Original Article

A Study on the Health and Socioeconomic Impact of COVID-19 Pandemic and Barriers to Self-management of Diabetes during the Lockdown among Rural Residents of South India

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Abstract

Aim: To study the health and socioeconomic impact of the COVID-19 pandemic and to assess the barriers to self-management of diabetes during the lockdown, in rural South India. **Materials and Methods:** Details of demographic, social, economic, migration and health status were collected using a structured questionnaire from participants aged ≥18 years belonging to the 21 villages of Chengalpattu and Kancheepuram districts of Tamil Nadu state in south India as part of the **T**elemedicine p**R**oject for scre**EN**ing **D**iabetes and its complications in rural Tamil Nadu (TREND) study. From the 11,249 TREND participants, a random list of 25% (n = 2812) was system-generated using random numbers and 2812 participants were contacted for the study, of whom 2511 individuals participated. Telephonic interviews were conducted during the lockdown from June to August 2020. Further, qualitative interviews(Focus group discussions) were conducted among 27 individuals with diabetes between September and December 2020. Data were analyzed using thematic analysis. **Results:** The mean age of the study population was 43 ± 14 years and 50.4% were women. Diabetes was present in 14.7%, hypertension in 31.9%, generalized and abdominal obesity in 33.3% and 46.5% respectively. When the lockdown was implemented in March 2020, 37% had migrated from urban to rural areas. Lack of daily wage jobs (68%), price of essential commodities (41.7%), social distancing/curfew (34.8%), mental fatigue/depression (14.7%), and loss of job (7.1%) were some reasons stated for their adverse social and financial circumstances. People with diabetes stated that they had to avoid or cut down their regular hospital visits due to travel restrictions. Many of the patients took the same medications for almost a year. **Conclusion:** Unemployment, poor mental health, and reduced household income were the most significant negative impacts faced by rural residents during the lockdown due to COVID-19. People with diabetes experienced disruptions in diabetes management due to the pandemic.

Keywords: Asian Indians, COVID 19, diabetes, lockdown, rural

Introduction

In India, as elsewhere in the world, the COVID-19 pandemic caused significant suffering as well as economic and social disruption. In January 2020, the first case of COVID-19 was detected in India, just before the World Health Organization (WHO) declared COVID-19 a pandemic.[1] In March 2020, India responded by enforcing a total lockdown of all states across the nation which aimed at halting the spread of COVID-19.[2] The control measures included the closure of schools, colleges, and several workplaces, curbs on public transportation, quarantine and isolation of symptomatic individuals, contact tracing, and massive education campaigns.[3]

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Following the first lockdown, India enforced three more lockdowns.[4]

There is evidence that lockdowns can have a significant impact on physical and mental health (depression, stress, and anxiety), education, and also social and economic ramifications.[5-7] In addition, lockdowns may also aggravate health disparities as the less privileged tend to be more affected.[8,9] The spread of COVID-19 from urban to rural areas made it difficult for those in rural areas with chronic conditions like diabetes or hypertension to access healthcare.[6] In addition, rural communities also experienced financial stress due to a lack of wages and loss of jobs.[10]

According to the Centers for Disease Control and Prevention (CDC), people with diabetes who have COVID-19 are more likely to be affected with a serious infection like pneumonia and have a 7% risk of death from COVID-19 once infected.[11] However, they can lower the risk of complications of COVID-19 by maintaining good diabetes control.[12,13] Due to restrictions to exercising outdoors, limited access to fruits and vegetables, non-availability of health care professionals due to the closure of health care clinics, and sometimes difficulty in getting diabetes supplies, people with diabetes may face barriers to self-management, all of which hinder overall diabetes control.[14,15]

In this paper, we investigate the health and socioeconomic impact of COVID-19 and assess the barriers to self-management of diabetes during the first lockdown between June to August 2020 in individuals with diabetes in rural South India.

