Brief Report

Knowledge of Diabetes among Adults at High Risk for Type 2 Diabetes in Kerala, India

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Abstract: We aimed to study the knowledge of diabetes among high-risk individuals for diabetes in the Indian state of Kerala. The baseline data collected from 1007 participants of the Kerala Diabetes Prevention Program were analyzed. Diabetes knowledge was assessed using a scale adapted from a large nationwide study conducted in India. The composite score of the scale ranges from 0 to 8. The mean age of participants was 46.0 (SD: 7.5) years, and 47.2% were female. The mean diabetes knowledge score was 6.9 (SD: 2.1), with 59.5% having the maximum possible score of 8. Of 1007 participants, 968 (96.1%) had heard the term diabetes, and of them, 84.7% know what diabetes is, 87.2% think more and more people are getting diabetes nowadays, 79.6% know that diabetes can cause complications in organs, and 75.9% know that diabetes can be prevented. While the level of diabetes knowledge was high among our participants, a quarter of them (24.1%) were not aware that diabetes can be prevented. Thus, there is a need for health promotion programs to increase the knowledge of diabetes prevention among high-risk individuals in Kerala.

Keywords: diabetes knowledge; diabetes; prediabetes; prevention; health promotion; awareness

1. Introduction

Type 2 diabetes poses significant health and economic challenges globally, especially in low- and middle-income countries (LMICs) such as India.[1] Current estimates show that about 537 million adults (20-79 years) are living with diabetes worldwide, and more than 75% live in LMICs. In addition, diabetes caused at least US$966 billion in health expenditure in 2021, a 316% increase over the last 15 years.[1] In this context, it is essential to understand the level of diabetes knowledge in the community, as increasing it could help prevent diabetes among high-risk individuals, and improve treatment compliance and potentially reduce complications in people with diabetes.[2,3] While studies have examined the diabetes knowledge of the general population[2,4-8] and people with diabetes[7,9] in India, no study has been conducted among those at high risk of developing diabetes. Therefore, we aimed to study the knowledge of diabetes among high-risk individuals for type 2 diabetes in the Indian state of Kerala.

2. Materials and Methods

2.1. Study design and Study population

For this analysis, we used the baseline data of participants of the Kerala Diabetes Prevention Program (K-DPP), a lifestyle-based diabetes prevention cluster randomized controlled trial conducted in Kerala.[10] The K-DPP study has been described in detail elsewhere.[10] Briefly, we randomly selected 60 polling areas (electoral divisions with geographical boundaries) from 359 polling areas in a *taluk* (the unit below district) of Trivandrum

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district, Kerala. From these 60 polling areas (clusters), which were randomized equally into the intervention and control groups, we randomly identified individuals aged 30-60 years for screening. After screening 3,689 adults in two steps, which were detailed elsewhere,[11,12] we identified 1007 high-risk individuals and 202 people with diabetes[13] on a 2-hr oral glucose tolerance test (OGTT). High-risk individuals were those who had a high diabetes risk score (Indian Diabetes Risk Score ≥60) with no diabetes on the OGTT.[11-13] Those with diabetes were excluded from the study and referred to healthcare centers for further management.

2.2. Diabetes knowledge scale

We collected data on the knowledge of diabetes using a scale developed and tested by a research group in the ICMR-INDIAB study, a large nationwide study on diabetes in India (Table S1).[4] This scale includes questions about a person's knowledge regarding diabetes and its risk factors, prevention, and complications. We computed a composite score for the knowledge of diabetes, as described in previous studies,[4,5] and as follows: 1) For closed questions, correct answers were given a score of 1 and incorrect answers (including "don't know") a score of 0; and (2) For risk factors for diabetes, a score of 4 was assigned for participants who answered obesity, unhealthy diet, physical inactivity, or family history of diabetes, 3 for consuming sweets, 2 for mental stress, 1 for tobacco or alcohol use, and 0 for don't know. The least possible score was 0, and the maximum score was 8. Data to calculate the composite diabetes knowledge score was available for 998 (99.1%) of the participants. The scale showed good internal consistency with this sample (Cronbach's α=0.77).

