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A Community Based Cross-Sectional Study to Assess the Risk for Type 2 Diabetes Mellitus in South Indian Rural Population Using Indian Diabetes Risk Score

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Abstract

Introduction: In a hugely populated country like India with over 1.2 billion people with diverse cultures, the screening and diagnosing methods for diabetes should be non-invasive, simple, cost-effective and less time-consuming. Indian Diabetic Risk Score (IDRS) developed by Dr V Mohan using four simple parameters, namely age, family history of diabetes, waist circumference and physical activity based on a multiple logistic regression model used to help identify undiagnosed diabetes in the community. **Objective:** To assess the risk for type 2 diabetes mellitus in South Indian rural population using Indian Diabetes Risk Score. **Methodology:** This community based cross-sectional study conducted in rural population covered by 3 Primary Health Centers (PHCs) namely Vantamuri , Handignur & Kinaye which are field practice areas of Dept of Community Medicine, Jawaharlal Nehru Medical college, KLE University, Belgaum-Karnataka to assess the risk for type 2 diabetes mellitus using IDRS. A total of 750 non-diabetic subjects aged 20 years and above were included in the study. The study Period was 1st August to15th November 2013. Data was collected using pre-tested questionnaire by house to house survey. **Results:** Out of 750 subjects recruited for the study, 53.33% of the participants belonged to PHC Vantamuri, 33.33% belonged to PHC Handignur and 13.34% belonged to PHC Kinaye. Nearly 50.5% were males and 49.5% were females. Among the study participants 21.8 % were doing regular exercise as well as strenuous work, 68.4 % were doing regular work / strenuous work and 9.8 % did not exercise and were sedentary workers. Out of 371 female participants, 46.9 % had waist circumference below 80 cm, 43.1 % had waist circumference between 80-89, and 10% had above 90 cm. Out of 379 male participants, 61.5 % had waist circumference below 90 cm, 32.5 % had between 90-99 and 6 % had above 100 cm. Out of 750 study participants majority (74.0%) had no family history of diabetes, 22.5 % had one parent as diabetic and 3.5 % of the people had both parents as diabetic. In this study 37 .1% of the study participants were at low risk, 37.7% were at moderate risk and 25.2 % were at high risk of developing diabetes. **Conclusion:** A diabetes risk score will help in devising effective screening strategies to unmask the hidden burden of the disease. The risk factor approach needs aggressive identification for planning prevention strategies and for an early diagnosis.

Keywords: Diabetes mellitus; Risk score; Physical activity; Family history; Abdominal obesity.

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Introduction

The health systems in many developing countries like India are not equipped to meet

the rising challenges of diabetes care and other non-communicable diseases (NCD). Type 2 diabetes mellitus (T2DM) accounts for approximately 90-95% of all types of diabetes worldwide.[1] The genetic susceptibility, overweight/obesity, physical inactivity, and a high-fat/low-fiber diet are major predisposing factors for explosion of T2DM.[2] According to the Indian Council of Medical Research-Indian Diabetes study (ICMR-INDIAB), a national diabetes study, India currently has 62.4 million people with diabetes[3] and estimated to rise to more than 100 million by 2030.[4] All the levels of prevention (primary, secondary and tertiary diabetes prevention) should be put into action to stop the tsunami of T2DM. Unfortunately, more than 50% of people with T2DM remain undiagnosed.[5] In a hugely populated country like India with more than 1.2 billion people with diverse cultures, the screening and diagnosing methods for diabetes should be non-invasive, simple, cost-effective and less time-consuming. The validated IDRS proved suitable in prediction of metabolic syndrome and cardiovascular disease in the South Indian population.[6] There are several strategies to assess the risk of developing diabetes in the population. This risk assessment plays a role in screening the population who are prone to develop diabetes in near future. This helps in promoting public awareness, prevention of the disease by pharmacological and non- pharmacological measures identifying the asymptomatic individuals, offering prompt treatment and preventing complications.

