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Research article

A CROSS SECTIONAL STUDY TO ASSESS INDIAN DIABETES RISK SCORE (IDRS) AND ASSOCIATED RISK FACTORS AMONG SOUTHERN INDIAN COMMUNITIES

Surendra Adusumalli*, Ajay K. Gupta, Sivareddy Challa

[1]CSJM University Kanpur, Uttar Pradesh, India.
[2]NRI College of Pharmacy, Agiripalli Mandal, Vijayawada, Andhra Pradesh 522212, India.
[3]KVSR Siddhartha College of Pharmacy, Vijayawada, Andhra Pradesh, India.

ABSTRACT

The present work is a cross sectional study with a sample size of 401 participants 381 participants were enrolled into the study following inclusion criteria was met. Data collection is done using structure questionnaire form. Statistical analysis was done using graph pad prism and Epi info. Out of 381 participants 181(47.3%) had a high-risk score (IDRS >60); 164(43%) were in moderate risk category (30-50); and 36(9.44%) participants were found to be at low risk for diabetes (IDRS<30). Women participants were more than male participants. 64(16.7%) of illiterates were at high risk in women participants,77(22.0%) participants with moderate exercise at home/work were at high risk in women participants; 107(27.2%) participants with waist circumference 90-99 were at high risk. Either parent diabetic is one of the major contributors for diabetes in male participants and two-non-diabetic family history are is another major contributor for female participants. Indian diabetic risk score is unique in a way that it takes measurement of waist circumference as a measure of abdominal obesity because Indian population is a characteristic of type II Diabetes mellitus with lean body mass index and waist to hip ratio. The use of waist circumference in the screening makes it a better screening tool for assessing type II diabetes mellitus.

Keywords: IDRS- Indian Diabetic Risk Score; DM-Diabetic Mellitus; MDRF - Madras Diabetic Research Foundation.

INTRODUCTION

Diabetes mellitus is a chronic disease caused by inherited and / or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves [1].

The prevalence of diabetes in rural areas was assumed to be one-quarter that of urban areas for Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka. Unfortunately, more than 50% of the diabetic subjects in rural India remain unaware about the disease [2].

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Corresponding Author
Surendra Adusumalli
NRI College of Pharmacy, Vijayawada, Andhra pradesh, India.

Email : surendracology@gmail.com

RISK FACTORS:

Weight: Being overweight is a primary risk factor for type II diabetes. The fattier you, the more resistant your cells become to insulin

Fat distribution: If your body stores fat primarily in your abdomen, your risk of type II diabetes is greater than if

your body stores fat elsewhere, such as your hips and thighs.

Inactivity: The less active you are, the greater your risk of type II diabetes. Physical activity helps you control your weight, uses up glucose as energy and makes your cells more sensitive to insulin.

Family history: The risk of type II diabetes increases if your parent or sibling has type II diabetes.

Race: Although it's unclear why, people of certain races — including blacks, Hispanics, American Indians and Asian-Americans — are more likely to develop type II diabetes than whites are.

Age: The risk of type II diabetes increases as you get older, especially after age 45. That's probably because people tend to exercise less, lose muscle mass and gain weight as they age. But type II diabetes is also increasing dramatically among children, adolescents and younger adults.

Prediabetes: Prediabetes is a condition in which your blood sugar level is higher than normal, but not high enough, left untreated, Prediabetes often progresses to type II diabetes.

Gestational diabetes: If you developed gestational diabetes when you were pregnant, your risk of developing type II diabetes increases. If you gave birth to a baby weighing more than 9 pounds (4 kilograms), you're also at risk of type II diabetes.

Polycystic ovarian syndrome: For women, having polycystic ovarian syndrome - a common condition characterized by irregular menstrual periods, excess hair growth and obesity - increases the risk of diabetes.

The study done by Indian Council of Medical Research (ICMR) in the year 1970 reported a prevalence of 2.3% in urban areas, which had increased to 12-19% in the year 2000.The prevalence of diabetes in South East Asia is also expected to increase by 70% in the next 20 years.

Coefficient analysis showed fasting glucose and HbA1c having the greatest impact on the risk score [3].

METHODOLOGY

Study design and Participants

A total of 401 patients who met the inclusion criteria were recruited into the study. It is a cross sectional study which was carried out for a period of 6 months (from November 2017 to April, 2018) in patients admitted to Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation which is a 850-bedded tertiary care teaching hospital at Chinaoutpalli , Gannavaram Mandal, Krishna district, Andhra Pradesh (India).

Ethical consideration

A study protocol was approved by Institutional Ethics Committee of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation. All study participants were informed about study details and informed consent was obtained. Cross sectional study was under taken to evaluate the performance of Indian diabetic risk score among adult population in community setting located in Vijayawada, district Krishna. Study was initiated after ethics committee clearance.

1. A total of 401 patient participated in the study from November- 2017 to January-2018 and participants with known diabetic mellitus and pregnant women are excluded from the study. We used Indian diabetic risk score calculator designed by madras research association Ramachandran et al. Socio-demographic, Anthropometric parameters, Lifestyle factors, Age, BMI, Waist circumference, Family history of diabetics, Use of blood pressure medication, Daily physical activity and rice in take were and in females history of PCOD taken into account and recorded on a pre-designed proforma [4].

Inclusion criteria

- ❖ Patients with age > 20 years old.
- ❖ Patients who were willing to participate (who gave written informed consent)

Exclusion criteria

2. Patients were excluded from the study if they are not willing to participate.
3. Patients who are critically ill and pregnant women.
4. Patients with altered mental status.

Data Collection:

5. A Structured interview schedule consisting of socio-demographic details and Indian diabetic risk score was used. Anthropometric measurement and blood pressure were recorded. The participants were classified as high risk, moderate risk and low risk, based on IDRS as per the following score- upto30 score as low risk,30-50 score as moderate risk and 60 above consider as high risk [5].
6. **Family history of diabetes**:
7. If either or both of participants parents had diabetes, they were considered to have a positive family history [6].

