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A Community Based Cross Sectional Study to Assess Risk of Type 2 Diabetes in Adult Population Using Indian Diabetes Risk Score in Field Practice Area of Urban Health Training Centre, Jaipur

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Abstract

Background: *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[1]. There are mainly two types of diabetes; Type 1 and Type 2. Type 2 is the most common form and comprises of 90% of people with diabetes around the world. Early identification of the high risk individuals would help in taking appropriate intervention in the form of dietary changes and increasing physical activity, thus helping to prevent, or at least delay, the onset of diabetes.*

Objective: *To assess the risk of type 2 diabetes in the adult population using Indian Diabetes Risk Score in the field practice area of Urban Health Training Centre, Jaipur.*

Material and Methods: *A total of 400 individuals participated in the study and various parameters including physical activities, family history of diabetes were assessed using a questionnaire previously developed by Mohan V et al. The study tool has got 4 important factors like age, abdominal obesity, physical activity and family history of diabetes.*

Results: *Out of 400 patients; majority 195(48.75%) of the patients were from 35- 49 years of age; among that most (54.67%) of the patients were at moderate risk of diabetes. In this study 214(53.5%) of the patients belongs to moderate risk of diabetes; followed by high risk of diabetes 150 (37.5%) and the least was low risk of diabetes 36(9%). In high risk of diabetes most 38.6% were family history of diabetes of single parents, 53.3% were waist circumference >90cm in female and >100cm in male and 34.6% were doing mild exercise in day to day life.*

Conclusion: *Screening and early identification of high risk individuals would help to take appropriate intervention like lifestyle modification. It would also help in early diagnosis and treatment to prevent or to delay the onset of diabetes mellitus and its complications.*

Keywords: *Abdominal obesity, Diabetes, Family history of diabetes, Indian Diabetes Risk Score, 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[1]. There are mainly two types of diabetes; Type 1 diabetes is immune-mediated and requires daily administration of insulin which is caused by lack of insulin

secretion, due to damage of ß-cells of the pancreas. The other common type is type 2 diabetes and characterized by insulin resistance or relative insulin deficiency that occurs at the level of skeletal muscles, liver and adipose tissue, with varying degrees of ß-cells damage[1,2]. It is the most common form and comprises of 90% of people with diabetes around the world[1].

Early identification of the high risk individuals would help in taking appropriate intervention in the form of dietary changes and increasing physical activity, thus helping to prevent, or at least delay, the onset of diabetes.

Various associations and federations throughout the world has developed the risk scoring for developing type 2 diabetes. Indian Diabetes Risk Score (IDRS) developed by Madras Diabetes Research Foundation (MDRS). A simplified IDRS for screening of undiagnosed diabetic subject was developed by Mohan Diabetes Foundation, Chennai. IDRS can be reliably used as an effective tool for the mass screening of diabetes in the community.

The Indian Diabetes Risk Score (IDRS) is comprised of four scored questions regarding age, abdominal obesity as measured by the waist circumference, family history of diabetes and physical activity levels. It is a simple, easy to administer screening tool to detect undiagnosed diabetes and to identify persons at risk of developing diabetes[3].

The advantages of IDRS are its simplicity, low cost and are easily applicable for mass screening programmes[4].

The purpose of community based screening for diabetes is to differentiate asymptomatic individuals who are at high risk of diabetes from individuals at lower risk, so that appropriate preventive strategies can be initiated early.

With this background the present study was designed to assess risk of Type 2 diabetes in the adult population using Indian Diabetes Risk Score in the field practice area of Urban Health Training Centre, Jaipur.

Material and Methods

Study Population: The present study was Community based Cross sectional descriptive type of observational study. A total of 400 individuals participated in the study and various parameters including physical activities, family history of diabetes were assessed using a questionnaire previously developed by Mohan V et al[3].

