

A study on Prevalence of type 2 diabetes mellitus Risk factors in a tertiary health care setting using Finnish Diabetes Risk Score (FINDRISC)

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Abstract: Background: Diabetes mellitus (DM) is growing in prevalence globally, according to the international diabetic federation more than 70.3 million people in Southeast Asian region have diabetes and by 2030 this will rise to 120.9 million. In India alone total of 63.0 million cases of diagnosed diabetes. Fifty percent or more of those with the disease are unaware of their condition. Early detection and treatment reduce the complications of DM. The objective of the study is to assess the risk of development of type 2 DM in rural Vikarabad population attending a tertiary health care hospital by simple scoring system. (Finnish Diabetes Risk Score (FINDRISC) questionnaire)

Methods: Community based cross sectional study was undertaken on subjects for any health ailment attending the different out-patient departments of Mahavir institute of Medical Sciences– hospital, Vikarabad, Telangana State, India, using Finnish diabetes risk score questionnaire.

Results: Out off total 200 participants, There were 128 (64%) females and 72 males (36%), with a male to female ratio was 1:1.7. The most of the participant's age was less than 45 years. 29% were overweight, 15% were obesity, 47% WC >102 cm, 41% daily physical activity of 30min, 8% Presence of high blood glucose level in past (health examination, pregnancy), 15% Regular intake of antihypertensive drugs, 5.5% no consumption of fruits and vegetables, 14.5 % positive family history of DM. This study shows 46.5% Low risk, 41.5% Slightly elevated, 6% moderate and 6% high risk of developing type 2 DM in rural population of Vikarabad.

Conclusions: This study has shown that 12% of rural populations have a moderate to high risk of developing Diabetes Mellitus due to prevalence of physical inactivity, obesity, large waist circumference and family history of Diabetes Mellitus.

The subjects who are at slightly elevated, moderate to high risk are called for a counseling sessions to discuss the study findings. Health education to adopt a healthy lifestyle in term of diabetes prevention strategies were discussed.

Keywords: Diabetes Mellitus, Early detection, Finnish Risk score, rural population, diabetes prevention strategies

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I. Introduction

The prevalence of diabetes is rapidly rising all over the world.[1] Current estimates are that there are at least 150 million people living with diabetes worldwide of which two-thirds are in developing countries.[2] According to the international diabetic federation more than 70.3 million people in Southeast Asian region have diabetes and by 2030 this will rise to 120.9 million. In India alone total of 63.0 million cases of diagnosed diabetes.[3] Fifty percent or more of those with the disease are unaware of their condition. [4]

The increase in the prevalence of DM2 across the world has become an important public health concern given that it is a major risk factor for death and numerous nonfatal complications. Hence, this situation will form a large burden to the patients, their families, and the health care system [5].

Diabetes mellitus is a clinical syndrome characterized by hyperglycemia due to absolute or relative deficiency of insulin. It is classified into two types: type 1 and type 2, where type 1 is most commonly due to autoimmune cause that leads to lack of insulin, whereas type 2 diabetes is a multi-factorial disorder involving both impaired insulin release leading to relative insulin deficiency and end-organ insufficiency.

Early detection and treatment reduce the complications of DM. Early detection can be enhanced by screening people even when consulting the physician for other ailments. [6] The onset of NIDDM may occur 4-7 years before the clinical diagnosis of the disease. During this time, diabetic complications are silently setting in. Studies have shown that many people with undiagnosed DM already have complications such as chronic kidney disease, heart failure, retinopathy and neuropathy [7-9]. Those who are not diagnosed of DM will not take steps to manage their blood glucose or change their life styles.

Among non-modifiable risk factors, family history of DM and age are of special importance as Indians have a tendency to develop DM at a younger age and are subjected to strong genetic predisposition. Asian Indian develops diabetes at a younger age, at least 0-15 years earlier than the Caucasian population. [10]

Recent studies have shown that type 2 DM can be prevented or at least delayed in high risk subjects by life style modification or by combining life style intervention and drug treatment [11-12]. The purpose of community-based screening for NCD is to differentiate asymptomatic individuals at high risk from individuals at low risk. Ideally, screening tests should be rapid, simple, and safe. When returned positive, the screening test only means that the person is more likely to have the disease than a person with a negative screening test. Screening for diabetes can identify patients at an early stage of the diseases, and identify those that will derive benefit from prevention and early treatment methods.

