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Original Research Article

Determination of Opportunistic Screening of Type-2 Diabetes at the District Level in India

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Abstract

Introduction: The following analysis has discussed the metabolic disorder known as diabetes mellitus is caused by an issue with insulin action, insulin secretion, or both. Chronic hyperglycemia is a defining characteristic, and microvascular and macrovascular complications impose a substantial burden on health. In addition, Diabetes complications may not appear or develop more slowly if the issue is detected and treated early. Despite the fact that type 2 diabetes may initially present with few symptoms, the disease's long-term effects can produce a wide range of complications, which can lead to debilitating complications.

Aims and Objectives: To determine the proportion of patients who are at risk of having diabetes mellitus using Indian Diabetes Risk Score (IDRS) and also to determine the various factors associated with risk of having diabetes mellitus in the future.

Methods: A study was carried out on 80 patients who visited our hospital's outpatient department. This study selected those patients who were aged 30. The researchers conducted personal interviews using a predesigned questionnaire to collect data. The researchers provided comprehensive details of the study to the participants. The patient's consent has been obtained. The hospital's ethics committee has approved the methodology of the study.

Results: High IDRS was determined using binary logistic regression with "IDRS" as the dependent variable. Hypertensives were 2.43 (95% CI = 1.132-4.980, P = 0.025) times more likely to have high IDRS. For study participants with a BMI of 25 kg/m2, the odds of having high IDRS were 3.24 times (95% CI = 1.475-6.721, P = 0.004) higher and 3.35 times (95% CI = (0.126-0.859), P = 0.006) lower than for those with a BMI of 18.5 kg/m2.

Conclusion: The current study concluded that females had higher IDRS scores than males. It highlights the importance of doing opportunistic diabetes screening among patients residing in rural communities.

Keywords: Diabetes, Risk, Blood Glucose, Screening, Opportunistic.

Introduction

The metabolic illness known as diabetes mellitus is brought on by a problem with insulin secretion, action, or both. Chronic hyperglycemia is a defining feature, and microvascular (such as retinopathy, nephropathy, and neuropathy) and macrovascular consequences provide a significant health burden (peripheral vascular, cardiovascular, and

cerebrovascular disease) [1,2]. Despite this, between one-third and fifty percent of those who have type 2 diabetes mellitus, the most common form of the condition, remain misdiagnosed. This is because access to care is insufficient and the preclinical period is lengthy, especially in low- and middle-income countries. Diabetes problems may not emerge or develop more slowly with early detection and treatment of the condition [3,4].

Although diabetes type 2 may initially show minimal symptoms, long-term repercussions can cause a wide range of issues later on in the course of the disease, which can result in crippling sequelae. In the US, there are more than 30 million diabetics. Due to its initially silent course, it frequently goes undiagnosed for a considerable amount of time until symptoms start to manifest. The goal of disease screening is disease prevention and early treatment with the understanding that early disease detection will be advantageous in the long run [5,6].

Screening is the process of using tests or examinations to find people who are more likely to develop a condition than others to identify persons who may have an undiagnosed ailment (Standing committee on screening 2018). The goal is to lessen the disease burden in the population, and morbidity, including disease incidence, or mortality [7]. This is accomplished through early intervention to lower personal disease risk, such as a hysterectomy in the precancerous stage to avoid cervical cancer or to enhance illness results (i.e. early detection of cancers in general to prevent their spread). Therefore, screening is only important if early illness detection has a noticeable impact on the outcomes and if it results in a considerable decrease in advanced disease [8,9]

Raised blood glucose levels occur over a protracted pre-clinical period in diabetes, which aid in the emergence of problems. As a result, it is a disorder that may be amenable to early detection through a screening program. As a result, several clinical recommendations now advocate for the early detection of diabetes through the use of screening tools [10].

The same tests that can be used to diagnose diabetes can also be used to screen for it. One of them is the oral glucose tolerance test, which is possibly the best but also the most difficult testing method. It takes two hours to complete, requires preparation for an overnight fast, and is hence not a good screening tool. Fasting glucose levels and random (casual) glucose levels are additional tests used to detect or diagnose diabetes. Another test that has been applied recently is the measurement of glycated hemoglobin A1c (HbA1c) levels [11-14].

HbA1C levels can be impacted by elements that lengthen or shorten RBC life. HbA1C readings are erroneously increased by anemia, whereas they are erroneously decreased by therapy. Values can be impacted by kidney illness and may increase or decrease depending on the patient's therapy. Erythropoietin may unintentionally lower HbA1c levels. HbA1c levels might vary due to hemoglobin variations such as HbS and HbC [15-17].

Materials and methods

Study design

A study was conducted on 80 patients who came to the outpatient department of our hospital from October, 2021 to October, 2022. Patients above the age of 30 years were included in the study. Data were gathered through personal interviews performed by the investigators using a predesigned questionnaire.

The study's questionnaire contained two pieces. Questions in the first segment asked about anthropometric measures, blood pressure (BP) readings, and sociodemographic information. The IDRS scale, which was used in the second half, asked questions about waist

circumference, family history of diabetes, and physical activity. Based on the participant's work and leisure time exercise, physical activity was determined.