Inclusion Criteria

- ≥ 20 year of age
- Either of gender
- Resident (≥1 year) of identified area

Exclusion Criteria

- Known diabetic population
- Pregnant and lactating up to 12 weeks
- Those who seriously ill to participate

Sampling Technique: A systematic random sampling method was used to select the participants. There were 5853 adult population and 1625 houses as per the family folder maintained at UHTC in the study area. Data collection was done by household survey by direct interview using a pre-tested and structured questionnaire. The questionnaire had 2 parts with part one of sociodemographic variables and part two made up of IDRS questionnaire as shown in Table 1.

The study tool has got 4 important factors like age, abdominal obesity, physical activity and family history of diabetes. Operational definitions used in the study are mentioned below.

Participants with IDRS "≥60", "30 to <60" and "<30" were considered as "High risk", "Intermediate risk", and "Low risk" for diabetes mellitus[5].

Family history of diabetes: If either or both of a participant's parents had diabetes, they were considered to have a positive family history[5].

Physical activity: Grading was done as per WHO STEPS definitions of sedentary, mildly, moderately, or vigorously physically active[6].

Abdominal/central obesity was considered to be present when the waist circumference was ≥80 cm in women and ≥90 cm in men.

Table 1 Indian Diabetes Risk Score (IDRS)

Particulars	Score
1. AGE	
a) 20 – 34 years	0
b) 35-49 years	20
c) ≥50 years	30
2. WAIST CIRCUMFERENCE	
a) Waist< 80 cm(female) & Waist <90 cm(male)	0
b) Waist >80-89 cm(Female) & Waist >90-99 cm(Male)	10
c) Waist>90 cm(F) Waist >100 cm(M)	20
3. **PHYSICAL ACTIVITIES**	
a) Vigorous exercise (regular) or strenuous (manual) work at home/work.	0
b) Moderate exercise (regular) or moderate physical activity at home/work.	10
c) Mild exercise (regular) or mild physical activity at home/work	20
d) No exercise and sedentary activities at home/work	30
4. **FAMILY HISTORY OF DIABETES**	
a) No diabetes in parents	0
b) One parent is diabetic	10
c) Both parents are diabetic	20

Statistical Analysis

The qualitative data were expressed in proportion and percentages. The difference in proportion was analyzed by using chi square test. Probability P value < 0.05 was considered statistically significant.

Results

Out of 400 patients, maximum cases were reported in the age group of 35-50 years (53.75%) followed by > 50 years (27.25%) and the least was in less than 35 years (19%). Among that 65% were female and 35% were male. Female to male ratio was 1.8:1 Out of 400 patients 253(63.25%) were living in joint family while 146(36.5%) were living in nuclear family.

Out of 400 patients majority i.e 214(53.5%) were at moderate risk of diabetes, 150(37.5%) were at high risk of diabetes while 36(9%) were at low risk of having diabetes.

Out of 400 patients; majority 195(48.75%) of the patients were from 35-49 years of age; among that most (54.67%) of the patients were at moderate risk of diabetes followed by 131(32.75%) of the patients were ≥50 years of age; among that 46.6% of the patients were at high risk of diabetes and the least was 74(18.5%) of the patients were <35 years of age; among that most (97.2%) of the patients were at low risk of diabetes. Thus our results are statistically significant (P value < 0.001)

In this study 214(53.5%) of the patients belongs to moderate risk of diabetes; followed by high risk of diabetes 150 (37.5%) and the least was low risk of diabetes 36(9%). In high risk of diabetes most 38.6% were family history of diabetes of single parents. Similarly in low risk and moderate risk most 86.1% and 77.1% respectively were no history of parents of diabetes. Thus our results are statistically significant. (P value < 0.001)

In this study majority 214(53.5%) of the patients belongs to moderate risk of diabetes; followed by high risk of diabetes 150(37.5%) and the least was low risk of diabetes 36(9%). In high risk of diabetes most 53.3% were waist circumference >90cm in female and >100cm in male. Similarly in low risk and moderate risk most 72.2%, 67.7% respectively were waist circumference 80-89cm in female and 90-99cm in male. Thus our results are statistically significant.

