Section: Community Medicine

Original Research Article

ASSESSMENT OF RISK FOR DEVELOPING TYPE 2 DIABETES MELLITUS USING INDIAN DIABETIC RISK SCORE AMONG THOSE ATTENDING OPD AT A TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Chronic non-communicable diseases are assuming greater importance among the adults in both developed and developing countries. The prevalence of chronic disease is showing an upward trend in most countries, and for several reasons this trend is likely to increase. In India, there are estimated 77 million people above the age of 18 years are suffering from diabetes (type 2) and nearly 25 million are prediabetics. More than 50% of people are unaware of their diabetic status which leads to health complications if not detected and treated early. Madras Diabetes Research Foundation (MDRF, Chennai) developed the Indian Diabetes Risk Score (IDRS) as a simple tool to help detect undiagnosed T2DM in the community. Present study was done using MDRF-IDRS to find subjects at high risk of developing Type 2 Diabetes Mellitus.

Materials and Methods: A cross-sectional hospital based study was carried out among adults aged 35 years and above in the General medicine OPD by simple random sampling technique. The duration of study was three months from October to December 2022. Data entered in excel and analysed using SPSS® software version 22. To test for differences in the two proportions, Chi-square test is employed.

Results: The mean age of participants was 49.24 ± 10.578 years, and majority were females (51%). Overall majority of the participants i.e., 88 (56.8%) were at high risk of developing T2DM, 62 (40%) study participants were at moderate risk and 5 (3.2%) were at low risk of developing T2DM.

Conclusion: The MDRF - IDRS is a simple, fast, non-invasive and reliable tool to identify individuals at high risk for T2DM. Our study observed a significant prevalence of modifiable risk factors among participants, such as lack of physical activity and abdominal obesity. Efforts should be made to educate all people to adopt healthy lifestyle for decreasing the prevalence of non-communicable diseases including diabetes.

Keywords: Diabetes Mellitus, Non-Communicable Diseases, Indian Diabetic Risk Score.

INTRODUCTION

Chronic non-communicable diseases are assuming greater importance among the adults in both developed and developing countries. The prevalence of chronic disease is showing an upward trend in most countries, and for several reasons this trend is likely to increase. Increasing life expectancy in most

of countries is one reason resulting greater number of people are living to older ages, and are at greater risk to chronic diseases of various kinds. Similarly life-styles and behavioural patterns of people are changing rapidly, these being favourable to the onset of chronic diseases.[1]

As per international Federation of diabetes around 537 million people worldwide, 8.8% of adults aged between 20to 79 years are estimated to have diabetes. About 79% of them live in low and middle income countries. Diabetes accounts for 10.7% of global population All- cause mortality among people in 20-79 years of age group in 2021.[2]

The recent WHO report suggests that in India, there are estimated 77 million people above the age of 18 years are suffering from diabetes (type 2) and nearly 25 million are prediabetics (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. Adults with diabetes have a two- to three-fold increased risk of heart attacks and strokes. Combined with reduced blood flow, neuropathy (nerve damage) in the feet increases the chance of foot ulcers, infection, and the eventual need for limb amputation. Diabetic retinopathy is an important cause of blindness and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. Diabetes is among the leading causes of kidney failure.[3]

Madras Diabetes Research Foundation (MDRF, Chennai) developed the Indian Diabetes Risk Score (IDRS) as a simple tool to help detect undiagnosed T2DM in the community.[4] Present study was done using MDRF-IDRS to find those who are at risk of developing Diabetes.

Objectives

1. To identify subjects aged 35 years and above at high risk of developing Type 2 Diabetes Mellitus, using the IDRS.
2. To estimate the proportion of subjects at high risk of developing Type 2 Diabetes Mellitus.
3. To determine the factors associated with the risk of developing Type 2 Diabetes Mellitus.