2.3. Statistical analysis

Continuous variables are summarised using mean and standard deviation (SD) or median and inter-quartile range (IQR), and categorical variables with frequency and percentage. Analyses were performed using STATA software (Version 17.0, StataCorp, College Station, TX, USA).

3. Results

3.1. Characteristics of the participants

A total 1007 high-risk individuals were included in this analysis. The mean age was 46.0 (SD: 7.5) years, and 47.2% were female. The majority were educated up to higher secondary school (75.6%), employed (72.3%), and married (95.1%) (Table 1). The median monthly household expenditure was 7000 (IQR: 5000-10000) Indian Rupees.

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Table 1: Socio-demographic characteristics of the participants.

Characteristics	N=1007
Age (years), mean (SD)	46.0 (7.5)
Sex, n (%)	
Male	532 (52.8)
Female	475 (47.2)
Education, n (%)	
Up to primary	253 (25.1)
Above primary to higher secondary school	653 (64.9)
College or above	101 (10.0)
Occupation, n (%)	
Skilled/unskilled	728 (72.3)
Homemaker	268 (26.6)
Unemployed/retired	11 (1.1)
Marital status, n (%)	
Single	11 (1.1)
Married	958 (95.1)
Divorced/separated/widowed	38 (3.8)
Monthly household expenditure (INR), median (IQR)	7000 (5000-10000)

SD, standard deviation; IQR, inter-quartile range; INR, Indian rupees.

3.2. Components of the diabetes knowledge scale and diabetes knowledge score

Of 1007 participants, 968 (96.1%) had heard the term diabetes. Of them, 84.7% know what diabetes is, 87.2% think more and more people are getting diabetes nowadays, 79.6% know that diabetes can cause complications in organs, and 75.9% know that diabetes can be prevented (Figure 1). A total of 89.4% were aware of at least one risk factor for diabetes. Family history of diabetes was the most commonly reported risk factor (75.7%), followed by unhealthy diet (67.4%), physical inactivity (61.7%), obesity (60.1%), alcohol use (42.6%), stress (39.4%), tobacco use (33.2%), and taking certain types of medications (0.3%). Slightly more than three-fourths (76.5%) knew that diabetes can cause complications in organs. The kidney was the most commonly reported organ (41.1%), followed by eyes (23.0%), liver (22.5%), heart (19.4%), feet (9.8%), hands and fingers (7.8%), brain (3.3%), nerves (2.8%), bones (2.7%), and others (2.8%). The mean diabetes knowledge score was 6.9 (SD: 2.1), with 59.5% having the maximum possible score of 8 and 3.9% having the least possible score of 0.

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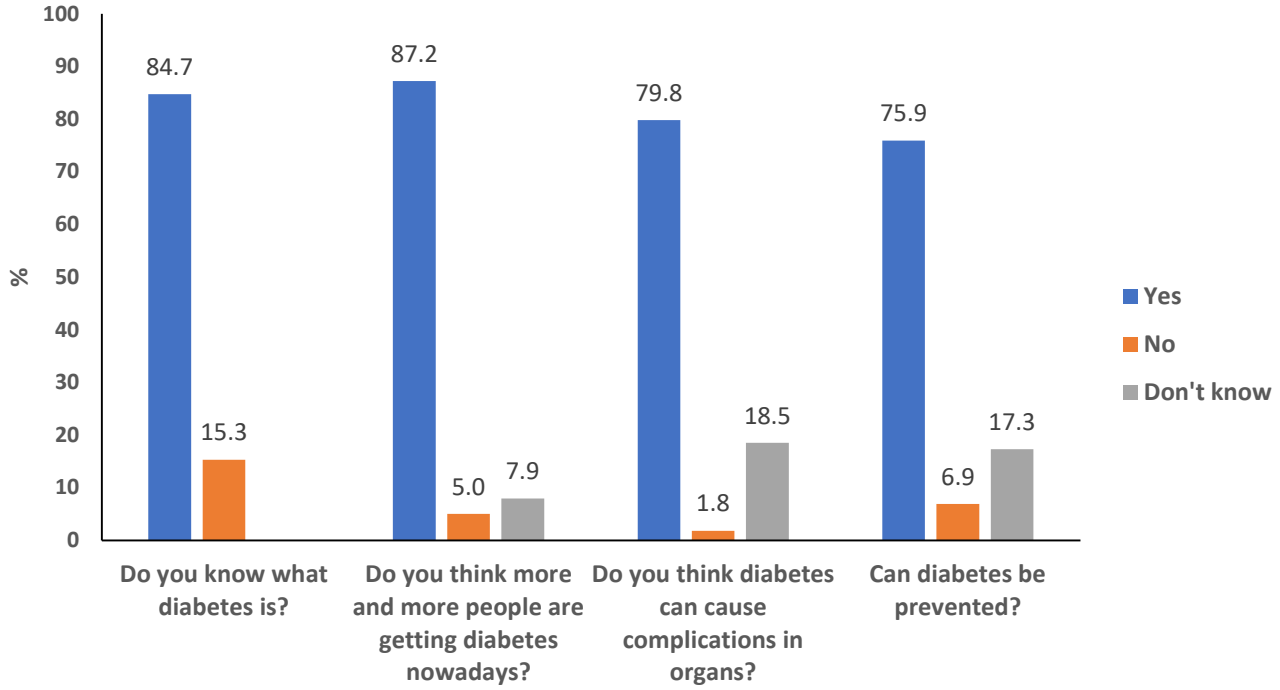