Out of 400 patients 214(53.5%) belongs to moderate risk of diabetes; followed by high risk of diabetes 150(37.5%) and the least was low risk of diabetes 36(9%). In high risk of diabetes most

34.6% were doing mild exercise in day to day life. Similarly in low risk and moderate risk most 72.2%, 60.2% respectively were doing moderate exercise in their day to day life. Thus our results are statistically significant. (p value < 0.001)

Table 2 Distribution of the patients according to IDRS score

IDRS	Number	Percentage
High risk (≥ 60)	150	37.5%
Moderate risk (30-<60)	214	53.5%
Low risk (< 30)	36	09%
Total	400	100%

Table 3 Association of diabetes risk with age in years

	High risk		Moderate risk		Low risk		Total		Chi squared
Age	no	%	no	%	no	%	no	%	P-VALUE
20-34	3	2.00	36	16.82	35	97.22	74	18.50	<0.001S
35-49	77	51.33	117	54.67	1	2.78	195	48.75	
≥50	70	46.67	61	28.50	0	0.00	131	32.75	
Total	150	100.00	214	100.00	36	100.00	400	100.00	

Table 4 Association of diabetes risk with gender

Gender	High risk		Moderate risk		Low risk		Total		Chi squared
	no	%	no	%	no	%	no	%	P-VALUE
Female	96	64.00	141	65.89	23	63.89	260	65.00	0.923NS
Male	54	36.00	73	34.11	13	36.11	140	35.00	
Total	150	100.00	214	100.00	36	100.00	400	100.00	

Table 5 Association of diabetes risk with family history of diabetes

Family history of diabetes	High risk		Moderate risk		Low risk		Total		Chi squared
	no	%	no	%	no	%	no	%	P-VALUE
No (0)	57	38.00	165	77.10	31	86.11	253	63.25	<0.001S
One parent (10)	58	38.67	43	20.09	5	13.89	106	26.50	
Both parents (20)	35	23.33	6	2.80	0	0.00	41	10.25	
Total	150	100.00	214	100.00	36	100.00	400	100.00	

Table 6 Association of diabetes risk with waist circumference

Waist circumference score	High Risk		Moderate Risk		Low Risk		Total		Chi squared
	no	%			no	%	no	%	P-Value
<80cm (F); <90cm (M)	5	3.33	29	13.55	9	25.00	43	10.75	<0.001S
80-89cm (F); 90-99cm (M)	65	43.33	145	67.76	26	72.22	236	59.00	
>90cm (F); >100cm (M)	80	53.33	40	18.69	1	2.78	121	30.25	
Total	150	100.00	214	100.00	36	100.00	400	100.00	

Table 7 Association of diabetes risk with physical exercise

Physical activity score	High Risk		Moderate Risk		Low Risk		Total		Chi squared
	no	%	no	%	no	%	no	%	P-Value
Vigorous	4	2.67	27	12.62	9	25.00	40	10.00	<0.001S
Moderate	43	28.67	129	60.28	26	72.22	198	49.50	
Mild	52	34.67	41	19.16	1	2.78	94	23.50	
No exercise	51	34.00	17	7.94	0	0.00	68	17.00	
Total	150	100.00	214	100.00	36	100.00	400	100.00	

Discussion

This study used the IDRS to screen adult population at risk of developing diabetes in healthy adults of UHTC area and to find out association of various sociodemographic and anthropometric measures with the degree of risk of developing diabetes.

We found that out of 400 patients majority i.e 214 (53.5%) were at moderate risk of diabetes, 150 (37.5%) were at high risk of diabetes while 36(9%) were at low risk of having diabetes. Our results are consistent with Patil R S et al[7] and Gupta et al[8] who reported (36.55%) and (31.2%) respectively had a high risk score. However, a study conducted by Mohan et al in the metropolitan city of Chennai, found 43% of the population was in the high-risk category[9]. This risk difference may be due to variance in life-styles of the population as our study was a community based study, whereas study by Mohan et al[3] was done in a medical facility in a metropolitan city and another study was done in the urban area of Pondicherry.