International Diabetes Federation suggests to do an early detection of undiagnosed DM2 patients, and to identify individuals at risk for developing DM2 by simple risk-scoring questionnaires. The Finnish diabetes risk score is a simple, fast, inexpensive, non-invasive, and reliable tool to identify individuals at risk of developing type 2 diabetes within 10 years. [13-14].

II. Objectives

The objective of the study is to assess the risk of development of type 2 DM in rural Vikarabad population attending a tertiary health care hospital by simple scoring system. (Finnish Diabetes Risk Score (FINDRISC) questionnaire)

III. Methods And Materials

A community based cross sectional study was undertaken on subjects for any health ailment attending the different out-patient departments of Mahavir institute of Medical Sciences– hospital, Vikarabad, Telangana State, India, after obtaining clearance from the Institutional Ethical Committee. A simple random sampling technique was adopted, purpose of doing the study was explained and 200 subjects were screened after they gave their written informed consent to participate in the study. Data was collected by using interview technique. The Finnish risk assessment model was adopted for this study.^{10,11} The FINDRISC is a self-administered questionnaire to gather information about the diabetic risk factors, originally developed by Lindstrom and Tuomilehto [12]. The questionnaire comprises eight items (Table-1): age, body mass index (BMI), waist circumference, physical inactivity, dietary consumption of fruits, vegetables or berries, use of antihypertensive medication, history of high blood glucose, and family history of diabetes. The total diabetes risk score (TDRS) for each study participant was the summation of all the scores. The total test score (maximum: 26) provides the measure of the possibility of developing T2DM, with a score of greater or equal to 15 being indicative of high probability (Fig. 1). The risk of developing T2DM within 10 years was classified as follows: low (<7), slightly elevated (7-11), moderately elevated (12-14), high (15-20) and very high (>20). (Table-1)

TYPE 2 DIABETES RISK ASSESSMENT FORM

Circle the right alternative and add up your points.

- Age**
 - 0 p. Under 45 years
 - 2 p. 45-64 years
 - 3 p. 65-74 years
 - 4 p. Over 74 years
- Body mass index (One square of four)**
 - 0 p. Lower than 25 kg/m²
 - 1 p. 25-30 kg/m²
 - 3 p. Higher than 30 kg/m²
- Waist circumference (measured below the ribs, usually at the level of the navel)**

Men	Women
0 p. Less than 94 cm	Less than 80 cm
2 p. 94-102 cm	80-88 cm
4 p. More than 102 cm	More than 88 cm
- Do you usually have daily at least 30 minutes of physical activity at work and/or during leisure time (including normal daily activity)?**
 - 0 p. Yes
 - 2 p. No
- How often do you eat vegetables, fruit or berries?**
 - 0 p. Every day
 - 1 p. Not every day
- Have you ever taken medication for high blood pressure on regular basis?**
 - 0 p. No
 - 2 p. Yes
- Have you ever been found to have high blood glucose (in a health examination, during an illness, during pregnancy)?**
 - 0 p. No
 - 5 p. Yes
- Have any of the members of your immediate family or other relatives been diagnosed with diabetes (Type 1 or Type 2)?**
 - 0 p. No
 - 3 p. Yes: grandparent, aunt, uncle or first cousin (but no own parent, brother, sister or child)
 - 5 p. Yes: parent, brother, sister or own child

Total Risk Score

The risk of developing type 2 diabetes within 10 years is:

Score	Risk Level
Lower than 7	Low: estimated 1 in 100 will develop disease
7-11	Slightly elevated: estimated 1 in 25 will develop disease
12-14	Moderate: estimated 1 in 6 will develop disease
15-20	High: estimated 1 in 3 will develop disease
Higher than 20	Very high: estimated 1 in 2 will develop disease

Not designed by Professor Anshu Tomar, Department of Public Health, University of Central, and State Institute, MP, National Public Health Institute.

Inclusion criteria: (1) Who are willing to take part in this study, (2) Who Could stand up for measurement of waist circumference.