Materials & Methodology

Indian Diabetic Risk Score (IDRS) developed by Dr V Mohan is a simplified risk score (Table No. 1) for identifying the risk of developing diabetes in non-diabetic and identifying the undiagnosed diabetic patients using simple parameters like age, waist circumference, physical activity and family history of diabetes mellitus. Here the minimum score is 0 and the maximum score is 100. A score of 60 and above is considered to be positive and is an indicative for the risk of developing Diabetes in near future. IRDS is cost effective, involves simple non biochemical measurements and is easily applicable in a non-hospital setting. It can therefore be used as a simple first step in identifying the individuals with increased risk.[7]

This community based cross-sectional study was conducted in a rural population covered by 3 Primary Health Centers (PHCs) namely

Table 1: Indian Diabetes Risk Score (IDRS)

Risk factors	Score
Age	
<35 years	0
35–49 years	20
=50 years	30
Abdominal obesity	
Waist circumference female <80 cm, Male <90 cm	0
Female 80–89 cm, Male 90–99 cm	10
Female =90 cm, Male=100 cm	20
Physical activity	
Vigorous exercise or strenuous at work	0
Moderate exercise at work/home	10
Mild exercise at work/home	20
No exercise and sedentary at work/home	30
Family history	
Two non diabetic parents	0
Either parent diabetic	10
Both parents diabetic	20
Minimum score	0
Maximum score	100

Table 2: Distribution of Study Participants According to Place

P.H.C	No. of people	%
Vantamuri	300	53.33
Handignur	250	33.33
Kinaye	100	13.34
Total	750	100.00

Table 3: Age Group Wise Distribution of Study Participants

Age group (years)	IDRS Score	No. of subjects	%
<35	0	292	38.9
36-49	20	172	22.9
50 & More	30	286	38.2
Total		**750**	**100.0**

Vantamuri, Handignur and Kinaye which are field practice areas of Dept of Community Medicine, Jawaharlal Nehru Medical college, KLE University, Belgaum-Karnataka to assess the risk for type 2 diabetes mellitus using IDRS. Sampling frame was prepared based on census 2011 report and study population was obtained from these 3 PHCs in the ratio of 3:3:4 based the proportion of population. 750 non-diabetic subjects aged 20 years and above who are permanent residents of the respective rural area were included in the study. The study period was 1st August to 15th November 2013. House surgeons were trained for data collection and taking anthropometric measurements. Data was collected using pre-tested questionnaire by house to house survey. The research protocol was approved by the college ethical committee and informed consent was obtained from each subject prior to inclusion in the study. The details on age, family history of diabetes and physical exercise were collected. The abdominal obesity was measured by using a measuring tape at the mid-point below the lower rib cage and the highest point of the iliac crest. The measurements were taken with the subjects in minimum clothes and when they were breathing quietly at the end of their expirations. The markers of insulin resistance such as

Table 4: Sex Wise Distribution Study Participants

Sex of the patient	No. of patients	% of patients
Male	379	50.5
Female	371	49.5
Total	**750**	**100.0**

Table 5: Distribution Study Participants According to Degree of Physical Activity

Degree of physical activity	Score	no.of patients	%
Regular exercise + strenuous work	0	164	21.8
Regular exercise / strenuous work	20	513	68.4
No exercise or sedentary work	30	073	9.8
Total		**750**	**100.0**

Table 6.1: Distribution Female Study Participants According to Waist Circumference

Waist circumference in cm (female)	Score	no.of patients	%
<80	0	174	46.9
80-89	10	160	43.1
>90	20	037	10.0
Total		**371**	**100.0**

Table 6.2: Distribution Male Study Participants According to Waist Circumference

Waist circumference in cm (male)	Score	no.of patients	%
<90	0	233	61.5
90-99	10	123	32.5
>100	20	023	06.0
Total		**379**	**100**

Table 7: Distribution Study Participants According Family History of Diabetes

Family history of diabetes	Score	no.of patients	%
No history	0	555	74.0
One parent diabetic	10	169	22.5
Both the parents diabetic	20	26	03.5
Total		**750**	**100.0**

Table 8.1: Distribution Study Participants According Potential Risk Cases

Result	No. of patients	%
Positive	183	24.4
Negative	567	75.6
Total	**750**	**100.0**

Table 8.2: Distribution Study Participants According Potential Risk Cases

Risk score	No.of people	%
Up to 30 (Low)	278	37.1
30 -59 (Moderate risk)	283	37.7
> 60 (High risk)	189	25.2
Total	**750**	**100.0**

acanthosis nigricans were noted, the risk score was calculated. Subjects with an IDRS value of <30 were categorized as low risk, those between 30 and 50 as medium risk and those with e"60 as high risk for diabetes.

Statistical Analysis

The data collected was analyzed using SPSS 16.0 version. The frequency and proportions were used for data analysis. Test of significance for proportions was done by chi square test. 'P' value of < 0.05 was taken as statistically significant.

