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A Study on the Effect of the COVID-19 Pandemic and Lockdown on Diabetes-related Behaviors, Psychosocial Consequences, and Glycemic Control in Patients with Type 2 Diabetes in a Tertiary Care Hospital in India

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Abstract

Background

This study aimed at studying the impact of COVID-19 and COVID-19 related lockdowns on glycemic control as well as the psycho-social aspects in patients with type 2 diabetes.

Methods

This was a cross-sectional study conducted from a tertiary care center in Telangana, India. Pre-lockdown and post-lockdown clinical aspects and the impact of the lockdown on psycho-social aspects were studied in a cohort of 300 patients suffering from type 2 diabetes.

Results

The post lockdown post-prandial blood glucose was found to be significantly higher (p=0.035) than the pre-lockdown and also observed higher HbA1c in post lockdown than pre-lockdown (p=0.065). There were varying degrees of anxiety and distress reported in various psycho-social parameters with an overall relatively low average score (2.8 out of 10) on a scale of 0 to 10. Diabetic distress was found to be low, and social support scores were reasonably high.

Conclusions

COVID-19 related lockdowns led to poorer glycemic control in patients suffering from type 2 diabetes. However, lockdown and COVID-19 related anxiety or distress was found to have a low prevalence in the studied cohort. It is important to ensure timely review and focus on the optimal management of chronic illnesses even during a lockdown.

Keywords: Anxiety, Covid, Diabetes, Distress, Lockdown, Survey

Introduction

The COVID-19 pandemic has crossed more than 273 million cases and over 5.3 million deaths have been reported globally [1]. As a measure of controlling the spread of the infection, various countries relied on 'lockdowns' early in the pandemic. These lockdowns have an adverse effect on patients with underlying chronic conditions such as diabetes, where the disruption of a routine diet, routine exercise regimens, regular medical reviews, anxiety, stress, and potential disruption in the supply chain of anti-diabetic drugs resulting in hyperglycemia [2]. In India, the initial lockdown started in the last week of March

2020, followed by serial lockdowns and relaxation of restrictions, which has had a direct impact on the management of chronic diseases [2].

A few reports have aimed to study the impact of these lockdowns on glycemic control and diabetes management, but data on the psychosocial aspects have been lacking [2-5]. We aimed to study these factors in a cohort of diabetes patients who visited our center in the pre-lockdown and post-lockdown period, along with the impact of the lockdown on glycemic control.

Methods

This was a cross-sectional study conducted in a tertiary care center in Telangana, India. Adult type 2 diabetes patients who visited the outpatient department of Endocrinology, Nizam's Institute of Medical Sciences, Hyderabad, India before and after the COVID-19 related lockdown were included in the study. Patients who only visited once, patients suffering from any chronic neurological or psychological illness unrelated to diabetes, and patients aged less than 18 years were excluded from the study. Ethical approval was obtained from the Institutional Ethics Committee. Informed consent was obtained from all the patients.

Definitions And Methods

A questionnaire which includes questions on COVID-19-specific worries as well as such worries related to diabetes, socio-demographic and health status, diabetes-related social support, diabetes distress, and changes in diabetes-related behaviors was developed and pre-tested on a group of 10 volunteers who were not included in the study.

Socio-demographic and health status items include age, gender, educational level, place of residence, occupation, duration of diabetes, specific diabetic drug classes, regularity of medication intake, complication status, and latest HbA1c measurement as well as questions regarding whether relatives or respondents themselves have experienced COVID-19 symptoms or been diagnosed with COVID-19 with or without hospitalization are also included.

Items on COVID-19-specific worries included one question measuring general worries due to the COVID-19 pandemic: 'How worried are you about the Corona-crisis on a scale from 1 to 10?', with a yes or no list of ten potential diabetes-related worries due to the COVID-19 pandemic.

Measures of social relations include general and diabetes-specific loneliness and diabetes-specific social support. General loneliness was measured with the three-item UCLA Loneliness Scale [6-7]. With response categories 'never/rarely', 'sometimes', and 'often', providing a total score from 0 to 9. Diabetes-related loneliness was measured with two questions developed for a previous qualitative pilot study [8] and takes the same format as the UCLA Loneliness Scale. The questions measure: (1) if the respondents missed someone to talk to about diabetes; and (2) whether they felt alone with diabetes. The questions on loneliness are accompanied by a 1- to 10-point scale about the degree of feelings of isolation.

