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Research Article

Study of Effectiveness of IDRS as a Screening tool in OPD attending Adults at a Medical College Hospital in Central India

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A B S T R A C T

Introduction: Type 2 Diabetes Mellitus (T2DM) has established itself as a silent pandemic with devastating multiorgan involvement. The only way forward is to nip it at its bud by proactive screening at every available circumstance. There are many types of cost-effective screening tools available at national and international level. Indian Diabetic Risk Score (IDRS) developed by Madras Diabetes Research Foundation (MDRF) is one of them. The sensitivity of this simple non-invasive tool has been studied mostly in the Southern part of India.

Aim: To study the screening accuracy of the IDRS among Outpatient (OPD) attending adults at a tertiary health care setup.

Objective: To screen the OPD attending adults aged between18 -60 years for risk of T2DM by IDRS score and check its sensitivity and specificity by univariate, bivariate and Receiver Operating Characteristic (ROC) Curve analysis taking Random Blood Sugar (RBS) as control.

Method: A cross-sectional study was carried out on OPD attending patients at a Medical college in central India. A total of 101 subjects were screened over a one-month period by purposive sampling method and their pertinent sociodemographic information along with RBS was collected in addition to IDRS data. Data coding and analysis was done in SPSS version 20.

Result: The participants mean age was 38.65±12.54), literacy rate at (63;62.4%).and male representation at 56 (56.5%). The prevalence of high risk, moderate risk and low risk for diabetes among participants as per IDRS were found to be 19.8 %,55.4% and 24.8 % respectively. 11 subjects (10.89%) recorded a RBS levels ≥ 140 mg/dl. The area under the ROC curve was in the acceptable range (.7-.8). Fixing the IDRS core ≥ 35 (moderate risk zone) the predicted risk of T2DM had a sensitivity of 90% and specificity of 64%.

Conclusion: IDRS may be considered as a viable screening method for OPD attending patients in central India for risk evaluation in asymptomatic cases.

Keywords: T2DM, IDRS, Screening, Central Indian Medical College

Introduction

The prevalence of diabetes mellitus is on rise all over the world, however, India is deemed as diabetic capital of the world with the rise in its burden which is expected to rise to 100 million by 2030.[1] The global prevalence of diabetes among adults belonging to the age group of more than 18 years has increased significantly from 4.7% in 1980 to 8.7% in 2015.[2,3] Every fifth diabetic in the world is an Indian. According to the International diabetic federation, India has approximately 72 million diabetics with an adult prevalence of 8.8% (2017) which is expected to double to 134 million with an expected adult prevalence of 11.4% by 2045.[4]

In India, the majority of people suffering from diabetes are unaware of their diabetic status since the disease is asymptomatic in its early stage, thus these patients do not seek treatment. Unfortunately, when they start seeking healthcare the disease is already in late pathogenesis phase with its dreaded complications looming large at their face.[5,6]

Multiple scientific works[7,8,9,10] of the literature suggest that by the time patients are diagnosed as diabetic, they have already developed subclinical atherosclerosis the unequivocal predecessor' of complications. Hence diagnosing diabetes at an early stage is of utmost importance. This will be possible when all available opportunities for screening are capitalized by a 'participant and worker-friendly, noninvasive and cost-effective screening tool'.[11,12] On this regards different diabetic societies have developed their own tools. IRDS is one such tool developed by Madras Diabetes Research Foundation (MDRF) and is derived based on the largest population-based study on diabetes in India 'The Chennai Urban Rural Epidemiology Study' (CURES) keeping the Indian population in mind.[4] Though it has been widely studied in Southern India its validation in other parts of the country needs to be done so as to give it a national acceptance. Here we have tried to test IDRS in a tertiary care hospital attending OPD population in central India.

We have aimed at evaluating the IDRS as a screening tool at a tertiary health care setup in the adult population.

Our objective was to screen the OPD attending adult population (18-60 years) for assessment of the risk of developing T2DM by IDRS score, to find sociodemographic associates, and estimation of odd's for Obesity (BMI), Hypertension and RBS with IDRS scores and finally validated its sensitivity and specificity by ROC curve analysis. The study had clearance from the institutional ethical committee of R.D. Gardi Medical College, Ujjain(M.P.), IEC Ref No-5/2019.

Methodology

This cross-sectional study was conducted at the teaching hospital of a Medical College in central India over a period of 1 month i.e. from 1st May 2019 to 30th May 2019. All the participants in the age group of 18 to 60 years attending the study setting constituted the study population and those who provided valid written consent during the specified time were considered as the study sample. All inclusive time bound sampling method was adopted meeting 10% criteria based on previous year OPD attendance from the selected OPD.Critically ill patients and pregnant ladies were excluded. A total of 101 participants fulfilling the inclusion criteria provided complete information and included for data coding and final analysis.