Exclusion criteria: (1) People with known diabetes mellitus (type 1 or 2) will not be recruited. (2) Any acute illness, (3) Pregnancy in women, and (4) Currently use of metformin or other glucose-modifying prescription drugs,

IV. Data Analysis

Statistical analyses will be conducted using SPSS for Windows (*version 23.0; SPSS Inc., Chicago, IL, USA*). Descriptive statistics was used to determine frequency, percentages, mean and standard deviation. Comparisons of the differences between genders will be carried out by Student's *t*-test for continuous variables and the Chi-squared test for categorical variables.

V. Results

The most of the participant's age was less than 45 years. There were 128 (64%) females and 72 males (36%) with a male to female ratio was 1:1.7.

Risk factor 1: Majority of study subjects 113 (%) are <45 years of age and 41 (%) were between 45-54 years and 25 (%) between 55-64 and 20 (%) were >60 years.

Risk factor 2: 112 Subjects had BMI (<25kg/m²), 52 had between (25-30 kg/m²) and 29 were high (>30 kg/m²)

Risk factor 3: 62 subjects had waist circumference (women<80 and men <94cm) 43 of them had (women80-88 and men 94-102cm) and 93 of them had (women>88 and men >102cm)

Risk factor 4: Majority of participants 118 () are physically active means doing daily physical activity for 30 minutes other than daily routine work. 81 (40.5%) are physically inactive means not doing daily physical activity for 30 minutes other than daily routine work.

Risk factor 5: Majority of the participants 189 (94.5%) had regular daily intake of vegetables or fruits. 11 of them (%) never consumed daily.

Risk factor 6: 170 subjects did not take medication for high blood pressure on regular basis whereas 30 subjects took medication for high blood pressure on regular basis.

Risk factor 7: 184 participants did not found to have high blood glucose (eg in a health examination, during an illness, during pregnancy) whereas 16 participants found to have high blood glucose (eg in a health examination, during an illness, during pregnancy)

Risk factor 8: 171 subjects did not have any of the members of their immediate family or other relatives been diagnosed with diabetes (type 1 or type 2) 29 of them had their parent, brother, sister or own child members been diagnosed with diabetes (type 1 or type 2)

Table-2 Distribution of study subjects according to scoring of risk parameter to develop type 2 DM in next 10 years.

S.No	Parameters	Score	Number	Percentage %
1.	Age (years)			
	<45	0	114	57
	45-54	2	41	20.5
	55-64	3	25	12.5
	>65	4	20	10
2.	Body mass index (kg/m²)			
	<25	0	112	56
	25-29.99	1	58	29
	>30	3	30	15
3.	Waist circumference (cm)			
	<95(m),<80(f)	0	62	31
	95-102(m),80-88(f)	3	44	22
	>102(m),>88(f)	4	94	47
4.	Daily Physical activity of 30 minutes			
	Yes	0	118	59
	No	2	82	41
5.	Regular daily intake of fruits/ vegetables			
	Yes	0	189	94.5
	No	1	11	5.5
6.	Regular intake of antihypertensive drugs			
	No	0	170	85
	Yes	2	30	15
7.	Presence of high blood glucose level in past (health examination, pregnancy)			
	No	0	184	92
	Yes	2	16	8

8.	Family history of diabetes mellitus (type 1 or type 2)?			
	No	0	171	85.5
	Yes*(grandparents, uncle, aunt, cousins)	3	0	0
	Yes**(Own, parents, siblings, children)	5	29	14.5

TABLE 3: Diabetes risk assessment by Finnish Diabetes Risk Score (FINDRISC)

Shows aggregate risk scoring for developing diabetes mellitus in next 10 years. 93 (46.5%) study subjects had low risk, while 83 (41.5%) had slightly elevated, 12 (6%) had moderate while 12 (6%) are at high risk.

Table 3: Distribution of study subjects according to total risk for developing diabetes mellitus.

Risk category	Number	Percentage
Low (Lower than 7)	93	46.5%
Slightly Elevated (7-11)	83	41.5%
Moderate (12-14)	12	6%
High (15-20)	12	6%
Very High (Higher than 20)	0	--
Total	200	100%

GRAPH 1: Diabetes risk assessment by Finnish Diabetes Risk Score (FINDRISC)

