Screening for risk of diabetes among adult population of Raipur city using Indian diabetic risk score

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ABSTRACT

Background: India is diabetic capital of the world, with maximum number of diabetic patients. There is large burden of undetected diabetic cases in community. There is increasing risk of diabetes in urban population, because of illiteracy, lack of awareness, low socioeconomic status, and unhealthy lifestyle. The Madras Diabetes Research Foundation (MDRF) has developed Indian Diabetes Risk Score (IDRS)to detect undiagnosed Type 2 diabetes. **Objective:** To find out the level of risk for diabetes in adult population of Raipur city using IDRS tool developed by MDRF. **Materials and Methods:** A cross-sectional, community-based study was conducted among 640 adult population in Raipur city. Sociodemographic information was collected using pretested and predesigned questionnaire. IDRS tool comprising two modifiable (waist circumference, physical activity) and two non-modifiable risk factors (age, family history) for diabetes was used to assess the risk of diabetes was obtained. After collection of data, it was analyzed using descriptive statistics, frequencies with the help of suitable statistical software. **Results:** Response rate was 100%. Mean age of the study subjects was 37.82 ± 10.68 years, body mass index 23.34 ± 3.81 kg/m², waist circumference 85.66 ± 11.15 cm. As per IDRS scoring study population were classified to be low, medium, and high risk for developing Type 2 diabetes were 34.69%, 47.34%, and 17.97%, respectively. The mean IDRS score is 34.5. **Conclusion:** IDRS can be used as an effective tool for screening undiagnosed diabetes in the community. More than 50% subjects are at high and medium risk for diabetes among the study population.

KEY WORDS: Indian Diabetic Risk Score; Adult Population; Diabetes

INTRODUCTION

Variability is an inherent characteristic of the biological world. The globe today faces a transition state, i.e., epidemic of non-communicable diseases (NCD), which will soon surpass communicable diseases both in the developing and developed world. India is no exception, and both native and migrant Asian Indians are ethnically a particularly vulnerable race from the metabolic standpoint. However, in NCD due to lack of a clear etiological agent, it is heavily dependent on identifying and tackling risk factors. The risk factors such as age, gender, and family history are non-modifiable while others - such as smoking, diet, physical activity, hypertension, and diabetes - are modifiable.[1]

The trend of diabetes in India has changed alarmingly in the recent years. There is a sharp increase in the prevalence of diabetes also associated with an increase in the prevalence of impaired glucose tolerance as indicated by the recent studies. It is reported that the prevalence of diabetes varies 16% in urban India to 3% in rural India. Like other developing countries in India, the prevalence of diabetes is higher among affluent urban living people different from the trends of diabetes in west. From the year 1980, the slow increase in

the trend of diabetes came up to 11% among obese sedentary urban Indians. The prevalence is widely different among different groups of people.[2,3]

India is leading the world having the largest number of diabetic people, hence termed as the "diabetic capital of the world." According to Diabetes Atlas 2011 published by the International Diabetes Federation, in India, there are 61.3 million diabetics and is expected to raise 101.2 million by 2030 unless effective preventive measures are taken.[4]

Various associations and federations throughout the world have developed the risk scoring for the development of Type 2 diabetes. Among these prediction tools, American Diabetes Association Risk Tools, Finnish Diabetes Risk Score, National Health and Nutrition Examination Survey risk score, and study to prevent non-insulin dependents diabetes mellitus (DM) risk score in developed countries, Schwarz PE, Li J, Lindstrom J, Tuomilehto J. Tools for predicting the risk of Type 2 diabetes in daily practice, Horm Metab Res. 2009;41(2):86-97 and currently in practice in India - Indian Diabetes Risk Score (IDRS) developed by Madras Diabetes Research Foundation (MDRF) and Ramachandran et al. are frequently used[3,4]

Ageing population, rapid urbanization and transition from agrarian life to a wage-earning, modern city life are reported as major contributors to increased unhealthy lifestyle pattern in urban areas. Chhattisgarh state is no exception to this. There is a paucity of epidemiological studies pertaining to diabetes in Chhattisgarh, which resulted in undertaking this study. Understanding the role of these risk factors is the key to develop a clear and effective strategy for improving community health. The study was conducted with an objective to find the risk of diabetes among the adult population of Raipur city using MDRF-IDRS questionnaire.

