despite a majority of them reporting their nearby health centre being open. Medication availability was not a problem as most pharmacies were also open. However, the percentage of patients having glucometers and blood pressure machines to allow self monitoring of blood glucose and blood pressure was low. Another important facet in accessing healthcare that this study highlighted was the relatively low awareness of telemedicine and an even lower percentage of patients with access to it. The lockdown did not affect dietary patterns and compliance to medications in patients with type 2 diabetes and hypertension. While there were some, who reported a decrease in their levels of physical activity, most patients did not notice any change. A very small percentage of patients were smokers and consumed alcohol and even they reported either no change or a decrease in consumption patterns during lockdown.

So, while on the one hand, patients had reduced exposure to hospital and physical or telemedicine consultations, on the other hand, compliance with medication, diet and physical activity was maintained. The present study found a non significant increase in the BMI, systolic blood pressure and the HbA1c levels.

If a negative impact were to be noted, it would mean that a greater effort would be required to educate patients with diabetes and hypertension, about diet and lifestyle changes, apart from self monitoring of blood glucose (whenever possible) and blood pressure monitoring, in unprecedented times such as the lockdown. Also, harnessing technologies such as telemedicine to keep patients in touch with their healthcare providers, would help in cutting down the unnecessary exposure of this group of patients to healthcare setups which are already buckling under the strain of looking after COVID-19 affected patients.

Now, several studies done across the world have looked into the impact of lockdown on various aspects relating to health and healthcare of patients- including those with diabetes and other metabolic problems. A multicentre cross-sectional study on the impact of health and provision of healthcare services during the first COVID-19 lockdown in India [12], showed that all five dimensions of healthcare (affordability, availability accessibility, adequacy, and appropriateness) were negatively affected.

Self-Monitoring of Blood Glucose (SMBG) is an approach which allows people with diabetes to monitor their blood glucose levels using a glucometer. A cross-sectional study on the impact of lockdown on self care management among 1406 patients with type 2 DM done in Lucknow, India, revealed that 69.7% (980/1406) patients were able to monitor their blood sugar levels [13]. Present study showed a lower percentage (39.2%) of patients possessing a glucometer. This could be due to the fact that 64.3% of patients in the present study were educated up to high school or lower.

Most studies have focused on the impact, lockdown had on glycaemic control and on the role of SMBG in patients with diabetes. The impact on hypertension control remains insufficiently studied. Most patients depend on the nearby clinic or health facility for blood pressure monitoring. So, it was no surprise that in this study, only 22.6% of patients with hypertension owned a blood pressure machine. How valid and accurate these devices were, was not known.

The pandemic brought forth the option of telemedicine. World Health Organisation (WHO) has defined it as "the delivery of health care services, where distance is a critical factor, by all health care

professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" [14]. Till the lockdown, this was not used widely by physicians for patient interaction. It was realised that telemedicine (through video, phone, and internet-based platforms (e.g., applications) could be used by doctors to monitor SMBG charts and self monitored blood pressure values. A meta-analysis of 35 randomised controlled trials of telemedicine (video, phone and email) from China {(N= 3514) given telemedicine over 3-60 months} was done. The study showed a reduction in HbA1c by -0.37% (p<0.001) in telemedicine group compared to controls [15].

In another study done in India, 2510 individuals (with type 2 diabetes mellitus) who had visited a tertiary care centre in the year prior to the lockdown were interviewed. 382(15.2%) of these patients attempted to consult their healthcare providers, but only 30.6% (n=117) patients utilised the telemedicine facility. Of these 82% were happy with their experience and 68% were willing to use telemedicine in the future [16]. In the present study, only 25.2% of patients were aware about telemedicine, and an even smaller percentage (17.4%) had access to it. A 53% of all patients were open to using telemedicine for managing their blood pressure and blood sugar during the lockdown.

An international expert position paper on the evidence and recommendations on the use of telemedicine for the management of hypertension has proposed that the best healthcare model for telemedicine in hypertension management should include remote monitoring and transmission of blood pressure readings along with education on lifestyle, risk factors and compliance with medication [17]. An online pilot survey done on 100 registered patients with diabetes in South India showed 80% of patients were able to follow a regular exercise regime and diet control during the lockdown [10], something similar to what this study found.

A study in Australia that analysed data from its 10,000 step program (members logged the number of steps using fitness trackers), showed a decrease in the step count per day during the lockdown across all age groups and gender. However, physical activity picked up towards the end of the lockdown as restriction was eased [18]. Alcohol and smoking are modifiable risk factors for hypertension. In India, pubs, liquor shops and shops selling tobacco products remained shut during lockdown. This reflected on the consumption pattern of alcohol and smoking. This study noted either no change or a decrease in use. It is also possible that associated decrease in social interaction may have played a role in this reduction. On the other hand, insecurity related to loss of employment, stress of getting infected, and boredom, could increase the desire to smoke [19]. World over, there was an increase in alcohol consumption. Sales in the United States of America (USA) increased 55% [20]. Similar trends were seen in Canada, where 44% attributed the increase to stress [21]. A survey of 1491 adults in Australia showed that a majority (93%) reported either no change or a decrease in smoking status during the pandemic [22].

