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Risk of developing Diabetes Mellitus among patients attending a Rural Health Training Centre, Kancheepuram district.

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ABSTRACT

Background: Diabetes as a non-communicable disease is a significant public health problem. The prevalence rate is increasing globally and reaching epidemic proportions. Globally, an estimated 422 million adults were living with diabetes in 2014 and they compared to 108 million in 1980. Over the past decade, diabetes prevalence has raised faster in low- and middle-income countries than in high-income countries. **Objectives:** To assess the risk of type 2 diabetes mellitus using the Indian Diabetes Risk Score (IDRS) among patients attending a RHTC;To measure the Random Blood Sugar levels (RBS) of all the study subjects and classify it according to their risk status. **Materials and Methods**: A cross sectional study was conducted during December 2018 to January 2019 among patients aged 18 years and above attending the Rural Health Training Centre of KIMS&RC, Pulipakkam, Kancheepuram District, Tamil Nadu. The patients were interviewed using a structured questionnaire consisting of socio-demographic details and Anthropometric measurement, Indian Diabetic Risk Score (IDRS) and Random Blood Sugar testing.   **Result:** Among 137 study participants, 65 (48%) were >50 years and 87(64%) were females. On evaluating the risk status of study subjects using IDRS, 43.7% had moderate risk and 35.0% had high risk score. With increase in age and BMI there was increase in the risk status for diabetes. Among the study subjects, 16(11.6%) were found to have an RBS value more than the cut off (i.e. >200 mg/dl). **Conclusion:** Majority of the subjects in our study belonged to the high risk and moderate risk category. A statistically significant association was seen between the age, BMI, Waist circumference and Physical activity.

Key Words: Diabetes mellitus, Indian Diabetic Risk Score, IDRS, RBS, Kancheepuram

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] Globally, an estimated 422 million adults were living with diabetes in 2014 and they compared to 108 million in 1980. WHO in 2016 estimated that "The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. This reflects an increase in associated risk factors such as being overweight or obese". Over the past decade, diabetes prevalence has raised faster in low- and middle-income countries than in high-income countries. Diabetes caused 1.5 million deaths in 2012. Higher-than-optimal blood glucose caused an additional 2.2 million deaths, by increasing the risks of cardiovascular and other diseases.[2] Unfortunately more than 50% of the diabetic subjects in India remain unaware of their diabetes status, which adds to the disease burden.[3] Early detection with life style modification and treatment may reduce the disease burden and complications. This emphasis the need of mass awareness and screening programmes to detect undiagnosed diabetes and thus to that reduce the burden of diabetes in India. There is good evidence that screening tests can detect type 2 diabetes during the early stages. In this study we assessed the risk of type 2 diabetes mellitus using the Indian Diabetes Risk Score (IDRS) and measured the Random Blood Sugar levels (RBS) of all the study subjects and classify it according to their risk status among patients attending a RHTC.

MATERIAL AND METHODS

A cross sectional study was conducted during December 2018 to January 2019 among patients aged 18 years and above attending the rural health and training centre of Karpaga Venayaga Institute of Medical Sciences and Research Centre, Pulipakkam, Kancheepuram District, Tamil Nadu.

Inclusion criteria and Exclusion criteria: All individuals aged 18 years and above were included in the study after obtaining their consent. Those individuals who were not willing to participate and known case of diabetes mellitus were excluded.

Study tool: A structured questionnaire was developed, translated into local language Tamil and back into English. The questionnaire included socio-demographic details and Anthropometric measurement, Indian Diabetic Risk Score (IDRS) and Random Blood Sugar testing.

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.[4]

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.[5]

Data analysis: Data obtained was entered in Microsoft Excel 2007 and analyzed using IBM SPSS version 16. Descriptive statistics was calculated as mean, SD and percentage. Association of difference was found using Chi-square test. A p-value of <0.05 was considered statistically significant.

Ethical Approval: Approval for the Study was obtained from the Institutional of Ethics Committee of Karpaga Vinayaga Institute of Medical Sciences and Research Centre.

RESULT

Among 137 study participants, 65 (48%) were >50 years followed by <35 years 37 (27%) and 35 to 49 years 35 (25%). Majority of the study participants 87(64%) were females followed by males. Among the study participants, 74 (54%) belonged to nuclear family, 95 (70%) were illiterates, 56 (42%) belonged to lower middle class followed by 51 (37%) middle class according to modified BG Prasad classification 2018. Family history of diabetes mellitus was found in 16 (12%). Among the study subjects 35 (25%) had habit of tobacco consumption, 48 (35%) had alcohol consumption and 25 (18%) had smoking habits. Among the study participants 28(21%) were overweight and 36(27%) obese. (Table 1)

On evaluating the risk status of study subjects for Type 2 Diabetes Mellitus using IDRS, 43.70% showed moderate risk , 35.0% showed high risk and 21.10% showed low risk score (Figure 1).

