



EFFECTS OF HOME CONFINEMENT DURING LOCKDOWN ON TYPE 1 DIABETES MELLITUS PATIENTS IN INDIA AND THE ROLE OF TELEMEDICINE

Prakhar Rustagi*	4 th MBBS Student, Amrita Institute of Medical Sciences and Research, Cochin, Kerala, India. *Corresponding Author
Ayush Prasad	4 th MBBS Student, Amrita Institute of Medical Sciences and Research, Cochin, Kerala, India.
Anna Maria Bastine	4 th MBBS Student, Amrita Institute of Medical Sciences and Research, Cochin, Kerala, India.
Harsh Divya	4 th MBBS Student, Amrita Institute of Medical Sciences and Research, Cochin, Kerala, India.
Aishwary Gupta	4 th MBBS Student, Amrita Institute of Medical Sciences and Research, Cochin, Kerala, India.
Aditi Arora	4 th MBBS Student, Amrita Institute of Medical Sciences and Research, Cochin, Kerala, India.
Dr Lakshmi Nagendra	Assistant Professor, Department of Endocrinology, K.S Hegde Medical Academy, Mangalore, Karnataka, India.
Dr Harish Kumar	Professor and HOD, Department of Endocrinology, Amrita Institute of Medical Sciences, Cochin, Kerala, India.

ABSTRACT **Context:** Global transmission of coronavirus disease 2019 (COVID-19) among the vulnerable sections has been major grounds for concern. Amongst them, people living with Type-1 Diabetes Mellitus (T1DM) patients are at an exaggerated state of risk requiring cautious attention. Telemedicine consultations have been found effective for management of type 1 diabetes patients, nevertheless its impact during the Covid-19 pandemic is untested. **Aim:** The aim of this study was to assess the effect of Covid-19 pandemic on patients with T1DM in India and the role of telemedicine in treatment provision. **Materials and Methods:** A cross-sectional survey was carried out among T1DM patients across the country. It constituted questions pertaining to Demographic status, Lifestyle practices, effect of telemedicine on their blood glucose control and their perceptions towards telemedicine. **Results:** there were 164 survey responses from type-1 diabetes patients across India. Of them, 75.6% patients were over 18 years of age. While 65.9% patients believe that all of their queries were solved, less waiting time was determined to be the rationale for majority (60.9%) of patients for using tele consultation. Though there was no gender difference in preferences, study subjects in the older age groups and majority of patients with post graduate education did not prefer telemedicine consultations over the regular face to face consultation. **Conclusion:** The use of telemedicine has played a major positive role in treatment of patients with T1DM in India.

KEYWORDS : Type 1 diabetes mellitus, COVID-19, telemedicine consultations, lifestyle changes

INTRODUCTION

On December 30, 2019, Wuhan City, China reported a cluster of cases of a pneumonia of unknown aetiology which was later named coronavirus disease 2019 (COVID-19) caused by the novel Corona Virus or SARS-CoV-2. [1] It rapidly crossed International borders and was declared a pandemic by the WHO in less than 3 months of its emergence on March 11, 2020 [2,3] Nationwide lockdowns were imposed all across the world including India, to curtail the spread of the Covid-19 virus. People all over the world endured anxiety and stress, specially patients with chronic illnesses and the elderly who were categorized as high risk. Diabetes Mellitus, one of the most common co-morbidities was found to be associated with augmented severity and mortality[4]. Management of such patients became tremendously challenging as patients were strictly advised to evade going to hospitals unless necessary. As no definite therapy against COVID-19 was available, it became imperative for patients with type 1 diabetes mellitus (T1DM) to take additional precautions, abide by government advisories of social distancing and hand hygiene stringently and simultaneously ensure good glycaemic control. [5,6]

