



Evaluation of Risk for Type 2 Diabetes Mellitus Using Indian Diabetes Risk Score among Urban Adult Population, Hyderabad

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ABSTRACT:

Introduction: Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. In India, there are estimated 77 million people above the age of 18 years suffering from diabetes (type 2) and nearly 25 million are pre-diabetics (at a higher risk of developing diabetes in near future). More than 50% of people are unaware of their diabetic status which leads to health complications if not detected and treated early

Objectives: 1. To assess the risk of Type 2 Diabetes Mellitus through IDRS in adults aged 18 and above

2. To study association of risk of Type 2 Diabetes Mellitus with various factors

3.To assess the sensitivity and specificity of IDRS method as a screening tool in the community

Methods: A community based, cross sectional study was conducted among 400 adult population in urban field practice area of Malla Reddy Medical College for Women. A pre-designed, pre-tested questionnaire and IDRS tools were used to assess the risk of diabetes among study population after obtaining the consent. Data were analyzed using SPSS version 20.

Results: Among study population, 15 % (low risk), 42% (medium risk) and 43% (high risk) according to IDRS. The factors waist circumference, physical activity, age and family history were associated and found statistically significant

Conclusions: Lifestyle modification is an effective tool for the primary prevention of diabetes in Asian Indians. The primary prevention of diabetes is urgently needed in India to curb the rising burden of diabetes.

1. Introduction

Non-communicable diseases (NCD) kill 41 million people each year which accounts to 74% of all deaths globally and emerged as pandemic of 21st century due to risk factors like rapid urbanization, sedentary lifestyles, unhealthy diets, tobacco, alcohol consumption, increasing life expectancy and stress etc. Diabetes is considered as an iceberg disease. India is diabetic capital

and ranks second with a diabetes population of 69.2 million and may rise to 123.5 million by 2040. The first WHO Global Report on Diabetes was launched on World Health Day 7th April 2016 which was dedicated to Diabetes.¹ The number of people diagnosed with diabetes increased from 200 million in 1990 to 830 million in 2022 globally. Prevalence is rising more rapidly in low and middle-income countries like India.



Above 50% of diabetic population did not take adequate treatment in 2022.²

The IDF Diabetes Atlas (2021) reports that 10.5% of the adult population (20-79 years) has diabetes, with almost half unaware that they are living with the condition. By 2045, IDF projections globally show that 1 in 8 adults, approximately 783 million, will be living with diabetes, an increase of 46%.³ The National Family Health Survey (NFHS-5) found that the prevalence of diabetes is 16.1%, undiagnosed diabetes is 1.22% in India.⁴

The Indian Diabetes Risk Score (IDRS) is a simple tool that helps identify people who may have diabetes. It's based on four factors: age, family history, waist circumference/abdominal obesity, and physical activity. The IDRS score is a number between 0 and 100. A score of less than 30 indicates a low risk, between 30 and 50 indicates a moderate risk and 60 or more indicates a high risk of diabetes. The IDRS is a cost-effective and non-invasive way to screen for diabetes. It can help identify people with undiagnosed diabetes and prediabetes. Madras Diabetes Research Foundation-Indian Diabetes Risk Score (MDRF-IDRS) developed by Mohan *et al.*,^{5,6} to estimate the usefulness of MDRF-IDRS for detecting the risk of diabetes.

Diabetes mellitus poses a significant global health challenge due to its increasing incidence & prevalence with complications, including cardiovascular disease, nephropathy, retinopathy and neuropathy etc. Early diagnosis and appropriate management are necessary to prevent complications. In this context, the goal of the present study was to evaluate risk prediction of diabetes by IDRS and to find out the association between diabetes and other risk factors.

2. Objectives: 1. To assess the risk of Type 2 Diabetes Mellitus through IDRS in adults aged 18 and above

2. To study association of risk of Type 2 Diabetes Mellitus with various factors

3. To assess the sensitivity and specificity of IDRS method as a screening tool in the community

3. Methods: A community based, cross sectional study was conducted in Shapur Nagar of Medchal-Malkajgiri, urban field practice area of Malla Reddy Medical College for Women, Hyderabad in May & June 2025. The UPHC covers the population of about 60,000.

Inclusion criteria:

- 1) All adult men and women aged 18 years and above residing in the study area
- 2) Subjects who were willing to participate and has given written consent

Exclusion criteria:

- 1) Known case of Type 2 Diabetes Mellitus
- 2) Pregnant and lactating women
- 3) Severe illness, mental retardation

The sample size was determined using the formula $n = \frac{Z^2 p (1-p)}{E^2}$ with a power of 80%, confidence limit of 95% and allowable error of 10%. The calculation was based assuming that 50% of the screened population will be correctly diagnosed by MDRF-IDRS, the sample obtained was 385, which was rounded off to 400 participants for easy analysis. The ethical clearance was obtained from Institutional Ethical Committee, Malla Reddy Medical College for Women, Hyderabad.