This shows that a large number (moderate and high risk) of the study subjects had some kind of risk of developing diabetes in future. This is the group where active interventions in the form of health education, counselling and further work up is urgently required. The earlier the interventions are started the later will be the onset of disease and its subsequent complications.

In this study we found that out of 400 patients; majority 195(48.75%) of the patients were from 35-49 years of age; among that most (54.67%) of the patients were at moderate risk of diabetes followed by 131(32.75%) of the patients were ≥50 years of age; among that 46.6% of the patients were at high risk of diabetes and the least was 74(18.5%) of the patients were <35 years of age; among that most (97.2%) of the patients were at low risk of diabetes. Our findings are in agreement with Patil R et al[7] However Maroof Khan Amir et al[10] in their cross sectional study from Lucknow also reported a lower prevalence of Diabetes (9.5%) in persons aged 20 years and above. The current study noted that, as age increases, the risk for diabetes also increases. Several other studies have noted similar findings[11,12]. There are studies who found a positive association between higher age and undiagnosed diabetes[13,14]. The difference could be attributed to the change in lifestyle patterns, rapid urbanization and increase awareness about diabetes over the last decade.

In this study we found that females are at high risk of having diabetes as compared to males. But there is statistically not significant difference was observed (p value <0.923). It may be due to more tendency of fat accumulation among females. Similar study conducted by S Jaya et al[15] and Acharya et al[16] where no significant differences were found. However Garima et al[17] and Arora et al[18] noted that more high risk cases were women than men in Urban Haryana and there was a statistically significant association.

A 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 themselves is more than 50%.23. In this study we found that in high risk of diabetes most 38.6% were family history of diabetes of single parents. Similarly in low risk and moderate risk most 86.1% and 77.1% respectively were no history of parents of diabetes. Our findings are in agreement with two other studies who have shown that increased risk for diabetes was associated with a family history of diabetes[5,12]. Thus, family history of diabetes is one of the major contributors for diabetes. Arora et al[18] noted that the majority of individuals with prediabetes had a family history[19]. Hadaegh et al[13], and Wang et al[14], in their studies done in an Iranian urban population and in Guangzhou urban community respectively, found an association between undiagnosed cases of diabetes and a family history of diabetes, as in the current study.

In this study we found that in high risk of diabetes most 53.3% were waist circumference >90cm in female and >100cm in male. Similarly in low risk and moderate risk most 72.2%, 67.7%

respectively were waist circumference 80-89cm in female and 90-99cm in male. Our results are statistically significant and concordant with Mansoor et al[20] and Krutarth et al[21] who also reported similar findings.

Physical activity is one of the important modifiable risk factors for diabetes. Globally, physical inactivity accounts for 14% of diabetes,[22] 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[9,11].

In this study we found that in high risk of diabetes majority 68.6% were doing mild or no exercise in day to day life. As statistically significant and consistent with the study conducted by Patil R et al[7], Gupta et al[8] and M M Singh et al[23], who have reported similar findings; that individuals with a sedentary lifestyle or who undertook only mild physical activity, had a higher risk for diabetes;[24] also, the Chennai Urban Population Study (CUPS-14) conducted by Mohan et al. found a significant association between light physical activity and undiagnosed diabetes[3]. However Gopalakrishnan et al and Subramani et al reported higher figure for moderate physical activity (76.5%) and (74.7%) respectively was seen in high risk of diabetes[25,26].

Conclusion

Screening and early identification of high risk individuals would help to take appropriate intervention like lifestyle modification. It would also help in early diagnosis and treatment to prevent or to delay the onset of diabetes mellitus and its complications. Our study highlight the importance and need to focus and strengthen health promotion and Information Education and Communication activities in young population so as to reduce the future burden of disease.

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