Diabetes-related social support from the family, friends, work colleagues, healthcare professionals, people in the community, and social media was measured using the questions inspired by the Diabetes Attitudes, Wishes and Needs (DAWN) Support for Diabetes Self-Management Profile [9]. The original scale is a measure of how supportive the potential support providers are. We also included social media as a potential source of support which is not included in the original scale. The social support questions were analyzed individually.

Diabetes distress is measured by the brief two-item diabetes distress scale (DDS2) [10] 'Feeling overwhelmed by the demands of living with diabetes and 'Feeling that I am often failing with my diabetes routine'. Possible scores on each item range from 1 (not a problem) to 6 (a very serious problem) was noted. The DDS2 score is derived as the average of the two items. A score > 2 indicates moderate to high diabetes distress.

Changes in diabetes-related behaviors as a result of the COVID-19 pandemic are measured with a yes/no list of potential behavior changes related to diet, physical activity, medication taking, and measurement of blood glucose. The questionnaire that was used is attached in the supplementary materials.

Procedure

Volume 5, Issue 1; January-February 2022; Page No 217-227

A cross-sectional survey was conducted among people with diabetes to know how they are coping with diabetes during the COVID pandemic. A self-constructed questionnaire which has two main components, one about their medication history of diabetes, presence of any other comorbidities including cardiac and renal disease, and another section about their perception about COVID-19 and its impact on their diabetes was administered after obtaining informed consent by two of the investigators to all patients in English or the local language (Telugu) as per the patient's preference.

Statistical Analysis

The data was entered in Microsoft excel 2016. Statistical analysis was carried out by using IBM SPSS, version 20. Continuous variables were described by using mean (S.D.) and proportions for the categorical variables. The paired t-test was used to assess the statistical significance to compare a dependent continuous variable having normally distributed data. A p-value of less than 0.05 was considered to be statistically significant.

Results

Socio-Demographic Parameters

Type 2 diabetes (n=300) patients who fulfilled the pre-determined inclusion criteria were enrolled in the study. There were 170 (56.7%) males and 130 (43.3%) female patients. The mean age of the study subjects was 55.35±12.33 years.

Clinical Parameters

The mean duration of diabetes in the study was 9.6 ± 7 years. Around 0.7% of the respondents were being managed with only lifestyle modifications, 176 (58.7%) of the respondents were being managed with oral antidiabetic drugs (OADD), 30 (10%) of the respondents were being managed with only insulin, while 92 (30.6%) of the respondents were being managed with a combination of OADD and insulin (Table 1).

We observed 263 (87.7%) of the respondents were receiving metformin, while 181 (60.3%) of the respondents were receiving a sulphonylurea, 3 (1%) of the respondents were receiving a thiazolidinedione, 18 (6%) of the respondents were receiving an alpha-glucosidase inhibitor, 93 (31%) of the respondents were receiving a DDP4 inhibitor, 27 (9%) of the respondents were receiving an SGLT-2 inhibitor, and 1 (0.3%) of the respondents was receiving a GLP-1 analog (Table 1).

As shown table 1, 16 (5.3%) of the respondents had documented diabetic retinopathy while 284 (94.7%) did not. On the otherhand, 30 (10%) of the respondents had documented diabetic nephropathy, while 270 (90%) did not. 49 (16.3%) of the respondents had documented diabetic neuropathy while 251 (83.7%) did not. 13 (4.3%) of the respondents had a history of a cerebrovascular accident while 287 (95.7%) did not. 47 (15.7%) of the respondents had a history of coronary artery disease while 253 (84.3%) did not. 1 (0.3%) of the respondents had a history of peripheral vascular disease while 299 (99.7%) did not (Table 1).

Diabetes-Related Parameters:

As shown in table 3, the mean pre-and post lockdown weights were 68.1±11.1 kg and 68.6±11.1 kg respectively. The mean pre-lockdown HbA1c was 8.1±1.9% whereas post lockdown was 8.4±2.1%. The post lockdown HbA1c was found to be higher than the pre-lockdown HbA1c (p=0.067). The mean pre-lockdown post-prandial blood glucose was 217.8±86.2 mg/d whereas in post lockdown was 233.6±97.4 mg/dL. The post lockdown PPBG was found to be significantly higher than the pre-lockdown PPBS (p=0.035), however we did not significant difference in fasting blood glucose between pre and post-lockdown period (p=0.259). The mean frequency of blood glucose monitoring during the lockdown was once in 3.1±0.6 months (Table 3).