Telemedicine has emerged as a critical technology to bring medical care to patients worldwide while attempting to reduce the transmission of COVID-19 among patients, families, and clinicians.[7] The Indian telemedicine guidelines, formed by the Ministry of Health and Family Welfare, Government of India, has facilitated the use of this mode of consultation in times of an emergency like the current pandemic. It has aided people in receiving the essential basic diabetes follow up without exposure to the virus while visiting a hospital.[8] A meta-analysis of 35 RCT's showed significant benefits of telemedicine in improving glycaemic control in T1DM patients.[9] Similarly, a Cochrane review

regarding use of interactive telemedicine, and another review of 46 studies where different modes of telemedicine were used, demonstrated promising results.[10,11] Unfortunately, there is scarcity of published literature regarding the role of telemedicine in T1DM in the Indian setting.

The objective of this study was to analyse the effects of home confinement during lockdown on patients with T1DM. In addition, we evaluated the effect of telemedicine on diabetes management and patient preferences regarding the use of telemedicine in the near future.

MATERIALS AND METHODS

Study Design

This cross-sectional research survey was conducted from 10th September 2020 to 10th November 2020, amid the ongoing COVID-19 Pandemic. The study was approved by the Institutional Ethics Committee

Survey development

The investigators developed a survey comprising 21 questions. The estimated time to complete the survey was approximately 15 min, and no personal data were requested to identify the participants. The survey consisted of 3 sets of questions in which: 7 questions were on demographic profile, second set consisted of 7 questions on changes in food intake, lifestyle, drug intake pattern and problems faced by them during the pandemic, the last section of the questionnaire consisted of 7 questions pertaining to the effect of telemedicine and telemedicine preferences for the near future as well as the rationality behind it. Reference values and ranges were provided along each questions for responders' convenience.

Study population

Our research respondents were from a non-profit organization group DIYA (Diabetes India Youth in Action) (<http://diya.org.in/>). DIYA is an all India social support group for adolescent, children, adults and elderly with T1DM. Patients diagnosed with T1DM who are a part of the DIYA group and contacted their doctor with the use of telemedicine during the period of lockdown in COVID-19 pandemic were eligible for the survey. DIYA consists of 2500 members with T1DM all over India. With a population of 2500, precision of 10% and an anticipated frequency of 50% of telemedicine users and an alpha error of 99%, sample was calculated to be 156. We reached out to 250 people by random selection and 164 people responded to the questionnaire.

Data collection

The investigators of the team approached the coordinator of the DIYA group for the further information after elucidating him about the study. People were personally called for telephonic interview and a verbal consent was taken. A questionnaire was sent electronically over mail or a social media platform like as per their convenience.

Statistical Analysis

Demographic details and respective percentage of the answers in the questionnaire given by the patients were calculated based on the available data. Statistical analysis was done using the IBM SPSS software (version 24, Chicago, IL, USA). Categorical variables are reported as absolute numbers and percentages.

RESULTS

A total of 164 subjects completed the survey. Baseline characteristics of the subjects are shown in Table 1.

The succeeding part of the questionnaire dealt with the general effects of COVID-19 and the subsequent lock down on the respondents' diabetic status. Results are summarised in Table 2.

The next section of the questionnaire collected data on why the study population resolved to use telemedicine during the COVID 19 pandemic, their perception regarding outcomes and their future preferences with regard to telemedicine. Results are summarised in Table 3.

The study analysed the future telemedicine preferences of study subjects with respect to age, gender and educational background. Though there was no gender difference in preferences, study subjects in the younger age groups and a higher proportion of patients with primary, secondary, vocational and high school education planned to use telemedicine in the future while majority of the post graduate patients also preferred telemedicine consultations over the regular face to face consultation.

DISCUSSION

This is a pan India study conducted among type 1 diabetes mellitus patients who resolved to use telemedicine for consultation during the COVID-19 pandemic. To the best of our knowledge, this is the first study conducted in India examining the problems faced by people with T1DM amid the ongoing COVID-19 pandemic and the role of telemedicine.

