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Original Research Article

Rural population at risk of development of diabetes mellitus: a cross sectional study using Indian diabetic risk score in Bengaluru

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ABSTRACT

Background: Prevalence of diabetes mellitus is increasing in an alarming way throughout the world. More than 50% of the diabetic subjects in India remain unaware of their diabetes status and screening for risk factors of diabetes mellitus enable us to initiate appropriate control measures. This study was undertaken to identify the people who are at risk of diabetes mellitus in rural area of Bengaluru.
Methods: It was a community based cross sectional study in which 1750 study subjects were randomly selected using multi stage random sampling method. Selected individuals were examined and interviewed using a semi structured questionnaire. Indian diabetic risk score was used to assess risk of developing diabetes. Data entry and analysis was done using SPSS version 20.0.
Results: According to IDRS, 46.2% of respondents were in the moderate risk group and 33.1% were in the high risk group. Family history of diabetes, low physical activity and abdominal obesity were found to associate with high risk group.
Conclusions: The prevalence of high risk for diabetes according to IRDS was 33%. Primordial and primary preventive actions are very much necessary.

Keywords: IDRS, Prevalence, Diabetes, Rural, Screening

INTRODUCTION

The recent WHO report says that number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014.[1] Diabetes prevalence in India is 8.8%.[2] Though it varies with in the country, being highest reported from Kerala (19.5%) and lowest from Kashmir valley (6.1%).[1]

Even with growing concern on diabetes, many sophisticated techniques to early detection of diabetes and also medications to manage diabetes with very less or no side effects along with the management guidelines, 50% of adults with diabetes are undiagnosed (212 million) and most patients are diagnosed at the time of complication.[2] A very high prevalence of complications at diagnosis has been reported from various studies across globe and from parts of India.[2]

Indian Diabetic Risk Score (IDRS) was developed by Mohan et al based on multiple logistic regression model using four simple parameters namely age, waist circumference, physical activity and family history. It is the cost effective method to detect high risk individuals (Table 1).[3] The IDRS has a sensitivity of 72.5% and specificity of 60.1% and is derived on the largest population based study on diabetes in India by CURES study by Mohan et al.[4] This IDRS score is also validated

by Stanley et al. in which the score of more than 60 has 100% sensitivity and 17.6% specificity.[5]

It is possible to identify the high risk group by simple parameters such as anthropometry, presence of family history of diabetes and assessment of the physical activity.[6] Use of a simple diabetic risk score is more effective and less expensive than genotyping and makes it less costly than universal OGTT screening of the whole population to detect subjects without diagnosed T2DM in India.[3] Screening for risk factors of diabetes mellitus will enable us to initiate appropriate control measures, and hence this study was undertaken to identify the people who are at risk of diabetes mellitus using IDRS.

METHODS

A community based cross sectional study was conducted in the rural field practice area of a tertiary care centre, Raja Rajeswari Medical college and Research Center in Bengaluru. In order to calculate sample size for this study, 18.66% of study subjects had high risk for diabetes mellitus (IDRS>60) in rural area of Tamil Nadu based on a study conducted by Gupta et al was considered, expecting similar prevalence and to get 95% confidence level and relative precision of 10%, 1750 subjects were considered for the study.[7] Study was conducted from July 2014 to April 2015.

All individuals aged more than 18 years of age, permanent residents, who were present on the day of survey were included in the study. Those individuals who were not willing to participate in the study were excluded. Multistage random sampling technique was done to select participants. Rural field practice area covering a population of 10,911(PHC record 2014) with 19 villages was selected. For the required sample size of 1750 people from entire population, the villages were divided into three different strata based on sub-center. Using stratified random sampling method, sample to be studied from each stratum was calculated.

Villages in each stratum were arranged according to alphabetical order. Using lottery method, one village was selected by random in each stratum. From the centre of the village using a currency note the street was selected. In that street by tossing a coin, side of the street was selected. Houses were numbered in that selected side of street. Then the first house was selected using a random number from currency note, then selected house in that particular street was visited and adults in that house were included in the study and the process was continued till the required sample from that particular stratum was reached.

Once the household was selected, study subject was explained about the purpose of the study, an informed written consent was obtained from each individual prior to administering the semi-structured questionnaire using interview method. Ethical clearance was obtained before conducting the study from the Institutional Ethical Committee.

Table 1: Distribution of characteristics as per IDRS.

