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Challenges faced in diabetes risk prediction among an indigenous South Asian population in India using the Indian Diabetes Risk Score

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ABSTRACT

Objectives: Indigenous populations around the world have a higher health disparity and an increased risk of diabetes. Scientific literature on the prevalence of diabetes in India is not available, and the current work is a pilot study to explore the risk of diabetes in one such indigenous population in India.

Study design: This is a cross-sectional survey and screening study.

Methods: The study took place in a remote tribal hamlet of Machuru in South India. A door-to-door survey was conducted in the hamlet with a population of 555. The Indian Diabetes Risk Score (IDRS) questionnaire was completed by 160 individuals older than 25 years. Capillary blood glucose levels were measured to compare the glycaemic status with the predicted IDRS.

Results: Of 160 adults who completed the questionnaire, 37 were at high risk (23.13%) as per the IDRS, 52 at medium risk (32.5%) and 71 at low risk (44.38%). None of the respondents knew their family history of diabetes owing to the lack of awareness about the condition. Interestingly, the villagers had a sedentary lifestyle owing to their unique family dynamics but a healthy diet. Five participants were diagnosed with diabetes, and 18 were diagnosed with impaired fasting glucose or prediabetes.

Conclusions: The IDRS might not be an accurate measure to understand the risk of diabetes in this particular population owing to their unique family dynamics and a lack of awareness about diabetes. The best possible way to assess the diabetes risk might be through blood examination.

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Introduction

The prevalence of diabetes is increasing worldwide, especially in the South Asian ethnic population.[1] An increase in the prevalence of diabetes is observed both in rural and urban India.[2] Indigenous populations are the natives of a country, with 'defined territory and ethnic distinctiveness' as the two distinguishing features.[3] In India, indigenous groups are classified by the government as 'scheduled tribes'.[4] Health disparities between indigenous and non-indigenous populations are universal.[5] In the case of diabetes, the prevalence and related mortality are 3–4 times higher in indigenous populations than in non-indigenous populations, and this has been extensively studied in various countries.[6] Most of the accessible information, such as the scientific articles or published reports, on indigenous populations is from Western countries, particularly the US, Canada, New Zealand, the UK and Australia.[6,7] With more than 705 individual ethnic groups and an indigenous population of more than 104 million in India,[8] such structured published scientific literature on the tribal or indigenous population is very limited;[7] in particular, there are no available scientific literature on the prevalence of diabetes.

Diabetes risk assessment questionnaires are cost-effective tools for assessing the risk of diabetes. Several risk assessment tools have been developed using a combination of demographic, clinical and biochemical information.[9] Every country has tailor-made questionnaires constructed based on the sociocultural factors and risk factors associated with the particular population. The Indian Diabetes Risk Score (IDRS) is one such tool to assess the risk of diabetes in the Indian population.[10] IDRS consists of four questions, namely, age, family history, physical activity and waist circumference. In general, indigenous populations are at an increased risk of diabetes when compared with non-indigenous populations. The present study aims at assessing the risk of diabetes in a remote tribal population in a southern state of India, using the IDRS questionnaire and evaluating the suitability of the IDRS questionnaire as an appropriate risk assessment tool.

Methods

Study design

The present study is a cross-sectional study, assessing the current diabetes risk of the given population through survey and capillary blood screening. The presented data were collected as part of a health camp.

Door-to-door surveys were conducted in a remote tribal hamlet of Machuru in South India as part of a health camp. The team went to every individual house to get the details of the family members. The total population of the hamlet was 555. The IDRS questionnaire was completed by 160 individuals who were older than 25 years. The research team included members who could speak the local language, in addition to a member of the local community. Capillary blood glucose levels were measured using a standardised digital glucometer (Accu-Chek, Roche Diagnostics, Germany) after 8–12 h of overnight fasting to compare the current glycaemic status with their IDRS.

Results

The population of the hamlet was 555. In total, 160 adults older than 25 years were surveyed initially using the IDRS, and capillary glucose levels were measured in 103 individuals. The remaining 57 individuals did not give consent for the finger prick test.

Among 160 adults, 37 were at high risk (23.13%) as per the IDRS, 52 at medium risk (32.5%) and 71 at low risk (44.38%; see Table 1). Five participants were diagnosed with diabetes, and 18 were diagnosed with impaired fasting glucose (IFG) or prediabetes, according to the American Diabetes Association criteria (see Table 2). There was no significant difference in mean glucose levels or IDRS between the genders ($P > 0.05$).

The risk prediction of the IDRS was not substantial in the current population. Amongst the 18 individuals with IFG, the IDRS recognised 12 to be at moderate risk and six at low risk of diabetes. Among the five individuals with diabetes, IDRS recognised four to be at moderate risk and one at high risk of diabetes.

Discussion

Exploring the lifestyle of a remote tribal indigenous population was a unique experience for the research team. The family dynamics of the population are very unique, in that there is only one earning member of the family (predominantly a man younger than 30 years) and the rest of the family members who are older than 30 years become dependants and subsequently lead sedentary lives.