The study was conducted in multistage sampling technique. In the first stage, out of fourteen colonies, four colonies from each direction were selected randomly. In the second stage, households were selected by systematic random sampling. For this a list of all households was prepared from the family household register. Sampling interval (k) was calculated by using formula $k = N/n$ (N-population size and n-sample size). On substitution in the formula ($4201/400=10.5$), sampling interval was rounded to 10. The first house is selected by last digit of a currency note randomly and it was found 5. Then subsequent houses were selected by adding sampling interval till the sample size of 400 is obtained.

In the third stage, if more than one eligible participants were present in the selected house, simple random sampling technique was used to select one eligible participant.

On first day, data was collected by pre-designed questionnaire consisting of socio-demographic data; IDRS tool and anthropometric measurements- height, weight, BMI; and history on risk factors like alcohol, smoking and blood pressure.

The participants were instructed to be on overnight fasting of minimum 8 hours. Second visit was done on the next day morning for recording fasting blood sugar by Accu-check (Roche Diagnostics, Germany) glucometer after necessary aseptic precautions. The World Health Organization criteria was utilised to define



diabetes and prediabetes. Subjects with fasting blood sugar (FBS) value of ≥ 126 mg/dl were considered as diabetic. FBS value of 110 mg/dl to 125 mg/dl was considered as impaired fasting glucose or prediabetic.⁷ Subjects with raised FBS values were referred to Urban Health Training Centre for further management. Confidentiality was ensured in all the stages of data collection.

Statistics: Data was entered in MicroSoft Excel version 10 and analysed using SPSS version 24 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.) for windows. Descriptive statistics were performed using frequency and proportion. Pearson's chi-square test was used to test the significance of association between the various risk factors of diabetes and IDRS categories. Statistical significance was done at 95% confidence interval i.e., $p < 0.05$ was statistically significant. Validity (sensitivity, specificity, positive predictive values [PPV], and negative predictive values [NPV]) was tested at different cut off points of IDRS.

4. Results: Majority of the study population were between 35-49 years (40%), female (61%) and married (81.2%). (32.5%) of the study population were illiterate and (81%) belongs to hindu religion. Around (51.5%) were unemployed and (75.8%) belonged to upper socio-economic class of modified BG Prasad classification. (90.5%) belongs to nuclear type of family. (Table 1)

Around (43%) study population were with BMI above 25 kg/m². (40%) of the male and female has waist circumference above 90 cm. Around (24.2%) population performs neither regular exercise nor strenuous work. (19%) and (28.5%) of the population have history of diabetes and hypertension respectively. Majority (37%) of the population recorded fasting blood sugars in a pre-diabetic range. Around (25 %) of the population consumes alcohol and (6%) have the habit of smoking. (Table 2)

Majority (43%) of the population fall under the high risk category of IDRS. (Figure 1)

The risk factors of IDRS viz., age, waist circumference, physical activity and family history of diabetes show statistically significant association. (Table 3)

Sensitivity of IDRS was (73.7%), Specificity (70.5%), Positive Predictive value (52.3%) and Negative Predictive value (85.9%). (Table 4)

Table 1: Frequency distribution of socio-demographic data

VARIABLE	FREQUENCY (%)
Age	
<35 years	122 (30.5%)
35-49 years	160 (40%)
≥ 50 years	118 (29.5%)
Gender	
Male	156 (39%)
Female	244 (61%)
Marital status	
Married	341 (85.2%)
Unmarried /Single/Widow	59 (14.8%)
Education	
Illiterate	130 (32.5%)
Primary	34 (8.5%)
Secondary	34 (8.5%)
High	59 (14.8%)
Intermediate	105 (26.2%)
Graduate & above	38 (9.5%)
Religion	
Hindu	324 (81%)
Muslim	59 (14.8%)
Christian	17 (4.2%)
Occupation	
Unemployed	206 (51.5%)
Unskilled	46 (11.5%)
Semiskilled	17 (4.3%)
Skilled	29 (7.2%)
Clerical /Shop owner/farmer	93 (23.3%)
Semi Professional	5 (1.2%)
Professional	4 (1%)
Socio economic status	
Upper	303 (75.8%)
Upper middle	97 (24.2%)
Type of family	
Nuclear	362 (90.5%)
Joint	38 (9.5%)



Table 2: Frequency distribution of risk factors of Diabetes Mellitus

VARIABLE	FREQUENCY (%)
BMI	
Normal	227 (56.75%)
Over weight	122 (30.5%)
Obesity grade 1	51 (12.75%)
Waist circumference	
<80cm(female), <90cm(male)	84 (21%)
>80-89cm(female), 90-99cm(male)	156 (39%)
>90cm(female), >100cm(male)	160 (40%)
Physical activity	
Exercise (regular)+strenuous work	76 (19%)
Exercise(regular) or strenuous work	227 (56.75%)
No exercise and sedentary work	97 (24.25%)
Hypertension	
Normal	286 (71.5%)
Prehypertension	59 (14.75%)
Stage 1	34 (8.5%)
Stage 2	21 (5.25%)
Family History of Diabetes	
No family history	254 (63.5%)
Either parent	84 (21%)
Both parents	62 (15.5%)
Alcohol	
Yes	101 (25.25%)
No	329 (74.75%)
Smoking	
Yes	25 (6.25%)
No	375 (93.75%)
FBS (mg/dl)	
70-109	130(32.5%)
110-125	148(37%)
≥126	122 (30.5%)