Materials and Methods

We conducted a cross-sectional survey using a mixed-methods approach of both quantitative and qualitative techniques. We recruited 2511 rural adults, aged ≥18 years, from 21 villages in Chengalpattu and Kancheepuram districts of Tamil Nadu, as part of an ongoing large cross-sectional study [**T**elemedicine p**R**oject for scre**EN**ing **D**iabetes and its complications in rural Tamil Nadu (TREND)]. Briefly, the TREND study planned to survey 15,000 rural residents from 30 villages in rural Tamil Nadu to assess the prevalence and complications of diabetes using telemedicine, between 2018 and 2021. This was a door-to-door cross-sectional survey conducted using a standardized questionnaire. Anthropometry and blood pressure was measured in all the individuals, and an oral glucose tolerance test (OGTT) was done in all participants (except in individuals with self-reported diabetes where only fasting plasma glucose was done).

From the 11,249 TREND participants (recruited between November 2018 and March 2020), a random list of 25% (n = 2812) was system-generated using random numbers. Of the 2812 participants who were contacted for the study, 2511 participated (response rate: 89.3%), and 301 (10.7%) either refused to participate or could not be contacted. The interview was conducted in the local language (Tamil) by the trained research team after obtaining informed consent. The telephonic interview was conducted from June 2020 to August 2020 during the1st lockdown of the COVID-19 pandemic. The time taken for completion of the questionnaire was 12–15 minutes. Details on the prevalence of COVID-19, possible symptoms of COVID-19, etc were collected through a structured pre-tested questionnaire. Other demographic details, biochemical and anthropometric details measured using standardized techniques, health behaviours (such as tobacco and alcohol use), and health history (participant's medical history) were extracted from the main TREND study.

For the qualitative study (September-December 2020), a total of 50/234 individuals with self-reported diabetes were randomly identified and approached for focus group discussions (FGDs) of whom 27 individuals consented to participate. Informed consent was obtained after explaining the purpose of the study. The main objective of the qualitative study was to gain insight into experiences of living with diabetes during the lockdown. More specifically, the interviews addressed: (i) diabetes management – medication adherence, hospital visits, hospital choices, and (ii) barriers to diabetes management. Three FGDs were conducted following proper COVID-19 related precautions. Nine participants in each group of both genders (n = 27) shared their barriers to self-management of diabetes due to COVID 19 lockdown restrictions. All participants were told they had the right to not answer any given question and that they could stop the interview at any time if they were not comfortable with the questions asked. Prior permission was obtained from the participants for recording the interviews using a digital recorder. Due to core code saturation, we did not proceed to conduct further focus group discussions after conducting 3 FGDs and this was communicated to the remaining consented participants (n = 23) over the phone.

Definitions

Diabetes

Diagnosed if individuals had a physician diagnosis of diabetes and/or fasting plasma glucose ≥126 mg/dl or 2-hr post glucose ≥200 mg/dl.[16]

Hypertension

Diagnosed based on past medical history (antihypertensive medications) and/or if the participant had systolic blood pressure (SBP) of ≥140 mmHg and/or diastolic blood pressure (DBP) of ≥90 mmHg[17]

Generalized obesity

Defined as a BMI ≥25 kg/m^2 for both sexes (based on the WHO Asia Pacific Guidelines) with or without abdominal obesity.[18]

Abdominal obesity (AO)

Defined as a waist circumference ≥90 cm for men and ≥80 cm for women with or without generalized obesity.[18]

Smoking/Alcohol:

Both current and past users were included.

Statistical analysis

Data are reported and presented as a number (proportion) for categorical variables and a mean (SD) for continuous variables. Chi-square was performed for categorical variables. Alpha was set at 0.05 to determine statistical significance. Data were analyzed by using SAS Statistical Software version 9.4 (Cary, NC). Qualitative data was collected and transcribed for further analysis. The transcribed interviews were analyzed using systematic text condensation that included independently reading the transcripts to gain a contextualized impression of the interview. For the purpose of this study, we exclusively extracted passages from the interviews concerning diabetes self-management and barriers to self-management. The passages were read thoroughly and coded into meaning units. The meaning units were grouped into first order and second order codes. The code groups were analyzed as analytic main themes and subthemes. Lastly, the themes were reviewed, compared, and transversely interpreted to ensure the uniqueness of the qualitative data. This analysis was performed using NVIVO software version 10.0.

