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ORIGINAL RESEARCH

A study of risk assessment of diabetes mellitus in the urban field practice area of GGSMCH, Faridkot, using the Indian Diabetes Risk Score

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Abstract

Background: The burden of diabetes in India is expected to worsen in the coming years. Indian Diabetes Risk Score (IDRS) is a validated and cost-effective tool to identify the risk of developing diabetes among the population.

Objectives: To assess the risk of Type 2 Diabetes mellitus using the IDRS in adults aged 20 years and above.

Material & Methods: A cross-sectional study was conducted in the Urban field practice area of the Department of Community Medicine, Guru Gobind Singh Medical College & Hospital, Faridkot. A total of 145 residents aged 20 years and above were included in the study. Data was collected using self-structured pre-tested and validated tools and analyzed using suitable statistical software.

Results: 83.7 % of the study subjects were aged between 20-50 years. More than half (51.7%) of the subjects were found to have a moderate risk of diabetes.

Conclusion: Early detection of the risk of diabetes by periodic screening and appropriate behavioral change communication would effectively control the diabetes crisis.

Keywords: Diabetes, Indian Diabetes Risk Score, Waist circumference, Physical activity.

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. Hyperglycemia 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(1,2), which leads to serious damage to the eyes, heart, and kidneys and has become the major cause of blindness, kidney failure, and lower limb amputation. The most common type of diabetes is Type II, usually seen in adults. the prevalence of diabetes has increased dramatically due to changing lifestyles, physical inactivity, and the increasing prevalence of obesity(2).

Diabetesis an important public health problem, one of four priority noncommunicable diseases (NCDs) targeted for action by world leaders (3). Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades. According to International Diabetes Federation in 2021 approximately 537 million adults are living with diabetes- 1 in 10 individuals. This number is predicted to rise to 643 million by 2030 and 783 million by 2045

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

.3 in 4 adults with diabetes live in low- and middle-income countries, and 1in 2 adults living with diabetes are undiagnosed. Diabetes is responsible for 6.7 million deaths in 2021 - 1 every 5 seconds (4).

In India, the burden has risen significantly in recent decades and will continue to rise in the coming decades. India ranks second after China in the global diabetes epidemic with 77 million people with diabetes. It is also estimated that nearly 57% of adults with diabetes are undiagnosed in India. This could have a great influence on morbidity and mortality associated with diabetes and thus, on the overall healthcare expenditure in India. The mean healthcare expenditure on diabetes per person is 92 US dollars, and total deaths attributable directly to diabetes account for 1 million. To curb the epidemic of diabetes and its associated complications, there is a need for a multipronged strategy involving early diagnosis of diabetes, screening for its complications, offering optimal therapy at all levels of care for those who already have diabetes, and primary prevention of diabetes in those with prediabetes (5).

The urban poor is a group that is known to be vulnerable to the adoption of a more urbanized lifestyle that places them at a higher risk for diabetes. Individuals who are unaware of their disease status are more prone to micro- and macrovascular complications. Hence, it is necessary to detect this large pool of undiagnosed participants with diabetes risk and offer them early interventions to prevent diabetes incidence. Moreover, no such study was conducted in this geographical area, so the present study proposed with the aim to assess the prevalence of people at high risk for diabetes using IDRS in the field practice area.

Indian Diabetes Risk Score (IDRS), devised and developed by Mohan et al. at the Madras Diabetes Research Foundation (MDRF-IDRS), is a validated tool to identify individuals with a high risk of developing type 2 diabetes mellitus(T2DM) in the future. It considers four risk factors namely age, family history, abdominal obesity, and physical activity(2)

Material & methods

Study settings: Urban field practice area of Urban Health Training Centre (UHTC) of Department of Community Medicine, Guru Gobind Singh Medical College & Hospital, Faridkot.

Study period: The study was conducted over a period of one year.

Study design: a cross-sectional.

Study population: The study was conducted among Individuals > 20 years of age residing in the urban field practice area of the Department of Community Medicine, Guru Gobind Singh Medical College & Hospital, Faridkot.

Inclusion criteria: Individuals > 20 years of age willing to participate in the study.

