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Original Research Article

Assessment of diabetes risk among adult population using Indian diabetes risk score and to correlate with actual capillary blood sugar level: a cross sectional study

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ABSTRACT

Background: Diabetes is one of the fastest growing health challenges of the 21st century, with the number of adults living with diabetes having more than tripled over the past 20 years. IDRS is pre-screening tool for assessing diabetes mellitus. It is also a non-invasive procedure and less time consuming. Aim were to assess diabetes risk among adult urban population of district Etawah by using Indian Diabetes Risk Score and to correlate it with actual capillary blood sugar status.
Methods: The present study was a cross sectional study carried out among 200 adult urban non diabetic population the age group of 30 years and above. The data was collected using predesigned questionnaire followed by capillary blood sugar estimation. The data was collected under following broad heading: socio-demographic profile, Behavioural factor, Indian diabetes risk score and capillary blood sugar estimation.
Results: Majority of the participants were in the age group of 35-49 years and Hindu by religion. 62.5% gave history of fast food consumption, nearly half of the participants gave the history of moderate to heavy physical exercise. It was found that 89% of the participants fall under the category of intermediate and high risk category. On application of test of association between IDRS score and actual capillary blood sugar level, strong association exist between the two variables.
Conclusions: The present study concludes that IDRS is a powerful tool for screening of high risk group of diabetes. There is a strong association between capillary blood sugar and IDRS score.

Keywords: Community based screening tool, Diabetes mellitus screening, Indian diabetes risk score

INTRODUCTION

Diabetes is one of the fastest growing health challenges of the 21st century, with the number of adults living with diabetes having more than tripled over the past 20 years. According to WHO global, globally, an estimated 422 million adult were living with diabetes in 2014, compared to 108 million in 1980.[1] In 2000, the global estimate of adults living with diabetes was 151 million. By 2009 it had grown by 88% to 285 million. Today, we calculate that 9.3% of adults aged 20-79 years-a staggering 463 million people-are living with diabetes. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. A further 1.1 million children and adolescents under the age of 20 live with type 1 diabetes. A decade ago, in 2010, the global projection for diabetes in 2025

was 438 million. With over five years still to go, that prediction has already been surpassed by 25 million.[2]

People living with diabetes are at risk of developing a number of serious and life- threatening complications, leading to an increased need for medical care, a reduced quality of life, and undue stress on families. Raised blood glucose, a common effect of uncontrolled diabetes may over time lead to serious damage to the heart, blood vessels, eyes, kidneys and nerves. Diabetes and its complications, if not well managed, can lead to frequent hospital admissions and premature death.

The International Diabetes Federation (IDF) estimated that the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025.[2] According to Agrawal S and Ebrahim S the prevalence to diabetes in Uttar Pradesh is around 9.13 per 1000 population.[3] In study done by Khan et al have reported a prevalence of 7.96% in the urban population of Aligarh.[4]

By early detection of the disorder, we would able to take therapeutic measures, which will allow us to prevent or at least to delay the complications of diabetes. For early detection of the disease by screening the patients, scales were developed to measure the risk score for diabetes based on the risk factors. One such scale developed was Indian Diabetic Risk score (IDRS). IDRS is prescreening tool for assessing diabetes mellitus. This tool was developed in Chennai, it consist of four parameters- 1. Age, 2. Abdominal obesity, 3. Family history, 4. Physical activity. This tool is cost effective for testing the type 2 diabetes mellitus. It is also a non-invasive procedure and less time consuming. But the performance of this tool may vary according to the different health parameters of people of various countries. As the prevalence of diabetes mellitus is rising vary rapidly in India therefore this tool can be used as prescreening tool for diagnosing the disease and for decreasing its burden from the community. So, the present study were designed to assess diabetes risk among adult urban population of district Etawah by using Indian Diabetes Risk Score and to correlate it with actual capillary blood sugar status.

METHODS

Study design

This was a community based cross sectional study.

Study period

Study was conducted for the period of one and half year from 1st January 2019 to June 2020.

Study subjects

Population age 30 yrs and above without known history of diabetes.

Sample, sampling technique and sample population

The sample size was calculated using formula

$N= [Z^2_{\alpha/2} PQ/L^2] X$ Design effect

$Z_{\alpha/2}$= 1.96: P=8.5[4]: Q=(100-P)=(100-8.5)= 91.5: Design effect=2

By substituting the above value in the formula, we got the value of 156. After including 10% dropout the value further increased to 171. The value was rounded off to 200.