Results

Overall, the mean age of the study participants was 43 ± 14 years, of whom 50.4% (n = 1267) were women, 26.8% had no formal schooling, 78% had a monthly income <5000 INR, 36.7% were unemployed and 29.4% of the participants were engaged in agricultural activities. Alcohol consumption was reported to be 30.3%, followed by smoking (6.4%), with higher use of both alcohol and smoking in males compared to females (P < 0.001) [Table 1]

Prevalence of co-morbid conditions such as diabetes, hypertension, generalized obesity, and abdominal obesity are shown in [Figure 1]. The overall prevalence of hypertension was 31.9% with a higher prevalence in males compared to females (39.3% vs 24.6, P < 0.001). The prevalence of diabetes (newly diagnosed and self-reported) was also significantly higher in males (17.4% vs. 12.2%, P < 0.001) with an overall prevalence of 14.7% in the study population. Generalized obesity (37.0% vs. 29.6%, P = 0.002) and abdominal obesity (56.9% vs. 46.5%, P < 0.001) were higher in females compared to males.

Table 1: General and Socio-demographic details of the study participants# (n = 2511)

Variables	Overall n=2511	Male n=1244	Female n=1267
Age (years)	43 ± 14	43 ± 14	43 ± 13
Waist circumference(cms)	83 ± 12	85 ± 12	82 ± 12
BMI kg/m2	23 ± 4	23 ± 4	23 ± 5
Body fat (%)	28 ± 10	25 ± 8	31 ± 10*
Systolic blood pressure (mm Hg)	125 ± 17	127 ± 17	123 ± 16
Diastolic blood pressure (mm Hg)	77 ± 11	79 ± 11	76 ± 10**
No formal schooling	672 (26.8)	245 (19.7)	427 (33.7) *
Below primary school	191 (7.6)	90 (7.2)	101 (8.0) *
Primary school	345 (13.7)	173 (13.9)	172 (13.6) *
Secondary school	1017 (40.5)	546 (43.9)	471 (37.2) *
Graduation and above	286 (11.4)	190 (15.3)	96 (7.6) *
<5000 INR	1958 (78)	912 (73.3)	1046 (82.6) *
5000-10000 INR	394 (15.7)	233 (18.7)	161 (12.7) *
>10000 INR	159 (6.3)	99 (8.0)	60 (4.7) *
Not working	921 (36.7)	242 (19.5)	679 (53.6) *
Agriculture	737 (29.4)	431 (34.6)	306 (24.2) *
Business/self-employed	23 (0.9)	21 (1.7)	2 (0.2)
Semiskilled/unskilled	398 (15.9)	222 (17.8)	176 (13.9) *
Skilled	384 (15.3)	291 (23.4)	93 (7.3) *
Professional	48 (1.9)	37 (3.0)	11 (0.9) *
Smoking n (%)	161 (6.4)	153 (12.3)	8 (0.6) *
Alcohol n (%)	762 (30.3)	708 (56.9)	54 (4.3) *

Data collected at the time of enrollment; * p<0.001; ** p<0.05

Regarding the COVID status among the study participants, only 0.03% reported that they were diagnosed with the disease, 0.23% reported that family members were affected with the COVID-19, while 11% reported that other village residents were diagnosed or treated with COVID 19.

[Table 2] shows the COVID-19-related symptoms experienced during the previous 5–6 months. Body pain (11.9%), fatigue (16.1%), headache (24.4%) and fever (9.9%) were the most common symptoms reported. Women reported significantly higher body pain ($P < 0.001$), headache ($P < 0.001$), fatigue ($P < 0.001$), loss of appetite ($P = 0.008$) and dry cough ($P = 0.03$) compared to men.

[Figure 2] shows the migration status of the study participants when the lockdown was announced in March 2020. More males migrated than females. Rural to urban migration was reported as 5.2% and rural to rural migration was also observed in 4.5% of the study population. After the lockdown was announced, 53% of the study participants did not travel to other places, but 37.1% of rural residents who were employed in urban areas travelled back to their rural villages due to the closure of educational institutions, loss of jobs etc.