COVID-19 Disease:

As shown in table 4, 18 (6%) respondents reported having symptoms suggestive of COVID-19 during the lockdown period, while 282 (94%) did not. Among the studied subjects, 17 (5.7%) respondents reported having tested positive for COVID-19 during the lockdown period, 5 (1.7%) respondents reported having a first-degree family member had tested positive for COVID-19 during the lockdown period, while 278 (92.6%) respondents did not have COVID-19 disease. Out of these 17 patients, 5 (29.4%) required hospitalization for COVID-19.

Diabetic Distress Parameters:

Volume 5, Issue 1; January-February 2022; Page No 217-227

The frequency of responses to the diabetic distress-related questions is summarized in table 5. Majority of the patients (70-75%) did not feel overwhelmed by the demands of living with diabetes and did not experience that they are failing with their diabetes routine.

Social Relations:

The frequency of responses to the social relations-related questions is summarized in table 6. Feelings like starving for company, being left out, isolated from others, miss someone to talk to about diabetes and feeling Lonely with diabetes were experienced by only a minor group (1-3%) of patients.

Social Support:

The frequency of responses to the social support questions is summarized in table 7. Family, friends or other close people were the most supportive (88%) while dealing with diabetes during the COVID pandemic. Around 87% of patients received support from their Diabetes Health care team.

Changes In Diabetes-Related Behaviors:

The frequency of responses to the diabetes-related behavior questions is summarized in table 8. Majority of the patients (53%) daily diabetes behavior such as Eating, Exercising, Checking blood sugar and medication intake did not change during the pandemic. 25% of the patients reported exercising less than usual because of constraints of the pandemic.

Discussion

This was a cross-sectional study aimed at studying the impact of COVID-19 and COVID-19 related lockdowns on glycemic control as well as the psycho-social aspects in patients with T2DM. We found that during the lockdowns for the COVID-19 pandemic, adults T2DM had lockdown-induced adverse effects on glycemic control and diabetes management as measured using blood glucose values. The glycemic control had worsened considerably as evidenced by the significantly higher post-prandial blood glucose, and higher glycated hemoglobin values post-lockdown as compared to pre-lockdown values. This was similar to the results reported by Dalmazi et al. in a cohort of adult and pediatric patients with type one diabetes [4] and by Ghosal et al. [5] who reported a significant increase in HbA1c values in a predictive model examining the impact of a complete lockdown on glycemic control in diabetics. A study done among T2DM patients in Turkey similarly showed increase in weight, HbA1C, blood glucose after lockdown period albeit the results were not statistically significant.[11] The gulf war which resulted in a lockdown of 60 days showed insignificant worsening of glycemic control and weight gain in both T1DM and T2DM patients. [12] The reason for higher mean glucose values across parameters at the end of the lockdown as compared to before, could be due to multiple factors. A lack of adequate medical care, regular review, lack of exercise and change in lifestyle due to remaining indoors, changes in diet, and possibly anxiety and stress induced by the pandemic as well as lockdowns [4-5]. A multinational electronic survey about home confinement showed that daily sitting time increased from 5 to 8 hours per day and the deterioration of eating quality. [13]. The Indian Government has not laid down any guidelines for exercise for people during lockdown which also contributes to physical inactivity. In countries like UK, exercise guidelines were in place both for outdoor and indoor activities even during stringent lockdown period. For example, people were allowed to exercise with one person outside of their household once a day. The socioeconomic difficulties caused by lockdown could also affect eating habits and nutrition. Obesogenic food with less healthy ingredients is cheap, easily prepared where as healthy and nutritious food is relatively expensive and time consuming to prepare.

We also found that there were varying degrees of worries associated with the impact of the pandemic and the lockdown on underlying diabetes. Overall, the patients had a relatively low average score (2.8 out of 10), but almost one-third of the respondents had concerns about certain factors such as diabetes being linked to more severe disease and poorer outcomes in COVID-19. Although we could not find a similar report to compare our findings to, Nachimuthu et al. reported that in a cohort of 100 diabetic patients, 40% of them reported feeling anxiety about the COVID-19 pandemic, which is a similar observation to ours [14]. Patients with underlying diabetes are found to have more severe disease and poorer outcomes in COVID-19 infections [15]. This factor was reflected in the worries expressed by the patient in our study, with this being the

Volume 5, Issue 1; January-February 2022; Page No 217-227

predominant source of anxiety among the studied patients. Interestingly, in both our study and in theirs, almost half the respondents denied any anxiety related to the pandemic.