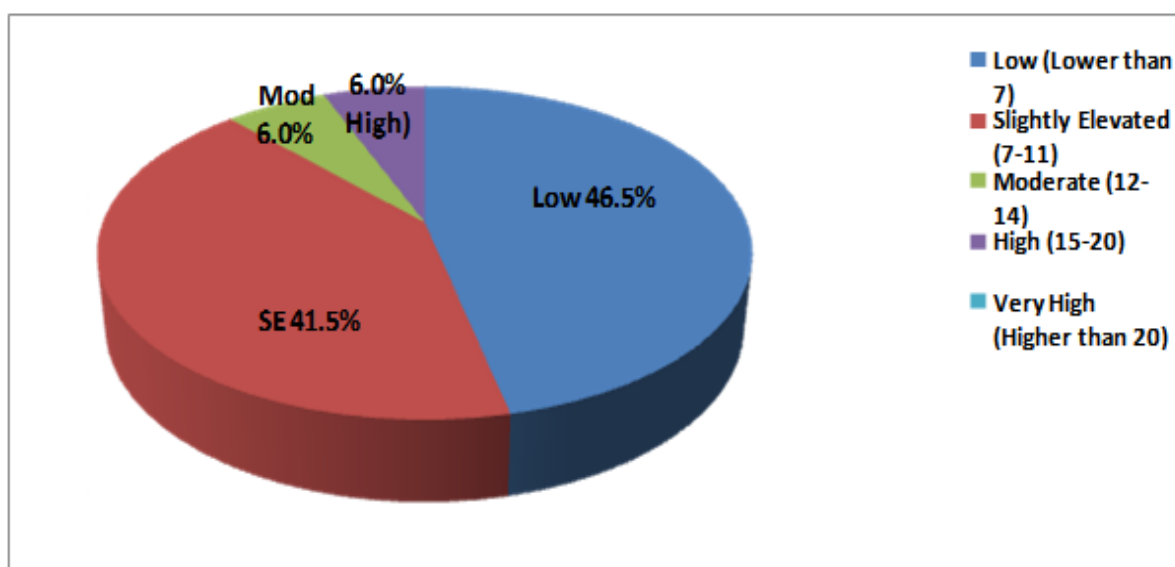
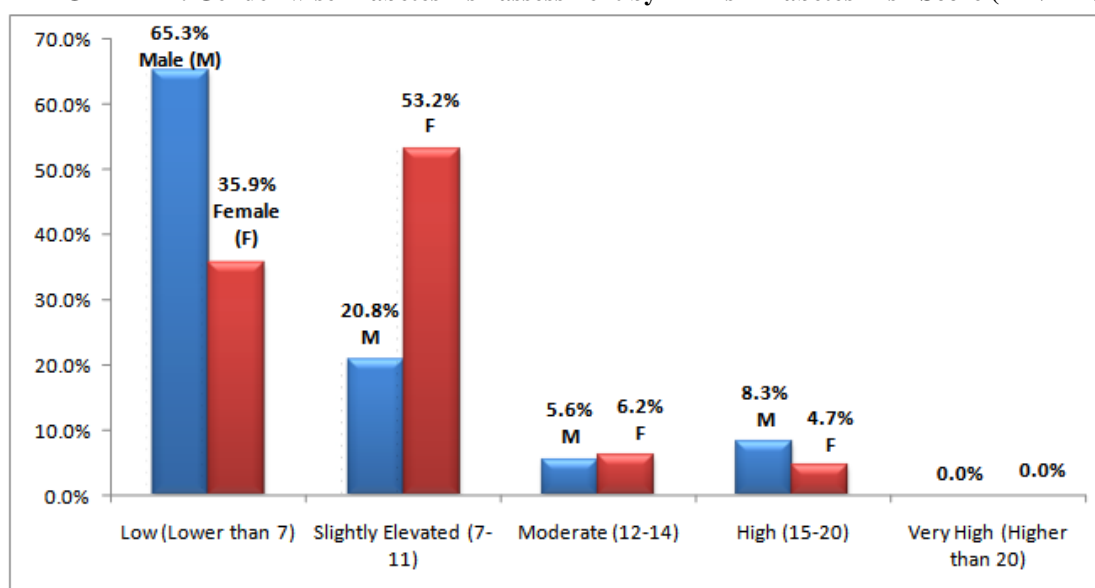


TABLE 4: Gender wise Diabetes risk assessment by Finnish Diabetes Risk Score (FINDRISC)