The socioeconomic impact of the COVID-19 pandemic lockdown among the rural migrant populations was further analyzed and is reported in [Figure 3]. The reasons for their social and financial circumstances during the lockdown were as follows: Lack of daily wage jobs (68.8%), increased price of essential commodities

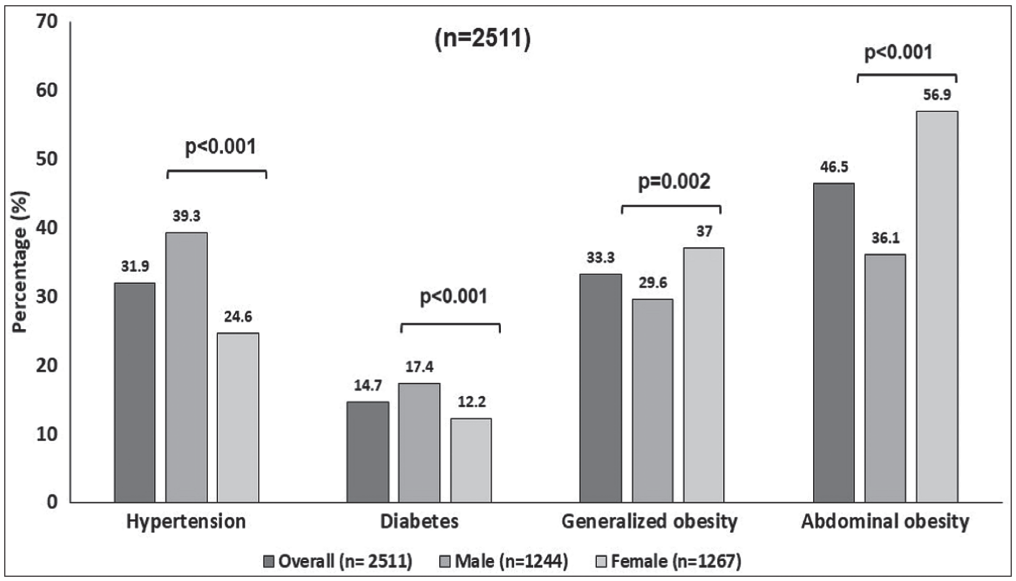

Figure 1: Prevalence of comorbid conditions in the rural study participants at the time of enrolment into the study

Table 2: COVID-19 associated symptoms experienced in the past 3 to 6 months in rural residents (March to August 2020)

Symptoms	Overall n (%) [n=2511]	Male n (%) [n=1244]	Female n (%) [n=1267]
Diarrhea	14 (0.6)	9 (0.7)	5 (0.4)
Loss of smell	4 (0.2)	1 (0.1)	3 (0.2)
Abdominal discomfort	44 (1.8)	15 (1.2)	29 (2.3)
Sore throat	38 (1.5)	22 (1.8)	16 (1.3)
Chills	14 (0.6)	8 (0.6)	6 (0.5)
Nausea or vomiting	21 (0.8)	12 (1.0)	9 (0.7)
Body pain	298 (11.9)	106 (8.5)	192 (15.2)*
Loss of appetite	20 (0.8)	4 (0.3)	16 (1.3)**
Runny or stuffy nose	185 (7.4)	86 (6.9)	99 (7.8)
Shortness of breath	21 (0.8)	10 (0.8)	11 (0.9)
Fever	248 (9.9)	114 (9.2)	134 (10.6)
Dry cough	72 (2.9)	27 (2.2)	45 (3.6)**
Chest congestion	108 (4.3)	57 (4.6)	51 (4.0)
Fatigue or tiredness	403 (16.1)	145 (11.7)	258 (20.5)*
Headache	610 (24.4)	239 (19.3)	371 (29.4)*