Assessment of behavioural characteristics during the pandemic revealed that there was no significant change in the calorie intake in over half of the study participants. This was a surprising finding and the study postulate that this is probably because majority of the study participants were adults diagnosed with T1DM for over 10 years and therefore might have known the importance of a strict glycaemic control and made efforts towards maintaining a healthy diet during the pandemic. However, 31% of them reported that there had been an increase in their calorie intake which can be a result of work from home causing increased amount and frequency of food consumption. As the government called for quarantine and curfew to reduce the transmission of the virus, over half of the participants reported that there has been a significant change in their exercise pattern. Such a change in exercise pattern maybe a result of work from home and closure of facilities that included not only gyms and parks but shopping malls, markets, and all other establishments which resulted in decrease of physical activity in the patients. A similar study in Italy in August 2020, found that there is a reduction in physical activity levels, steps number, minutes of exercise and an increase of glycaemic values in patients with T1DM although, 37.8% of the people also reported weight gain which again is attributed to the reduced physical activity.

^[12] Furthermore a study in Germany suggests that tailor made exercises for different risk groups is a necessity for future pandemic responses. ^[13] A major proportion of the participants in the study experienced an increase in their blood glucose levels. This may be a result of to multiple factors like increase in the calorie intake and decreased physical activity as mentioned above. However, a study done on 307 diabetic patients in Spain suggested that despite the limitations of the lockdown, there had been a better glycaemic control in these patients since there was more time for self-management and decreased stress due to regular work. ^[14] Another study conducted in Italy also had similar results where adults with T1DM had a better glycaemic control during the lockdown due to regular meal times and a less stressful work environment. ^[15]

Even though there was a general increase in blood glucose levels during the pandemic among the participants, blood glucose fluctuations were also common and 29.9% of the subjects reported increase in frequency of hypoglycaemic periods during this time. Surprisingly, 56.1% of patients did not report any difficulties in procuring healthcare during the pandemic. 30% of the participants complained that there were difficulties to meet their doctor whereas a little less than 20% of them has also complained about difficulty in procuring their medication. This is in line with results of a global survey ^[16] where it was found that 30% of the participants had to cancel their appointments with their health care providers during the pandemic whereas diabetes related supplies like insulin, continuous glucose monitor and fast acting carbohydrates were most difficult to procure during the COVID-19 pandemic.

A number of studies have previously assessed the potential benefits of telemedicine in diabetic care. ^[17-19] It has been observed that virtual diabetes care may not only prove effective in aiding behavioural change, but also help in providing social and psychological support. ^[20] From the responses to our study questionnaire, it was clear that majority of patients with T1DM from India have used telemedicine for regular check-ups while others have used it because non availability of drugs, high blood glucose levels and to enquire about precautions to be taken during the COVID-19 pandemic. Telemedicine was deemed a success by majority of the patients. Of the study participants, 74.3% reported that their blood glucose levels were restored back to normal and 65.9% of patients reported that all their queries had been solved through telemedicine. Various other studies have been conducted in different parts of the world with similar results where the blood glucose levels were brought back to normal after telemedicine consultation despite the restrictions caused due to the lockdown and curfews. ^[21] Majority of the participants reported that the effectiveness of telemedicine consultations was equivalent to the regular face to face consultations. Further, 59.7% patients reported that they would prefer using telemedicine for future consultations. This is in agreement to a similar study conducted worldwide ^[16] which found that telemedicine appointments have largely been viewed positively with the majority (75%) claiming that they would consider telemedicine appointments beyond the pandemic. The merits of using telemedicine for consultation are reported as lesser waiting time, budget friendly consultations and similar or better results as compared to normal face to face consultation. Similarly, a study done on Veterans with type 1 diabetes in rural Alabama and Georgia found that the patients not only saved ample amount of travelling time but also had a cost reduction in their consultations. ^[22]

