International Journal of Community Medicine and Public Health
Shaik NN et al. Int J Community Med Public Health. 2020 Jan;7(1):170-176
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20195849

Original Research Article

Assessment of risk of developing diabetes using Indian diabetes risk score in the urban field practice area of Rajarajeswari Medical College and Hospital, Bangalore

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Received: 23 October 2019
Revised: 06 December 2019
Accepted: 07 December 2019

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ABSTRACT

Background: Diabetes is one of the largest global health emergencies of the 21st century. As per International Federation of Diabetes some 425 million people worldwide are estimated to have diabetes. The prevalence is higher in urban versus rural (10.2% vs 6.9%). India had 72.9 million people living with diabetes of which, 57.9% remained undiagnosed as per the 2017 data. The objectives of the present study were to identify subjects who at risk of developing Diabetes by using Indian diabetes risk score (IDRS) in the Urban field practice area of Rajarajeswari Medical College and Hospital (RRMCH).
Methods: A cross sectional study was conducted using a Standard questionnaire of IDRS on 150 individuals aged ≥20 years residing in the Urban field practice area of RRMCH. The subjects with score <30, 30-50, >or =60 were categorized as having low risk, moderate risk and high risk for developing diabetes type-2 respectively.
Results: Out of total 150 participants, 36 (24%) were in high-risk category (IDRS≥60), the majority of participants 61 (41%) were in the moderate-risk category (IDRS 30–50) and 53 (35%) participants were found to be at low-risk (<30) for diabetes. Statistical significant asssociation was found between IDRS and gender, literacy status, body mass index (p<0.0000l).
Conclusions: It is essential to implement IDRS which is a simple tool for identifying subjects who are at risk for developing diabetes so that proper intervention can be carried out at the earliest to reduce the burden of diabetes.

Keywords: Diabetes, IDRS, Urban area

INTRODUCTION

Diabetes is one of the largest global health emergencies of the 21st century. Diabetes is among the top 10 causes of death globally and together with the other three major noncommunicable diseases (NCDs) (cardiovascular disease, cancer and respiratory disease) account for over 80% of all premature NCD deaths.[1] Diabetes prevalence has been rising more rapidly in middle and low-income countries.[2]

As per International Federation of Diabetes some 425 million people worldwide, or 8.8% of adults 20-79 years, are estimated to have diabetes. About 79% of them live in low and middle-income countries. By 2045, 629 million or 10.6% of people 20-79 years, will have diabetes. The prevalence of diabetes for women 20-79 years is estimated to be 8.4% which is slightly lower than among men (9.1%). The prevalence is higher in urban versus rural (10.2% vs 6.9%).[3]

India had 72.9 million people living with diabetes as per the 2017 data. Of these, the proportion undiagnosed is 57.9%, which adds to the disease burden. Diabetes accounted for 10.7% of global all-cause mortality among people in 20-79 years age group.[3]

Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation, vision loss and nerve damage.[2] The starting point for living well with diabetes is an early diagnosis– the longer a person lives with undiagnosed and untreated diabetes, the worse their health outcomes are likely to be.[4]

Diabetes is one of the contender diseases for which the community can be screened as it qualifies criteria of having a long latent asymptomatic stage that may be present for up to seven years before diagnosis, is treatable, and testing is acceptable to patients.[5] Early treatment of diabetes improves micro as well as macro vascular outcomes in the long run.[4]

It has been acknowledged that diabetic screening can add quality of life years.[6] Madras Diabetes Research Foundation gave the countrymen the Indian Diabetes Risk Score (IDRS) which effectively screens for those at high risk of developing diabetes. This score is based on an extremely large population base study on diabetes in India (Chennai Urban Rural Epidemiology Study). This screening score has a sensitivity of 72.5% and specificity of 60.1% in the Indian community.[7] The advantages of this tool encompasses it is no cost, non-invasive, simple, and easy applicability by the target population during mass screening programmes.[8]

Early identification of the individuals at risk of developing diabetes would help in taking appropriate intervention in the form of dietary changes and increasing physical activity, thus helping to prevent, or at least delay, the onset of diabetes. Hence, identification of at-risk individuals is extremely important to prevent diabetes in India.[9]

According to the study done by ICMR–INDIAB, the prevalence of diabetes mellitus in rural and urban areas in Karnataka was found out to be 5.6% and 11.1% respectively.[10] Considering, high prevalence in urban areas this study is conducted in an Urban area.

Objectives

The objectives of the present study were to identify subjects at risk of developing diabetes by using IDRS in the field practice area of Rajarajeswari Medical College and Hospital, Bengaluru.