Particulars	Score
Age (in years)	
<35	0
35–49	20
≥50	30
Abdominal obesity	
Waist <80 cm [female] , <90cm [male]	0
Waist ≥80–89 cm [female], ≥90–99 cm [male]	10
Waist ≥90 cm [female], ≥100 cm [male]	20
Physical activity	
Exercise [regular]+strenuous work	0
Exercise [regular] or strenuous work	20
No exercise and sedentary work	30
Family history	
No family history	0
Either parent	10
Both parents	20

Minimum score 0; Maximum score 100.

Data collected was entered in Microsoft excel sheet and analysed using statistical package for Social Sciences Software version 20.0.0.

RESULTS

Among 1750 study subjects 683 (39%) were aged more than 50 years followed by 556 (31.8%) and 511 (29.2%) less than 35 years and 35 to 49 years respectively. Around 50 % were males and 99.4% were Hindu by religion. Most of the study subjects, 412 (23.5%) had studied up to intermediate and 343 (19.6%) were not literate. Unemployment was seen in 603 (34.5%) and 353 (20.2%) were in clerical, shop owner or farmer by occupation. According to updated B G Prasad socio-economic classification for 2015, 707 (40.4%) belonged to middle social class, followed by 493 (28.2%) in upper middle social class (Table 2).

According to IDRS, 808 (46.2%) of respondents were in the moderate risk group and 579 (33.1%) were in the high risk group Figure 1.

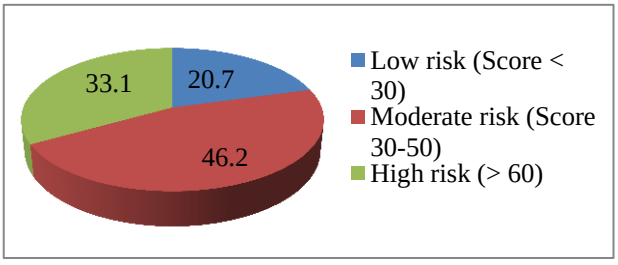

Figure 1: Distribution of study subjects according to IDRS category: (n=1750).

Table 2: Socio-demographic characteristics of study subjects: (n=1750).

Characteristics		Frequency	%
Gender	Male	884	50.5
	Female	866	49.5
Religion	Hindu	1739	99.4
	Muslim	11	00.6
Educational status	Not literate	343	19.6
	Primary	245	14.0
	Secondary	198	11.3
	High school	323	18.5
	Intermediate	412	23.5
	Graduate	194	11.1
	Profession	35	02.0
Occupational status	Profession	45	02.6
	Semi- profession	200	11.4
	Clerical, shop owner, farmer	353	20.2
	Skilled worker	254	14.5
	Semi-skilled worker	198	11.3
	Unskilled worker	97	05.5
	Unemployed	603	34.5
Socio economic status (per capita income per month in rupees)	Upper class [>5356]	119	06.8
	Upper middle class [2652-5356]	493	28.2
	Middle class [1570-2651]	707	40.4
	Lower middle class [812-1569]	374	21.3
	Lower class [<811]	57	03.3

Table 3: Distribution of study subjects according to components of IDRS (n=1750).

Characteristics		Frequency	High risk	Moderate risk	Low risk	χ^2	P
		N (%)	N (%)	N (%)	N (%)		
Age (in years)	<35	556 (31.8)	340 (61.2)	208 (37.4)	8 (1.4)	156.3	<0.001
	35-49	511 (29.2)	23 (04.5)	373 (73.0)	115 (22.5)		
	>50	683 (39.0)	-	227 (33.2)	456 (66.8)		
Exercise	Vigorous regular exercise/ strenuous manual labor	329 (18.8)	138 (41.9)	191 (58.1%)	-	883.4	<0.001
	Mild to moderate regular exercise or physical activity	1063 (60.7)	225 (21.2)	601 (56.5)	237 (22.3)		
	No exercise or sedentary	358 (20.5)	-	16 (04.5)	342 (95.5)		
Family history	None	1315 (75.1)	348 (26.5)	55 (42.4)	408 (31.1)	116.5	<0.001
	Either parent	352 (20.2)	3 (00.8)	213 (60.5)	136 (38.7)		
	Both parents	83 (4.7)	12 (14.4)	36 (43.4)	35 (42.2)		
Waist circumference	<90- Male <80- Female	924 (52.8)	357 (38.6)	470 (50.9)	97 (10.5)	716.5	<0.001
	90-99- Male 80-89- Female	724 (41.4)	6 (00.8)	338 (46.7)	380 (52.5)		
	>100- Male >90- Female	102 (5.8)	-	-	102 (100)		