Inclusion criteria

Person age 30 years or more and resident of Urban Etawah District, and subject giving written consent to participate in the study were included.

Exclusion criteria

All known cases of diabetes mellitus, subject with serious illness, and pregnant and lactating females were excluded.

Methodology

For the present study cluster sampling technique was used for data collection. Urban etawah has 41 wards and we decided to select 10 wards using cluster sampling techniques. Thus from each ward we selected 20 participants.

Steps for selection of wards

First of all cumulative frequency of population was calculated. Then divide the total population by the number of desired wards. Then we had chosen a number smaller than the number we got in above step using currency note method. Then saw the obtained number in cumulative frequency table. The ward that corresponds to that number was selected as ward number 1. Then by adding step number (2) and (3), we got ward number 2. Similarly add step (2) to the number we got till 10 wards were selected.

On reaching the selected ward, we move to a fixed point which was a school, temple or any structure of public importance and then we move in the left direction till the desired sample was reached through house to house survey. If the house has more than one eligible participants, one particpants was selected through lottery method. If the participant did not gave the consent for participation we move to the next house till the desired sample was not reached.

The selected participant was interviewed using a pre tested questionnaire and date was fixed for estimation of capillary blood sample collection for fasting blood sugar

sample and post prandial blood sample sample. The data was collected under following headings: 1) Socio-demographic profile, 2) Behavioural factor, 3) Indian diabetes risk score, 4) Capillary blood sugar estimation, 5) Fasting blood sugar estimation, 6) Two hour post prandial sugar estimation.

All the anthropometric data were collected using standard methodology. Sample collection was done using all necessary aseptic precautions.

Data collection and statistical analysis

Data were collected using questionnaires was entered in Microsoft excel 2019. Data was cleaned in Microsoft Excel and transferred into Statistical Package for Social Sciences (SPSS) version 24.0, IBM Inc. Chicago, USA software for Mac OS for analysis. The prevalence of diabetes among each of the high-risk groups, according to risk factors, was presented as a percentage. The chi squared test was used to establish whether there was an association between the risk of diabetes and each of the potential risk factors. Similarly, the odds of diabetes among the high-risk and moderate-risk groups were assessed for each risk factor, using univariate logistic regression. An adjusted analysis was performed using multivariate logistic regression. All statistical significance was assessed at the 5% significance level.

RESULTS

In the present study, 200 participants from 10 urban wards of district Etawah was selected. Majority of the participants were in the age group of 35-49 years and Hindu by religion. Most of the participants did not gave the history of either parents having diabetes or they were unaware of their diabetes status (Table 1).

On distribution of the participants on the basis of risk factors, it was note that more than half of the participants gave the history of fast food consumption (62.5%) more than once in a week. However, nearly half of the participants gave the history of moderate to heavy physical exercise. Their was also history of three or more times of salad intake (100gms per intake) in nearly 72% of the participants. Similarly, 82% of the participants gave the history of any fruit intake three times per week (Table 2).

The distribution of the participants on the basis of IDRS score, it was found that 89% of the participants fall under the category of intermediate and high risk category (Table 3).

On application of test of association between IDRS score and actual capillary blood sugar level. It was noted that a strong association exist between the two variables (Table 4).

Table 1: The distribution of the participants on the basis of socio demographic profile.

Characteristics	Frequency (n=200)	Percentage (%)
Age (in years)		
<35	39	19.5
35-49	98	49
≥50	63	31.5
Religion		
Hindu	172	86
Muslim	28	14
Gender		
Male	112	56
Female	88	44
Family history		
No parent is diabetic or not aware	136	68
One parent is diabetic	55	27.5
Two parent is diabetic	9	4.5
Education		
Illiterate	33	16.5
Literate	39	19.5
High School	59	29.5
Intermediate	34	17
Graduate and other	35	17.5
Socio-economic scale (SES)		
Upper class	27	13.5
Upper middle class	42	21
Middle class	48	24
Lower middle class	58	29
Lower class	25	12.5
Occupation		
Unskilled workers	44	22
Semiskilled workers	31	12.5
Skilled workers	26	13
Clerical worker	23	11.5
High skilled worker	10	5
Housewife	66	33
Marital status		
Married	184	92
Widow	7	3.5
Un-married	9	4.5
Type of family		
Nuclear	124	62
Joint	76	38

On doing further analysis, it was noted that a positive correlation exist between both fasting and post prandial blood sugar level and IDRS score (Figure 1 and 2).