There was no difference in perception about telemedicine between genders. However, patients from the younger age groups preferred telemedicine, suggesting that older generations may not find telemedicine as effective. This can be due the lack of knowledge or inadequate access to telemedicine. When educational qualification of the study participants and the preference of telemedicine for future consultations was compared, interestingly, a higher proportion of patients with primary, secondary, vocational and high school education planned to use telemedicine in the future whereas majority of the post graduate patients did not prefer telemedicine consultations over the regular face to face consultation. This was contrasting to the results of a global survey which showed that perception of telemedicine was not different between age groups or level of educational background. ^[16]

It is evident that the lifestyle and health of T1DM Mellitus patients have been affected at various levels. The results also demonstrate that telemedicine is a potential alternative for face to face consultation during the COVID-19 pandemic as it helps in isolation and preventing the spread of the virus. But it should also be noted that the patients in

the older age groups in our country did not prefer to use telemedicine for consultations. Beyond the pandemic, telemedicine can be considered as an effective alternative for medical consultations as it saves time and resources.

CONCLUSION

Diabetic care has faced unique challenges due to the COVID-19 pandemic and subsequent lockdown has impacted the health of T1DM patients in various ways. The use of telemedicine has played a major positive role in treatment.

Table :1 Age groups, gender, education level, employment status, time of diabetes diagnosis, current diabetes medication, number of comorbidities of T1D in India.

SL NO.	PARTICULARS	FREQUENCY (n)	PERCENTAGE (%)
1.	AGE GROUPS		
	0-18 YEARS	40	24.4 %
	19-35 YEARS	98	59.8 %
	36-50 YEARS	18	11.0 %
	51 AND ABOVE	8	4.8 %
2.	GENDER		
	FEMALE	81	49.4 %
	MALE	81	49.4 %
	OTHERS	2	1.2 %
3.	EDUCATIONAL LEVEL		
	ILLITERATE	1	0.6 %
	PRIMARY EDUCATION	22	13.4 %
	SECONDARY EDUCATION	8	4.9 %
	HIGH SCHOOL	14	8.5 %
	GRADUATE	65	39.6 %
	POST GRADUATE	54	32.9 %
	4.	EMPLOYEMENT STATUS	
EMPLOYED		45	27.4 %
SELF-EMPLOYED		23	14.0 %
DISABLED		2	1.2 %
STUDENT		77	47.0 %
UNEMPLOYED		8	4.6 %
HOME-MAKER		9	5.5 %
5.		TIME OF DIABETES DIAGNOSIS	
	0-5 YEARS	41	25.0 %
	6-10 YEARS	55	33.5 %
	11-20 YEARS	41	25.0 %
	>20 YEARS	27	16.5 %
6.	CURRENT DIABETES MEDICATION		
	INSULIN	143	87.2 %
	BOTH OHG & INSULIN	21	12.8 %
7.	NUMBER OF COMORBIDITIES		
	NONE	106	64.6 %
	ONE	42	25.6 %
	MORE THAN ONE	16	9.8 %

Table 2 - Changes in the food intake, lifestyle, drug intake pattern and problems faced by T1DM patients during the pandemic.

SL NO	PARTICULARSS	FREQUENCY (n)	PERCENTAGE (%)
1.	CHANGE IN CALORIE INTAKE		
	INCREASED	52	31.7 %
	DECREASED	28	17.1 %
	NO CHANGE	84	51.2 %
2.	CHANGE IN EXERCISE PATTERN		
	SIGNIFICANT CHANGE	59	36 %
	SLIGHT CHANGE	44	26.9 %
	NO CHANGE	23	14.0 %
	NEVER EXERCISED	38	23.1 %
3.	SELF-MADE CHANGES IN DRUG INTAKE		