MATERIAL AND METHODS

A cross-sectional hospital based study was carried out in the General medicine OPD of the Government General Hospital, between the months of October to December 2022, after the approval from the institutional ethical committee. The subjects are fully informed regarding the purpose of the study. Each interview began with a general discussion to build rapport with the participants and gain their confidence and the data was collected through subsequent interview to assess their risk for developing Type 2 Diabetes Mellitus using the semi structured questionnaire after obtaining written informed consent from the subject.

Sample Size

Based on the Multi-centric nationwide screening for DM and its risk in all populous states and Union territories of India in 2017 [5], the first pan India DM screening study conducted on 240,000 subjects in a short period of 3 months based on IDRS, which showed that 40.9% subjects were detected to be high risk, sample size was calculated at 95% confidence levels, 5% alpha error and 20% relative precision.

Sample size = Z^2PQ/L^2, Z = 1.96, P = 40.9%, Q = 100-68 = 59.1%, L= 20% of P = 8.18%

Sample size was estimated to be 139 subjects.

Making an allowance of 10% coverage error or non-response rate, the sample size was proposed to include 155 subjects for the study.

Study Population

Subjects aged 35 years and above attending General medicine OPD

Inclusive Criteria

1. Subjects aged 35 years and above who sign the informed consent.
2. Subjects without any psychiatric disorders and who will be able to answer the questions clearly

Exclusive Criteria

1. Subjects aged 35 years and above who are already diagnosed with Diabetes Mellitus.
2. Subjects who have any psychiatric disorders like mental illness or any as diagnosed by mental health professionals.
3. Pregnant and lactating women up to 12 weeks postpartum were excluded, owing to the possibility of impaired glucose tolerance status in this group.

Sample Technique

Simple random sampling method was executed to select the subjects aged 30 years and above attending general medicine OPD.

Study Instruments

A semi-structured questionnaire was used for obtaining information and it will be administered to the subjects aged 30 years and above.

- The first part of the questionnaire is regarding the socio-demographic profile of the subjects.
- Second part of the questionnaire is Indian Diabetic Risk Score (IDRS) form which is a self-reporting instrument where all items are presented positively and scored.

The IDRS considers age, waist circumference, physical activity, family history of diabetes.

- **Age:** This was categorized into 3 groups; age < 35 years was scored as 0, 35- 49 years as 20 and ≥ 50 years as 30.
- **Abdominal obesity:**
  - **Males:** Individuals with waist circumference ≥90 – 99 cm for males scored as 10, those with ≥ 100 cm as 20 and the rest as 0.
  - **Females:** individuals with waist circumference ≥ 80 -89 cm as 10, those with ≥ 90 cm as 20 and the rest as 0.
- **Family history of diabetes:** Individuals with no family history of diabetes were scored 0,

those with one diabetic parent as 10 and those with both parents diabetic scored 20.

- **Physical activity:** Individuals were scored as 0 if they did leisure time exercise and in addition had physically demanding work in their occupation; individuals who either did exercise or performed physically demanding work were scored 20 and the rest scored 30. The score greater than 60 is considered as very high-risk, score between 30 to 60 is considered as moderate risk and score below 30 is considered as low risk.

Operational Definitions:

- **High-risk of developing Type 2 Diabetes Mellitus:** Subjects with IDRS >60 were considered at high risk of diabetes.
- **Family history of DM:** If either or both of a subject's parents had diabetes, they were considered to have a positive family history.
- **Waist circumference:** 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.

Statistical Analysis of Data

- The quantitative variables like age, waist circumference, BMI are assessed using mean and standard deviation.
- The qualitative data like literacy status gender, family history, and physical activity are assessed using frequency and percentage.

To test for differences in the two proportions, Chi-square test is employed.