Results

This community based cross-sectional study was conducted in a rural population covered by 3 Primary Health Centers among 750 non-diabetic subjects aged 20 years and above from 1st August to 15th November 2013. Out of 750 subjects recruited for the study, 53.33% of the participants belong to PHC Vantamuri, 33.33% belong to PHC Handignur and 13.34% belong to PHC Kinaye. (Table 2) Further, 38.9 % of the population was below 35 years of age, 22.9 % of the population was between 36 – 49 years of age and 38.2 % of the population was 50 or more years of age (Table 3). Nearly 50.5% were males and 49.5% were females (Table 4). Among the study participants 21.8 % were doing regular exercise as well as strenuous work, 68.4 % were doing regular work / strenuous work and 9.8 % did not exercise and were sedentary workers (Table 5). Out of 371 female participants, 46.9 % had waist circumference below 80 cm, 43.1 % had waist circumference between 80-89, and 10 % had above 90 cm (Table 6.1). Out of 379 male participants, 61.5 % had waist circumference below 90 cm, 32.5 % had between 90-99 and 6.0 % had above 100 cm (Table 6.2). Out of 750 study participants majority (74.0%) had no family history of diabetes, 22.5 % had one parent as diabetic and 3.5 % of the people had both parents as diabetic(Table 7).In this study 37.1 % of the study participants were at low risk, 37.7% were at moderate risk and 25.2 % (Table 8.1&8.2)were at high risk developing diabetes. There is a significant association found between age and risk of prediabetes. As age increases there is increase score of IRDS which indicates person may land up in diabetes (table 9).

Table 9: Association between Age Group and Risk of Diabetes

Age group (years)	Positive Cases	%	Negative Cases	%
<35	009	4.92	283	49.91
36-49	031	16.94	141	24.87
50 & more	143	78.14	143	25.22
Total	**183**	**100**	**567**	**100.00**

X^2= 1777.34 DF =2 P < 0.001

Discussion

IDRS is a simple and cost-effective tool. It helps or a health worker or a primary care physician to identify at risk individuals for both diabetes and cardiovascular diseases. Out of 750 subjects recruited for the study, 400 study participants belonged to PHC Vantamuri, 250 belonged to PHC Handignur and 100 belonged to PHC Kinaye. There have only been three multicentre studies on the prevalence of diabetes in India. The earliest study reported a prevalence of 2.1% in urban and 1.5% in rural areas8.

In our study 37.1 % of the study participants

were at low risk, 37.7% were at moderate risk and 25.2 % at high risk of developing diabetes. The high prevalence of prediabetes is worrisome as this implies a huge population at risk of developing diabetes in the near future. With greater growth of the middle class, urbanization and ageing of the population, we can expect huge increases in the numbers of people with diabetes in India in the future.

Out of 750 study participants majority (74.0%) had no family history of diabetes, 22 .5 % had one parent as diabetic and 3.5 % of the people had both parents as diabetic. For family history of DM it was found that type 2 DM has a strong genetic component. The individuals with a parent with type 2 DM have an increased risk of diabetes; if both parents have type 2 DM, the risk approaches 40%9. So the rural population with family history of type 2 DM should be followed regularly every year for early diagnosis of prediabetes or type 2 DM.

Among the female study participants 10% and in male study participants 38.5% had waist circumference above 90 cm. It has shown that as the abdominal obesity increases the score also increases so it is important that they should be followed up every year screening for type 2 DM and advice should be given for reduction of abdominal obesity.

In this study among the study participants 21.8 % were doing regular exercise as well as strenuous work, 68.4 % were doing regular work/strenuous work and 9.8 % did not exercise and were sedentary workers. Major contribution to risk score was sedentary lifestyle which was seen in 78.2% study participants not doing any regular exercise other than daily routine activities. This is a big concern for future risk as without exercise they may get more obesity in future which in turn can lead to diabetes. So these participants should be given proper health education and are encouraged for doing physical activity like exercise.

Conclusion

Indian Diabetic Risk Score is user-friendly, simple, fast, economical and effective. It can be reliably applied as an effective screening tool for diabetes in the community. The score helps to identify the undiagnosed diabetes from the general population. Hence, the early identification of at risk individuals and appropriate intervention in the form of weight reduction, changes in dietary habits and increased physical activity could greatly help to prevent, or at least delay the onset of diabetes and thus reduce the socio-economic burden of India.

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