With respect to diabetic distress as well as social relations, the majority of our patients reported good support systems and low levels of stress and anxiety. This was also reflected in the social support assessment with relatively low scores in either extreme, ie, patients did not feel that they were lacking support nor were they being overwhelmed by it. The majority of our patients also reported that their behavior related to diabetes had not changed as a result of COVID-19 or the lockdowns. These findings reflected the findings of Nachimuthu et al, where their patients were also found to be keeping active and managing diabetes-related parameters well [14]. Bala et al. [16] reported in a similar survey looking at diabetes related distress and other psychological stress related to COVID-19 among diabetic patients and found that the prevailing stress and worry was very low. However, these results should be interpreted with caution and may be geography specific as a large online survey involving more than 2000 respondents all over India found that the prevalence of anxiety was 3.3%, of obsession was 13.5% and of fear was 46.9% in the general population [17]. The disparity in our population could be due to the difference in scales that were used to measure these parameters and also because our questions pertained specifically to diabetes and COVID-19 rather than COVID-19 alone.

The strengths of our study include direct face to face interview with the participants rather than telephonic and online interviews used in the previous studies. This helps to avoid erroneous reports when measuring important parameters like blood glucose and HbA1c.

Our study had some limitations. We did not measure any of these psycho-social parameters prior to the pandemic in this population, and hence a comparison was not possible. The interval between the pre-lockdown and post-lockdown parameters were also variable in the study which could have led to some confounding factors. The convenient sampling method used in the study couples with the fact that this data was obtained from a single center and would not be representative of the general population and could account for some of the results based on local societal norms and culture.

Conclusion

COVID-19 related lockdowns led to poorer glycemic control in patients suffering from T2DM. However, lockdown and COVID-19 related anxiety or distress was found to have a low prevalence in the studied cohort. It is important to ensure timely review and focus on the optimal management of chronic illnesses even during a lockdown. Adequate care must be taken during situations like these to maintain good glycemic control in order to minimize the adverse effects associated with COVID-19 in patients with diabetes. Ensuring adequate exercise and an appropriate diet with timely access to medication and medical help can serve to improve glycemic control as well as reduce anxiety and stress associated with COVID-19 in diabetic. People should be educated about availability of teleconsultation facilities and should be encouraged to utilize such facilities for the management of chronic conditions like diabetes. The insights from this study aids us to manage diabetes effectively in future lockdowns if any, for COVID pandemic or any novel pandemics which may ensue in future.

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Volume 5, Issue 1; January-February 2022; Page No 217-227

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Volume 5, Issue 1; January-February 2022; Page No 217-227

Table 1: Clinical characteristics of the subjects

Parameter	N =300 (%)
Duration of diabetes (yrs) (mean ± SD)	9.6 ± 7.0
Treatment regimen	
Lifestyle modifications	2 (0.7)
OADDs	176 (58.7)
Insulin	30 (10)
OADDs and insulin	92 (30.6)
Type of OADD	
Metformin	263 (87.7)
Sulphonylurea	181 (60.3)
Thiazolidinedione	3 (1)
α-glucosidase inhibitor	18 (6)
DDP4 inhibitor	93(31)
SGLT-2 inhibitor	27 (9)
GLP-1 analogue	1 (0.3)
Microvascular complications	
Diabetic retinopathy	16 (5.3)
Diabetic nephropathy	30 (10)
Diabetic neuropathy	49 (16.3)
Macrovascular complications	
Cerebro-vascular accident	13(4.3)
Coronary artery disease	47 (15.7)
Peripheral vascular disease	1 (0.3)
Other co-morbidities	
Asthma	4 (1.3)
Cancer	8 (.7)
Thyroid related disorders	62 (20.7)
Rheumatological conditions	9 (3)
Neurological conditions other than stroke	6 (2)

Volume 5, Issue 1; January-February 2022; Page No 217-227

Table 2: Frequency of responses to diabetes-related questions

Question	N =300(%)
Regular diabetes medications intake over the last 6 months?	280 (93.3)
Difficulty in getting medications over last 6 months?	12 (4)
If yes to the previous question, which diabetic medication was unavailable in the pharmacy? (n=12)	
Metformin	1 (8.3)
Sulphonylurea	2 (16.7)
Thiazolidinedione	0 (0)
Alpha glucosidase inhibitor	0 (0)
DDP4 inhibitor	3 (25)
SGLT-2 inhibitor	3 (25)
GLP-1 analogue	0 (0)
Insulin	3 (25)
Did you have financial problems to buy your diabetic medications?	9 (3)
Did you stop taking any diabetic medications due to financial constraints?	8 (2.7)
Number of visits for diabetes management made post lock down? (mean ± SD)	2 ± 0.9

