ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Diabetes risk assessment with Indian Diabetes Risk Score: A cross-sectional study among adults in rural Mandya, Karnataka

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Submission: 07-11-2023 Revision: 30-01-2024 Publication: 01-03-2024

ABSTRACT

Background: Screening for diabetes using the Indian Diabetes Risk Score (IDRS) is an inexpensive yet effective way of early diagnosis. **Aims and Objectives:** The present study was conducted to assess the risk of developing diabetes among individuals in rural field practice areas using IDRS. **Materials and Methods:** A community-based observational study was conducted among persons aged 20 years and older in the rural field practice area for 2 months. A semi-structured interview schedule, including the "IDRS" questionnaire, was used to obtain the data. **Results:** Out of 1100 subjects, around 50% were above 50 years, only 38.6% of the subjects had a waist circumference within the normal limits; 73.8% did moderate exercise; 86% of the subjects had no history of diabetes in their parents. The mean IDRS score of the subjects was 44.12 ± 14.33, ranging from 10 to 90. Nearly 2/3rd (69.6%) of them were at moderate risk, and 21.2% were at high risk for developing diabetes. The IDRS score was significantly higher among those with diabetes and hypertension. **Conclusion:** The majority of the subjects in our study had a moderate to high risk of developing diabetes as per the IDRS.

Key words: Diabetes; India Diabetes Risk Score; Rural area

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v15i3.59238

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Diabetes has emerged as a silent epidemic in India, with around 77 million people above the age of 18 years diagnosed with type 2 diabetes. The disease prevalence has increased exponentially in urban areas from 3.3% (1972) to 19% (2015–2019) as well as in rural areas from 2.4% (1972) to 15% (2015–2019).[1-4]

This increase in burden has a huge impact on health-care system of India, apart from its individual economic impact. It is estimated that annually, a diabetic (without complications) spends Rs. 10,000 in urban areas and Rs. 6,260 in rural areas on treatment. The total costs will shoot up to 15,000 if there's a complication.[5,6]

Hence, to reduce the burden on health care, early diagnosis of diabetes using screening tools is a good alternative, as evidence suggests that early diagnosis helps to delay the complications of diabetes,[7] as even today, more than 50% of people are still unaware of their diabetic status,[4] thereby increasing the clinical, social, and economic burden of the disease.[1,8]

The Indian Diabetes Risk Score (IDRS) is a simple screening tool that has been validated across India for assessing the risk of developing diabetes among the general population.[9-11] The risk assessment not only helps in early

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diagnosis, but it also pushes those who are at risk to adopt a healthy lifestyle, which reduces the risk of developing diabetes.[12] Hence, the present study was carried out in the rural field practice area of a tertiary medical college to assess the risk of developing diabetes.

Aims and objectives

To assess the diabetes risk and factors associated with the development of diabetes among adults in the study area.

MATERIALS AND METHODS

Study design

A community-based observational study with a cross-sectional design.

Study subjects

Persons aged 20 years and above in the study area.

Study period

The study was carried out for 2 months, i.e., April and May 2022.

Study area

The study was carried out in rural areas of Nagamangala, Mandya (Southern Karnataka, India), with a population of 169000 (rural) as of March 31, 2022.

Sample size

Assuming the prevalence of diabetes in the age group of ≥20 years as 9.6%[13] with an allowable error of 20% and at a level of significance of 95%, in the standard formula for calculating the sample size: $N=4PQ/L^2$ (where N is the sample size to be taken, P is the prevalence of domestic accidents, here 20%, Q= 1-prevalence, L= standard error), a sample size of 1100 was obtained (with inclusion of 10% non-response rate).

Exclusion criteria

Those unwilling to be a part of the study

1. Subjects whose general health condition did not allow them to communicate
2. Subjects who could not be contacted on three consecutive visits.

Study tool

A pre-designed, pre-tested, and semi-structured interview schedule includes the "IDRS" questionnaire.

Methodology

A total of 20 villages were selected randomly, out of the total of 330 villages in the study area. From each village, 50–60 subjects aged ≥20 years were randomly selected and included. Prior ethics committee approval was taken. (Write the number).

A house-to-house visit was done, and written informed consent was obtained from all the participants by explaining the purpose of the study. If a subject could not be interviewed for any reason, an eligible subject from a neighboring house was included to meet the final sample size.

Data analysis

The collected data were entered in the Microsoft Excel spreadsheet, coded appropriately, and cleaned for any possible errors. Epi-Info software was used for analysis. Categorical data were presented as percentages (%). Pearson's chi-square test was used to evaluate differences between groups for categorized variables.

Conditional logistic regression analysis (adjusted odds ratio with a 95% confidence interval) and correlation tests were applied to evaluate factors significantly associated with the IDRS. All tests were performed at a 5% level of significance; thus, an association was significant if the P-value was <0.05.