Stress, may lead to people consuming 'comfort foods'- those rich in sugar and salt. High intake of sodium is linked to increase in blood pressure. In a study in India done by Khader MA et al., a large majority of patients with type 2 DM had increased their food intake during the lockdown [23]. The index study did not point to any significant changes in dietary habits. This could be because of the decrease in eating out as well as in social gatherings such as marriages and also because of reduced availability of packaged and processed food.

A study done in Turkey showed a statistically insignificant increase in the body weight and HbA1c in patients with Type 2 DM during the lockdown [24]. These findings were similar to that in the present study. Fewer studies have assessed the impact of the lockdown on blood pressure control. Kreutz R et al., in a review article looked into various factors that could influence blood pressure control during lockdown. They noted that increase in amount of food consumed, increase in processed food intake, decrease in physical activity, increase in alcohol use and anxiety could potentially increase blood pressure. Decrease in work related stress, increase in sleep time and a decrease in noise and air pollution could result in blood pressure decrease [25]. This study did not look at the overall impact on blood pressure. Our study showed an increase in the systolic blood pressure and a decrease in the diastolic pressure after lockdown. These changes were however statistically non significant.

Limitation(s)

For calculation of the sample size, the allowable error was taken as 10%. A lesser MOE would have allowed a larger sample size. Another aspect that could have been explored was how many patients actually used telemedicine. We did not follow-up the patients beyond their first visit after the lockdown was lifted, and it would have been interesting to note the trend in blood pressure measurements and HbA1c levels on subsequent visits.

CONCLUSION(S)

This study looked at how the first lockdown had an impact on access to healthcare and its ramifications on the glycaemic control of patients with type 2 DM and on the blood pressure control of hypertensive patients. Despite reduced access to healthcare and telemedicine facilities, BMI, glycaemic and blood pressure control were not significantly affected. This was probably due to the easy availability of medications, and the relatively few changes in the diet and lifestyle of most patients. However, a lack of monitoring and follow-up could have a detrimental effect on patient health. Increasing telemedicine penetration might help in overcoming this problem.

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ANNEXURE-1

Access to healthcare during lockdown, and its effect on glycemic and blood pressure control of patients with diabetes and hypertension

Hospital ID   Age :   Sex:

Address:

*Phone no: *Marital status:

*Type of household: Joint/Nuclear

*Educational qualifications: *Occupation :

Chronic conditions:	*Duration
DM	
HTN	
Cardiovascular Disease	
Ckd and Others	

1. Nature of follow-up: Regular/Irregular

2. Frequency of hospital visit

HEIGHT:_____cm

	Before lockdown	After lockdown
WEIGHT/BMI		
SYSTOLIC BP		
DIASTOLIC BP		
FBS		
PPBS		
HBA1C		

QUESTIONNAIRE:

1. Nearest hospital/clinic- distance from home.	____KM
2. Nearest pharmacy- distance from home.	____KM
3. Was your routine/nearby health facility/clinic open during the lockdown period?	YES/NO
4. Did you experience any worsening of any symptom/emergencies during the lockdown period?	YES/NO
5. Did you visit any health facility during the lockdown period?	YES/NO
6. Were you treated there or referred?	TREATED/REFERRED
7. Did you have difficulty reaching the nearest health facility/pharmacy?	YES/NO
8. Were all your medications available in the pharmacy?	YES/NO
9. Do you have a glucometer at home?	YES/NO
10. Do you have a BP measuring instrument at home?	YES/NO
11. Are you aware about telemedicine?	YES/NO
12. Do you have access to telemedicine?	YES/NO
13. Would you prefer communicating with your doctor through telemedicine?	YES/NO
14. Were you afraid of visiting your health facility during the lockdown.	YES/NO
15. Are you aware you are at an increased risk of developing symptomatic COVID?	AWARE/NOT AWARE
16. Do you feel your health concerns will be given less importance in these times?	YES/NO
17. Were you able to stick to the prescribed diet?	YES/NO
18. How would you compare your physical activity to before lockdown?	INCREASED/DECREASED/SAME
19. Were you compliant with medication?	YES/NO
20. Do you smoke?	YES/NO
21. If yes	INCREASED/DECREASED/SAME
22. Do you consume alcohol?	YES/NO
23. If yes	INCREASED/DECREASED/SAME