Table 3: Association between the IDRS score and known risk factors

Variable	Low risk	Moderate risk	High risk	Total	Chi-square test	p value
Age(years)						
<35	54	30	38	122	124.9	<0.00001
35-49	5	88	67	160		
≥ 50	1	50	67	118		
Waist circumference (cm)						
<80 cm (F) & <90 cm (M)	35	41	8	84	129.1	<0.00001
≥80-89 cm (F) & ≥ 90-99 cm (M)	22	84	50	156		
≥90 cm (F) & ≥100 cm (M)	3	43	114	160		
Physical activity						
Exercise (regular)+s strenuous work	12	27	37	76	77.85	<0.00001
Exercise(regular) or strenuous work	37	130	60	227		
No exercise and sedentary work	11	11	75	97		
Family history						



Two non-diabetic parents	44	140	70	25	71.	<0.000001
Either parents diabetic	10	12	62	84	4	
Both parents diabetic	6	16	40	62	56	

Table 4: Sensitivity and Specificity of IDRS

	FBS (≥126)	FBS (<126)	Total
IDRS (≥60)	90	82	172
IDRS (<60)	32	196	228
Total	122	278	400

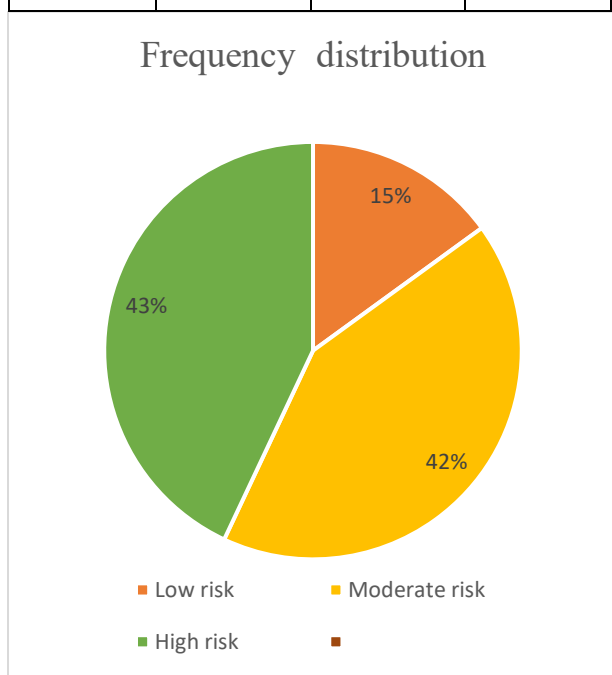


Figure 1: Distribution of study subjects according to Indian diabetes risk score

5. Discussion: The present study utilized a validated IDRS tool to evaluate and identify the study subjects with risk for diabetes. In the present study, different risk factors for diabetes was measured and assessed by IDRS score and found 15% study population were at low risk, 42% were at moderate risk and 43% were at high risk for diabetes mellitus. Similarly, a study done by Poornima MP et al⁸ found that 12.2% low risk, 51.6% moderate risk and 36.3% had high risk for diabetes mellitus. In a study conducted by Mohan V et al⁹ found 43% of the population were in high risk category of IDRS.

In the study the sensitivity and specificity were found to be 73.7% and 70.5% respectively. Similar results were noticed with sensitivity of 75.4% and specificity of 70% in a study conducted by Sulaiman et al.¹⁰ The IDRS has a sensitivity of 72.5% and specificity of 60.1% according to CURES by Mohan et al.⁵ As per Dudeja et al study, the IDRS has a sensitivity of 72.5% and specificity of 60.1% which is largest population based study.¹¹

In the present study the risk of diabetes as predicted by the IDRS, increased significantly with cm in females) has high risk scores. Waist circumference or abdominal obesity was significantly associated with increased risk of diabetes (p<0.05). This is similar to the findings of a study conducted in India.¹³

In the present study, (18.7%) of subjects with sedentary lifestyle has high risk score and found that physical activity has a significant association with risk of diabetes (p<0.05). This is parallel with other study where physical inactivity was found to be significantly associated with diabetes.¹⁴

In current study, family history was significantly associated with risk of diabetes (p<0.05).

Similar findings were noticed in a study conducted by Anand K et al.¹⁵

This is in contrast to the findings of Dasappa et al,¹³ Acharya et al¹² whereby family history was not found to be significantly associated with prediabetes.

Conclusion:

The present study utilises Indian Diabetes Risk Score for identifying high risk in study subjects. Significant association was seen between increasing age and physical inactivity with diabetes risk. Increasing waist circumference and positive family history were also found to be significantly associated with risk of diabetes.



Majority of the study subjects were categorised into high risk IDRS has good sensitivity and specificity with the diagnostic FBS values.

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