* p<0.001; ** p<0.05

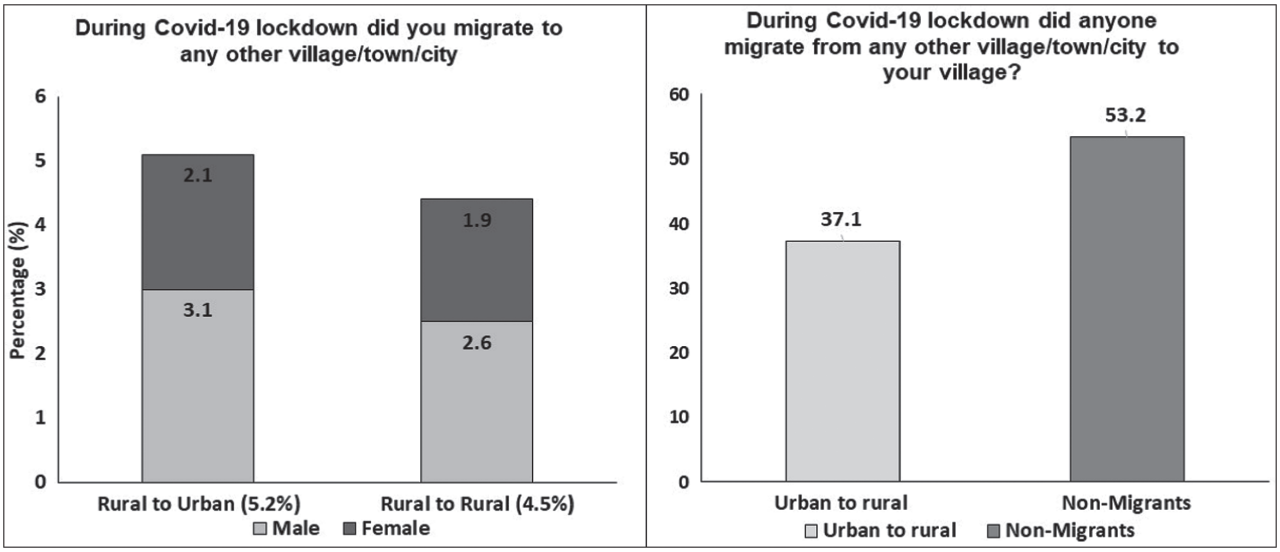

Figure 2: Migration status of the study participants during the COVID pandemic

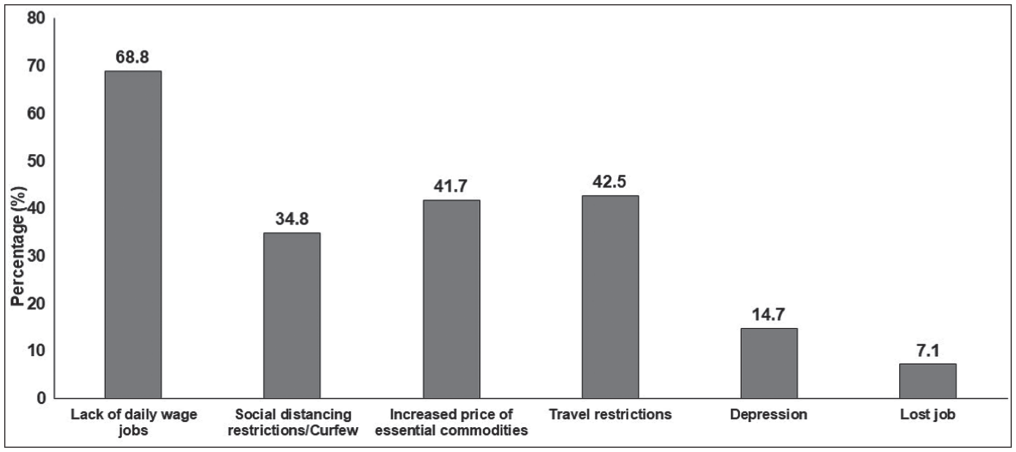

Figure 3: Socio-economic impact of COVID-19 pandemic in the rural participants

(41.7%), mental fatigue/depression (14.7%), loss of job (7.1%), and social distancing /curfew restrictions (34.8%).

The results of the qualitative research showed that many of the participants did not check their blood sugar levels for almost one year even after the relaxation of the lockdown restrictions. The main reason behind this was financial constraints as the participants had to spend money for their health checkups in the private sector when many of them did not have job during the lockdown. Below are the responses:

> "I have checked my blood sugar almost 1.5 years back. I am taking medicines using the prescription which I have received during the last check-up"
> "I don't wish to go for a check-up. I think my sugar levels are under control and if I get any disturbing symptoms, then I will go. Until then it is not necessary for me"
> "Who will go to the hospital for diabetes check-ups while CORONA (COVID) is prevailing all around the places. Wherever we go, cops are restricting and we had to show e-pass and other ID proofs which is quite annoying"

On further probing they revealed that they had to travel a long distance to the Government hospitals and transport restrictions made it difficult for them to take care of their health. Another learning was that they have been taking the same medications for almost a year without regular health check-ups. Few of the participants stated that they have been to hospitals after the relaxation of lockdown, but they felt that they have not given enough priority as more importance was given to COVID 19 patients.