None of the 160 adults who answered the IDRS questionnaire knew whether their parents had diabetes. And, for the question on the 'family history' of diabetes, every single participant said that their parents were not diagnosed with diabetes as they had never checked their blood glucose levels before. It is noteworthy that the awareness about diabetes as a health condition is very minimal in the current population, let alone the previous generations. Family history scored '0' for all the subjects as none of them knew the diabetic status of their parents as no blood test was carried out to detect diabetes. This indicates that diabetes awareness and screening programmes should also be conducted in the remote areas of

Table 1 – Indian Diabetes Risk Score (IDRS) across both genders.

		Male (n = 68)	Female (n = 92)
Age in years (mean ± SD)		34 ± 2.83	46 ± 4.24
IDRS risk (n)	High risk	10	27
	Medium risk	24	28
	Low risk	34	37
IDRS (Mean ± SD)	High risk	55 ± 13	56 ± 12
	Medium risk	40 ± 4.7	38 ± 4.4
	Low risk	29 ± 7.1	32 ± 12

SD, standard deviation.

Table 2 – Fasting capillary blood glucose measurement (n = 103).

Range	Fasting glucose (mg/dL) [mean ± SD]	
	Male	Female
Normal range	88.79 ± 16.82	87.69 ± 19.29
Prediabetes range	107.17 ± 12.58	110 ± 14.96
Diabetes range	275 ± 19.52	225.33 ± 18.31

SD, standard deviation.

the country to curb the increasing prevalence of diabetes in India.

Age was found to be the major risk factor for diabetes in this study, followed by the lack of physical activity and abdominal obesity. In the current indigenous population, abdominal obesity was not prevalent and contributed only minimally to the risk score.

The prevalence of diabetes and prediabetes in this particular indigenous population is much lower at 3.24% and 3.42% when compared with the national prevalence of 8.7% and 4.6%, respectively.[11] This is contradictory to the findings from the indigenous populations of other countries, where the prevalence of diabetes was 3–4 times higher, on average, than non-indigenous populations.[6] The possible reasons could be that urbanisation has not reached this particular indigenous community as much as in the developed countries. Health disparity in indigenous populations is attributed more to lifestyle factors than genetic factors.[3] Despite a sedentary lifestyle above the age of 30 years, there are a few factors that are protective against diabetes in this study population. For example, whole-grain consumption helps to reduce the risk of diabetes,[12,13] and this particular indigenous population still consumes whole grains and has not even heard about or used refined products for cooking. Locally grown vegetables are used in abundance and become a part of their daily diet which is possibly an added advantage as fruit and vegetable consumption is inversely associated with diabetes.[14] Basic amenities such as electricity have still not reached these indigenous community dwellings. This could be seen as a blessing in disguise as they go to bed early and get up before sunrise, maintaining an optimal circadian rhythm, possibly keeping them healthy and protected against a metabolic disorder such as diabetes.[15,16] Similar to most diabetes risk assessment questionnaires around the world, lifestyle risk factors such as diet and sleep are not included in the IDRS. The Finnish Diabetes Risk Score questionnaire, which includes a question on diet, is found to be better than the IDRS in diagnostic accuracy and clinical utility.[17] The addition of questions on diet and sleep in the diabetes risk assessment questionnaire might, thus, be beneficial in increasing the diagnostic accuracy of type 2 diabetes.

The main strength of the study is that it has been conducted on a remote indigenous tribal population whose diabetic status is not widely studied in India, as even accessibility by road is still limited in these areas.

Limitations

Diagnosis of type 2 diabetes was performed using capillary glucose levels and not venous blood glucose levels. Owing to the funding constraints and lack of resources at the remote tribal location, it was not possible to measure the plasma glucose levels, and the capillary blood glucose tests were performed using a glucometer. Screened individuals were older than 25 years, and there are higher chances that other types of diabetes such as type 1 diabetes or latent autoimmune diabetes of adulthood might have gone unnoticed. The data reported were from a remote indigenous community in a southern state of India. The data might not be considered as a representative sample to explain the diabetic status of all the indigenous populations across the country.

Conclusions

The best way to assess the diabetes risk in this population might be through blood glucose measurements, rather than analysing the diabetes risk scores. The IDRS might not be an appropriate measure to detect the risk of diabetes in the given tribal population. The IDRS has definitely been of great benefit in the early type 2 diabetes risk prediction in a developing country such as India, similar to all other risk prediction questionnaires. Adding a few key lifestyle risk factors to the current available risk prediction tools could make them more precise. It might not be appropriate to generalise the findings obtained from this particular population to all the indigenous tribes in India, and further large-scale studies including other parameters such as glycated haemoglobin A1c and the oral glucose tolerance test would give a much better understanding about the diabetes prevalence in the indigenous populations of India.

Author statements

Ethical approval

Ethical approval was not applied for the study as the data presented here are a part of a health camp, and this was not performed exclusively as a research study.

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Competing interests

The authors declare no conflict of interest.

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