MATERIALS AND METHODS

A cross-sectional, community-based study was conducted among 640 subjects of age group 25-59 years in Raipur city during the period July 2015 to June 2016.

Sample Size

Sample size was calculated using WHO statistical formula for sample size determination. The following formula used: $n = Z^2 P (1-P)/d^2$.[5]

Where n = Sample size, Z = Z statistic for a level of confidence (1.96), P = Expected prevalence of risk factors of diabetes (50%, $P = 0.5$), and d = precision (in proportion of one; if 4%, $d = 0.04$). As there was no baseline study in Raipur to estimate P, a figure of 50 % was used. A total of 600 figures came using statistical formula. To give an equal representation to all the selected area, it was decided to select

40 subjects from each of 16 areas, that came out to be 640. Therefore, a total 640 subjects were included in the study.

Sampling Method

Multistage random sampling technique.

Study Tool

The study tool, which has been used in this study, was IDRS - A simplified form of score for screening undiagnosed diabetics. An IDRS value > or = 60 had the optimum sensitivity (72.5%) and specificity (60.1%) for determining undiagnosed diabetes with a positive predictive value of 17.0%, negative predictive value of 95.1%, and accuracy of 61.3%.[4] The study tool has got four important factors such as age, abdominal obesity, family history of diabetes, and physical activity. The study questionnaire also includes the measurement of body mass index (BMI), dietary habits, smoking and alcohol habits. Informed/verbal consent before interview and anthropometric measurements was taken.

Outcome Measures

The outcomes are expressed in percentages based on low, medium, and high risk of developing diabetes using the IDRS risk score. The minimum score is 0 and the maximum score is 100.

IDRS

Variables	Score
Age	
<35 years	0
35-49 years	20
≥50 years	30
Waist circumference	
<80 cm (female) and <90 cm (male)	0
80-89 cm (female) and 90-99 cm (male)	10
>90 cm (female) and >100 cm (male)	20
Physical activity	
Regular vigorous exercise or strenuous (manual) activities at home or work	0
Regular moderate exercise or moderate (manual) activities at home or work	10
Regular mild exercise or mild (manual) activities at home or work	20
No exercise and/or sedentary activities at home/work	30
Family history of diabetes	
No diabetes in parents	0
One parent is diabetic	10
Both parents are diabetic	20

Minimum score=0, Maximum score=100. If the score is ≥60: Very high risk of having diabetes. Oral glucose tolerance test is recommended to rule out diabetes. If this is not possible, at least a random blood sugar or a fasting blood sugar should be done. 30-50: The risk of having diabetes is moderate. It is still recommended to have the above check up. <30: Risk of having diabetes is probably low

RESULTS

Our study included 640 subjects with mean age of 37.82 ± 10.68, male (47.66%) and female (52.34%) proportion were almost equal, 59.38% belonging to nuclear family, majority were from Class IV socioeconomic status. Out of the total population, smokers and alcoholics constituted 66 (10.31%) and 129 (21.15%) individuals, respectively (Table 1). According to IDRS score of MDRF, the study population were classified to be low, medium, and high risk for developing Type 2 diabetes were 34.69%, 47.34%, and 17.97%, respectively (Table 2).

Table 3 shows different variables used in IDRS screening questionnaire and their scoring system. Approximately, 21% were more than 50 years of age, 20% had high abdominal obesity by waist circumference, 7% were having sedentary habits, and 7% had family history of diabetes in both parents.

According to BMI measure, the mean BMI was 25.6 among the total study population of which 142 (22.19%) had BMI between 25 and 29.99 and 28 (4.38%) had BMI above 30. The mean IDRS score is 34.5.

Comparing study subjects on the basis of place of residence (Table 4), it was found that around 22% of non-slum was at high risk compared to 15% in slum areas. The proportion of medium-risk individuals in slum (48.12%) and non-slum (46.56%) population were almost the same. The low-risk proportion is higher in slum population (37.5%) compared to non-slum population (31.88%). The difference in the risk level of diabetes between slum and non-slum subjects was found to be statistically significant (Chi-square = 6.14, df = 2, *P* = 0.0464).

