Assessing Risk of Developing Type 2 Diabetes Mellitus in a Village of Andhra Pradesh State, India.

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Abstract:
Introduction: Although there is a global raise in the occurrence of type 2 diabetes, the increase has been dramatic in those societies in economic transition especially in developing countries, both in urban and rural areas. The World Health Organization (WHO) has declared that people living with diabetes are increasing rapidly worldwide, and this has become a major public health concern.
Objectives: To identify risk of developing Type 2 diabetes mellitus in a rural population using the FINDRISC questionnaire.
Methodology: This cross sectional study done in September 2015 involved 322 people above age 30 years (160 Males and 162 Females). All were administered a proforma consisting of gender, age, weight and height, blood pressure, history of high blood glucose, level of physical activity, family history of diabetes (DM) etc. after obtaining informed consent. Based on FINDRISC score, risk of diabetes was labeled as low, slightly elevated, moderate, high and very high. The data obtained was entered and analysed in MS Excel and presented in tables and graphs. Important findings were subjected to Chi Square test at 5% level of significance.
Results and discussion: Of the known diabetics, 44.3% had family history of diabetes as compared to 32.1% without family history (Chi Square 4.63, p 0.03). Increased risk of developing diabetes (59.1%) was seen in women (Chi Sq 8.69, p 0.003). 29.3% of the women and 15.3% of the men had a BMI of more than 30 (obese). Even in the younger age group of less than 45 years age, 17.9% men and 34.5% women were found to be obese.
Conclusions: Risk scoring is very useful in identifying those at risk and giving them proper advice. This approach can be done as a routine activity in the local health center and applied for all people above the age of 25 years. There is a need for regular educational programmes on life style related illnesses, their prevention and control.
Keywords: diabetes, FINDRISC, obese, family history, BMI

I. Introduction

There has been a dramatic rise of type 2 diabetes in developing countries both in urban and rural areas. According to the World Health Organization (WHO) the prevalence of type 2 diabetes among people of all income levels has risen considerably in the past three decadesin proportion with the global increase in overweight and obesity.[1]In India, diabetes has a multifactorial causation which includes both genetic factors and environmental influences such rising living standards and changes in lifestyle.[2]In a study on diabetes, Madaan H. et al found a diabetes prevalence of 19.4% and 16.9% for males and females respectively in a rural population.[3]Jost JB et al found that prevalence of diabetes was similar for men and women and suggest that it increased with age, body weight, and body mass index.[4]

As India has a large burden of diabetes and its complications, it is essential to institute strategies for its primary prevention. Screening for early detection and initiation of therapeutic interventions like dietary modifications and medications will be instrumental in the drive towards this goal.[5]Increasing age, obesity, family history of diabetes, lack of physical activity, stressful environment and dietary habits for Type 2 diabetes are well established risk factors for diabetes. Using these risk factors, risk scoring tools have been developed across the world, some of which are the American Diabetes Association (ADA) Risk Tools, Finnish Diabetes Risk Score (FINDRISC), National Health and Nutrition Examination Survey (NHANES) risk score, and study to prevent non-insulin dependents diabetes mellitus (STOP-NIDDM) Risk Score in developed countries. In India the Indian Diabetes Risk score was developed by the Madras Diabetes Research Foundation.[6]Risk screening tools for diabetes which are cost-effective, non-invasive and reliable are essential for early diagnosis.

They are also useful in the identification of people at high risk of developing type 2 diabetes and to target them with sustainable prevention strategies.