RESULTS

Out of 1100 subjects included in the study, there were a total of 637 (57.9%) females and 463 (42.1%) males. The mean age of the subjects was 50.46±13.170 years, varying from 21 to 89 years. The mean family income was 9640.36±9540.21 Rs. One-third (385) of the subjects were illiterate, 16.5% had completed secondary school, and only 7.5% (82) of them were graduates. One-fourth (266) of the subjects were unemployed, nearly half (490, 44.5%) of the subjects were agriculturists by occupation, 12.3% were laborers, 10% of them were in business, 5.6% were officials, and 1% had retired from their job.

The majority of the subjects (93.8%) were consuming a mixed diet, 0.3% of them used eggs in their diet, and 5.9% of them were vegetarians by diet. Most of them were non-smokers, and only 4.7% had a history of smoking and 6.2% had a history of alcohol intake. Among those who consumed alcohol (69), 4 units was the average intake of alcohol per week.

The mean height and weight were 158.92±8.54 cm and 64.15±12.55 kg, respectively. The mean abdominal circumference was 91.30±9.56 cm (Table 1).

More than 1/4th of the subjects (26.9%) had food from outside at least once or twice in a month, and only 3% of them were having it at least once a week. Nearly 10% of the subjects were diabetic, and the remaining were either unaware of or not having diabetes. More than

Table 1: Anthropometric measurements of the subjects

Anthropometric measurements	Mean	Standard Deviation
Height in cm	158.92	8.542
Weight in kg	64.155	12.5519
Abdominal circumference in cm	91.30	9.568

1/10th (14.3%) of the subjects were hypertensives, and the remaining were unaware.

Components of IDRS

Among the subjects, 11.9%, 39.5%, and 48.5% of them were in the age groups of <35 years, 35–49 years, and ≥50 years, respectively (Table 2).

Only 38.6 % of the subjects were having a waist circumference within the normal limits (Females <80 cm or Males <90 cm) (Table 3).

Only 6.4% of subjects were into some vigorous physical activity, 73.8% did moderate exercise, 13% did mild exercise and the remaining 6.8% were sedentary (Table 4).

The majority (86%) of the subjects had no history of diabetes in their parents. Whereas, 11.7% had a history of diabetes in one of their parents, and 2.3% had a history of diabetes in both parents. The mean dietary diversity score was 3.89±1.0 (Table 5).

The mean IDRS score of the subjects was 44.12±14.33, ranging from 10 to 90. Nearly 2/3rd (69.6%) of them were at moderate risk, 9.2% were at low risk, and 21.2% were at high risk of developing diabetes. No significant difference in IDRS score was found among males and females (Table 6).

IDRS score was significantly higher among those with diabetes and hypertension (Table 7).

A significant positive correlation was seen with age, weight, and abdominal circumference with that of IDRS. Cronbach's alpha value is low for various items of IDRS, as each of the items is independent of each other (Table 8).

DISCUSSION

In our study, 26.9% of the subjects ate food from outside, at least once or twice a month. Only 6.4% of subjects were into some vigorous physical activity; 73.8% did moderate exercise; 13% did mild exercise and the remaining 6.8% were following a sedentary lifestyle. Nearly 2/3rd (61.4%) of the subjects had waist circumferences beyond the normal limit. (Females >80 cm or males >90 cm).

Table 2: Age

Age group in years	Frequency	Percent
<35 years	131	11.9
35–49 years	435	39.5
50 years and above	534	48.5
Total	1100	100.0

Table 3: Waist circumference

Waist Circumference	Frequency	Percent
Females<80 cm or Males<90 cm	425	38.6
Females≥90 cm or Males≥100 cm	191	17.4
Females 80–90 cm or Males 90–99 cm	484	44.0
Total	1100	100.0

Table 4: Physical activity

Physical activity	Frequency	Percent
Mild exercise	143	13.0
Moderate exercise	812	73.8
Sedentary	75	6.8
Vigorous exercise	70	6.4
Total	1100	100.0

Table 5: Family history of diabetes

Family history of diabetes	Frequency	Percent
Both parents are diabetic	25	2.3
No diabetes in parents	946	86.0
One parent is diabetic	129	11.7
Total	1100	100.0

Nearly 10% of the subjects were diabetic, and 14.3% of the subjects were hypertensives. The majority (86%) of the subjects had no history of diabetes in their parents. Whereas, 11.7% had a history of diabetes in one of their parents, and 2.3% had a history of diabetes in both parents. The mean dietary diversity score was 3.89±1.0.

The mean IDRS score of the subjects was 44.12±14.33, ranging from 10 to 90. Nearly 2/3rd (69.6%) of them were at moderate risk, 9.2% were at low risk, and 21.2% were at high risk of developing diabetes. No significant difference in IDRS score was found among males and females. The IDRS score was significantly higher among those with diabetes and hypertension. A significant positive correlation was seen between age, weight, and abdominal circumference with that of IDRS.