DISCUSSION

Our study showed more than 50% of subjects were at high and medium risk for diabetes. The difference in the level of risk for diabetes between slum and non-slum was found to be statistically significant. Although various questionnaire methods have been adopted by various organizations, still the IDRS developed by MDRF (By Mohan V et al.) is a clear and usable tool utilizing the very simple risk factors such as age, waist circumference, physical activity level and family history of diabetes along with sociodemographic pattern, weight and height. In India, there are also cases of Type 2 DM in lean

Table 1: Distribution of study subjects and its variables

Variables	Frequency (%)
Gender	
Male	305 (47.66)
Female	335 (52.34)
Family type	
Joint	133 (20.78)
Nuclear	380 (59.38)
Three generation	127 (19.84)
Socioeconomic status	
Class I	04 (0.63)
Class II	174 (27.19)
Class III	119 (18.59)
Class IV	340 (53.13)
Class V	03 (0.47)
H/O smoking	
Yes	66 (10.31)
No	574 (89.69)
H/O alcohol intake	
Yes	129 (20.15)
No	511 (79.85)

Table 2: Risk of development of diabetes based on IDRS score

Level of risk	Frequency (%)
High (IDRS ≥60)	115 (17.97)
Medium (IDRS 30-50)	303 (47.34)
Low (IDRS <30)	222 (34.69)

IDRS: Indian diabetes risk score

Table 3: Scoring system of IDRS among study population

Variable	Frequency (%)
Age	
0	283 (44.22)
20	226 (35.31)
30	131 (20.47)
Waist circumference	
0	330 (51.56)
10	180 (28.13)
20	130 (20.31)
Physical activity	
0	44 (6.88)
10	487 (76.09)
20	77 (12.03)
30	32 (5.0)
Family history	
0	496 (77.5)
10	102 (15.94)
20	42 (6.56)

IDRS: Indian diabetes risk score

Table 4: Scoring system of IDRS among study population according to place of residence

Place of residence	High (%)	Medium (%)	Low (%)	Total (%)
Slum	46 (14.38)	154 (48.12)	120 (37.5)	320 (50.0)
Non-slum	69 (21.56)	149 (46.56)	102 (31.88)	320 (50.0)
Total	115 (17.97)	303 (47.34)	222 (34.69)	640 (100.0)

IDRS: Indian diabetes risk score

BMI individuals. Hence, waist circumference is better an indicator than BMI in assessing the risk factor for diabetes. The IDRS has a sensitivity of 72.5% and specificity of 60.1% and is derived based on the largest population-based study on diabetes in India CURES. The advantage of IDRS is its simplicity, low cost and is easily applicable for mass screening programs. Using this tool, our study showed around 2/3rd of the study subjects are in high (17.97%) and medium (47.34%) risk category. Early identification of the high-risk individuals would help in taking an appropriate intervention in the form of dietary changes and increasing physical activity, thus helping to prevent, or at least delay, the onset of diabetes.[4] IDRS is very useful in mass screening and comparing in both urban and rural setup. Similar studies were done by Vardhan et al. among medical students, Stanley et al. study among rural community in Tamil Nadu, Adhikari et al. among South Indian population using IDRS developed by MDRF.[6-8]

There are very few studies of risk factors for diabetes among adult population from India, especially this is the first one from Chhattisgarh. The study has been undertaken using standard tool like IDRS tool developed by MDRF. In this study, the comparison of risk factors for diabetes has been done on the basis of place of residence, i.e., slum versus non-slum. From the findings, appropriate recommendations can be given to government. Data collection has been done by a single investigator. Hence, the chances of interobserver bias were eliminated. Male and female participation was almost equal. Hence, there won't be any bias related to gender. Health education was given for at least 10 min to 622 study participants out of 640 irrespective of the presence of risk factors. The limitations of our study are qualitative aspects were not covered, and blood sugar levels of the study subjects were not taken. Hence, the sensitivity, specificity, positive predictive value, negative predictive value could not be found out.

CONCLUSION

All these studies proved IDRS as a critically sensitive and specific tool for predicting risk of diabetes in the population after identifying metabolic syndrome and cardiovascular diseases in the population. Hence, this tool can be used in a low cost set up and also as a mandatory screening tool in NCD clinic of health facilities for primary prevention of diabetes, metabolic syndrome, and other cardiovascular diseases.

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