Physical activity [7]:

8. Grading was done as per who steps definitions of sedentary, Mildly. Moderately, or vigorously physically active.

Abdominal obesity [8]:

9. Waist circumference and hip circumference was measured using a non-stretchable measuring tape. Waist circumference was measured at the smallest horizontal girth between the costal margins and the iliac crest at the end of expiration. Waist circumference >90cm for men and >80cm for women. (krutarth r brahmbatti).

Hip circumference [9]:

Hip circumference was measured with a same tape to the nearest 0.1cm at the widest part of the hips;

usually this corresponds to the groin level for women and about 2-3 inches below the navel in men.

BMI Calculation [10]:

Body mass index was calculated by dividing the weight (in kilograms) with the square of height (in meters).BMI defined <20 Underweight, and >30 kg/m^2 obesity.

Waist to hip ratio was calculated dividing the waist circumference with hip circumference.

Other socio demographic details were collected along with the IDRS calculator parameters and BMI and waist to hip ratio were calculated. After calculating IDRS Score health education was given to high risk individuals regarding diet, exercise, and life style modifications.

Occupation [11]:

Employed: A person who is able to work of cash or kind but can get the work in any agency or directly, on either temporary and permanent, part-time or full-time basis, to do the work but not including any members of the family.
Unemployed: A person who is able any wishes to work any cash or kind, but can't get the work;
Self employed: Any well or semi established organized business owned by an individual, irrespective of its size and category, if it is meant for profit;
Labourer /farmer: A person involved in occupation for cash or kind; this group included mostly unskilled laborer's working for daily wages;
Education [12]: –
Illiterate: A person, who can neither read nor write or can only read but cannot write in any language;
Primary: A person who has completed sixth standard;
Secondary: A person who has studied from to fifth to tenth standard;
A graduate (a person who has obtained a degree from any university); a postgraduate (a person who has obtained a postgraduate degree from any university); and a professional degree/diploma award (a person who has obtained any professional degree/diploma from any university).

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 and positive score is >60.

Experimental design [13].

Study was initiated after approval of IEC
↓
All eligible candidates who were willing to submit inform consent were enrolled in the study
↓
Participants were briefed regarding the study
↓
Data collection was done by using structured questionnaire form which contains 3 parts
↓
First part is about socio demographic information
↓
In second part IDRS score was estimated which was developed &validated by Madras Diabetic research foundation and Ramchandran A et al
↓
In the third part the risk factors were assessed
↓
Each participant risk score was analyzed using statistical tools
↓
Finally we created awareness regarding the risk factors were assessed among the risky population.

Categorized risk factors	**Score**
Age	
<35 years	0
35-49 years	20
≥ years	30
Abdominal obesity	
Waist circumference	0
female<80cm ,Male	10
<90cm(Reference)	20
Female 80-89cm , Male 90-99cm	
Female ≥ 90cm, Male ≥ 100cm	
Physical activity	
Vigorous exercise or strenuous	0
at work	10
Moderate exercise at work /home	20
Mild exercise at work/home	30
No exercise and sedentary at work/ home	
Family history	
Two non-diabetic patients	0
Either parent diabetic	10
Both parent diabetic	20
MAXIMUM SCORE	100

Score ≥ 60; High risk, 30-50: Medium, <30: Low risk

Statistical Analysis

The prevalence of diabetes among each of the high-risk groups, according to risk factors, was represented as percentage. The chi-square test was used to establish whether there was an association between the risk of diabetes and each of the potential risk factors. Similarly, odds of diabetes among high- risk and moderate risk groups were assessed for each risk factor, using univariate logistic regression.

The obtained data shall be analyzed using the statistical tools like Graph Pad Prism Software version 5.0 and SPSS software version 19.0.

RESULTS

EDUCATION:

Table 5 indicates that, out of 381 participants, over all diabetic risk score was found to be higher in Secondary education participants 117(30.7%) followed by Illiterate 107(28%), Primary 91(23.8%),Degree 46 (12%) and PG 20(5.24%).

In high risk score IDRS >60, out of 181 (47.5%) participants, the diabetic risk score was found to be higher in the secondary education participants 58 (15.22%) followed by illiterate 47 (12.33%), primary 40(10.49%), Degree 26 (6.82%) and PG 10(2.62%).

In moderate risk score IDRS 30-50, out of 164 (43%) participants, the diabetic risk score was found to be higher in the secondary education participants 49 (12.86%) followed by illiterate 47 (12.33%),primary 42 (11.02%), Degree 18(4.72%) and PG 8(2.09%).

In low risk score IDRS <30, out of 36(9.44%) participants, the diabetic risk score was found to be higher in Illiterate participants 13(3.41%) followed by secondary 10(2.62%), primary 9(2.36%), Degree 2(0.52%) and PG 2(0.52%).

But the results are statistically not significance (P=0.8448).

EMPLOYMENT STATUS:

Table 5 indicates that , out of all 381 participants, over all diabetic risk score was found to be higher in unemployed participants 198(51.9%) followed by employed 101(26.5%), self-employed 71(18.6%) and farmers 11(2.8%).

In high risk IDRS >60, out of 181(47.5%) participants, the diabetic risk score was found to be higher in unemployed participants 87(22.83%) followed by employed 47(12.33%), self-employed 43(11.28%) and farmers 7(1.83%).

In moderate risk IDRS (30-50), out of 164(43%) participants, the diabetic risk score was found to be higher in unemployed participants 89(23.25%) followed by employed 42(11.02%), self-employed 26(6.82%) and farmers 7(1.83%).

In low risk IDRS <30, Out of 36(9.44%) participants, the diabetic risk score was found to be higher in unemployed participants 22(5.77%), followed by employed 12(3.14%), self-employed 2(0.52%) and farmers 0%.

But the results are statistically not significance (P=0.0908).