METHODS

A community-based cross-sectional study was conducted for a period of 3months from January 2019 to March 2019 after obtaining clearance from the ethical committee in the urban field practice area of Rajarajeswari Medical College and Hospital which has a total population of 7745. Among them 5291 (68.33%) belonged to adult (≥20 years) age group. Adults (≥20 years), who are not known cases of diabetes mellitus from each house were included in the study. All the participants were briefed regarding the objectives of the study. Participant information sheets which contained information about the objectives and procedures of the study were distributed and explained to all the participants. Written informed consent was obtained from them. Adults residing for less than 6 months in the area, pregnant and lactating mothers were excluded from the study. Study was conducted on 150 adults. The sample size was calculated using the formula, $n=z^2p$ (1-p) $/d^2$ where: z=1.96; p=prevalence=11%; q=1-p=89%; d=absolute precision: 5%; n=sample size=150.[10] House to house visit was done, houses were selected by systematic random sampling and a single eligible participant from each selected house was interviewed.

Details on sociodemographic profile and IDRS tool given as Figure 1 was used to collect data by interview method. Anthropometric measurements were done following this.[7]

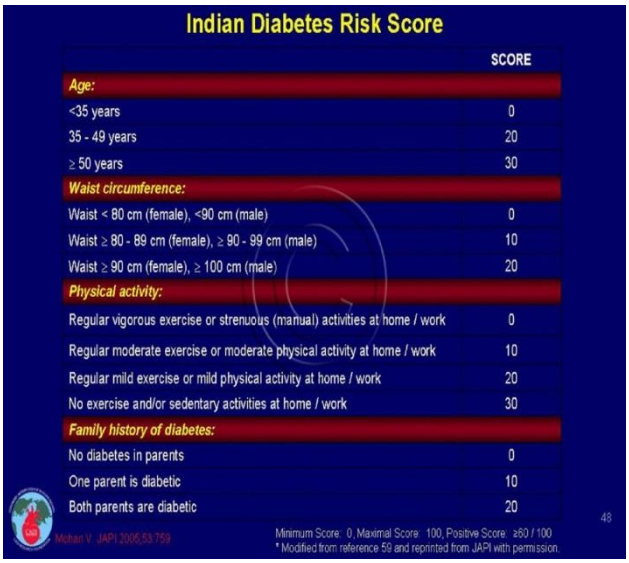

Figure 1: Indian diabetic risk score.[7]

IDRS developed by Mohan et al and parameters comprising two modifiable (waist circumference, physical activity) and two non-modifiable risk factors (age, family history) for diabetes.[7] IDRS analysis was done with the help of all four parameters.

If age <35 years score is=0, if 35-49 years score is=20, if >50 years score=30, waist circumference <80 cm for female and <90 cm for male score = 0, >80-89 cm for female and >90-99 cm male score=10, >90 cm for female and >100 cm for male score=20, physical activities vigorous exercise or strenuous work score=0, moderate exercise work-home=10, mild exercise work/home=20, no exercise and sedentary work-home=30, family history

of diabetes, no family history=0, family history present either parent=10, family history present both parents=20.

After adding all four parameters, if risk score (>60 very high risk, 30-50 moderate risk, <30 low risk). It is helpful to identify subjects at high risk for diabetes and also raised awareness about diabetes and its risk factors.

Waist circumference was measured to the nearest 0.1 cm at the midpoint between the tip of the iliac crest and the last costal margin in the back and at the umbilicus in the front, using a non-stretchable tape, at the end of normal expiration, with the subject standing erect in a relaxed position. Abdominal central obesity was considered to be present when the waist circumference was >80 cm in women and >90 cm in men.[11]

Physical activity levels were graded based on WHO steps definitions of sedentary, mildly, moderately or vigorously physically active.[12]

Family history of diabetes if either or both of a subject's parents had diabetes, they were considered to have a positive family history.[13]

Illiterate is a person aged ≥7 years, who can neither read nor write, or can only read but cannot write in any language. Literate is a is a person aged ≥7 years, who can read and write with understanding in any language.[14]

Weight was measured in minimal clothing with bathroom weighing scale. Height was measured with a stadiometer with person standing erect, feet parallel and bare-feet. Body mass index (BMI) grading was done using WHO international standards.[15]

Subjects under high risk category were referred to our urban health centre and those with high blood sugar levels were started on treatment and were followed up. Those with moderate risk category were counselled on life style modification.

Statistical analysis

The data was collected and compiled using Excel and analysed using SPSS software version 21. The quantitative variables like age, waist circumference; BMI was assessed using mean and standard deviation. The qualitative data like literacy status, gender, family history, physical activity was assessed using frequency and percentage. Test of significance used was Chi-square test.