Exclusion criteria:

- Known patient with diabetes
- Pregnant or lactating female
- People who refused to participate

Sampling:

- **Sample size:** Sample size was calculated using a single proportion sample size formula:
- **$X = Z_{\alpha/2}^2 * p*(1-p) / MOE^2$**
- $Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$
- MOE is the margin of error; p is the sample proportion.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

The sample size was decided by taking into account
1. Prevalence of undiagnosed diabetes is 9%
2. Confidence limit of 95%
3. Margin of sampling error 5%

The literature review reveals that the prevalence of undiagnosed diabetes in India is 9% (2). Since no such figure is available for Punjab (Faridkot), the sample size was calculated by presuming the prevalence of undiagnosed diabetes 9 %. The sample size came out to be 131. Assuming the non-response rate to be 10%, the total study subjects included were 145.

Sampling technique:

Simple random technique.

A list of individuals>20 years of age was procured from ANMs of the urban field practice area of GGSMCH. The individual was selected using computer-generated random numbers till the desired sample size was achieved.

Study tool:

1. A pre-tested semi-structured and validated questionnaire was used to collect the required information from individuals >20 years of age. This tool consisted of a Socio-demographic profile.
2. A risk factor profile was found by using IDRS.

It consists of four sections, section 1(socio-demographic profile) section 2(risk factor profile) section 3(Health status assessment), and Section 4(IDRS- Indian diabetes risk score).

Methodology

Before the commencement of the study, a house-to-house survey was conducted in the field practice area of the Department of Community Medicine GGSMCH during which a line list of people aged more than 20 years was done. Unique numbers were given to each household in the line list with people > 20 years and the allocated sample size was extracted using computer-generated random numbers.

Each selected household was visited and before conducting of one-to-one interview with the respondent, informed consent was taken regarding the socio-demographic profile and the data collection tool.

If the selected household fails to satisfy inclusion criteria, immediately next household in the line list is visited. The same procedure was followed if a house was locked or the concerned person was not available in the house.

Health Status Assessment: After completion of their interview, a health assessment of the respondent was done Blood Pressure (BP), height, weight, Body Mass Index (BMI), waist circumference, hip circumference, and waist-to-hip ratio were measured and recorded. Height was recorded with a standardized stadiometer to a minimum of 0.1 cm. The weight of the respondent was recorded using ISI marked non-digital weighing scale to a minimum of 100 grams.

- **BP measurement**: BP was recorded using a standardized Sphygmomanometer and 2 readings were taken at a gap of 5 min. The average of both the BP values (Systolic & Diastolic) was taken.
- **Height measurement**: To record height, the respondent was told to remove footwear, and headgear (hat, cap, etc.) and stand straight with feet together, eyes looking in front, by moving to measure arm gently down onto the head of the respondent the height was recorded in centimeters

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

- **Weight measurement**: While recording the weight, the scale was placed on a firm, uniform& flat ground. respondent was told to step onto the scale with one foot on each side of the scale and stand still with her face forward and arms on the side. Weight was recorded in kilograms.
- **Waist measurement**: To measure waist circumference, locate and mark the inferior margin of the last rib& top hip bone. Then by using constant tension tape measurements were taken at the end of expiration with arms relaxed at bodies either side.
- **Hip circumference measurement**: Hip circumference was measured using a firm tension tape by placing it around the hips at maximum circumference over the buttocks, in centimeters.
- Physical activity levels were assessed and graded based on the WHO STEPS definitions of sedentary, moderately, or vigorously physically active

Operational definitions

Urban area: -All the places with a corporation, municipality, containment, or notified town area along with all the other places, which satisfied the following criteria: A minimum population of 5000, in which at least 75% of the male main workers engaged in non-agriculture pursuits; and population density of at least 400/km^2 was considered an urban area for this study (6).

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (7).

Sedentary behavior is defined as any waking behavior characterized by an energy expenditure ≤ 1.5 metabolic equivalent (8).

Moderate physical activity refers to activities equivalent in intensity to brisk walking or bicycling (7).

Vigorous physical activity produces a high increase in respiratory rate & heart rate for example: - jogging, aerobic dance, or bicycling uphill (7).

Educational status:(9)

- **Illiterate**: A person (above the age of 7 years) who cannot read or write.
- **Primary school education**: education from 1st to 5th standard.
- **Middle school education**: education up to 8th standard.
- **High school education**: education up to 10th standard.
- **Intermediate education**: education up to 12th standard.
- **Graduate and above:** The successful completion of an education program (9).