AGE:

Table 5 indicates that, out of all 381 participants, over all diabetic risk score was found to be higher in 35-49 age group 175(45.9%) followed by 20-34 age group 108 (28.3%) and greater than 50 age group 98(25.7%).

In high risk IDRS>60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in 35-49 age group 91(23.88%) followed by greater than 50 age group 79(20.73%) and 20-34 age group 11(2.88%).

In moderate risk IDRS (30-50), out of 164(43%) participants, the diabetic risk score was found to be higher in 35-49 age group 81(21.25%) followed by 20-34 age group 64(16.79%) and greater than 50 age group 19(4.98%).

In low risk IDRS<30, Out of 36(9.44%) participants, the diabetic risk score was found to be higher in 20-34 age group 34(8.66%) followed by 35-49 age group 3(0.78%) and greater than 50 age group 0%.

But the results obtained were statistically significant (P<0.0001).

FAMILY HISTORY:

Table 5 indicate that, Out of all 381 participants, over all diabetic risk score was found to be higher in participants with two non diabetic parents190(49.8%) followed by either parent diabetic 160(41.9%) and both parent diabetic 31(8.1%).

In high risk IDRS>60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in participants with either parent diabetic 88(23.0%) followed by two non diabetic 67(17.5%) and both parent diabetic 26(6.82%).

In moderate risk IDRS (30-50), Out of 164(43%) participants, the diabetic risk score was found to be higher in participants with two non-diabetic parents 93(24.4%) followed by either parent diabetic 66(17.3%) and both parent diabetic 5(1.31%).

In low risk IDRS<30, Out of 36 (9.44%) participants, the diabetic risk score was found to be higher in participants with two non-diabetic parents 30(7.87%) followed by either parent diabetic 6(1.57%) or both parent diabetic 0%.

But the results obtained were statistically significant (P<0.0001).

PHYSICAL ACTIVITY:

Table 5 indicate that, out of all 381 participants, over all diabetic risk score was found to be higher in participants doing mild exercise at home/work 141(37%) followed by moderate exercise at home/work 136(35.6%), no exercise at home/work 80(20.9%) and vigorous exercise at home/work 24(6.29%).

In high risk IDRS<60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in participants doing mild exercise at home/work 90(23.6%) followed by no exercise at work/home 70(18.3%), moderate exercise at home/work 21(5.51%).In moderate risk IDRS (30-50), Out of 164(43%) participants, the diabetic risk score was found to be higher in

participants doing moderate exercise at home/work 87(22.86%) followed by mild exercise at home/work 49(2.26%), vigorous exercise at home/work 18(4.72%) and no exercise at home/work 10(2.62).

In low risk IDRS<30, Out of 36 (9.44%) participants, the diabetic risk score was found to be higher in participants with moderate exercise at work/home 28(7.34%) followed by vigorous exercise at work/home 6(1.57%), mild exercise at home/work 2(0.52%) and no exercise at work/home0%.

But the results obtained were statistically significant (P<0.0001).

WAIST CIRCUMFERENCE MALE:

Table 5 indicate that, Out of all 381 participants, over all diabetic risk score was found to be higher in participants with 90-99cm waist circumference 104(27.2%) followed by lesser than 90cm waist circumference 53(13.9%) and greater than 100 waist circumference 45(11.8%).

In high risk IDRS<60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in participants with 90-99cm waist circumference 56(14.6%) followed by greater than 100cm waist circumference 34(8.92%) and lesser than 90cm waist circumference 26(6.82%).

In moderate risk IDRS (30-50), Out of 164(43%) participants, the diabetic risk score was found to be higher in participants with 90-99cm waist circumference 45(11.8%) followed by lesser than 90cm waist circumference 18(4.72%) and greater than 100 waist circumference 11(2.88%).

In low risk IDRS<30, out of 36 (9.44%) participants, the diabetic risk score was found to be higher in participants with less than 90cm waist circumference 9(2.36%) followed by 90-99cm waist circumference 3(1.57%) and greater than 100cm waist circumference 0%.

But the results obtained were statistically significant (P=0.0002).

WAIST CIRCUMFERENCE FEMALE:

Table 5 indicate that, out of all 381 participants, over all diabetic risk score was found to be higher in participants with 80-89cm waist circumference 90(23.6%) followed by greater than 90cm waist circumference 56(14.6%) and lesser than 80cm waist circumference 54(14.1%).

In high risk IDRS<60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in participants with 80-89cm waist circumference 47(12.3%) followed by greater than 90cm waist circumference 36(9.44%) and lesser than 80cm waist circumference 3(0.78%).

In moderate risk IDRS (30-50), Out of 164(43%) participants, the diabetic risk score was found to be higher in participants with 80-89 cm waist circumference 36(9.44%) followed by lesser than 80cm waist circumference 34(8.92%) and greater than 90cm waist circumference 20(5.24%).

In low risk IDRS<30, out of 36 (9.44%) participants, the diabetic risk score was found to be higher in participants with less than 80cm waist circumference 17(4.46%) followed by 80-89cm waist circumference 7(1.83%) and greater than 100cm waist circumference 0%.

But the results obtained were statistically significant (P<0.0001).

BODY MASE INDEX:

Table 5 indicate that, out of all 381 participants, over all diabetic risk score was found to be higher in participants with 20-30kg/m_2 -294(77.1%) followed by greater than 30kg/m_2-63(16.5%) and lesser than 20 kg/m_2-24(6.2%).

In high risk IDRS<60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in participants with 20-30kg/m_2 -135(35.43%) followed by greater than 30kg/m_2-41(10.76%) and lesser than 20 kg/m_2-5(1.31%).

In moderate risk IDRS (30-50), Out of 164(43%) participants, the diabetic risk score was found to be higher in participants with 20-30kg/m_2 -131(34.38%) followed by greater than 30kg/m_2-22(5.77%) and lesser than 20 kg/m_2-11(2.88%).