Figure 1. Components of diabetes knowledge scale among adults at high-risk for type 2 diabetes.

4. Discussion

The key findings of this study were: (1) The knowledge of various components of the scale was high, with percentages ranging from 76.5-96.1%; (2) The mean composite diabetes knowledge score was high (6.9 out of 8.0), with the majority (60%) having the maximum possible score of 8.0; and (3) Nearly a quarter (24.1%) were not aware that diabetes can be prevented.

Compared with our study figures, previous studies conducted among the general population[2,4-8] and people with diabetes[7,9] in India have shown much lower levels of knowledge of diabetes. For example, in the ICMR-INDIAB study conducted among 16,607 adults (≥20 years) in four Indian states, only 43.2% had heard the term diabetes compared to 96.1% in our study.[4] Further, in that study, 58.5% had a composite diabetes knowledge score of 0 compared to only 3.9% in our study. In another study conducted among 385 type 2 diabetes patients in three government hospitals in Delhi, the average composite diabetes knowledge score was 3.8 out of a maximum possible score of 7 (54.3%).[9] The score was 6.9 out of 8 (86.3%) in our study. These differences in findings between our study and other studies are likely attributed to the higher level of literacy (94.% literacy rate),[14] higher screening rates for diabetes,[12] and higher burden of diabetes and its risk factors in Kerala[15,16] compared with other Indian states. The differences in population characteristics between the studies may also have played a role.

Notably, nearly a quarter (24.1%) of our participants did not know that diabetes can be prevented. This is surprising, given that they were individuals at high risk of developing type 2 diabetes, and the high prevalence of diabetes in Kerala (~20%).[17] The reasons for the above finding are unknown and should be explored by further research, mainly qualitative studies.

Our study has certain strengths. First, to the best of our knowledge, this is the first study to assess the knowledge of diabetes among high-risk adults for type 2 diabetes in an Indian population. The internal consistency of the diabetes knowledge scale among our study population was high. Finally, the missing data to calculate the composite diabetes knowledge score was negligible (0.9%). However, the generalizability of our findings to other regions in the country is limited, as Kerala is a highly literate state in India and has a higher prevalence of diabetes compared with other Indian states. However,

Kerala is in the advanced stage of epidemiological transition[18] and is supposedly the "harbinger" for other Indian states with regard to the burden of diabetes and other non-communicable diseases.[15,19] Thus, we can assume that what is happening now in Kerala concerning the knowledge of diabetes could occur in the rest of the country in the future.

5. Conclusions

While the level of diabetes knowledge was high among our participants, a quarter of them were not aware that diabetes can be prevented. Thus, there is a need for health promotion programs to increase the knowledge of diabetes prevention among high-risk individuals in Kerala.

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Informed Consent Statement: Written informed consent was obtained from all study participants.

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Conflicts of Interest: The authors declare no conflict of interest.

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