The Finnish Diabetes Risk Score (FINDRISC) questionnaire is a validated risk assessment tool to predict type 2 diabetes. It estimates the probability of a person developing diabetes within the next 10 years.[7]It takes into account the usual clinical characteristics, such as age, body mass index (BMI), waist circumference (WC),physical activity, dietary consumption of fruits, vegetables, and berries, use of antihypertensive medication, history of high blood glucose, and family history of diabetes. FINDRISC has been successfully implemented in European countries as a practical screening instrument to assess diabetes risk and to detect undiagnosed type 2 diabetes.[8]

Using the Madras Diabetes Research Foundation - Indian Diabetes Risk Score (MDRF - IDRS) Nagalingam S et al found that the majority of the adult population were at medium to high risk of developing type 2 diabetes[6]. This confirms the urgency for the initiation of lifestyle changes to delay the occurrence of type 2 diabetes. Katulanda P et al suggest that non-invasive, low cost, sensitive and specific tools for screening communities for diabetes will have a potential for improved outcomes in hitherto undiagnosed people.[9]The aim of the current study is to investigate the prevalence of undiagnosed dysglycaemia and the risk for type 2 diabetes using the FINDRISC questionnaire in a south Indian village.

II.   Methods

This cross sectional study done in September 2015 at Pedanandipadu village of Guntur District in Andhra Pradesh involved 322 people above age 30 years (160 Males and 162 Females). This convenient sample is made up of residents who responded to an invitation to enter the study and get their blood sugar tested. After obtaining an informed consent, a predesigned and tested proforma which included the Finnish Diabetes Risk Score Assessment tool which is an instrument used for risk scoring to identify the risk of developing Type 2 diabetes mellitus within 10 years was administered to the participants.[10] The proforma consisted of gender, age, weight and height from which BMI was calculated, Blood pressure, history of high blood glucose, level of physical activity, family history of diabetes and history of daily consumption of vegetables and fruits. A single Random Blood Sugar was done on each subject using a Blood glucometer under standard aseptic precautions. Based on risk score, stratification of diabetes risk was labeled as low risk, slightly elevated, moderate, high and very high. The data obtained was entered in Excel, analysed and presented in tables and graphs. Important findings were subjected to Chi Square test at 5% level of significance.

Findings: Many of the study subjects had some suspicion of illness or were concerned about their health and wanted to know their health status.Prevalence of hypertension in the study sample was 40.4% (males 34.4% and females 46.3%) The difference between the genders was found to be statistically significant (Chi square 4.75, p value 0.03). Prevalence of Type 2 Diabetes Mellitus was 36.3% (males 39.4% and females 33.3%) with no statistically significant gender difference.18.9% of the subjects were known to have both hypertension and diabetes.

Prevalence of obesity (>30 BMI) was found to be 23.6 % (males 15.6% and females 29.01%). The difference between the genders was found to be statistically significant (Chi square 8.31, p value 0.004). Looking at obesity in the younger age group of less than 45 years age also revealed that 20.0% of the men and 34.0% of the women had a BMI > 30 (gender difference not statistically significant). However, comparing obesity between younger

(<45 years) and older (>45 years) subjects it is seen that there was 34.7% obesity in the younger group and 20.4% in the older group (Chi square 6.36, p value 0.01). This difference is statistically significant.

It is seen in this study that overall 72.5 % of the men and 79.6 % of the women were not partaking in sufficient exercise (at least 30 minutes) on a daily basis. In the younger age group of <45 years also the exercise habit was not present in 84.0 % men and 87.2 % women. Waist circumference of over 94 cms in men was 64.4 % and >80 cms was seen in 85.8% women. >102 cms waist circumference in men was 38.1 % and >88 cms in women was 69.1 %. In the <45 years age group, waist circumference of >102 cms was seen in 36.0 % men and >88 cms was seen in 65.9 % women.

Of the 131 people who were known to be hypertensive, 41 had a diastole of > 90 mmHg. (11 people with diastolic > 100 mmHg). Of the 198 members who were not known to have hypertension 96 were found to have a diastole of > 90 mm of Hg. (15 had > 100 diastole). Family history of DM was present in 32.3% of the 322 people seen. In the <45 years age group, 28 out of 63 (44.4%) had a family history of diabetes (mostly parents and occasionally sibling). Of those with a family history of DM, 44.3% have already acquired the disease when compared to those without a family history of DM (32.1%). 72 out of 119 known DM cases had Random Blood Glucose (RBS) >140 mgs/dl. 43 of them had an RBS of >200 mgs/dl. In the younger age group of <45 years, 8 members had an RBS of more than 140 mgs/dl (range 140 to 311).