In a study done among those aged 25 years above, by Rawat et al., in Western Uttar Pradesh, low, moderate, and high diabetes risk were found among 5.4%, 42.4%, and 52.2% of the subjects, respectively. A higher risk of diabetes was found in those with >40 years compared to those in the <40 years age group, which was statistically significant. The study also showed a high diabetes risk among those in the high BMI

Table 6: Indian diabetes risk score

Indian diabetes risk score	Mean	Standard. deviation	Low risk (<30)	Moderate risk (30–50)	High risk (≥60)
	44.1182	14.32893	101 (9.2%)	766 (69.6%)	233 (21.2%)

Table 7: Logistic regression model for IDRS score being moderate or high (≥30)

Logistic regression model for IDRS	aOR	Confidence interval	P value
Diabetic (Reference-Non-diabetic)	2.646	1.693–4.137	<0.001
Hypertensive (Reference-non-hypertensive)	3.259	2.277–4.666	<0.001

Table 8: Correlation of IDRS with Age, weight and abdominal circumference

IDRS	Age in years	Weight in kg	Abdominal circumference in cm
Pearson correlation	0.556**	0.240**	0.382**
Sig. (2-tailed)	<0.001	<0.001	<0.001

category.[14] In a study done among attendees of a medical college in Pondicherry, 12.6%, 73.7%, and 13.7% were at low, moderate, and high risk of developing diabetes as per the IDRS scale.[15] These findings are similar to our study.

In a study by Khare et al., among those aged >18 years in central India, they found a mean IDRS of 51.29 (moderate risk) among their subjects. And also, 35.93%, 18.2%, and 45.87% had a scores of <30, 30–60, and ≥60, respectively.[16] The findings from our study showed a comparatively lesser risk of developing diabetes, as we included subjects in a rural community as opposed to those visiting endocrinology units in their study.

In a study among adults aged >20 years in Rajasthan, done by Jangir et al., found low, moderate, and high diabetes risk among 33.17%, 61.83%, and 5% of the subjects.[17] The majority of the subjects were in the moderate-to-high risk category for developing diabetes, and the general risk of any disease of interest is comparatively higher among those visiting hospitals for a wide variety of symptoms.

In a study done by Sidenur et al., in Karnataka, 11% of the subjects were diabetic, and the prevalence of diabetes was higher among those with a high IDRS score.[18] In a study by George et al., in Kerala, low, moderate, and high diabetes risk were found among 33.17%, 61.83%, and 5% of the subjects. Increasing age, high BMI, above-normal waist circumference, high blood pressure, positive family history, and female gender were associated with a high risk of developing of diabetes.[19] In a study done among the rural population of Punjab, a higher IDRS score showed an increasing trend with increasing age, and females had a higher risk of developing diabetes compared to males.[20]

In a study by Tamilarasan et al., in Tamil Nadu, 31% of the subjects aged 20 years and above were at high risk of developing diabetes. Nearly half (47%) of them were at moderate risk, and 22% were at low risk. One-fourth of the subjects had a positive family history of diabetes, and among them, 9% had diabetes in both of their parents. And also, high diabetes risk was seen among those aged 50 years and above.[21] In a study done in Mumbai by Patil and Patil among women aged 21–40 years, 28% were at high risk, 70.9% were at moderate risk, and 1.1% was at low risk of developing diabetes as per the IDRS score. Those aged 31–40 years and following a sedentary lifestyle were at higher risk of developing diabetes.[22]

Limitations of the study

The generalizability of our study findings to a larger population with lesser IDRS score in predicting prediabetes and diabetes occurrence has few restrictions as sensitivity and specificity of Indian diabetes risk score varies widely for lesser score compared to those with higher score in predicting prediabetes and diabetes. IDRS has components like physical activity and family history, which are subjective and calls for need of an objective update in predicting prediabetes and diabetes risk. And also, even though our study involved a large sample, multicentric representation would have improved the outcome and helps in better interpretation.

CONCLUSION

The majority of the subjects in our study had moderate to high risk of developing diabetes as per the IDRS, which is a cause of major concern for each individual in the community as well as for policymakers and administrators at the local level. An approach that is continuous in nature to address the health needs of the community, more specifically the risk of diabetes, is the need of the hour. Risk assessment related to diabetes should also be continuous, with appropriate preventive measures to tackle the burden of diabetes and its complications in the community as a whole.

ACKNOWLEDGMENT

We sincerely thank all those field health workers and respondents for their cooperation and input. We also thank our colleagues for their guidance and support.

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Authors Contribution:
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Source of Support: Nil, **Conflicts of Interest:** None declared.