Table 3: The comparison of diabetes-related parameters in the study in the pre-lockdown and post-lockdown period

Parameter	Pre-lockdown	Post-lockdown	p value
Weight (Kg)	68.1±11.1	68.6±11.1	0.58
HbA1c (%)	8.1±1.9	8.4±2.1	0.067
FBS (mg/dL)	160.5±62.3	166.6±68.4	0.259
PPBS (mg/dL)	217.8±86.2	233.6±97.4	0.035*
Frequency of blood sugar monitoring (months)	3.1 ± 0.6		

All values are expressed as mean ± SD

Volume 5, Issue 1; January-February 2022; Page No 217-227

Table 4: Frequency of responses to COVID-19 related questions

Parameter	N=300 (%)
On a scale from 1 to 10, how worried are you about the Corona crisis? (mean ± SD)	2.8±2.3
What makes you worried about the Corona crisis regarding your diabetes?	
If there could be a shortage of the diabetes medication, I need	14 (4.7)
If there could be a shortage of the equipment, I need to manage my diabetes (e.g., test strips, sensor parts)	11(3.7)
If there could be a shortage of the food, I need to manage my diabetes	15 (5)
That I due to my diabetes might be overly affected if infected by the Corona virus	58 (19.3)
That people with diabetes are labelled as a 'risk group' regarding the Corona virus	100 (30)
That I may not be able to manage my diabetes if I am infected with the Corona virus	32 (10.7)
That I may not be able to access my diabetes health care team if I need to	28 (9.3)
That the quality of the provision of diabetes care may decrease during the Corona crisis	11(3.7)
That I may not be able to manage how changes in my everyday life (e.g., work from home, less social interaction) affect my blood sugar	10 (3.3)
I am not worried about my diabetes because of the Corona crisis	141(47)

Volume 5, Issue 1; January-February 2022; Page No 217-227

Table 5: Frequency of responses to diabetic distress related questions

	Not a problem	Mild problem	Moderate problem	Significant problem	Serious problem	Very serious problem
Feeling overwhelmed by the demands of living with diabetes	214 (71.3%)	65 (21.7%)	15 (5%)	4 (1.4%)	1 (0.3%)	1 (0.3%)
Feeling that I am often failing with my diabetes routine	225 (75%)	48 (16%)	15 (5%)	10 (3.4%)	1 (0.3%)	1 (0.3%)

Table 6: Frequency of responses to social relations related questions

	Almost never or never	Sometimes	Often
Starved for company	249 (83%)	43 (14.3%)	8 (2.7%)
Left out	267 (89%)	29 (9.7%)	4 (1.3%)
Isolated from others	263 (87.7%)	34 (11.3%)	3 (1%)
Miss someone to talk to about diabetes	261 (87%)	36 (12%)	3 (1%)
Lonely with diabetes	274 (91.3%)	24 (8%)	2 (0.7%)

Table 7: Frequency of responses to social support related questions

Overall support	Not supportive	Somewhat supportive	Very supportive	Not relevant	They have been too aware of my diabetes
Family, friends or other people close to you	6 (2%)	22 (7.3%)	264 (88%)	0	8 (2.7%)
People at work or school	8 (2.7%)	69 (23%)	144 (48%)	76 (25.3%)	3 (1%)
Diabetes Health care team	6 (2%)	23 (7.7%)	263 (87.7%)	4 (1.3%)	4 (1.3%)

Volume 5, Issue 1; January-February 2022; Page No 217-227

Other people in your community	17 (5.7%)	81 (27%)	140 (46.7%)	59 (19.6%)	3 (1%)
Other people with diabetes	13 (4.4%)	61 (20.4%)	79 (26.4%)	144 (48%)	2 (0.8%)
People on social media (e.g., Facebook groups for people with diabetes)	8 (2.7%)	8 (2.7%)	1 (0.3%)	282 (94%)	1 (0.3%)

Table 8: Frequency of responses to diabetes-related behavior related questions

Parameter	**N = 300 (%)**
How has your daily diabetes management changed during the Corona crisis?	
I check my blood sugar more often	38 (12.7)
I am more aware of taking medication	50 (16.7)
I exercise more than usual	23(7.7)
I exercise less than usual	77 (25.7)
I eat more healthy than usual	20 (6.7)
I eat less healthy than usual	22 (7.3)
I behave as I have always done	158 (52.7)

Volume 5, Issue 1; January-February 2022; Page No 217-227