A total of 60 (43.7%) individuals belonged to the moderate risk group, 26 (43.3%) of them were found to be 35 to 49 years of age, 42 (40%) of them were in the age group of more than 50 years and 10 (16.6%) of them were aged less than 35years. Among 48 (35%) individuals belonged to the high risk group, 40 (83.3%) of them were found to be more than 50 years of age, 8 (16.6%) of them were in the age group of 35 to 49 years. Thus, it is noted that with increasing age group of the study population the

percentage of the individuals belonging to risk group also increased. A statistically significant association was seen between the age of the study subjects and the IDRS risk status (p = 0.000) (Table 3).

Table 1: Distribution of socio-demographic characters of the study subjects.(n=137)

Characteristics	Category	Frequency	Percentage
Age	<35	37	27
	35 to 49	35	25
	>50	65	48
Gender	Male	50	36
	Female	87	64
Type of family	Nuclear	74	54
	Joint	63	46
Literacy Status	Literate	42	30
	Illiterate	95	70
SES	Upper class	5	3.5
	Upper middle class	19	13
	Middle class	51	37
	Lower middle class	56	42
	Lower class	6	4.5
Family H/O DM	No family History	121	88
	One parent	16	12
Tobacco consumption	Yes	35	25
	No	102	75
Alcohol consumption	Yes	48	35
	No	89	65
Smoking consumption	Yes	25	18
	No	112	82
BMI	Under weight	10	7
	Normal	63	45
	Overweight	28	21
	Obese	36	27
Total		137	100

Figure 1: Distribution of the study population according to IDRS risk status. (n=137).

IDRS Risk status

21.10%
43.70%
35.00%

■ Low risk ■ Moderate risk ■ High risk
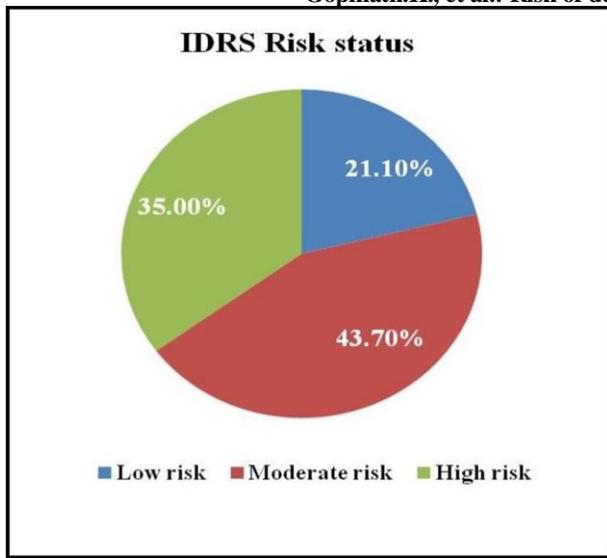
Table 2: Distribution of study subjects according to IDRS system. (n=137)

Particulars	Score	Frequency (%)
Age (years)		
<35	0	37 (27)
36 to 49	20	35 (25)
>50	30	65 (48)
Abdominal obesity		
Waist <80cm (females) <90cm (male)	0	54 (39)
Waist 80 – 89cm(females) 90 -99cm (males)	10	54(39)
Waist >90cm (females) >100cm (males)	20	29 (22)
Physical activity		
Exercise (regular)+Strenuous Work	0	-
Exercise (regular) or Strenuous work	20	105 (76)
No exercise and sedentary work	30	32 (24)
Family History		
No family History	0	121 (88)
Either parents	10	16 (12)
Both parents	20	-

Table 3: Distribution of study subjects according to age category and IDRS risk status. (n=137)

Age	IDRS category				
	Low risk (%)	Moderate risk (%)	High risk (%)	Total	p-value
<35 years	27 (93.1)	10 (16.6)	0 (0)	37 (27)	
35 to 49 years	1 (3.4)	26 (43.3)	8 (16.6)	35 (27.7)	<0.000
>50 years	1(3.4)	24 (40)	40 (83.3)	65 (47.4)	
Total	29 (21.1)	60 (43.7)	48 (35.0)	137 (100)	

Table 4: Distribution of study subjects according to BMI category and IDRS risk status. (n=137)