Socio-economic status (According to the Modified Kuppuswamy Scale 2022)

Waist-Hip Ratio: ideally it should be less than 0. 85 less than 1 in females and males respectively (10).

Section 4: IDRS

This included calculating IDRS by adding the obtained values to respondents from the 4 parameters of IDRS: - age, waist circumference, physical activity, and family history of DM.

Risk factors	Score

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Age (years)	
<35	0
35-49	20
>50	30
Abdominal obesity (waist circumference)	
<80cm(f) <90cm(m)	0
≥80-89(f) ≥90-99(m)	10
≥90 cm(f) ≥100 cm(m)	20
Physical activity	
Exercise regularly +strenuous work	0
Exercise regular/strenuous work	20
No exercise & sedentary work	30
Family history of Diabetes	
No family history	0
Either parent	10
Both parent	20

Minimum score: 0 **Maximum score:100**

High risk: ≥60; Moderate risk: 30-50; Low risk: <30

According to IDRS obtained from this study, individuals are categorized as having low, moderate, and high risk for diabetes in the future.

Data analysis

The data collected during the survey was entered in MS Excel and was analyzed by using SPSS software.

Results

Socio-demographic factor

Table 1: distribution of participants according to socio-demographic characteristics (n=145)

Characteristics of subjects	Frequency(n)	Percentage (%)
Age in Group(year)		
<35 =0	70	48.3
35-49	52	35.9
>/=50	23	15.9
Gender		
Male	74	51
Female	71	49
Education		
Professional or Honour	1	0.7
Graduate/ postgraduate	36	24.8
Intermediate/post-high school diploma	10	6.9
High School	42	29
Middle school certificate	20	13.8
Primary school certificate	15	10.3

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Illiterate	21	14.5
Socioeconomic Status (SES)		
Upper	9	6.2
Upper middle	19	13.1
Lower middle	35	24.1
Upper lower	62	42.8
Lower	20	13.8
Marital Status		
Unmarried	20	13.8
Married	117	80.7
others	8	5.5

Table 1 shows that out of a total of 145 subjects majority belong to those less than 35 years of age. Most of the subjects 42(29%) were studied up to high school followed by 36(24.8%), and 20(13.8%) with graduate /postgraduate and middle school pass respectively. Out of 145 subject's majority 62(42.8%) belong to the upper lower socio-economic class. The majority 117(80.7%) were married**.**

Table 2: Distribution of Subjects According to Physical Activity(n=145)

Physical Activity	Frequency(n)	Percentage (%)
Exercise Regular +strenuous work	59	40.7
Exercise Regular /strenuous work	33	22.8
No Exercise &sedentary work	53	36.6

Table 9 shows that out of 145 subjects, 59(40.7%) indulged in regular exercise and strenuous work followed by 33(22.8%) who indulged in either regular exercise or strenuous work, and 53(36.6%) were not indulged in any kind of exercise & do sedentary work.

Table 3: Distribution of Subjects According to Family History of Diabetes(n=145)

Family History of Diabetes	Frequency(n)	Percentage (%)
No family history	100	69.0
Either parent	38	26.2
Both parents	07	4.8

Table 10 indicates that out of 145 subjects, the majority 100 (69%) have no family h/o Diabetes, followed by 38(26.2%) and 7(4.8%) who have a family h/o one parent or both parents, respectively.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