In low risk IDRS<30, Out of 36 (9.44%) participants, the diabetic risk score was found to be higher in participants with 20-30kg/m_2 -28(7.34%) followed by lesser than 20 kg/m_2-8(2.09%) and greater than 30kg/m_2-0%

But the results obtained were statistically significant (P<0.0001).

WAIST TO HI RATIO:

Table 5 indicates that, out of 381 participants, in high risk IDRS >60, Diabetic risk score was found to be higher in participants with >0.9were 98(25.7), followed by 0.8-0.9 were 8(2.09) and<0.8 were 6(1.57).

In moderate risk 30-50, risk score was higher in participants with 0.8-0.9 were 78(20.4), followed by >0.9 were 69(18.1), and <0.8 were (3.14).

In low risk, risk score was higher in participants with 0.8-0.9 was found to be 19(4.98), followed by >0.9 were 13(3.41) and <0.8 6(1.57).

But the results obtained were statistically significant (p=0.0141)

RICE INTAKE:

Table 5 indicate that, out of all 381 participants, over all diabetic risk score was found to be higher in participants with rice intake twice a day 196(51.4%) followed by rice intake twice a day 166(43.5%) and rice intake once a day19(4.9%).

In high risk IDRS>60, Out of 181(47.5%) participants, the diabetic risk score was found to be higher in participants with rice intake twice a day 110(28.8%)

followed by rice intake twice a day 61(21.7%) and rice intake once a day 10(2.62%).

In moderate risk IDRS (30-50), Out of 164(43%) participants, the diabetic risk score was found to be higher in participants with rice intake thrice a day 83(21.78%) followed by rice intake twice a day 73(19.16%) and rice intake once a day 8(2.09%).

In low risk IDRS<30, Out of 36 (9.44%) participants, the diabetic risk score was found to be higher in participants with rice intake thrice a day 22(5.77%) followed by rice intake twice a day 13(3.41%) and rice intake once a day 1(0.26%).

But the results obtained were statistically significant (P=0.0044).

Association between gender and risk among high risk-group:

Table 6 indicates out of 181 (47.5%) high risk category, the male people are in high risk compared to female participants. the result obtained were highly significant (p<0.0001) and shows that there was strong significant association between gender and high risk for diabetes using univariant logistic analysis among high risk groups.

Association between level of education and risk among high risk group:

Table 6 indicates the secondary education participants were more in high risk category, but results were obtained not shows any significance and there is no statistical significant association.

Association between Unemployed status among high risk group:

Table 6 indicates the Unemployed participants were 87(22.83) more in high risk category compared to other employment status persons and results shows significant (0.0186*) and there was a significant association between unemployment status and high risk for diabetes.

Association between age and risk among high risk group:

Table 6 indicates, 35-49 aged persons were more in high risk category followed by >50 aged people and the results obtained shows highly significant and shows that there was stronger significant association between age 35-49(<0.0001) and >50(<0.0001) and high risk for diabetes.

Association between family history and risk among high risk group:

Table 6 indicates Either parent diabetic participants were more among high risk category followed by moderate risk and results obtained were highly significant (<0.0001) and shows that there was a greater significant association between family history and risk and both parents diabetic shows significant (0.0011) association between family history and risk.

Association of waist circumference (male) and risk among high risk group:

Table 6 indicates, the Waist circumference 90-99cm participants were in high risk followed by >100cm persons in high risk group and results obtained were significant (0.0038*) followed by (0.0015*) and showed that there was a significant association between waist and risk.

Association between physical activity and risk among high risk group:

Table 6 indicates, Mild exercise participants were more among high risk group followed by moderate exercise people and the results obtained were significant (0.2145*) and there was a significant association between mild exercise and high risk; moderate exercise and vigorous results shows highly significant (<0.0001) association between exercise and high risk.

Waist circumference (female)

Table 6 indicates Waist circumference 80-90cm followed by >90cm participants were more in high risk category and results obtained were highly significant (<0.0001) and shows that there was a significant association between waist and risk.

Body mass index:

Table 6 indicates Participants with 20-30 compared to >30 body mass index were high among high risk category but two bass mass index results obtained were significant (<0.0001*) and showed that there was a significant association between BMI and risk.

How many times take rice in a day:

Table 6 indicates the Participants who takes rice twice a day were found to be at high risk but the results obtained were not significant and shows that there was no significance association between rice and risk.

Association between gender and risk among moderate risk-group:

Table 7 indicates out of 164(43%) moderate risk category, the female people were more in moderate risk compared to male participants. The result obtained were highly significant (p<0.0001) and shows that there was strong significant association between gender and moderate risk for diabetes using univariant logistic analysis among high risk groups.

Association between level of education and risk among moderate risk group:

Table 7 indicates the secondary education participants were more in moderate risk category, but results obtained not shows any significance and there is no statistical significant association between level of education and risk.

Association between unemployed status among moderate risk group:

Table 7 indicates Unemployed participants were) more in moderate risk category compared to other employment status persons and results shows not significant and there was no significant association between unemployment status and moderate risk for diabetes.

Association between age and risk among moderate risk group:

Table 7 indicates 35-49 aged persons were more among moderate risk category followed by 20-34 aged people and the results obtained shows highly significant and shows that there was stronger significant association between age 35-49(<0.0001) and high risk for diabetes.

Association between family history and risk among moderate risk group:

Table 7 indicates Either parent diabetic participants were more among moderate risk category followed by two non-diabetic persons were more and results obtained were not significant (<0.0001) and shows that there was no significant association between family history and risk and .

Association of waist circumference (male) and risk among moderate risk group:

Table 7 indicates Waist circumference 90-99cm participants were in high risk followed by >100cm persons in high risk group and results obtained were significant (0.0021*) followed by (0.028*) and showed that there was a significant association between waist and risk.