BMI	IDRS category				
	Low risk (%)	Moderate risk (%)	High risk (%)	Total	p-value
Under weight	0 (0)	10 (16.6)	0 (0)	10 (7.2)	
Normal	18 (62)	27 (45)	18 (37.5)	63 (45.9)	
Over weight	8 (27.5)	7 (11.6)	13 (27.08)	28 (20.4)	<0.001
Obese	3 (10.3)	16 (26.6)	17 (35.4)	36 (26.2)	
Total	29 (21.1)	60 (43.7)	48 (35.03)	137 (100)	

A total of 60 (43.7%) individuals belonged to the moderate risk group, 23 (38.23%) of them were found to be overweight and obese. Among 48 (35.03%) individuals belonged to the high risk group, 30 (62.48%) of them were found to be overweight and obese. Thus, it is noted that with increase in BMI of the study population the percentage of the individuals belonging to risk group also increased. A statistically significant association was seen between the BMI of the study subjects and the IDRS risk status (p = 0.001) (Table 4).

Table 5: Distribution of study subjects according to waist circumference category and IDRS risk status. (n=137)

Waist circumference	IDRS category				
	Low risk (%)	Moderate risk (%)	High risk (%)	Total	p-value
Waist <80cm (females) <90cm (male)	26 (89.6)	24 (40)	4 (8.3)	54 (39.4)	
Waist 80 – 89cm (females) 90 -99cm (males)	0 (0)	29 (48.3)	25 (52.08)	54 (39.4)	<0.000
Waist >90cm (females) >100cm (males)	3 (10.4)	7 (11.6)	19 (39.5)	29 (21.1)	
Total	29 (21.1)	60 (43.7)	48 (35.03)	137 (100)	

Table 6: Distribution of study subjects according to Physical activity category and IDRS risk status. (n=137)

Physical activity	IDRS category				
	Low risk (%)	Moderate risk (%)	High risk (%)	Total	p-value
Exercise (regular)+ Strenuous Work	0 (0)	0 (0)	0 (0)	0 (0)	<0.000
Exercise (regular) or Strenuous work	25 (86.2)	59 (98.3)	21 (43.7)	105 (76.6)	

100

| No exercise and sedentary work | 4 (13.8) | 1 (1.6) | 27 (56.2) | 32 (23.3) |
| Total | 29 (21.1) | 60 (43.7) | 48 (35.03) | 137 (100) |

Table 7: Distribution of study subjects according to their risk Status and RBS value. (n=137)

RBS value (mg/dl)	IDRS risk status			
	Low risk (%)	Moderate risk (%)	High risk (%)	Total
<200 mg/dl	26 (89.6)	53 (88.3)	42 (87.5)	121 (88.3)
>200 mg/dl	3 (10.3)	7 (11.6)	6 (12.5)	16 (11.6)
Total	29 (21.1)	60 (43.7)	48 (35.0)	137 (100)

A total of 60 (43.7%) individuals belonged to the moderate risk group, 36 (59.9%) of them were found to be in waist circumference category II and III. Among the high risk group, 48 (35.03%), 44 (91.58%) of them were found to be in waist circumference category II and III. Thus, it is noted that with increasing waist circumference of the study population the percentage of the individuals belonging to risk group also increased. A statistically significant association was seen between the waist circumference of the study subjects and the IDRS risk status (p = 0.000) (Table 5).

A total of 60 (43.7%) individuals belonged to the moderate risk group, 59 (98.3%) of them were found to be doing physical activity like regular exercise or any strenuous work. Among the high risk group 48 (35.03%), 27 (56.2%) of them were found to be not doing any exercise and sedentary. A statistically significant association was seen between the physical activity of the study subjects and the IDRS risk status (p = 0.000) (Table 6).

RBS was measured for all the study subjects irrespective of their risk Status. Among the study subjects, 16(11.6%) were found to have an RBS value more than the cut off (i.e. >200 mg/dl), of which 7 (11.6%) subjects belonged to moderate risk group, 6 (12.5%) belonged to high risk group and 3 (10.3%) persons belonged to low risk group. These subjects were advised for further investigations to confirm the Diabetes status by Fasting and post prandial blood glucose estimation (Table 7).

