

Original Research Article

A study to determine the hidden part of the iceberg of diabetes, using Indian diabetes risk score as a screening tool in rural population of Bangalore, Karnataka, India

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ABSTRACT

Background: Diabetes as a non-communicable disease is a significant public health problem and the prevalence rate is increasing globally and reaching epidemic proportions. This highlights the need to employ screening programs for early identification of people at the risk of diabetes.

Methods: A community based cross-sectional study was conducted in three pre-selected villages in and around Kakaramanahalli, rural field practice area of Rajarajeswari Medical College. The screening tool used to assess the risk status was Indian diabetes risk score (IDRS). Body mass index (BMI) was calculated and random blood sugar (RBS) level was also estimated.

Results: A total of 101 subjects formed the study population. On evaluating the risk status of study subjects using IDRS, 25.7% had high risk score. With increase in BMI there was increase in the risk status for diabetes. Among the subjects, 5(5%) were found to have an RBS value more than the cut off (i.e. >200 mg/dl).

Conclusions: To conclude, in our study 1/4th of the study population were in high risk group. A statistically significant association was seen between the age of the study subjects and the IDRS risk status ($p = 0.001$). There was no statistically significant association between BMI categorization and the IDRS risk status ($p = 0.483$).

Keywords: BMI, Diabetes, IDRS, RBS

INTRODUCTION

Diabetes as a non-communicable disease is a significant public health problem and the prevalence rate is increasing globally and reaching epidemic proportions.¹ It is a leading cause of premature morbidity and mortality and is posing a serious challenge to Indian society and economy.

India is predominantly an agricultural nation with 72.2% of the population living in rural areas. The rural population in India is undergoing drastic lifestyle transition due to socio-economic growth. A study done

by Indian Council of Medical Research (ICMR) in the 1970s reported a diabetes prevalence of 1% in rural areas which has increased to 4 -10 % in 2000.² Thus, it is seen that even in rural India, prevalence rates of diabetes is rising rapidly.

The Indian population is known to have an increased susceptibility to develop diabetes mellitus. The ethnicity, presumable genetic vulnerability of Asians, manifests into diabetes when subjected to unfavourable lifestyles.³ In addition to this the changing epidemiological trends, economic boom, reduced physical activity, changing

dietary patterns and varied environmental factors also contribute to the increasing risk.⁴

This highlights the need to employ screening programs for early identification of people at the risk of diabetes and also those in the pre-diabetic stage, where simple lifestyle interventions can help prevent or delay the onset of the disease.

Hence, this study was undertaken to assess the risk of developing type-2 diabetes and also to detect the undiagnosed cases of diabetes among rural population.

Aims and objectives

- To determine people at risk of developing diabetes using the Indian Diabetes Risk Score (IDRS).
- To calculate the Body Mass Index and measure the Random Blood Sugar levels (RBS) of all the study subjects and classify it according to their risk status.

METHODS

Study design: Community based cross sectional study

Study area: Three pre-selected villages in and around Kakaramanahalli, rural field practice area of RajaRajeswari Medical College.

Study duration: Two months between May and June 2016

Data collection: Using pre designed, semi structured questionnaire based on the Indian Diabetic Risk Score (IDRS)

Sampling method: Convenience sampling

Inclusion criteria: All individuals aged 20 years and above and not known to be diabetics were included in the study after obtaining their consent.

Exclusion criteria: Those individuals who were not willing to participate in the study.

A community based cross-sectional study was conducted in three pre-selected villages in and around Kakaramanahalli, rural field practice area of Department of Community Medicine, Rajarajeswari Medical College. In the three pre-selected villages a house to house survey was conducted. The subjects present in the house at the time of visit were included and were informed about the purpose of the study and a written consent was obtained from all the subjects. At the end of the study we were able to reach 101 individuals

The Indian Diabetes Risk Score was used as the study tool and the general socio demographic profile was also collected along with the score. The components of Indian Diabetic risk score include age, waist circumference,

physical activity and family history of diabetes. Minimum Score is 0 and Maximum is 100. Interpretation: score <30- low risk, score 30-50- medium risk, score >60- high risk.⁵

Height and weight measurements were taken and BMI was calculated. The BMI cut off values for Asian Indians as recommended by the WHO was used in the present study. A desirable BMI according to the WHO recommended cut-offs for Asians is considered to be between 18.5 and 22.9 kg/m². A BMI of 23–24.9 kg/m² is defined as “overweight” and ≥ 25 kg/m² as “obese”. Random Blood Glucose (RBS) was also estimated using a glucometer.⁶

Statistical analysis

Data collected was entered into Microsoft excel sheet and analyzed using SPSS (Statistical package for social sciences) version 16.0. Results were expressed in terms of frequency and percentage. Test of significance was done using chi square. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 101 subjects formed the study population. The mean age was 52.13±16 years. Minimum and maximum ages were 23 and 90 years respectively. Majority of the study participants were in the age category of 50 years and above. Among study subjects, 33 (32.7%) were males and 68 (67.3%) were females. More than half of the study subjects (52.5%) were illiterates. Greater proportion of the study subjects were Agriculturists. Majority of the respondents were living in joint family (Table 1).