Table 1.IDRS scoring and grading

Particulars		Score
Age (years)	< 35	0
	35-49	20
	≥ 50	30
Abdominal obesity	Waist<80 cm [female], <90 cm [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	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)	No risk	<30
	Moderate risk	30-50
	High risk	>60

Information regarding sociodemographic profile such as age, gender, marital status, education, family type and socioeconomic status was obtained from all the participants. Height and weight were recorded for calculating BMI. A digital weighing scale with accuracy up to 100grams was used to measure weight. The weighing scale was adjusted to 0.0 and the participants were weighed with minimal clothing. Standing height was measured using a stadiometer with a fixed vertical backboard and an adjustable headpiece. Resting Blood Pressure (BP) both systolic and diastolic were measured by mercury standing sphygmomanometer and RBS was measured by glucometer for all the participants and findings thus obtained were recorded. IDRS consisting of four simple parameters namely age, abdominal obesity, family history of diabetes and physical activity, was calculated

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for individual patients. The scoring pattern and risk grading for IDRS is presented in Table 1.

Statistical Analysis

Data was compiled using MS excel and analyzed by using IBM SPSS software version 20. Continuous data were expressed as mean and standard deviation. The categorical data were expressed as a percentage and χ2 test was used wherever applicable. Univariate and bivariate analysis along with ROC curve analysis was employed for drawing an inference. p-value<0.05 was considered as the cut-off for drawing statistical inference.

Result

For 101 participants the mean age was 38.65±12.5 years. The estimated prevalence (RBS levels ≥ 140 mg/dl) of diabetes in the participants was 10,1%. As per IDRS score,19.8%, 55.4% and 24.8% of the participating population belonged to respective high risk, moderate risk and low-risk category for developing T2DM.

Table 2.Profile and univariate analysis of IDRS with respect to sociodemographic, anthropometric and biochemical variables

		IDRS				Chi-square	p-value
		low+moderate risk		high risk			
		N	%	N	%		
Age (years)	< 35	33	40.7%	0	0.0%	12.10	0.001
	35-60	48	59.3%	20	100.0%		
Sex	Male	49	60.5%	7	35.0%	4.22	0.04
	Female	32	39.5%	13	65.0%		
Residence	Urban	34	42.0%	9	45.0%	0.06	0.81
	Rural	47	58.0%	11	55.0%		
Education	Literate	53	65.4%	10	50.0%	1.63	0.20
	illiterate	28	34.6%	10	50.0%		
Socioeconomic status	class I	22	27.2%	8	40.0%	1.98	0.57
	class II	45	55.6%	9	45.0%		
	class III	11	13.6%	3	15.0%		
	class IV	3	3.7%	0	0.0%		
	class V	0	0.0%	0	0.0%		
Family type	nuclear	8	9.9%	0	0.0%	6.15	0.046
	Joint	59	72.8%	12	60.0%		
	three generation	14	17.3%	8	40.0%		
Systolic Blood Pressure	normal BP	36	44.4%	6	30.0%	9.64	0.02
	pre hypertension	39	48.1%	8	40.0%		
	stage I	5	6.2%	6	30.0%		
	stage II	1	1.2%	0	0.0%		
Diastolic Blood Pressure	normal BP	12	14.8%	2	10.0%	5.24	0.15
	pre hypertension	38	46.9%	6	30.0%		
	stage I	28	34.6%	9	45.0%		
	stage II	3	3.7%	3	15.0%		
BMI	underweight	11	13.6%	0	0.0%	10.06	0.02
	normal range	35	43.2%	7	35.0%		
	overweight	20	24.7%	3	15.0%		
	Obese	15	18.5%	10	50.0%		
RBS	<140	75	92.6%	15	75.0%	5.12	0.02
	>140	6	7.4%	5	25.0%		

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Table 3.Binary regression for IRDS score and it's associate odd's for obesity, HTN and T2DM

Independent variables	B	Sig.	Adjusted odds	95% C.I. for EXP (B)	
				Lower	Upper
HTN	0.713	0.04	2.04	1.01	4.10
BMI	0.742	0.01	2.09	1.21	3.63
RBS	1.427	0.03	4.16	1.12	15.44

On univariate analysis sociodemographic factors like increased age, female sex and persons from three-generation families reported stronger risk, and so also high systolic BP, BMI and RBS. These details are presented in Table 2.

On bivariate analysis, it was found that the participants with high IDRS score had higher odd's for developing obesity, systolic BP and diabetes. This is presented in Table 3.

The sensitivity and specificity if IDRS in detecting diabetes was subjected to ROC curve analysis. The area under the curve was 70% and for a cut-off score of 35(in moderate risk zone) IDRS recorded a sensitivity of 90% and specificity of 64%. Figure 1 presents the results of the ROC curve in this regards.