Association of physical activity and risk among moderate risk group:

Table 7 indicates Moderate exercise 80(22.26%) are high among moderate risk people compared to mild and vigorous exercise people but the results obtained were not significant and showed that there was no significant association between exercise and moderate risk.

Waist circumference (female):

Table 7 indicates Waist circumference 80-90cm followed by >90cm participants were more in moderate risk category and results obtained were not significant (<0.0001) and shows that there was no significant association between waist and risk.

Body mass index:

Table 7 indicates Participants with 20-30 compared to >30 body mass index was high among moderate risk category but two bass mass index results obtained were significant (<0.05) and showed that there was a significant association between BMI and risk.

How many times take rice in a day:

Table 7 indicates that who takes rice twice a day were found to be at moderate risk but the results obtained were not significant and shows that there was no significance association between rice and risk.

INDIAN DIABETIC RISK SCREENING FORM

Part I:

a) Sociodemographic Variables:

1. Gender :

Male [ ] Female [ ]

2. Level of Education :

i) Illiterate [ ] ii) Primary [ ] iii) Secondary [ ] iv) Degree [ ] v) PG [ ]

3. Employement Status :

i) Employed [ ] ii) Unemployed [ ] iii) Self-employed [ ] iv) Farmer [ ]

4. Maritial Status :

i) Married [ ] ii) Unmarried [ ]

5. Personal History :

i) Nil [ ] ii) Smoker [ ] iii) Alcoholic [ ] iv) Both [ ]

b) IDRS SCORE

1. Age :

< 35 [ ]
35 – 49 [ ]
≥ 50 [ ]

2. Physical Activity :

1. Vigorous exercise or strenuous at work [ ]
2. Moderate exercise at work / home [ ]
3. Mild exercise at work / home [ ]
4. No exercise and sedentary at work / home [ ]

3. Family History :

i) Two non-diabetic parents [ ]
ii) Either parent diabetic [ ]
iii) Both parents diabetic [ ]

c) Anthropometric Measurements:

Height ---------
Weight ---------
BMI = ---
Waist circumference :
Female < 80 cm □ , Male < 90cm [ ]
Female 80-89cm □ , Male 90-99 cm [ ]
Female ≥90 cm □ , Male ≥ 100 cm [ ]
v) Hip circumference: ----
vi)Waist to hip ratio: -----

RISK FACTORS:

1) **Hypertensive (BP)** : Yes [ ] No [ ]
If yes, Value : _____ .
Have you ever used drugs for high blood pressure?
Yes [ ] No [ ]
2) **Poly Cystic Ovarian Disease (PCOD)** : Yes [ ] No [ ]

4) **Other risk factors : _____**

3) **How many times you take rice in one day :**

Once [ ] Twice [ ] Thrice [ ]

Table 1: IDRS Frequency distribution

VARIABLES	FREQUENCY (%)		
	Low Risk	**Medium Risk**	**High Risk**
Age			
20-34	33(8.66%)	64(16.79%)	11(2.88%)
35-49	3(0.78%)	81(21.25%)	91(23.88%)
>50	0	19(4.98%)	79(20.73%)
Physical activity			
1.Vigorous exercise or strenuous work at home/work	6(1.57%)	18(4.72%)	0
2.Moderate exercise at home/work	28(7.34%)	87(22.86%)	21(5.51%)
3.Mild exercise at work or home	2(0.52%)	49(2.26%)	90(23.6%)
4.No exercise and sedentary activities at home/work	0	10(2.62%)	70(18.3%)
Waist circumference(Female)			
<80cm	17(4.46%)	34(8.92%)	3(0.78%)
80-90cm	7(1.83%)	36(9.44%)	47(12.3%)
>90cm	0	20(5.24%)	36(9.44%)
Waist circumference(Male)			
<90cm	9(2.36%)	18(4.72%)	26(6.82%)
90-99cm	3(0.78%)	45(11.8%)	56(14.6%)
>100cm	0	11(2.88%)	34(8.92%)
Family History			
Two non-diabetic parents	30(7.87%)	93(24.4%)	67(17.5%)
Either parent diabetic	6(1.57%)	66(17.3%)	88(23.0%)
Both parents diabetic	0	5(1.31%)	26(6.82%)
Level of education			
Illiterate	13(3.41%)	47(12.33%)	47(12.33%)
Primary	9(2.36%)	42(11.02%)	40(10.49%)
Secondary	10(2.62%)	49(12.86%)	58(15.22)
Degree	2(0.52%)	18(4.72%)	26(6.82%)
PG	2(0.52%)	8(2.09%)	10(2.62%)
Employment status			
Employed	12(3.14%)	42(11.02%)	47(12.33%)
Unemployed	22(5.77%)	89(23.25%)	87(22.83%)
Self employed	2(0.52%)	26(6.82%)	43(11.28%)
Farmer	0	7(1.83%)	4(1.04%)
BMI			
<20	8(2.09%)	11(2.88%)	5(1.31%)
20-30	28(7.34%)	131(34.38%)	135(35.43%)
>30	0	22(5.77%)	41(10.76%)
No. of times take rice in a day			
Once	1(0.26%)	8(2.09%)	10(2.62%)
Twice	13(3.41%)	73(19.16%)	110(28.8%)
Thrice	22(5.77%)	83(21.78%)	61(21.7%)

Table 2: Other socio demographic frequency distribution

VARIBLES	FREQUENCY (%)
Marital status	
Married	365(95.8%)

Unmarried	16(4.20%)
Personal history	
Alcoholic	28(7.35%)
Smoker	43(11.29%)
Both	25(6.56%)
Nil	285(74.8%)
PCOD	
Yes	10(2.62%)
No	371(97.38%)
Waist to hip ratio	
<0.8	15(3.94%)
0.8-0.9	173(45.41%)
>0.9	193(50.66%)
Hypertensive	
Yes	85(22.31%)
No	296(77.69%)
Other risk factors	
Alcohol addiction	1(0.26%)
Asthma	7(1.83%)
Thyroid	19(4.99%)
Thyroid and asthma	1(0.26%)
Nil	350(92.65%)