	CHANGED THE DRUG	10	6.1 %
	INCREASED THE DOSE	67	40.8 %
	DECREASED THE DOSE	18	11.0 %
	NO CHANGES MADE	66	40.3 %
	STOPPED TAKING MEDICINE	3	1.8 %
4	CHANGE IN WEIGHT		
	INCREASED	62	37.8 %
	DECREASED	38	23.2 %
	NO CHANGE	64	39.0 %
5	CHANGE IN BLOOD SUGAR LEVEL		
	INCREASE	93	56.7 %
	NO CHANGE	46	28.0 %
	DECREASE	25	15.2 %
6	INCREASE IN FREQUENCY OF HYPOGLYCEAMIC PERIODS		
	YES	49	29.9 %
	NO	115	70.1 %
7	PROBLEMS FACED		
	LACK OF DRUG AVAILABILITY	30	18.3 %
	LACK OF DOCTOR AVAILABILITY	45	27.4 %
	LACK OF FOOD AVAILABILITY	7	4.3 %
	LACK OF LAB FACILITY AVAILABILITY	21	12.8 %
	NONE	92	56.1 %

Table 3- Purpose and perceptions regarding outcomes of telemedicine and future preferences of T1D patients.

SR.NO.	PARTICULARS	FREQUENCY	PERCENTAGE
1	REASON FOR TELEMEDICINE CONSULTATION		
	For regular check ups	66	40.2 %
	High sugar level	34	20.9 %
	To know about the precautions	30	18.2 %
	Anxiety	23	14.0 %
	Non availability of medicines	11	6.7 %
2	EFFECTIVENESS OF TELEMEDICINE		
	Blood glucose level was restored back to normal	122	74.3 %
	Blood sugar level remained high	42	25.7 %
3	PREFERENCE OF USING TELEMEDICINE FOR FUTURE CONSULTATION		
	PREFERRING	98	59.7 %
	NOT PREFERRING	66	40.3 %
4	REASON FOR TELEMEDICINE CONSULTATION IN THE FUTURE		
	Lesser waiting time	100	60.9 %
	Budget friendly	49	30.5 %
	Same results as face to face consultation	11	6.7 %
	Better results than face to face consultation	4	2.4 %
5	FEELINGS ABOUT CONSULTING DOCTOR VIA TELEMEDICINE DURING LOCKDOWN		
	Not Satisfactory	55	33.5 %

	Same as usual check-up	82	50.0 %
	Better than usual check-up	27	16.5 %
6	WAS THERE ANY CHANGE IN MEDICATION OVER TELEMEDICINE CONSULTATION		
	Yes, dose increased	36	22 %
	Yes, dose decreased	15	9.1 %
	No change in medication	113	68.9 %
7	HAVE ALL YOUR QUERIES BEEN SOLVED THROUGH TELEMEDICINE DURING COVID-19 PANDEMIC?		
	Yes	108	65.9 %
	No	56	34.1 %

Table 4- Frequency and percentage of people consulting via telemedicine in future based on age group, gender and educational background.

SI. NO.	PARTICULARS	FREQUENCY (N1) WHO WILL CONSULT WITH TELEMEDICINE IN FUTURE	FREQUENCY (N2) WHO WON'T CONSULT WITH TELEMEDICINE IN FUTURE	PERCENTAGE (%) WHO WILL CONSULT WITH TELEMEDICINE IN FUTURE	PERCENTAGE (%) WHO WON'T CONSULT WITH TELEMEDICINE IN FUTURE	
1.	AGE GROUP	<18 YEARS	14	26	35.0%	65.0%
		19-35 YEARS	41	57	41.8%	52.8%
		35-50 YEARS	9	9	50%	50%
		>50 YEARS	4	4	50%	50%
		TOTAL	68	96	41.5%	58.5%
2.	GENDER	FEMALE	35	46	43.2%	56.8%
		MALE	33	48	40.7%	59.3%
		TOTAL	68	96	41.5%	58.5%
3.	EDUCATIONAL BACKGROUND	ILLITERATE	0	1	0	100%
		PRIMARY EDUCATION	5	16	23.8%	76.2%
		SECONDARY EDUCATION	3	5	37.2%	62.5%

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