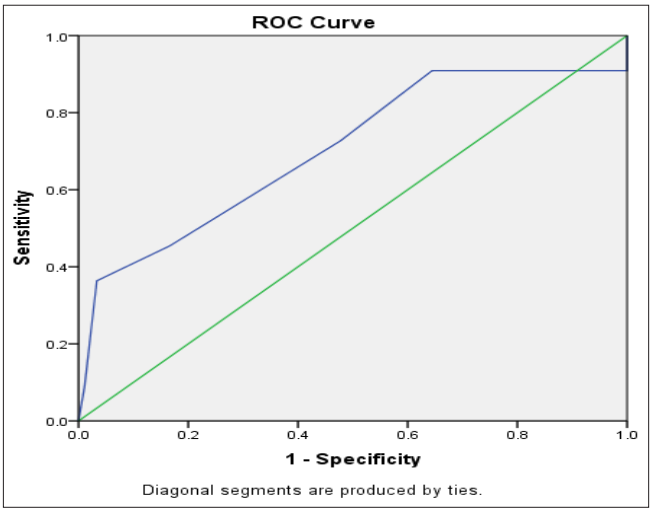

Figure 1.The ROC curve for IDRS for detecting its sensitivity and specificity

Discussion

In order to tame the menace of diabetes proactive screening is the need of the hour. The designed tool should be simple to carry out, cost-effective and noninvasive in nature. This should also be geo-cultural sensitive and specific. The Indian Diabetes Risk Score (IDRS) is one such tool designed specifically for the Indian population which gives more weightage to ethnic risks like measurements for detection of truncal obesity.[11] It has two modifiable and two nonmodifiable screeners. The modifiable ones are abdominal obesity and physical activity and the nonmodifiable ones are age and family history. This simple to use instrument is user-friendly and can be carried out at the community level by a health worker or any literate motivated personnel with minimal training.[13]

Using IDRS, about 19.8% of participants were detected to have high risk, 55.4% at moderate risk and 24.8% at low risk for developing diabetes. Dugg et al in their study on 185 adults reported a risk prevalence of 49.2%, 46.5%, and 4.3% respectively for high risk, moderate risk and low risk for developing diabetes.[14] Bala et al also observed similar risks in their study.[15] The studies using IRDS by Panda et al and Khandhedia et al had results closer to ours with the high-risk prevalence at 17.9% and 22.8% respectively.[16,17]

In the present study, IDRS was significantly higher in patients with advanced age group, females, members of the three-generation family, hypertensive and obese individuals ($p<0.05$). Association of age and IDRS could be explained by the fact that IDRS scoring depends upon age. Dugg et al also observed similar findings i.e. on univariate analysis, the female had high IDRS as compared to the males.[14] Dudeja et al observed a significant association between risk factors for diabetes like age, family history, waist circumference, waist-hip ratio and occurrence of diabetes.[18]

In our study, hypertensive participants, High BMI candidates and persons with RBS over 140mg/ dl were reported to have increased odd's of higher IDRS score. These findings are supported by various other studies in which odds of developing diabetes were higher in individuals with higher BMI (>25kg/m^2) and raised BP.[13,17,18] The possible explanation could be rapid urbanization, with its consequent lifestyle transitions like the shift from manual work to less physically active jobs, the dietary transition from traditional Indian diet to the western diet, high in fat, refined sugar and processed foods with added preservatives etc. Subjects with high IDRS regardless of their blood sugar status, are ideal candidates for lifestyle modification as these are risk factors for not only diabetes but also for cardiovascular disease.

Receiver Operating Characteristic [ROC] curve was constructed to identify the optimum value of IDRS for detecting diabetes. The Area Under the Curve (AUC) was in the acceptable range at 0.704 with a 95% confidence interval (CI) of 0.518-0.889 and a p-value of 0.028 (supplementary table 1). An IDRS value 0f ≥35 was selected from 'Coordinates of the Curve' that had an optimum sensitivity of 90.9%

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and specificity of 64.4% (supplementary table 2). Mohan V et al. and Dudeja P et al. had similar observation but for a coordinate value of ≥ 60.[13,18] We suppose we could have improved the accuracy by enrolling a bigger population.

Conclusion

This study highlights the importance of screening program for early identification of diabetes. The study also suggests that IDRS can be considered as a cost-effective, simple, non-invasive and fairly accurate tool for screening of diabetes in undiagnosed individuals attending premier hospitals on a routine basis; thereby enhancing the domain for detecting diabetes and helping them in getting early treatment. However, at the same time, we would like to adopt caution regarding its generalizability, which should be established by more extensive and multicentre studies.

Study High Light

Every opportunity should be explored especially at health care setups, by socio-cultural and ethnic-specific, easy to administer, noninvasive, and cost and empirically productive screen tools to detect diabetes in the undetected population.

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Conflict of Interest: None

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Supplementary Tables

Table 1

Area Under the Curve				
Test Result Variable (s): totalscore				
Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.704	.095	.028	.518	.889
The test result variable(s): total score has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.				
a. Under the nonparametric assumption				
b. Null hypothesis: true area=0.5				

Table 2

Coordinates of the Curve		
Test Result Variable (s): IDRS Score		
Positive if Greater Than or Equal To[a]	Sensitivity	1 - Specificity
9.00	1.000	1.000
15.00	.909	1.000
25.00	.909	.733
35.00	.909	.644
45.00	.727	.478
55.00	.455	.167
65.00	.364	.033
75.00	.091	.011
81.00	.000	.000

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