However, in the present study no association was noted between IDRS score and known risk factors except physical activity (Table 5).

Table 2: The distribution of the participants on the basis of risk factors.

Risk factors	Frequency	Percentage
Smoking	36	18
Smokeless tobacco	44	22
Fruit consumption	165	82.5
Salad consumption	155	77.5
Fast food consumption	125	62.5
Alcohol consumption	38	19
Physical activity level		
Vigorous activity	43	21.5
Moderate activity	56	28
Low activity	57	28.5
Sedentary	44	22

Table 3: Distribution of the participants on the basis of IDRS score.

IDRS score	Frequency	Percentage
<30 (low risk)	22	11
30-50 (moderate risk)	110	55
>60 (high risk)	68	34

Table 4: Association between the IDRS score and actual capillary blood sugar level.

IDRS score	Diabetic (n=37) (%)	Pre diabetic (n=74) (%)	Diabetic (n=99) (%)	Chi-square test	P value
<30 (low risk) (n=22)	1 (2.7)	10 (13.5)	11 (12.4)	30.35	<0.001
30-50 (moderate risk) (n=110)	13 (35.1)	33 (44.6)	64 (71.9)		
>60 (high risk) (n=68)	23 (62.2)	31 (41.9)	14 (15.7)		

Table 5: The association between the IDRS score and known risk factors.

Behavioural factors		<30 (Low risk) (n=22) (%)	30-50 (Moderate risk) (n=110) (%)	>60 (High risk) (n=68) (%)	Chi-square test	P value
Smoking	Yes	0	23 (20.9)	13 (19.1)	5.51	0.63
	No	22 (100)	87 (79.1)	55 (80.9)		
Smokeless tobacco	Yes	1 (4.5)	26 (23.6)	17 (25)	4.43	0.109
	No	21 (91.5)	84 (76.4)	51 (75)		
Fruit consumption	Yes	19 (86.4)	88 (80)	58 (85.3)	1.07	0.585
	No	3 (13.6)	22 (20)	10 (14.7)		
Salad consumption	Yes	19 (86.4)	79 (71.8)	57 (83.8)	4.58	0.101
	No	3 (13.6)	31 (28.2)	11 (16.2)		
Fast Food consumption	Yes	12 (54.5)	67 (60.9)	46 (67.7)	3.27	0.513
	No	10 (45.5)	43 (39.1)	22 (32.4)		
Alcohol consumption	Yes	2 (9.1)	22 (20)	14 (20.6)	1.58	0.452
	No	20 (90.9)	88 (80)	54 (79.4)		

DISCUSSION

In the present study 200 participants without the known history of diabetes participated in the study. The proportion of male to female participants was 56% and 44% respectively. Majority of the selected participants were in the age group of 35-49 years with the mean age male of the participants was 44.58±11.15 years and female participants was 42.16±10.61 years. This is similar to the findings of Brinda et al and Prasad et al.[5,6] It was observed in the present study that proportion of the participants aged ≥50 years was only 31.5% which is in the line with the fact that as the age advances the incidence of diabetes increases.

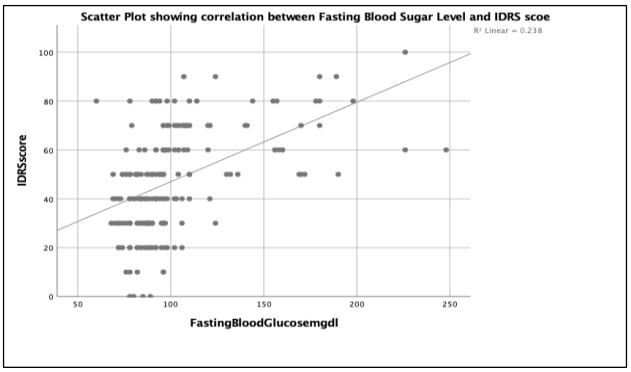

Figure 1: Correlation between fasting blood sugar level and IDRS score.