DISCUSSION

In this study we identified the risk status of undiagnosed diabetics in rural population by using Indian Diabetic Risk Score. 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 incidence of diabetes in India.[6,7] 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.[8]

The present study identified 35% 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.[4] In a similar study conducted by Brinda P et al, they found 26% of their study population to have a high risk score.[9] In this study, 43.7% of the subjects were found to be in moderate risk category according to IDRS, similar to the findings obtained by Brinda et al.[9]

In present study was 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 other studies.[10-13]

In this study 88% of the study subjects did not have any family history of diabetes, similar to the study conducted by Patil RS et al, where 89% of the individuals did not have any family history of diabetes.[10] In a study conducted by Gupta SK et al in urban Pondicherry, their study observed that 68.5% of the respondents had no family history of diabetes.[14] This difference could be due to lack of awareness about the disease and lack of screening tests at the community level to detect the cases of diabetes in rural areas.

Of the 48 subjects who belonged to high risk group according to IDRS in the present study, 12.5% had RBS value >200mg/dl. Similar findings was 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.[15]

Conclusion: Majority of the subjects in our study belonged to the high risk and moderate risk category. A statistically significant association was seen between the age, BMI, Waist circumference and Physical activity of the study subjects (p<0.005). Among the subjects, 16 (11.6%) were found to have an RBS value more than the cut off (i.e. >200 mg/dl) using IDRS. Hence, our study shows that IDRS is a quick, simple and cost effective screening tool for early identification of people at the risk of developing diabetes.

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

REFERENCES

1. Nandeshwar S, Jamra V, Pal DK. Indian Diabetes Risk Score for screening of undiagnosed diabetic subjects of Bhopal city. National J Community Med. 2010;1(2):176-7.

2. Global Report on Diabetes - World Health Organization. Available at:

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http://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf?sequence=1

3. Deepa M, Deepa R, Shanthirani CS, Manjula Datta, Unwin NC, Kapur A, Mohan V; Awareness and knowledge of diabetes in Chennai – The Chennai Urban Rural Epidemiology Study (CURES – 9). J Assoc Physicians India 2005; 53: 283–7.

4. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A Simplified Indian Diabetes Risk Score for Screening for Undiagnosed Diabetic Subjects. JAPI. 2005;53:759-63.

5. Humayun A, Shah AS, Sultana R. Relation of hypertension with body mass index and age in male and female population of Peshawar, Pakistan. J Ayub Med Coll Abbottabad. 2009;21(3):63.

6. Ramachandran A, Snehalatha C, Vijay V, Wareham NJ and Colagiuri S. Derivation and validation of diabetes risk score for urban Asian. Diabetes Res and Clinical Practice. 2005;70:63-70.

7. Stanley JML, Elantamilan D, Mohanasundaram K, Kumaravel TS. Evaluation of Indian diabetic risk score for screening undiagnosed diabetes subjects in the community. Indian J Sci Technol. 2012;5(6).

8. Abhishek A, Srivastava JP, Gupta P, Sachan B, Prakash D, Zaidi ZH. Indian diabetes risk score (IDRS), a strong predictor of diabetes mellitus: A cross sectional study among urban and rural population of Lucknow. Int J Applied Res.2015;1(7):135-8

9. Brinda P, Santosh A. 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. Int J Community Med Public Health 2016;3:3076-80.

10. Patil RS, Gothankar JS. Assessment of risk of type 2 diabetes using the India Diabetes Risk Score in an urban slum of Pune, Maharashtra, India: a crosssectional study. WHO South-East Asia J Public Health. 2016;5(1):53-61.

11. Mohan V, Shanthirani CS, Deepa R. Glucose intolerance (diabetes and IGT) in a selected South Indian population with special reference to family history, obesity and lifestyle factors – the Chennai Urban Population Study (CUPS 14). J Assoc Physicians India. 2003;51:771-7.

12. Singh RB, Bajaj S, Niaz MA, Rastogi SS, Moshiri M. Prevalence of type 2 diabetes mellitus and risk of hypertension and coronary artery disease in rural and urban population with low rates of obesity. Int J Cardiol. 1998;66(1):65-72

13. Menon VU, Kumar KV, Gilchrist A, Sugathan TN, Sundaram KR, Nair V, et al. Prevalence of known and undetected diabetes and associated risk factors in central Kerala – ADEPS. Diabetes Res Clin Pract. 2006;74(3):289-94.

14. Gupta SK, Singh Z, Purty AJ, Vishwanathan M. Diabetes prevalence and its risk factors in urban Pondicherry. Int J Diabetes Dev Ctries. 2009; 29(4):166-9.

15. Rao CR, Kulkarni MM, Narayanan SS, Kamath VG, Kamath A, Ballala K, Sujatha K. Utility of Indian Diabetic Risk Score (IDRS) in a Rural Area of Coastal Karnataka, India". Journal Evolution Medical and Dental Sciences. 2014;3(13):3272-7.