Inclusion and exclusion criteria

The outpatient department services are available to all individuals who are 30 years of age or older. Patients with known diabetes, those in critical condition, expectant mothers, and those unwilling to provide consent were all excluded from the study.

Statistical analysis

After entering the data into a Microsoft Excel spreadsheet and checking it for mistakes, it was cleaned up and then analyzed using the SPSS 20.0 program. Frequencies were determined and simple descriptive tabulations were performed. Bivariate analysis was carried out using the Chi-square test, with significance set at P 0.05, to find associated factors. Binary logistic regression was used with IDRS scoring as the dependent variable to identify the predictors. Using a backward stepwise likelihood ratio, the significant predictors were located. P < 0.05 and >0.10 were required for the independent variables to be added to and removed from the backward stepwise model, respectively.

Ethical approval

The patients were given thorough information about the study by the authors. The patient's permission was obtained. The concerned hospital's ethical committee has approved the study's methodology.

Results

Table 1 shows a total number of patients n=80, where the IDRS was divided into 3 groups low, moderate, and high risk with 10,30, and 40 patients in each respectively. Males were high in number compared to females. There are about 60% literate, 33.3% unskilled in low and moderate risk, and 25% unskilled in high-risk individuals. BMI is 40% in 18.5-22.9, Rbs is high in <140 in 70% of patients.

Table 1: sociodemographic profile and IDRS univariate analysis with various research participant variables (n=80)

Variables	n (%)	IDRS n (%)		p-value
		Low+ moderate risk	High-risk	
Gender				
Females	4 (5)	10 (33.3)	8 (20)	0.032*
Males	6 (7.5)	20 (66.6)	32 (80)	
Religion				0.324
Muslim	7 (8.75)	25 (83.3)	33 (82.5)	
Hindu	3 (3.75)	5 (16.6)	7 (17.5)	
Education status				0.217
Literate	6 (7.5)	18 (60)	24 (60)	
Illiterate	4 (5)	12 (40)	16 (40)	
Occupational status				0.007*
Unemployed	0 (0)	2 (6.6)	5 (12.5)	
Unskilled	3 (3.75)	10 (33.3)	10 (25)	
Semi skilled	1 (1.25)	4 (13.3)	4 (10)	
Skilled	2 (20)	6 (20)	6 (15)	
House-wife	4 (40)	8 (26.6)	15 (37.5)	
Socioeconomic status				0.155

Lower and upper lower	7 (70)	20 (66.6)	17 (42.5)	
Lower middle and upper middle	3 (30)	10 (33.3)	13 (32.5)	
BP (mmHg)				0.004*
Non-hypertensive	8 (80)	17 (56.6)	18 (45)	
Hypertensive	2 (20)	13 (43.3)	12 (30)	
BMI (kg/m2)				<0.002*
<18.5	2 (20)	8 (26.6)	4 (10)	
18.5-22.9	4 (40)	12 (40)	13 (32.5)	
23-24.9	1 (10)	4 (13.3)	6 (40)	
≥25	3 (30)	6 (20)	17 (42.5)	
RBS (mg/dl)				0.005*
<140	7 (70)	21 (70)	23 (57.5)	
≥140	3 (30)	9 (30)	17 (42.5)	

IDRS: Indian diabetes risk score, *P value<0.05, BMI: Body mass index, RBG: Random blood glucose, BP: Blood pressure

Table 2 shows the IDRS of the participants with 48.75% of participants in the age raneg of 35-50 years. 62.5% of participants does exercise or strenuous works. 93.75% participants do not provide a family history.

Table 2: IDRS of the participants in this study (n=80)

Particulars	Score	n (%)
Age (years)		
<35	0	10 (12.5)
35-50	20	39 (48.75)
≥50	30	31 (38.75)
Abdominal obesity		
Waist <80cm (female), <90 (male)	0	25 (31.25)
Waist ≥80-90 cm (female), ≥ 90-99 cm (male)	10	23 (28.75)
Waist ≥90 cm (female), ≥100 cm (male)	20	32 (40)
Physical activity		
Exercise (regular) + strenuous work	0	7 (8.75)
Exercise (regular) or strenuous work	20	50 (62.5)
No exercise and sedentary work	30	23 (28.75)
Family history		
No family history	0	75 (93.75)
Either parent	10	5 (6.25)
Both parents	20	1 (1.25)

Binary logistic regression was used with "IDRS" as the dependent variable to determine the causes of high IDRS. When compared to non-hypertensives, people with hypertension had a 2.43 (95% confidence interval [CI] = 1.132-4.980, P = 0.025) times higher likelihood of having high IDRS. For study participants with a BMI of 25 kg/m2, the odds of having high IDRS were 3.24 times (95% CI = 1.475-6.721, P = 0.004) greater, and 3.35 times (95% CI = (0.126-0.859), P = 0.006) lower than for persons with a BMI of 18.5 kg/m2

compared to participants with a BMI of 18.5-22.9 kg/m2 (table 3).