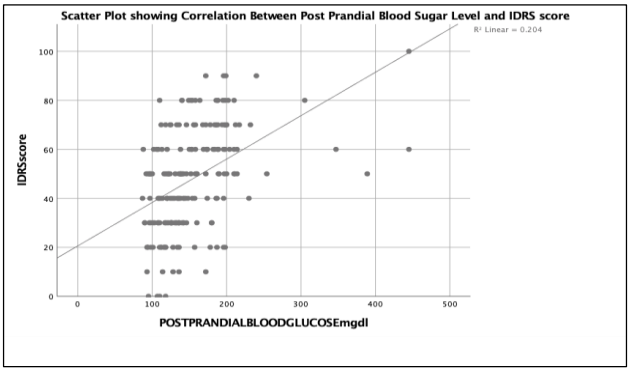

Figure 2: Correlation between post prandial blood sugar level and IDRS score.

It was observed in the present study that majority of the study participants were having educational qualification of high school or above (64%) and belong to middle class or above according to modified BJ Socio economic classification.

On assessment of known risk factors of diabetes, it was noted that 18% and 22% of the participants were using tobacco as smoking or smokeless tobacco respectively which is similar to the findings of Saleem et al and Nagalingam et al.[7,8]

However, it was noted in the present study that the proportion of person eating salad and fruit three times per week was nearly 77.5% and 82.5% respectively. This was similar to the findings of Agrawal et al.[3] Among the 200 participants, 17.9% were living a sedentary life, 32.1% were involved in moderate activity, while 23.2% were involved in vigorous exercises. Similar results were seen in Oruganti et al where 19.5% were sedentary, 66.5% were involved in moderate activity and 14% were vigorous activities.[9]

Based on the IDRS, out of 200 participants, majority of the participants (55%) belonged to the moderate diabetes risk in this study and this finding was similar to the study conducted by Brinda et al and Oruganti et al.[5,9] In continuation to the above finding, 22 (11%) were in low risk category, and 68 (34%) were in high risk group as per the IDRS. The observations made in our study were very close to the study done by Nandershwar et al.[10] However, contrasting results were shown by various others. Patel et al reported that only 4% participants were with high diabetes risk, 41% with moderate diabetes risk and 55% were found with low risk.[11] Singh et al found that risk of developing diabetes was high in 6% subjects, moderate in 44.3% and low in 49.7% participants.[12] This could be attributed to the difference in the study population between various studies. There is also variation in the distribution of the age, socio-demographic profile and geographical distribution of the study population.

It was noted in the present study that a strong association exist actual capillary blood sugar level and IDRS score. There is also a positive correlation between IDRS score and both fasting and post prandial blood sugar level.

On further evaluation of association of IDRS with known risk factors, no statistically significant association was noted between IDRS and any risk factors. In the present study, prevalence of tobacco consumption in was 22% and there was no significant association between tobacco intake and IDRS in our study which corroborate with the findings of Bharathi et al.[13] However, tobacco use showed a statistically significant association with diabetes in studies done by Valliyot et al and Shrivastava et al.[14,15] Lack of association in the present study could be due to lower tobacco consumption in the study participants of the present study.

The fruit and salad consumption among the participants in the present study was 82.5% and 77.5% respectively. There was no statistically significant association of consumption of fruits and vegetables with diabetes risk. It was in agreement with the findings by Agrawal et al and Acharya et al.[3,16] Majority (69.8%) of the study subjects in the study conducted by Agrawal et al were taking inadequate fruits and vegetables (<5 times/day) which was almost similar for both men and women.[3]

Our study showed no significant association between alcohol intake (19%) and diabetes risk. Similar results were obtained in the study conducted by Acharya et al where alcohol intake was 5.6%.[16]

Among the 200 participants, 17.9% were living a sedentary life, 32.1% were involved in moderate activity, while 23.2% were involved in vigorous physical activities. Similar results were observed in the study conducted by Orunganti et al, in which 76.9% of the sedentary workers were at high risk of developing diabetes as compared to vigorous workers.[17] Another study conducted by Dudeja et al, demonstrated that sedentary activity is an important risk factor for diabetes.[18] However, in the present study, we did not evaluate the similar link as physical activity is a part of IDRS. Since none of the behavioural factor showed

significant association with IDRS score, further evaluation was not done.

CONCLUSION

The present study concludes that IDRS is a powerful tool for screening of high risk group of Diabetes, especially in middle age group as most of the people fall in the category of moderate to high risk group. There is a strong association between capillary blood sugar and IDRS score. Thus it can be used as a tool for screening of peoples at risk in various settings like OPD, office etc as it is a low cost tool and does not requires higher skills for its application.

However, the present study also concludes that there is no association between IDRS score and known risk factors for diabetes.

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