Of the 205 people with no known DM, 16.5% males and 13.9% females had an impaired RBS of >140 mgs/dl. 9 of them had >200 mgs/dl (range 200 to 400 mgs/dl). In 97 males not known to have DM, 22.7% are at a moderate to high risk of developing dm within 10 years according to the FINDRISC categorization (Table 1). In 108 females not known to have diabetes, 41.7% are at a moderate to high risk of developing diabetes within 10 years. The difference between the genders is highly significant (Chi Square 14.57, p 0.002)

Risk stratification based on risk score was done as low risk, slightly elevated risk, moderate risk, high risk and very high risk. A total of 61 men and 88 women were found to be at moderate to high risk of developing Diabetes within 10 years. In the less than 45 years of age bracket, 15 out of 63 seen (23.8%) were at moderate to high risk. In the 45 to 54 age bracket, 39 out of 86 seen (45.3%) were at risk. Of those found to have elevated blood sugar in the course of this study, 9% were from low risk group, 14% from slightly elevated risk, 20% from moderate risk and 21% from high risk group.

III.   Discussion

The WHO in its diabetes country profiles 2016 states that theprevalence of diabetes in India is 7.9% among males and 7.5% among females. (Total 7.8%). Related risk factors are as follows: Overweight (Males 19.0% Females 23.9% Total21.4%)Obesity (Males 3.1% Females 6.5% Total 4.7%) and Physical inactivity (Males 9.2% Females 15.1% Total12.1%).[11] Studies show that urban women in India have higher levels of overweight and obesity due to unfavorable diets and lower physical activity levels when compared to rural women[12]. However this study shows a high prevalence of obesity in rural women too.Ranasinghe CD et al observed that females were more inactive in the South Asian region when compared to males, a finding which is seen in most other regions and even in developed countries.[13]

Zaman FA et al noted that Diabetes mellitus was seen among 19.8 % of the participants in south Indian rural community, with an additional 12.0 % with impaired glucose tolerance. Hypertension observed among participants with diabetes and impaired glucose tolerance was 65.13 % and 53.94%, respectively.[14] Effective primary prevention strategies have to be intensified among high-risk population groups, to promote awareness through behavior change communication. Pragya Kumar et al in their study in Delhi (urban and rural) ,found that BMI was significantly and positively correlated with blood sugar, blood pressure, waist hip ratio, mid triceps, anterior abdominal wall thickness and mid arm circumference.They suggest that not only urban but the rural population is also at risk of developing cardiovascular disease. [15]

Jost JB et al suggest that among their diabetic study participants, 25% were aware of their disease, and 15 (11%) subjects were under treatment. These figures are markedly lower than those reported from urban and semi-urban regions in India,suggesting that major improvements in medical infrastructure are needed to address this wide spread condition in India[4].Godelieve Jet al found in their study that the prevalence of unknown dysglycaemia was 1.8%. Twelve percent of the employees had a FINDRISC score of 12 to 14 corresponding to a moderate risk of 17% to develop diabetes within the next 10 years, and 5.5% had a score of 15 or more corresponding to a high – very high risk of 33% to 50%. All dysglycaemic individuals had a FINDRISC score of 12 or higher[7].

Jølle A et al found in their large population-based survey of adults without previously known diabetes, the overall prevalence of elevated FINDRISC (≥15) was 11%, and the prevalence increased with age and was higher among women than men [16].Omech B et al in their cross-sectional study designed to assess the validity of the Finnish Diabetes Risk Score for predicting undiagnosed type 2diabetes among general medical outpatients in Botswana found it to be only modestly effective [17].Zhang L et al suggest that FINDRISC performs well not only in high risk population but also in the general free-living population. However their stratified analysis indicated that the discriminating ability of FINDRISC is lower in people aged 65 years or above[18].