Table 3: IDRS Risk values for Male Vs Female

S.NO	Risk level	MALE(%)	FEMALE(%)	TOTAL(%)
1	High risk[Score is >60]	96(25.19)	85(22.3)	181(47.5)
2	Moderate risk Score is [30-50]	74(19.4)	90(23.6)	164(43)
3	Low risk[Score is <30]	12(3.14)	24(6.29)	36(9.44)
4	Total	182(47.7)	199(49.3)	381(100)

Table 4: Male Vs Female Frequency distribution

Sl.no	Characteristics	Frequency(%) n=381	
		Female	male
1	**Age**		
	20-34	67(17.5)	41(10.7)
	35-49	80(20.9)	95(24.9)
	>50	52(13.6)	46(12.0)
2	**Physical activity**		
	Vigorous exercise or strenuous exercise at work/home	14((3.6)	11(2.88)
	Moderate exercise at work/home	77(20.2)	58(15.2)
	Mild exercise at home/work	66(17.3)	75(19.6)
	No exercise at work/home	42(11)	38(9.9)
3	**Waist circumference(female)**		
	<80cm	52(13.6)	
	80-89cm	91 (23.8)	
	>90cm	56(14.6)	
	Waist circumference(male)		53(13.9)
	<90cm		104(27.2)
	90-99cm		45(11.8)
	>100cm		
4	**Family history**		
	Two non-diabetic	117(30.7)	73(19.1)
	Either parent diabetic	61(16)	99(25.9)

	Both parents diabetic	21(5.5)	10(2.6)
5	**BMI**		
	<20	12(3.1)	12(3.1)
	20-30	158(41.4)	136(35.6)
	>30	29(7.6)	34(8.9)
6	**Level of education**		
	Illiterate	64(16.7)	43(11.2)
	Primary	56(14.6)	35((9.1)
	Secondary	54(14.1)	63(16.5)
	Degree	16(4.1)	30(7.8)
	Pg	9(2.3)	11(2.8)
7	**Employment status**		
	Employed	43(11.2)	58(15.2)
	Unemployed	130(34.1)	68(17.8)
	Self employed	26(6.8)	45(11.8)
	Farmer	0	11(2.8)
8	**No .of times takes rice in a day**		
	Once	10(2.6)	9(2.36)
	Twice	103((27)	93(24.4)
	Thrice	86(22.5)	80(20.9)

Table 5: Association between Variables and IDRS Risk

Characteristics	**Total (%) N=381**	**High risk IDRS >60 181(47.5%)**	**Moderate risk IDRS(30-50) N=164(43%)**	**Low risk IDRS(<30) N=36(9.44%)**	**Chi-squared p-value**
Gender					
Male	182(47.7)	96(25.19)	74(19.4)	12(3.14)	
Female	199(49.3)	85(22.3)	90(23.6)	24(6.29)	0.0645[a]
Education					
Illiterate	107(28)	47(12.33)	47(12.33)	13(3.41)	
Primary	91(23.8)	40(10.49)	42(11.02)	9(2.36)	
Secondary	117(30.7)	58(15.22)	49(12.86)	10(2.62)	
Degree	46(12)	26(6.82)	18(4.72)	2(0.52)	
Pg	20(5.24)	10(2.62)	8(2.09)	2(0.52)	0.8448[a]
Employment status					
Employed	101(26.5)	47(12.33)	42(11.02)	12(3.14)	
Unemployed	198(51.9)	87(22.83)	89(23.25)	22(5.77)	
Self employed	71(18.6)	43(11.28)	26(6.82)	2(0.52)	
Farmer	11(2.8)	4(1.04)	7(1.83)	0	0.0908[a]
Age					
20-34	108(28.3)	11(2.88)	64(16.79)	33(8.66)	
35-49	175(45.9)	91(23.88)	81(21.25)	3(0.78)	
>50	98(25.7)	79(20.73)	19(4.98)	0	<0.0001*
Family history Two-non-diabetic parents	190(49.8)	67(17.5)	93(24.4)	30(7.87)	
Either-parents diabetic	160(41.9)	88(23.0)	66(17.3)	6(1.57)	
Both-parents diabetic	31(8.1)	26(6.82)	5(1.31)	0	<0.0001*
Physical activity Vigorous-exercise at work /home	24(6.29)	0	18(4.72)	6(1.57)	
Moderate-exercise at work /home	136(35.6)	21(5.51)	87(22.86)	28(7.34)	

Mild exercise at work/home	141(37)	90(23.6)	49(2.26)	2(0.52)	
No exercise at work /home	80(20.9)	70(18.3)	10(2.62)	0	<0.0001*
Waist circumference(male) <90cm	53(13.9)	26(6.82)	18(4.72)	9(2.36)	
90-99cm	104(27.2)	56(14.6)	45(11.8)	3(1.57)	
>100cm	45(11.8)	34(8.92)	11(2.88)	0	0.0002*
Waist circumference(female) <80cm	54(14.1)	3(0.78)	34(8.92)	17(4.46)	<0.0001*
80-89cm	90(23.6)	47(12.3)	36(9.44)	7(1.83)	
>90cm	56(14.6)	36(9.44)	20(5.24)	0(0)	
BMI <20	24(6.2)	5(1.31)	11(2.88)	8 (2.09)	<0.0001*
20-30	294(77.1)	135(35.43)	131(34.38)	28(7.34)	
>30	63(16.5)	41(10.76)	22(5.77)	0	
Waist to hi ratio <0.8	24(6.2)	6(1.57)	12(3.14)	6(1.57)	0.0141*
0.8-0.9	105(27.5)	8(2.09)	78(20.4)	19(4.98)	
>0.9	180(47.2)	98(25.7)	69(18.1)	13(3.41)	
No. of times take rice in a day Once	19(4.9)	10(2.62)	8(2.09)	1(0.26)	
Twice	196(51.4)	110(28.8)	73(19.16)	13(3.41)	
Thrice	166(43.5)	61(21.7)	83(21.78)	22(5.77)	0.0044*
Characteristics	**Total (%) N=381**	**High risk IDRS >60 181(47.5%)**	**Moderate risk IDRS(30-50) N=164(43%)**	**Low risk IDRS(<30) N=36(9.44%)**	**Chi-squared p-value**
Gender Male	182(47.7)	96(25.19)	74(19.4)	12(3.14)	
Female	199(49.3)	85(22.3)	90(23.6)	24(6.29)	0.0645[a]

Table 6: Univariate logistic regression analysis of diabetes and associated risk factors among the high-risk group.