RESULTS

Of all the 150 participants interviewed, majority of the study participants, 60 (49%) were in the age group of 35-49 years followed by 57 (38%) <35 years and 33 (22%) were ≥50 years. Mean Age in study population was 41.44±15.5 years. As shown in the Table 1, out of 150 participants, 49 (37%) were males, 101 (63%) were females. Out of 150 subjects, 82(55%) were literate, 68(45%) were illiterate. 130 were married and 20 were unmarried. Mean BMI was 26.3±6.2 kg/m^2.

As shown in the Table 2, out of 150 participants, 36 (24%) had a high-risk score (IDRS≥60), the majority of participants 61 (41%) were in the moderate-risk category (IDRS 30–50) and 53 (35%) participants were found to be at low-risk (<30) for diabetes.

Table 1: Distribution of study subjects according to socio-demographic profile (n=150).

S. no.		Characteristic	No. of subjects	%
1	Gender	Male	49	33
		Female	101	67
		Total	150	100
2	Literacy status	Literate	82	55
		Illiterate	68	45
		Total	150	100
3	Marital status	Married	130	87
		Unmarried	20	13
		Total	150	100
4	Family history	Present	47	22
		Absent	103	69
		Total	150	100

Table 2: Distribution of study subjects according to IDRS (n=150).

S. no.	IDRS risk score	No. of subjects	%
1	High risk ≥60	36	24
2	Moderate risk 30-50	61	41
3	Low risk <30	53	35
	Total	150	100

Table 3: Distribution of risk components of IDRS among study subjects (n=150).

Variables	No. of study subjects (%)	IDRS		
		≥60 high risk (%)	30-50 moderate risk (%)	<30 low risk (%)
Age (in years)				
<35	57 (38)	1 (1)	20 (13)	36 (24)
35 to 49	60 (40)	15 (10)	33 (22)	12 (8)
≥50	33 (22)	20 (13)	8 (6)	5 (3)
Total	150 (100)	36 (24)	61 (41)	53 (35)
Waist circumference				
<80 cm (female)	39 (26)	1 (2)	6 (11)	8 (10)
<90 cm (male)	15 (10)	1 (2)	3 (5)	5 (7)
≥80–89 cm(female)	34 (23)	7 (4)	18(18)	9 (6)
≥90–99 cm (male)	27 (18)	2 (2)	12(12)	13 (9)
≥90 cm (female)	28 (18)	17 (11)	6 (4)	5 (2)
≥100 cm (male)	7 (5)	4 (3)	2 (1)	1 (1)
Total	150 (100)	36 (24)	61 (41)	53 (35)
Family history				
No	103 (69)	14 (9)	38 (26)	51 (34)
One	33 (22)	13 (9)	19 (13)	1 (0.5)
Both	14 (9)	9 (6)	4 (2)	1 (0.5)
Total	150 (100)	36 (24)	61 (41)	53 (35)
Physical activity				
No exercise	13 (9)	10 (7)	2 (1)	1 (0.5)
Mild exercise	46 (31)	20 (13)	19 (13)	7 (4.5)
Moderate exercise	81 (54)	5 (3)	39 (26)	37 (25)
Vigorous exercise	10 (6)	1 (1)	1 (1)	8 (5)
Total	150 (100)	36 (24)	61 (41)	53 (35)

Table 4: Association of characteristics among study subjects with IDRS (n=150).

Variables	No. of study subjects (%)	Indian diabetic risk score			P value
		≥ 60 high risk (%)	30 to 50 moderate risk (%)	< 30 low risk (%)	
Gender					
Male	49 (33)	6 (4)	20 (14)	23 (15)	
Female	101 (67)	30 (20)	41 (27)	30 (20)	0.030741
Total	150 (100)	36 (24)	61 (41)	53 (35)	
Chi square value (χ^2)	6.9643		df-2		
Literacy status					
Illiterate	68 (45)	28 (19)	25 (1)	15 (10)	
Literate	82 (55)	8 (5)	36 (40)	38 (25)	0.000017
Total	150 (100)	36 (24)	61 (41)	53 (35)	
Chi square value (χ^2)	21.9605		df-2		
Body mass index					
<18.5	8 (5)	1 (1)	3 (2)	4 (3)	
18.5-22.99	52 (35)	3 (2)	17 (11)	32 21)	
23-24.99	23 (16)	3 (2)	18 (12)	2 (2)	<0.0000l
>25	67 (44)	29 (19)	23 (16)	15 (9)	
Total	150 (100)	36 (24)	61 (41)	53 (35)	
Chi square value (χ^2)	47.0514		df-6		

As shown in Table 3, out of 101 females 39 (26%) females had waist circumference <80 cm, 34 (23%) had between ≥80–89 cm and 28 (18%) had ≥90 cm. Out of 49 males 15 (10%) females had waist circumference <90 cm, 27 (18%) had between ≥90–99cm and 7 (5%) had ≥100 cm. Mean waist circumference for females was

82.63±9.3 cm, for males was 92.81±9 cm. 47 (31%) out of 150 had a positive family history. 13 (9%) subjects did no physical activity, 46 (31%), 81 (54%) and 10 (6%) subjects did mild, moderate and vigorous physical activity respectively.