On evaluating the risk status of study subjects for Type 2 Diabetes Mellitus using IDRS, 26 (25.7%) out of the 101 subjects showed low risk score, 49 (48.5%) moderate risk and rest 26 (25.7%) high risk score (Figure 1).

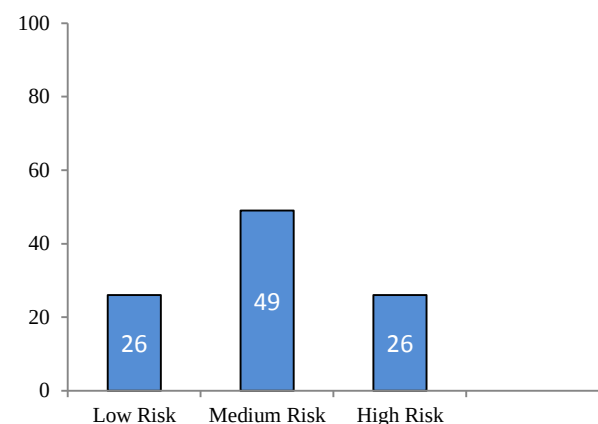


Figure 1: Distribution of the study population according to IDRS risk status.

Table 1: Socio-demographic characters of the study subjects.

Characteristics	Category	Frequency	Percentage
Gender	Male	33	32.7
	Female	68	67.3
Age	< 35 years	19	18.8
	35-49 years	29	28.7
	>50 years	53	52.5
Occupation	Professional	5	5.0
	Business	1	1.0
	Agriculture	54	53.5
	House wife	27	26.7
	Unemployed	7	6.9
	Unskilled	6	5.9
	Skilled	1	1.0
Educational status	Illiterate	53	52.5
	Primary school	3	3.0
	Higher primary school	10	9.9
	High school	26	25.6
	PUC	5	5.0
	PG and above	4	4.0
Type of family	Nuclear	40	39.6
	Joint	60	59.4
	3 Generation	1	1
Total		101	100

A total of 26 individuals belonged to the high risk group, 4% of them were found to be <35years of age, 15% of them were in the age group of 35-49 years and 81% of them were aged >50years. Thus, it is noted that with increasing age group of the study population the percentage of the individuals belonging to the high risk group also increased. A statistically significant association was seen between the age of the study subjects and the IDRS risk status ($p = 0.001$)(Table 3).

It was observed that among males and females, who were in high risk Group, 38% of them were males and 62% were females. There was no statistically significant association seen between the gender of the study subjects and the IDRS risk status ($p = 0.625$) (Table 4).

Table 2: Distribution of study subjects according to IDRS system.

Particulars	Score	Frequency (%)
Age (years)		
<35	0	14 (13.9)
35-49	20	36 (35.6)
≥50	30	51 (50.5)
Abdominal obesity		
Waist <80cm (Females); <90cm (Males)	0	47 (46.5)
Waist 80-89cm(Females); 90-99cm (Males)	10	33 (32.7)
Waist >90cm (Females); >100cm (Males)	20	21 (20.8)
Physical activity		
Exercise (regular)+strenuous work	0	68 (67.3)
Exercise (regular) or strenuous work	20	23 (22.8)
No exercise and sedentary work	30	10 (9.9)
Family history		
No family history	0	92 (91.1)
Either parents	10	9 (8.9)
Both parents	20	0 (0)

When the BMI score was assigned according to IDRS risk status, it was found that 51 (50.5%) of subjects had a BMI ≥23, among whom, 16 (31.37%) were under high risk category (IDRS). There was no statistically significant association between BMI Categorization and the IDRS risk Status ($p = 0.483$) (Table 5).

RBS was measured for all the study subjects irrespective of their risk Status. The mean RBS value of the study subjects was 128 ± 36 . Among the subjects, 5(5%) were found to have an RBS value more than the cut off (i.e. >200 mg/dl), of which 2 subjects belonged to high risk group and 2 belonged to medium risk group. These subjects were advised for further investigations to confirm the Diabetes status by Fasting and post prandial blood glucose estimation (Table 6).