RESULTS

A total of 155 participants were included in the final analysis and the risk for developing T2DM using IDRS was assessed. The mean age of participants was 49.24 ± 10.578 years, and majority were females (51%). Of all the participants, 52.9% were all illiterate, 45.2% were in semi-skilled employment, 97.4% were married and 79.4% were Hindu by religion. [Table 1]

The risk for developing T2DM was assessed using IDRS and the participants with score less than 30 were the low risk group, with score between 30 and 60 were the moderate risk group and those with score above 60 were the high risk group. Overall majority of the participants i.e., 88 (56.8%) were at high risk of developing T2DM, 62 (40%) study participants were at moderate risk and 5 (3.2%) were at low risk of developing T2DM. [Figure 1]

Regarding the risk components in the IDRS, out of 155 participants, 86 (55.5%) were aged between 35 and 49 years and 69 (44.5) were of age 50 years and above. The age of participants ranged from 35-85 years. Regarding their waist circumference, out of 155 participants, 30 (19.4%) were having WC < 80 cm in females and < 90 cm in males, 42 (27.1%) were having WC 80-89 cm in females, 90 – 99 cm in males and 83(53.5%) were having WC ≥ 90 cm in females, ≥100 cm in males. Waist circumference ranged from 26 to 135 cm with mean WC being 95.92 ± 14.280 cm. Regarding physical activity, out of 155 participants, 63 (40.6%) were doing regular exercise and strenuous work, 28 (18.06%) were doing exercise or strenuous work and 64 (19.35%) were doing no exercise and strenuous work. Regarding family history, out of 155 participants, 111 (71.6%) had no family history of DM, 34 (21.9%) were having any one parent diabetic and 10 (6.5%) were having both parents diabetic. [Table 2]

Based on the previous literature, selected factors like education, employment, smoking status, alcohol consumption, BMI, hypertension, H/o heart disease and or stroke, H/o gestational diabetes mellitus and or delivering a big baby and H/o PCOS among females were analysed for association with the risk for developing T2DM using chi-square test. Of these selected factors, BMI (p-value = 0.019), diastolic blood pressure (p-value = 0.017), alcohol consumption (p-value = 0.037), employment (p-value = 0.030), education (p-value = 0.017) had significant association with the risk for developing T2DM with p-values < 0.05. [Table 3]

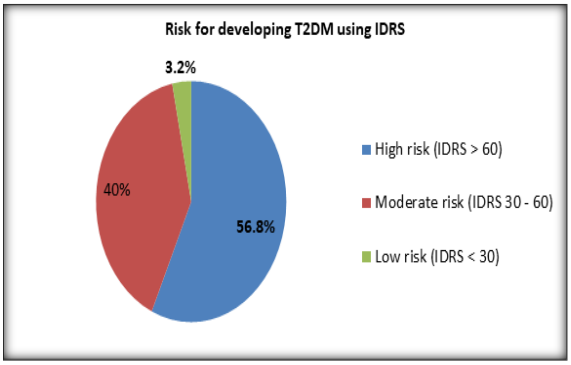

Figure 1: Pie chart showing assessment of risk for developing T2DM using IDRS

Table 1: Distribution of participants according to their socio-demographic characteristics

Socio-demographic characteristics	Mean/ Frequency	Standard deviation/ Percentage
Age (years)	49.24	10.578
Gender		
Males	76	49%
Females	79	51%
Education		
Graduate	5	3.2%

High school	22	14.2%
Illiterate	82	52.9%
Intermediate	7	4.5%
Middle school	24	15.5%
Primary	15	9.7%
Employment		
Professional	5	3.2%
Semi professional	6	3.9%
Semi-skilled	70	45.2%
Skilled	9	5.8%
Un skilled	21	13.5%
Unemployed	44	28.4%
Marital status		
Married	151	97.4%
Never married	1	0.6%
Widow	3	1.9%
Religion		
Hindu	123	79.4%
Christian	20	12.9%
Muslim	12	7.7%
Total	**155**	**100%**