As shown in Table 4, on applying chi-square test, statistical significant difference was found between IDRS and gender, literacy status, BMI (p<0.0000l).

DISCUSSION

In this study, we used a simplified IDRS for identifying newly diagnosed diabetic subjects in our country. This is of great significance as use of such scoring system could prove to be a cost-effective tool for screening of diabetes. Further, use of such a risk score would be of great help in developing countries like India where there is a marked explosion of diabetes and over half of the diabetic cases remain undiagnosed.

Mean age in our study population was 41.44±15.5 years, 49 (37%) were males and 101 (63%) were females. Comparing with a study conducted by Stanley et al, mean age for population was 56.1±17.5, 60 (39%) were males and 94 (61%) were females which is similar to our study.[16] 49 (37%) were males, 101 (63%) were females, 68 (45%) were illiterate which was similar to a study reported by Brinda et al, 68 (67.3%) were females and 33 (32.7%) were males, 52.5% were illiterates.[17]

In our study out of a total of 150 subjects, 24% were in high risk category,41% were in moderate risk category and 35% were in low risk category, where as in a study conducted by Stanley et al out of a total of 154 subjects, 18 (12%) were at moderate risk which is less and 132 (88%) were at high risk which is very high compared to our study.[16] Similar findings as our study were reported in a study done by Choudary et al, 46% had moderate risk, 31.5% had high risk, and 22.5% had low risk but our study had more participants at low risk followed by high risk.[18] Comparing with a study conducted by Khandhedia et al.[19] 22.8% were in high risk category which is similar to our study, 66.8% were in moderate risk category which is more compared to our study and lesser proportion, 10.4% were in low risk category. A lesser proportion of low risk 8.9% was also reported in a study conducted by Joshi et al and 36.6% were at high risk and 56.6% were at moderate risk.[20]

Subjects at moderate risk were more, 67.7% in a study conducted by Arun et al, where-as lesser proportion of subjects were at high risk 14.9% and low risk 17.4% compared to our study.[21] In a study conducted by Nagalingam et al, 37% were at high risk which is more compared to our study, 45% were at moderate risk which is similar to our study and lesser proportion 18% were at low risk.[22] In a study conducted by Reshma et al high risk for diabetes was 36.55%, 54.6% of participants were at moderate risk and lesser proportion 8.9% of participants were at low risk compared to our study.[23]

A study conducted in an Urban Resettlement Colony of Delhi by reported a lower proportion 5.3% of low risk and 94.6% of the individuals with moderate and high risk.[24] A study conducted in Urban Poor South Indian population by Oruganti et al lesser proportion of participants were at low risk 6%, 64% had moderate risk, and a similar proportion, 30% were at high risk where as 2.80% were in low risk, 28.40% in moderate risk and 68.80% were in high risk group in a study conducted by Nandeshwar et al.[25,26] Study done by Brahmbhatt et al reported 33.8% in high risk, similar proportion 57.2% in moderate risk and 9.0% in low risk. Madhavi et al reported 21.5%, 52.8%, 19.9% of the individuals in high, moderate, and low risk group respectively which is similar to our study.[27,28]

CONCLUSION

This study provides the use of IDRS for identifying subjects who are at risk for developing diabetes so that proper intervention can be carried out at the earliest to reduce the burden of diabetes. IDRS is a cost-efficient and practical way to identify individuals at high risk for Diabetes in the general population.

Recommendations

We recommend that every individual above 20 years should be assessed for the risk of developing diabetes by calculating the IDRS. Development of suitable primary preventive approaches, including lifestyle and dietary modifications are recommended for the moderate risk participants, fasting and postprandial blood sugar levels for high-risk participants.

ACKNOWLEDGEMENTS

We are thankful to all the post graduates of Department of Community Medicine, interns and health workers for their co-operation in undertaking this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Shaik NN, Jaswanth SM, Manjunatha S. Assessment of risk of developing diabetes using Indian diabetes risk score in the urban field practice area of Rajarajeswari Medical College and Hospital, Bangalore. Int J Community Med Public Health 2020;7:170-6.