It was observed that 456 (66.8%) of >50 years subjects were in high risk category, whereas 340 (61.2%) of <35 year old study subjects were in low risk category. Most of the subjects 1063 (60.7%) were indulged in mild to moderate regular physical activity, followed by 358 (20.5%) were in no exercise or sedentary activity category. Among no exercise or sedentary category, 342 (95.5%) were in high risk with waist circumference more

than 100 cms for male and more than 90 cms for female whereas in vigorous regular exercise or strenuous manual labor category 191 (58.1%) were in moderate risk group and is statistically significant (p<0.001) (Table 3).

Normal waist circumference was seen in 924 (52.8%) subjects. Among 724 (41.4%) subjects who had their waist circumference between 90-99 cm for males, 80-89 cm, 380 (52.5%) were in high risk group and it was found to be statistically significant (p<0.001) and all 102 (5.8%) subjects with waist circumferences of >100cm for males, >90 cm for females were in high risk group.

Majority of study subjects 1315(75.1%) had no family history of diabetes. Among them 559 (42.4%) were in moderate risk group. 36 (43.4%) subjects with family history of both parents having diabetes were in moderate risk group and it was found to be statistically significant (p<0.001) (Table 3).

DISCUSSION

Diabetes has become a global epidemic. In India the incidence rate is increasing in an alarming rate. We used simplified Indian diabetes risk score to identify high risk people in rural Bangalore. As this is a most cost effective method in our country as over half of diabetic people remain unaware of their condition. The subjects included in the study have fairly equal distribution among male and female subjects constituting 50.6% and 49.4% respectively. Most of the subjects (99.4%) were Hindu by religion. 61% of subjects are below 50 years old. This finding was comparable to a study conducted by Subramani et al where 55.2% were males and 44.8% were females. Whereas about 54.5% people belong to below 35 years age group.[8]

Various studies in the west used different diabetes risk scores, based on demographic, simple anthropometric, and behavioral factors to detect undiagnosed diabetes.[9,10] We also used diabetes risk score suitable for detecting undiagnosed diabetes in South Asia. The risk score used in this study are those recommended by American Diabetes Association.[11]

In our study 31.3% of study population had high risk score (>60) for diabetes. A similar type of study conducted by Mohan et al.at Chennai found 43% of study population in the high risk group and another study by Gupta et al found 19% of study population in the rural Tamil Nadu to be in the high risk group.[3,12] This risk difference may be due to variance in regional dietary habits, life-styles of the population.

Around 18.8% of subjects were involved in Vigorous regular exercise/ strenuous manual labour, 60.7% were involved in mild to moderate regular exercise or physical activity. Around 20% lead sedentary life style without exercise. This pattern is similar to that seen in a study done by Subramani et al 17.2% were involved in vigorous regular exercise/strenuous manual labour, 72.7% were involved in mild to moderate regular exercise or physical activity and 9.5% lead sedentary life style without exercise.[8] In another study done by Gupta et al showed that 90% were involved in mild to moderate category as this study was done in urban area.[12]

Majority of study subjects 1315 (75.1%) had no family history of diabetes among their parents. Only 4.7% were had family history of diabetes among both parents. Similar observations were found in study done by Gupta et al, 68.5% of the respondents had no family history of diabetes.[12] The family history of diabetes could be important public health tool in predicting development of diabetes and useful in prevention of diabetes.

This study provides the use of simplified Indian diabetic risk score for identifying the subjects who are at high risk of diabetes in the community. Mass screening for high risk cases can be made cost effective with regular use of IDRS. Further confirmation with GTT is required among subjects with IDRS >60 to early detect the occurrence of diabetes. Besides this, and lifestyle modification are to be initiated to reverse the risk factors among high risk group.

CONCLUSION

The prevalence of high risk for diabetes according to IRDS was 33%, Family history of diabetes; physical activity and abdominal obesity were found to associate with high risk group. Primordial and primary level prevention measures are necessary to prevent early onset of diabetes.

Recommendations

Rural population in India can no longer be ignored as a traditionally low risk group, as non-communicable diseases like diabetes are almost as much prevalent in rural India as in their urban counterpart, because of the change in lifestyle. Under the National Non-Communicable Disease Control Program, the National Diabetes Control Program can further be strengthened by the government by promoting awareness among the general publics about the disease and also by improving the gross root level workers in screening for diabetes.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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