Risk category	Male N (72)	Female N (128)	Chi square value & Degree of freedom (df)	p value
Low (Lower than 7)	47 (65.3%)	46 (35.9%)	21.17 df=3	0.00009* (Statistically significant)
Slightly Elevated (7-11)	15 (20.8%)	68 (53.2%)		
Moderate (12-14)	04 (5.6%)	08 (6.2%)		
High (15-20)	06 (8.3%)	06 (4.7%)		
Very High (Higher than 20)	--	--		
Total	72	128		

GRAPH 2: Gender wise Diabetes risk assessment by Finnish Diabetes Risk Score (FINDRISC)



VI. Discussion

The increasing prevalence of type 2 diabetes requires the development and introduction of better prevention strategies to reduce the incidence and prevalence of the disease [15,16]. Although the development of specific preventive measures for diabetes diagnosis targeting the entire population is not practically feasible, cost effective nor as appropriate strategy; it is therefore essential to identify subjects at increased risk of developing diabetes. Hence, a simple, inexpensive, non-invasive and valid tool focused on classic and valuable risk factors is needed [17]. This study shows 46.5% Low risk, 41.5% Slightly elevated, 6% moderate and 6% high risk of developing type 2 DM in rural population of Vikarabad.

Similar studies:

S.NO	Study	Prevalence	Risk of developing DM	Risk factors
	Present study	12%	Moderate to high risk	29% were overweight, 15% were obesity, 47% WC >102 cm, 41% daily physical activity of 30min, 8% Presence of high blood glucose level in past (health examination, pregnancy), 15% Regular intake of antihypertensive drugs, 5.5% no consumption of fruits and vegetables, 14.5% positive family history of DM
	Dagdiya KR et al.	11.33%	High risk to Very high risk ^[22]	
	Uloma Agu	9%	High	high prevalence of obesity, physical inactivity, sedentary life style, family history of DM and large waist circumference ^[3]
	An international study by Dankyau M	5%	High risk ^[13]	
	A study -employees of Finnish airlines by Viitasala K et al.	15%	High Moderate risk ^[15]	
	A study by Jølle A et al Norway,	11%	High risk ^[14]	
	Vandersmissen G have found	12%, 17%, 5.5%	Moderate risk High Very high risk	
	Alebiosu OC et al			28.9% overweight and 19.2% were obese. ^[10]
	Bangladesh study by Saquib N et al shown			42% overweight and 21.1% obese. 18 positive family history of Diabetes Mellitus 47.4%. ^[18]
	Also In Indian study			overweight is 59% and obesity 23%. ^[20]
	Marinho N			22% of large waist circumference less than study were it is 84%. 20 positive family history of diabetes was present in 24.9%. ^[21,22]

In present study 59% subjects are physical active. Promoting higher physical activity levels lowers risk of development of Type 2 Diabetes Mellitus in rural population of Vikarabad thus making the prevalence of 12% (6% Moderate to 6% high risk), developing risk of DM in 10years.

VII. Conclusions

This study has shown that 12% of rural populations have a moderate to high risk of developing Diabetes Mellitus due to prevalence of physical inactivity, obesity, large waist circumference and family history of Diabetes Mellitus. The subjects who are at slightly elevated, moderate to high risk are called for a counseling sessions to discuss the study findings. Health education to adopt a healthy lifestyle in term of diabetes prevention strategies were discussed which included:

Weight reduction- includes a combination of caloric restriction, increased physical activity, and behavior modification.

Diet: ~500 kcal restriction daily equates to weight reduction of 1 lb per week. Diets restricted in carbohydrate typically provide a rapid initial weight loss. Adherence to the diet is more important than which diet is chosen.

A high-quality diet— i.e., enriched in fruits, vegetables, whole grains, lean poultry, and fish—should be encouraged to achieve the maximum overall health benefit.

60–90 min of daily activity (At least 30 min.) Gradual increases in physical activity should be encouraged to enhance adherence and avoid injury.

Physical activity could be formal exercise such as jogging, swimming, or tennis or routine activities, such as gardening, walking, and housecleaning. By interventional life style modification, persons at risk have a chance to delay disease progression and limit secondary damage caused by undiagnosed diabetes.

As Finnish Diabetes Risk Score (FINDRISC) is a feasible, non-invasive, cheap and easy to use tool should be used for routine clinical evaluation to identify individuals or population subgroups that might benefit from more comprehensive risk assessment for development of T2DM.

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