Characteristics	**Number(%) high risk(IDRS>60), N=181(47.5%)**	**Number(%)low risk (IDRS<30), N=36(9.44%)**	**Odd' ratio**	**95% confidence interval**	**p-value**
Gender Male	96(25.19)	12(3.14)	1	Rf	
Female	85(22.3)	24(6.29)	11.67	5.622-24.23	<0.0001*
Education Illiterate	47(12.33)	13(3.41)	1	Rf	Rf
Primary	40(10.49)	9(2.36)	0.8135	0.3149-2.101	0.6694[a]
Secondary	58(15.22)	10(2.62)	0.6233	0.2509-1.549	0.3060[a]
Degree	26(6.82)	2(0.52)	0.281	0.05819-1.329	0.0915[a]
Pg	10(2.62)	2(0.52)	0.7231	0.1405-3.721	0.6970[a]
Employment status Employed	47(12.33)	12(3.14)	1	Rf	Rf
Unemployed	87(22.83)	22(5.77)	0.9904	0.4504-2.718	0.9809[a]
Self employed	43(11.28)	2(0.52)	0.1822	0.0385-0.8612	0.0186*
Farmer	4(1.04)	0	0.4222	0.0212-8.381	0.3161[a]

Age 20-34	11(2.88)	33(8.66)	1	Rf	Rf
35-49	91(23.88)	3(0.78)	0.0109	0.00288-0.0418	<0.0001*
>50	79(20.73)	0	0.00215	0.000123-0.0377	<0.0001*
Family history Two-non-diabetic parents	67(17.5)	30(7.87)	1	Rf	Rf
Either-parents diabetic	88(23.0)	6(1.57)	0.1523	0.0599-0.386	<0.0001*
Both-parents diabetic	26(6.82)	0	0.0417	0.00246-0.708	0.0011*
Physical activity No exercise at work /home	70(18.3)	0	1	Rf	Rf
Moderate-exercise at work /home	21(5.51)	28(7.34)	186.9	10.94-3193	<0.0001*
Mild-exercise at work /home	90(23.6)	2(0.52)	3.895	0.1839-82.5	0.2145*
Vigorous exercise	0	6(1.57)	183.3	33.49-1003	<0.0001*
Waist circumference(male) <90cm	26(6.82)	9(2.36)	1	Rf	Rf
90-99cm	56(14.6)	3(1.57)	0.154	0.0386-0.619	0.0038*
>100cm	34(8.92)	0	0.0404	0.0022-0.726	0.0015*
Waist circumference (female) <80cm	3(0.78)	17(4.46)	1	Rf	Rf
80-89cm	47(12.3)	7(1.83)	0.02628	0.00609-0.113	<0.001*
>90cm	36(9.44)	0(0)	0.00274	0.00013-0.05604	<0.001*
BMI <20	5(1.31)	8 (2.09)	1	Rf	Rf
20-30	135(35.43)	28(7.34)	0.1296	0.0394-0.425	<0.0001*
>30	41(10.76)	0	0.00779	0.00039-0.1548	<0.0001*
No. of times take rice in a day Once	10(2.62)	1(0.26)	1	Rf	Rf
Twice	110(28.8)	13(3.41)	1.182	0.1397-9.995	0.8780
Thrice	61(21.7)	22(5.77)	3.607	0.4359-29.84	0.2068

Table 7: Univariate logistic analysis of diabetes and associated risk factors among the moderate-risk group

Characteristics	**Number (%) Moderate risk IDRS(30-50) N=164(43%)**	**Number(%) low risk (IDRS<30), N=36 (9.44%)**	**Odd's ratio**	**95%confidence interval**	**P –value**
Gender Male	74(19.4)	12(3.14)	1	Rf	Rf
Female	90(23.6)	24(6.29)	1.644	0.77-3.51	0.195[a]
Education					