Table 3: Distribution of study subjects according to age category and IDRS risk status.

Age categorisation	IDRS Category			Total	P value
	Low risk frequency (%)	Medium risk frequency (%)	High risk frequency (%)		
< 35 years	11 (42)	7 (14)	1 (4)	19	0.001
35 - 49 years	12 (46)	13 (27)	4 (15)	29	
> 50 years	3 (12)	29 (59)	21(81)	53	
Total	26	49	26	101	

Table 4: Distribution of study subjects according to the gender and IDRS risk status.

Gender	IDRS category			Total	P Value
	Low risk frequency (%)	Medium risk frequency (%)	High risk frequency (%)		
Male	9 (35)	14 (29)	10 (38)	33	0.625
Female	17 (65)	35 (71)	16 (62)	68	
Total	26	49	26 (100)	101	

Table 5: Distribution of study subjects according to BMI category and IDRS risk status.

BMI categorization	IDRS category		Total	P value
	Low/medium risk	High risk		
<18.5 (Under nutrition)	11 (85)	2 (15.3)	13 (12.9)	0.483
18.5 -22.9 (normal)	29 (78)	8 (22)	37(36.6)	
23 and above (overweight and obese)	35 (69)	16 (31)	51(50.5)	
Total	75	26	101	

Table 6: Distribution of study subjects according to their risk Status and RBS value.

IDRS risk status	RBS Value(mg/dl)		Total
	<200	>200	
Low risk	25	1	26
Medium risk	47	2	49
High risk	24	2	26
Total	96	5	101

DISCUSSION

In this study, we used the Indian Diabetes Risk Score to identify the risk status of undiagnosed diabetics in a rural population. Although various risk factor scoring systems (Ramachandran) were developed previously, IDRS developed by Mohan *et al* is considered to be one of the strongest predictors of incident diabetes in India.^{7,8} IDRS uses two non-modifiable risk factors (age and family history of diabetes) and two modifiable risk factors (waist circumference and physical activity) giving a clear message that if the modifiable risk factors are altered the risk score can be considerably reduced.⁹

The biochemical tests most commonly used to screen diabetes are Fasting blood glucose estimation, 2 hour post prandial blood glucose estimation and oral glucose tolerance test. These tests are labor intensive and expensive to do on a large scale in a community setting. Thus, estimation of Random capillary blood glucose level is the most convenient method as this has the advantage that it can be done at any time of the day and does not need venipuncture.

The current study identified 25.7% of the subjects to be in the high risk category according to IDRS. In a study by Mohan *et al.* reported that 43% of their study subjects

were in high risk group.⁵ In a similar study conducted by Gupta *et al*, they found 31% of their study population to have a high risk score.² Reason for this difference could be the varied life styles of the study subjects, as our study was conducted in a rural area where as the other studies were done in an urban setting.

In our study it is noted that with higher the age group of the study population, the percentage of the individuals belonging to the high risk group also increased which is similar to the findings obtained by Patil RS *et al.*¹⁰ Several other studies have recorded similar findings.¹¹⁻¹³

In this study 91% of the study subjects did not have any family history of diabetes. In another study conducted by Patil RS *et al* 89% of the individuals did not have any family history of diabetes.¹⁰ Gupta SK *et al* in their study observed that 68.5% of the respondents had no family history of diabetes.² This difference could be due to previous lack of awareness about the disease and lack of screening tests at the community level to detect the cases of diabetes.

Of the 26 subjects who belonged to high risk group according to IDRS, 7% had RBS value >200mg/dl. These findings are concurrent with the results obtained in a study done by Chythra *et al*, in which 6% of the subjects in high risk group had RBS value of >200mg/dl and belonged to the high risk group.³

CONCLUSION

In conclusion, it is seen that 1/4th of the subjects in our study belonged to the high risk category. A statistically significant association was seen between the age of the study subjects and the IDRS risk status ($p=0.001$). There was no statistically significant association seen between the gender of the study subjects and the IDRS risk status ($p=0.625$). There was no statistically significant

association between BMI Categorization and the IDRS risk Status ($p = 0.483$). Among the subjects, 5 (5%) were found to have an RBS value more than the cut off (i.e. >200 mg/dl). Hence, our study shows that IDRS is a simple, quick and cost effective screening tool for early identification of people at the risk of developing diabetes. Use of IDRS has made mass screening for diabetes more practically feasible.

Recommendations

All the subjects with RBS value more than the cut-off were asked to undergo further confirmatory testing, and those who belonging to IDRS moderate and high risk category were advised to implement lifestyle modifications and dietary changes.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethical committee, RajaRajeshwari Medical College

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