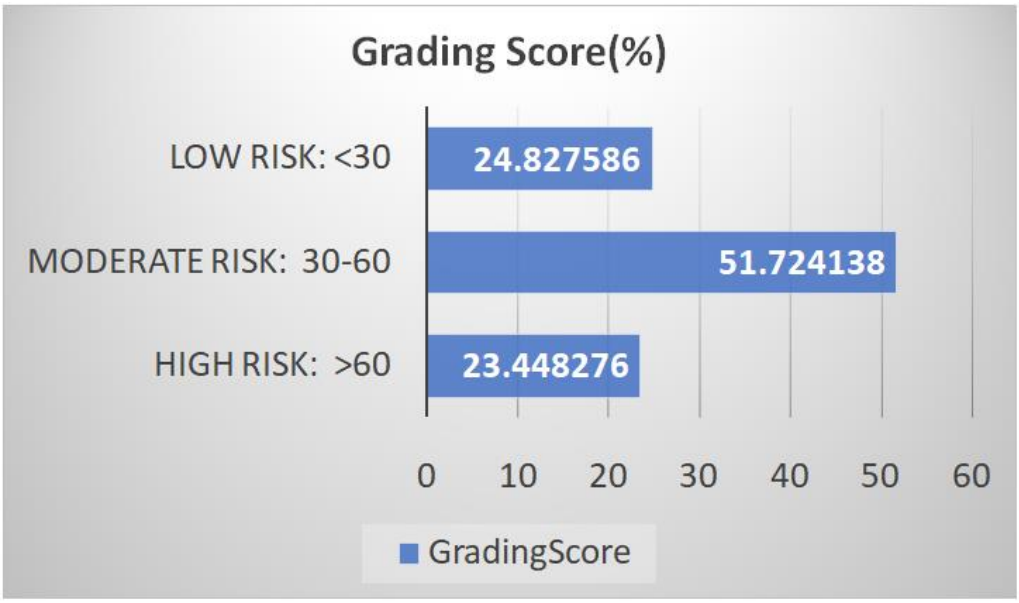

Fig 3: Distribution of subjects according to IDRS(Indian Diabetic Risk Score)

Figure 5 shows the distribution of subjects according to IDRS (Indian Diabetic Risk Score) 51.7% had a moderate risk of Diabetes followed by 24.8% and 23.5% who had low risk and high risk respectively.

Discussion

In the current study, it was observed that the majority, 48.3% of the subjects, were aged <35 followed by those between 35-49 years of age (35.9%), and the rest of the participants, were >50 years of age. The mean age of the study subjects was 37.9 years. In contrast, in the study conducted by **Acharya A et al**. 43.7% of the subjects were aged 50 years and above followed by those between 35-49 years of age (38.9%) and the rest were between 30- 35 years of age. It varied in different studies as per the availability of study participants at the time of study, and the place of study (11).In the current study, 51% of participants were males and 49% of the subjects were females, the same way of distribution was seen in the studies conducted by **Bhatia T et al**. and **Mandal M et al**.(12,13) but in most of the other studies, female subjects participated more (11,14–16).

Gender-wise distribution varies in different studies according to the study population, the place of studies, and the availability of the subjects at the time.

In our study, the majority (86.2%) of the subjects were literate, and the majority (80.7%) of the subjects were married, which is similar to the findings of **Acharya A et al**. and **Prenissl J et al.** (11,17).this may be because the age group selected is in the reproductive age. We are more concentrated on young, have not been diagnosed with diabetes previously, to find the diabetic risk.

In our study, the majority 100 (69%) have no family history of Diabetes, followed by 38(26.2%) and 7(4.8%) who have a family history of one parent or both parents, respectively, which means 31% of participants have family h/o diabetes in either or both parents. This is similar to the study conducted by **Patel S et al**. (18).

In our study, on assessing the subjects using IDRS, almost half (51.7%) were in moderate risk, followed by 24.8% in low-risk and 23.5% in the high-risk group, similar results were found in the study of **Bhatia T et al.** in which1%, 68%, and 31% participants were in high, moderate, and low-risk groups respectively(12). and in a study by **Arun A et al.** 67.7% were in moderate risk, while 17.4%-low risk and only 14.9% -the high-risk IDRS category(19). Similarly, in research done by **Subramani R et al.** 12.1% of individuals had a high risk of diabetes, 74.7%

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

had a moderate risk of diabetes and 13.3% of individuals had no risk of diabetes(20). In contrast, in a study by **Patil RS et al.** 36.6% had a high-risk score, remaining 54.6% and 8.9% were in moderate and low-risk categories for diabetes(21). In the study by **Nandeshwar S et al.** 68.80% were in the high-risk group as per the IDRS rest 2.80% and 28.40% were in the low-risk and moderate-risk categories of diabetes(22).In a study completed by **Girdher S et al.** 58.6% and 31.5% were at moderate and high risk of diabetes, respectively only 9.9% were at low risk of diabetes(2). Here some disparity happened in the distribution of subjects in high and low-risk groups concerning our study. A study conducted by **Achary A et al.** shows more than half (59.31%) of the subjects have a high risk of diabetes(11).

Conclusion

The study shows the risk of diabetes increases with age and the presence of a family history of diabetes. It was found that over half of the participants had a moderate risk of diabetes, while the remaining half was evenly split between low and high risk, with a slight increase in the number of low-risk individuals.

Conflict of interest: Nil

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