Table 3: Factors that contribute to high IDRS in the study participants.

Predictor variables	B	SE	Adjusted OR (95% CI)	P value
Blood pressure (mmHg)				0.025*
Non-hypertensive	0.862	0.372	1#	
Hypertensive			2.43 (1.132–4.980)	
BMI (kg/m2)				0.006*
<18.5	-1.128	0.498	0.335 (0.126–0.859)	
18.5-22.9			1#	
23-24.9	1.065	0.613	3.2 (0.892-9.53)	0.078
≥25	1.134	0.392	3.24 (1.475-6.721)	0.004*
RBS (mg/dl)				
<140	0.721	0.374	2.025 (0.987–4.216)	0.056
≥140				
Constant	−0.709	0.275	0.496	0.009

*P<0.05, 1# Reference value, IDRS: Indian diabetes risk score, *BMI: Body mass index, RBG: Random blood glucose, CI: Confidence interval, SE: Standard error

Discussion

Given the lack of early type 2 diabetes symptoms, problems are frequently present when the condition is finally diagnosed. Although routine population-based screening is not advised, there is still potential to test out novel approaches to enhancing illness early diagnosis in high-risk people. The study presents the findings of an opportunistic diabetes screening that was conducted in a community pharmacy environment. According to the study, a community pharmacy-based screening program can help lessen the burden of the disease by concentrating on those who are at higher risk, such as the elderly and socially vulnerable [18,21].

Diabetes mellitus is a metabolic illness marked by hyperglycemia and accompanied by a significant number of microvascular and macrovascular consequences. The early diagnosis and treatment of type 2 diabetes mellitus as well as the prevention or delay of the emergence of related problems may result from screening people who appear to be in good health [19]. To evaluate the results of screening for type 2 diabetes mellitus, a study was carried out. The effects of type 2 diabetes screening on death from all causes and mortality from diabetes were unclear to the study. Only one study's findings were accessible as evidence. As a result, we are unable to make any definitive judgments about the effects of early type 2 diabetes mellitus screening on health [22].

For patients at high risk for heart failure (HF), international recommendations advise natriuretic peptide biomarker-based screening to enable early diagnosis. There aren't many reports of screening procedures being incorporated into current clinical practice [20]. Implementing screening for left ventricular failure in people with type 2 diabetes mellitus is the study's main goal (DM). The study concludes that relatively simple implementation of NT-proBNP and ECG screening could allow early diagnosis of cardiovascular complications and enhance long-term results [23].

An analysis of the effects of two alternatives to the American Diabetes Association (ADA)-recommended tests for initial type 2 diabetes screening—opportunistic random plasma glucose

(RPG) > 6.7 mmol/l and a 1-h 50-g glucose challenge test (GCT) > 8.9 mmol/l—was done on the U.S. population level. According to the study, initial screening with an opportunistic RPG or a GCT may help identify more type 2 diabetic adults in the United States without raising expenditures for society [22-24].

While new diagnostic criteria based on a fasting plasma glucose (FPG) of > 126 mg/dl (7.8 mmol/l) have improved the detection of diabetes, several reports suggest that many people with diabetes who have been diagnosed by 2-h oral glucose tolerance test (OGTT) glucose measurements > or = 11.1 mmol/l (200 mg/dl) would go undiagnosed based on this FPG criteria. Therefore, new diabetes detection techniques are especially required for high-risk individuals. The study assessed whether combining FPG and HbA1c measures improved diabetes identification in people at risk for the disease who had nondiagnostic or barely increased FPG. The diagnosis of early type 2 diabetes in at-risk people is generally insensitive when using diagnostic criteria based on FPG criteria. The sensitivity of screening in high-risk people is increased by HbA1c testing [21,23,24,25].

Conclusion

The current study concluded that females had higher IDRS scores than males. Although multiple logistic regression did not find this link to be significant, the univariate analysis did. One of the key variables influencing the IDRS is BMI. In our study, persons with BMIs of less than 25 kg/m2 had 3.1 times the likelihood of having high IDRS as compared to those with higher BMIs. One of the predictors is hypertension; higher BP has been linked to increased IDRS, according to our research. In comparison to non-hypertensives, participants who had high IDRS were 2.3 times more likely to have them. The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke in India is now using RBS measurement as a screening technique for diabetes. On univariate analysis, a strong correlation between high RBS value (>140 mg/dl) and high IDRS was discovered.

According to the findings of our study, IDRS is an easy, rapid, and reliable screening technique for identifying patients who are at high risk of getting diabetes in the future. IDRS is easily applicable to primary healthcare settings, opportunistic screening for diabetes, and diabetes mass screening. For those identified as having a high risk of developing diabetes, targeted interventions and specific preventive measures can be given while taking into account their BMI and blood pressure levels.

This study emphasizes the significance of conducting opportunistic diabetes screening among individuals from a rural community. A scale created by MDRF that has been validated and standardized was also employed in this investigation. Because the majority of the participants were female and were chosen from a single rural healthcare facility, it is possible that the findings cannot be applied to the entire community.

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