> "Believe it or not, I am taking medicines regularly but still, my sugar levels are between 400 and 500 mg/dl. Many of my neighbours suggested to go

to private hospitals but they don't know that I am jobless. Who will take care of the financial part?"

Concerning the accessibility of medicines, the majority of patients have reported that medicines were available in the shops after the relaxation of lockdown, but due to their bad economic situation, they could not bear the costs of medicines, and hence, they were irregular in consuming tablets.

Discussion

This study reports that the lockdown in India due to COVID-19 created adverse impacts on the health status, social, economic, and financial circumstances of the people living in rural areas of South India. Similar results were reported by Singh *et al.*,[6] who reported that people with health issues, especially among rural, poor, and marginalized populations, experienced difficulties in their daily lives and were severely affected both socially and financially during the COVID-19 pandemic.[6]

The effect of the outbreak of COVID-19 on health, society, and the economy is far-reaching, significant, and distressing.[19] Our study showed that the effects of the pandemic extended beyond health to encompass adverse effects on household incomes, individual livelihoods, social contacts, and other health-related factors. We also report that significant economic impacts in our study which include loss of employment (75%), increased prices of essential commodities, and restrictions in the state preventing workers from returning to work may have caused further stress and health implications to the rural populations. Singh (2020) investigated the impact of the coronavirus pandemic on India's rural economy, focusing on the plight of migrant workers. The findings of their study suggest that COVID-19 could have an impact on the rural economy in both the short and long term, with reverse migration i.e. urban-to-rural migration putting additional strain on agriculture and the rural economy.[20] We also observed reverse migration, during the pandemic possibly because employment became scarce and people also felt the need to be nearer to their families during such uncertain times.

People with chronic conditions like diabetes and hypertension are known to be most vulnerable to the complications of COVID-19 as highlighted in the WHO global survey and several published reports.[21,22] Depression was also reported in 14.7 of the rural population. Another comparable study also showed the association of greater financial stress with poorer mental health, higher anxiety, depression, and stress in the Indian population of both urban and rural residents during COVID 19 lockdown[23]

Singh *et al*,[6] reported a significant increase in the mean fasting blood glucose of the study participants during lockdown when compared to before lockdown. This suggests that people with diabetes are more likely to have uncontrolled blood sugars during the pandemic, which is consistent with the findings of another study from India, which found diabetes to be the most common comorbidity among those affected with COVID-19.[24] In our study, many individuals with diabetes said that they could not afford to pay for their medicines and were worried about their blood sugar levels going out of control. Some of the participants neglected their health conditions due to mental fatigue, loss of job, and other factors such as poor economic conditions, curfew restrictions etc.

Our study provides evidence that the delivery of health care should be more focused on chronic health conditions in rural India. A potential strategy is to concentrate on improving access to medications, especially in vulnerable populations. Governmental and non-governmental organizations authorities have an important role to play within the rural community by enhancing and monitoring the socioeconomic and health needs of individuals. More investment in building support systems and facilities can help save future burdens and augment resilience against future pandemics. This study points to the need to evaluate the long-term health impact of the COVID-19 pandemic, especially for people living with chronic health conditions like diabetes in rural areas.

There are few limitations in this study. Since the study was conducted during the pandemic and the country was under national lockdown, we were not able to interview more number of the participants in person and thus do more in-depth analysis. Phone interviews do not allow direct observation of participants' expression and body language.

Conclusion

In response to the rapid transmission of the COVID-19 pandemic and the corresponding health system interruptions in under-resourced rural settings, there needs to be an emphasis on building resilient care delivery that can achieve treatment goals without financial strain. Rural residents of south India have faced challenges in health services and experienced increasing symptoms related to COVID-19 disease, health issues such as diabetes, hypertension, and depression as well as significant financial and employment losses. Social distancing, self-isolation, and travel restrictions during COVID pandemic have led to a reduced workforce across all economic sectors and caused many jobs to be lost. The pandemic highlighted discrepancies in primary health care but also created a platform for innovation to overcome gaps in the new post-COVID era. This could be used to improve health care delivery in rural India.

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Conflicts of interest

There are no conflicts of interest.

Ethical clearance

This study was approved by the Institutional Ethics Committees of the Madras Diabetes Research Foundation, Chennai, India

Author disclosure statement

No competing financial interests exist.

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