IV.   Conclusions

Risk scoring identifies those at risk and gives scope for early interventions and advice. Risk factors for lifestyle illnesses are on the rise even in rural areas of India. There is a female preponderance for the onset of risk factors. The younger age groups are showing an increase in the various risk factors.

Recommendations

The risk scoring was very useful in identifying those at risk and advising them to go for full scale investigations and treatment. This kind of approach can be done as a routine activity in the local Primary Health Center (PHC) and applied for all people above the age of 30 years. Those who were already known to have diabetes or hypertension need education about proper control of their illness. There is a need for regular educational programmes on life style related illnesses and their prevention and control. Regular exercise habit must be inculcated in the people. Life style changes/interventions and drugs are thecurrent strategies that exist to prevent or reduce theonset of diabetes.
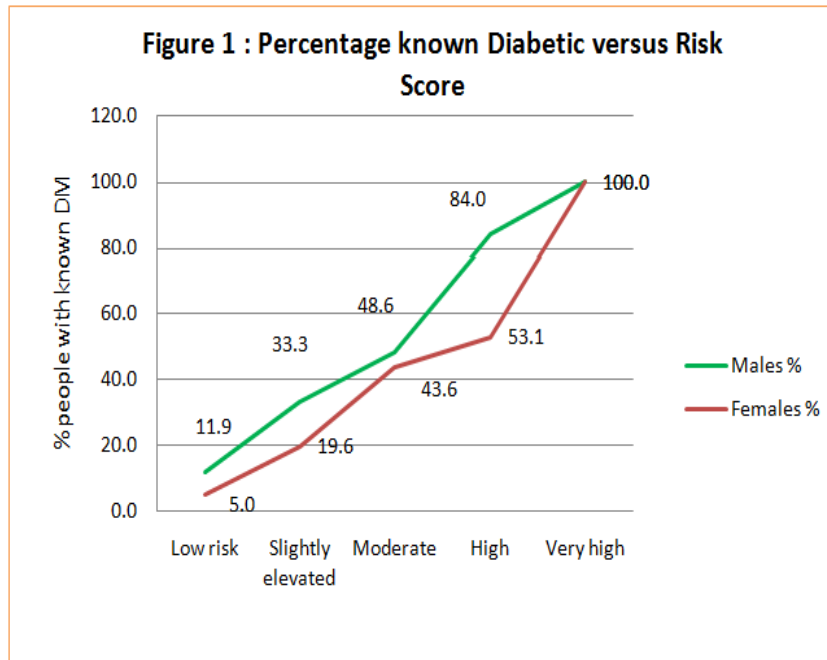
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Table 1: Finnish Diabetes Risk Score Assessment Tool

Finnish Diabetes Risk Score Assessment Tool	
Risk parameter	**Score**
Age (years)	
<45	0
45–54	2
55–64	3
>65	4
BMI (kg/m^2)	
<25	0
>25 to 30	1
>30	3
Waist circumference (cm) (measured below the ribs)	
Men <95; Women < 80	0
Men 94 to <102; Women, 80 to < 88	3
Men >102; Women >88	4
Use of blood pressure medication	
Not taken	0
Taken HTN drugs on regular basis	2
History of high blood glucose	
No	0
Yes	2
Physical activity - Daily exercise of at least 30 minutes	
Yes	0
No	2
Family history of diabetes	
No	0
Yes (Grandparent, aunt, uncle, first cousin)	2
Yes (Father, mother, brother, sister, own child)	5
Daily consumption of vegetables, fruits, or berries	

Everyday				0	
Not every day				1	
Table 2: FINDRISC Risk stratification SCORE Category in those not known to have DM					
Risk	**M**	**%**	**F**	**%**	**Total**	**%**
Low	35	36.1	18	16.7	53	25.9
Slightly elevated	40	41.2	45	41.7	85	41.5
Moderate	18	18.6	30	27.8	48	23.4
High	4	4.1	15	13.9	19	9.2
	97	100	108	100	205	100
Chi Square 14.57, p 0.002					

Figure 1 : Percentage known Diabetic versus Risk Score