Table 2: Distribution of participants according to the risk components in IDRS

Risk components in IDRS	Score	Frequency	Percentage
Age			
35 – 49	20	86	55.5%
≥ 50 years	30	69	44.5%
Abdominal obesity			
WC < 80 cm female, < 90 cm male	0	30	19.4%
WC 80 – 89 cm female, 90 – 99 cm male	10	42	27.1%
WC ≥ 90 cm female, ≥ 100 cm male	20	83	53.5%
Physical activity			
Exercise (regular) and strenuous work	0	63	40.6%
Exercise (regular) or strenuous work	20	28	18%
No exercise and strenuous work	30	64	19.4%
Family history			
No family history	0	111	71.6%
Either parent	10	34	21.9%
Both parents	20	10	6.5%
Total		**155**	**100%**

Table 3: Association of select factors with the risk for developing T2DM among the study participants

Select factors	Low and moderate Risk	High Risk	Total
BMI vs risk for developing T2DM (χ^2 value = 7.944, p-value = 0.019)			
Underweight	7 (10.4%)	5 (5.7%)	**12 (7.7%)**
Normal	31 (46.3%)	25 (28.4%)	**56 (36.1%)**
Overweight and obese	29 (43.3%)	58 (65.9%)	**87 (56.2%)**
Education vs risk for developing T2DM (χ^2 value = 8.176, p-value = 0.017)			
Illiterate	34 (50.7%)	48 (54.4%)	**82 (52.9%)**
Up to High school	32 (47.8%)	29 (33%)	**61 (39.4%)**
Intermediate and above	1 (1.5%)	11 (12.5%)	**12 (7.7%)**
Employment vs risk for developing T2DM (χ^2 value = 4.686, p value = 0.030)			
Employed	54 (80.6%)	57 (64.8%)	**111 (71.6%)**
Unemployed	13 (19.4%)	31 (35.2%)	**44 (28.4%)**
Alcohol consumption vs risk for developing T2DM (χ^2 value = 4.361, p value = 0.037)			
Yes	21 (31.1%)	15 (17%)	**36 (23.2%)**
No	46 (68.7%)	73 (83%)	**119 (76.8%)**
Diastolic blood pressur vs risk for developing T2DM (χ^2 value = 5.678, p value = 0.017)			
≥ 90	34 (50.7%)	28 (31.8%)	**62 (40%)**
< 90	33 (49.3%)	60 (68.2%)	**93 (60%)**
Total	**67 (100%)**	**88 (100%)**	**155 (100%)**

DISCUSSION

The IDRS, developed by Mohan V et al,[4] is a simple, fast, inexpensive, non-invasive and reliable tool to identify individuals at high risk for T2DM also useful tool for public health professionals to screen for high-risk cases without the need of a laboratory and has been previously validated by other researchers in India. The IDRS has a sensitivity of 72.5% and specificity of 60.1% based on the largest population study on diabetes in India (CURES).[6]

In the present study, risk for developing T2DM was assessed using IDRS. In the current study majority of the study participants i.e., 88 (56.8%) are at high risk of developing T2DM. Our study showed higher percentage of participants at high risk compared to other studies,[7,8] because in our study only

participants aged above 35 years are considered and hence they will have minimum score of 20 and the other factors score added up resulting in a score more than 60.

Our findings demonstrated a significant prevalence of modifiable risk factors, such as lack of physical activity and abdominal obesity. Many other studies have also noted the high prevalence of risk factors, such as obesity, sedentary behaviour, and the intake of fatty and sugary foods in metropolitan regions.[7-9]

CONCLUSION

The MDRF - IDRS is a simple, fast, non-invasive and reliable tool to identify individuals at high risk for T2DM. Our study observed a significant prevalence of modifiable risk factors among participants, such as lack of physical activity and abdominal obesity. Efforts should be made to educate all people to adopt healthy lifestyle for decreasing the prevalence of non-communicable diseases including diabetes.

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Conflicts of interest: There are no conflicts of interest.

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