Illiterate	47(12.33)	13(3.41)	1	Rf	Rf
Primary	42(11.02)	9(2.36)	0.774	0.30-1.99	0.596[a]
Secondary	49(12.86)	10(2.62)	0.737	0.29-1.84	0.514[a]
Degree	18(4.72)	2(0.52)	0.401	0.082-1.96	0.247[a]
Pg	8(2.09)	2(0.52)	0.903	0.17-4.78	0.905[a]
Employment status Employed	42(11.02)	12(3.14)	1	Rf	Rf
Unemployed	89(23.25)	22(5.77)	0.865	0.391-1.91	0.7204[a]
Self employed	26(6.82)	2(0.52)	0.269	0.537-1.30	0.853[a]
Farmer	7(1.83)	0	0.226	0.012-4.25	0.164[a]
Age 20-34	64(16.79)	33(8.66)	1	Rf	Rf
35-49	81(21.25)	3(0.78)	0.0718	0.021-0.245	<0.0001*
>50	19(4.98)	0	0.049	0.0028-0.843	0.0027[a]
Family history Two non-diabetic	93(24.4)	30(7.87)	1	Rf	Rf
Either parent diabetic	66(17.3)	6(1.57)	0.281	0.11-0.7156	0.0053[a]
Both parents diabetic	5(1.31)	0	0.278	0.0149-5.19	0.206[a]
Physical activity No exercise at work /home	10(2.62)	0	1	Rf	Rf
Moderate exercise at work/home	87(22.86)	28(7.34)	6.84	0.388-120.5	0.0765[a]
Mild exercise at work /home	49(2.26)	2(0.52)	1.06	0.047-23.7	0.524[a]
Vigorous exercise at work /home	18(2.62)	6(1.57)	7.37	0.376-144.6	0.081[a]
Waist circumference (male) <90cm	18(4.72)	9(2.36)	1	Rf	Rf
90-99cm	45(11.8)	3(1.57)	0.133	0.032-0.549	0.0021*
>100cm	11(2.88)	0	0.084	0.0044-1.599	0.028*
Waist circumference (female) <80cm	34(8.92)	17(4.46)	1	Rf	Rf
80-90cm	36(9.44)	7(1.83)	3.88	0.1434-1.054	0.058[a]
>90cm	20(5.24)	0	0.048	0.00274-0.843	0.0031[a]
BMI <20	11(2.88)	8 (2.09)	1	Rf	Rf
20-30	131(34.38)	28(7.34)	0.2939	0.108-0.7975	0.012*
>30	22(5.77)	0	0.03007	0.0015-0.5869	0.0007*
No. of times take rice in a day Once	8(2.09)	1(0.26)	1	Rf	Rf
Twice	73(19.16)	13(3.41)	1.425	0.164-12.37	0.7471
Thrice	83(21.8)	22(5.77)	2.121	0.251-17.88	0.4802

DISCUSSION

There are many screening questionnaires and tools developed by various national and international

diabetic association throughout the world, which vary according to the ethnic group, life style and races. Indian diabetic risk score is one such screening tool which clear and easy to use tool developed by madras diabetic research foundation (MDRF) which takes in account only four risk factors like age, waist circumference, physical activity and family history. Indian diabetic risk score is a unique in a way that it takes measurement of waist circumference as a measure of abdominal obesity because Indian population is a characteristic of type II Diabetes mellitus with lean body mass index and waist to hip ratio. The use of waist circumference in the screening makes it a better screening tool for assessing type II diabetes mellitus [14].

The present study shows that 181(47.5%)of the participants in rural area are at high risk of developing type II diabetes mellitus as per the IDRS assessment, Similar type of study conducted Mohan et.al., found 43% of study population was in the high-risk category.

The difference in risk prevalence between the current study and the one in Chennai may be due to variance in lifestyles of the populations. The present study noted 164(43%)of participants with moderate risk and 36(9.44%) of participants with low risk, while Gupta et sal. found 50.3% of participants at moderate risk and 18.5% at low risk for diabetes. Pune is an evolving metropolitan city, owing to changes in physical activity and eating habits of the people, and the current study shows very few participants in the low-risk category compared to the high-risk category. It is becoming a problem even among the middle-income and poorer sections of society. This may be due to changes in the lifestyle and standard of living of people from urban slum areas, as a result of urbanization. However, Mohan et al. in 2003 found a significant association between diabetes and higher socioeconomic class. The present study noted that a high proportion of housewives were at high risk for developing diabetes. Reshma s Patil et.al. Observed similar findings, with the highest prevalence in housewives among occupational groups in their study carried out in urban slum of Pune. The probable reason for this is that housewives are not doing any other physical activity apart from their household work and are not involved in any other day-to-day exercise [15].

The current study noted that, as age increases, the risk for diabetes also increases. Several other studies have noted similar findings. Two further studies found a significant association between higher age and undiagnosed diabetes.

High incidence of diabetes is seen among first-degree relatives where one has diabetes, and the risk of a child with a parental history of diabetes developing diabetes them self is more than 50%.

From our study either parent diabetic is one of the major contributors for diabetes in male participants similar findings observed in Reshma S et.al., with family history of diabetes is one of the major contributors for diabetes and two-non diabetic family history are is another major contributors for female participants the probable reason for this is that the female participants are not doing any other physical activity apart from their household work and are not involved in any other day to day exercise.

Physical activity is one of the important modifiable risk factors for diabetes. Globally, physical inactivity accounts for 14% of diabetes, and it also acts as a major risk factor for obesity, which again has a significant relationship with diabetes. Over the past few decades, a huge proportion of the working population has shifted from manual labour associated with the agriculture sector to less physically demanding office jobs.

India is undergoing rapid urbanization, which is associated with increasing obesity and decreasing physical activity, owing to changes in lifestyle and diet and a change from manual work to less physical occupations. Gupta et al. reported similar findings to those of the present study, that individuals with a sedentary lifestyle or who undertook only mild physical activity, had a higher risk for diabetes; also, the Chennai Urban Population Study (CUPS-14) conducted by Mohan et al. found a significant association between light physical activity and undiagnosed diabetes.

Despite having a lower prevalence of obesity as defined by body mass index, Asian-Indians tend to have a higher waist circumference and waist-to-hip ratio greater than 0.9- 180(47.5%) compared to white Caucasians, thus having a greater degree of central obesity. Waist circumference is a more powerful determinant of a subsequent risk of diabetes mellitus. Several other studies have noted a significant association between waist circumference and undiagnosed diabetes, which is similar to the findings of the present study.

In the present study the prevalence of abdominal obesity was 27.2% and 23.6% among males and females respectively. While a study conducted in Krutarth R et.al. Using the same cut off values for waist circumference reported prevalence of abdominal obesity up to 44 and 84% among males and females [16].

CONCLUSION

The Indian diabetes risk score is highly sensitive test for early diagnosis of pre-diabetes, and if screening is done in the pre-diabetic stage then we can prevent it into conversion in diabetes mellitus and late diabetic complications in Indian community.

The finding of our study may aid in convincing health care professionals and people at high risk of developing diabetes to take stern action towards healthy lifestyle and achieving the goal of ‘’Health for all’’

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