ORIGINAL ARTICLE

Validity of Indian Diabetes Risk Score (IDRS) in Population in and Around Agra

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Abstract

India leads the world with largest number of Diabetic subjects earning the dubious distinction of "Diabetic Capital of the world." Every 5th patients visiting a physician is diabetic. Epidemiological data from various parts of country show a rising prevalence of diabetes. India faces a grave health care burden due to high prevalence of Type-2 diabetes and its sequelae. The brunt of disease is that type 2 DM frequently remains undiagnosed until its complications appear. Early detection and prompt treatment may reduce the burden of disease and its complications. There is good evidence that screening tests help to detect type 2 DM early in the course of disease, however due to lack of high class, cost effective protocols, screening is yet not recommended. V Mohan et al created Indian Diabetic Risk Score to screen the population for diabetes through the CURES study based on population in Chennai[1]. We applied the same score to population in and around Agra to assess its validity as prevalence of diabetes has been found to be different in northern population and southern population of India.

Introduction

According to the 5th edition of Diabetes Atlas published by the International Diabetes Federation in 2011, India is only second to China in world for the number of people suffering from diabetes.[1] The number of people with diabetes in India was around 61.3 million in 2011 and will probably grow to 101.2 million by 2030 unless imperative preventive steps are taken. Early identification of at-risk individuals by simple screening tools like the Indian Diabetes Risk Score (IDRS) and appropriate lifestyle intervention would help in preventing or postponing the onset of diabetes and thereby reducing the burden on the community and the nation as a whole. Unluckily more than 50% of the diabetic subjects in India remain oblivious of their diabetes status and are left untreated and thus are more prone to develop microvascular and macrovascular complications which add to the disease load. Hence it is essential to detect the large pool of undiagnosed diabetic subjects in India and suggest early therapy to these individuals.

Aims and Objectives

To assess the validity of Indian diabetes risk score in population in and around Agra.

Objectives

1. To assess the prevalence of diabetes in study population by using IDRS and Fasting blood glucose.
2. To check the validity of IDRS by comparing the results of IDRS with direct blood glucose estimation.

Material and Methods

This study was conducted in post graduate department of medicine, Sarojini Naidu Medical College, Agra from July 2012 to Dec 2013.

Sampling unit

All individual's > 20 years of age willing to participate in study were included. The data for this study was obtained from individuals attending the outdoor clinics, indoor wards, and general population (attendants/ accompanying persons).

Exclusion Criteria

Severe co-morbid illness, steroid intake, known cases of diabetes.

Methodology

Verbal consent was taken from all individuals entering into the study. A written consent was taken from all the individuals who underwent fasting blood glucose estimation. Indian Diabetes risk Score was applied to all individuals. Then all individuals were tested for fasting (8 hr fasting) plasma glucose level using venous blood sample in Fluoride vial. Sample was sent to the lab and processed.

Diagnosis of diabetes is based on

American diabetes association 2007 criteria: Fasting blood glucose -126mg/dl.

Abdominal girth was measured at the mid-point between the lowest rib and the highest point of the hip bone (iliac crest) using a non-stretchable measuring tape. These data were obtained and validity of Indian diabetes risk score in predicting the risk of developing diabetes were assessed.

One examination sheet was made that included patient particulars, general examination, Risk Score and blood sugar estimation

All the person included in the study were subjected to history and evaluation and fasting blood sugar was taken.

Results

Out of total 550 subjects, 82 subjects had fasting blood glucose - 126mg/dl i.e. 14.9% subjects in the study population had diabetes.

After applying the measurements following table could be drawn that describes the number persons having the risk score and number of diabetics found among them

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Indian Diabetes Risk Score – IDRS

Particulars Score

1. Age [years]

Age	Score
<35	0
35-49	20
>50	30

2. Abdominal obesity [cm]

Waist size	Score
<80 in female, < 90 in male	0
80-89 in female ,90-99 in male	10
>90 in female, >100in male	20

3. Physical activity

Activity	Score
Exercise [regular] + strenuous work	0
Exercise[regular] or strenuous work	20
No exercise and sedentary work	30

4. Family history

Family history	Score
No family history	0
Either parent	10
Both parents	20

Higher IDRS cut off increased the specificity but decreased the sensitivity and lower IDRS cut off increased the sensitivity but decreased the specificity.

Discussion

Various diabetes risk scores have been formulated in other countries.

Jaana Lindström et al (2003) developed a risk score using the Age, body mass index (BMI), waist circumference, history of antihypertensive drug treatment and high blood glucose, physical activity, and daily consumption of fruits, berries, or vegetables as categorical variables. The Diabetes Risk Score value varied from 0 to 20. To predict drug treated diabetes, the score value D9 had sensitivity of 0.78 and 0.81, specificity of 0.77 and 0.76, and positive predictive value of 0.13 and 0.05 in the 1987 and 1992 cohorts, respectively.[3]

Charlotte Glümer et al (2000) developed a Danish diabetes risk score using age, sex, BMI, known hypertension, physical activity at leisure time, and family history of diabetes, items independently and significantly (P<0.05) associated with the presence of previously undiagnosed diabetes. The area under the receiver operating curve was 0.804 (95% CI 0.765–0.838) for the first half of the Inter99 population, 0.761 (0.720–0.803) for the second half of the Inter99 population, and 0.803 (0.721–0.876) for the ADDITION pilot study. The sensitivity, specificity, and percentage that needed subsequent testing were 76, 72, and 29%, respectively.[4]

Table 1: Categorization of patients according to the risk score and number of diabetics among them

Score greater than or equal to	Number of persons	Percentage of total subjects	Diabetics among them
10	548	99.6	82
20	524	95.2	82
30	480	87.2	82
40	418	76	70
50	302	55	62
60	153	24.2	38
70	43	7.8	13
80	4	.7	1

Timo Saaristo et al (2005) developed a Finnish diabetes risk score using the following parameters age, BMI, waist circumference, physical activity, daily consumption of fruits, berries or vegetables, account of antihypertensive drug treatment, history of high blood glucose, and family history of diabetes. Using the risk score cutoff value of 11 to identify undiagnosed diabetes resulted in a sensitivity of 66% in men and 70% in women. The corresponding false-positive rates were 31% in men and 39% in women. The proportion of the population to be screened with this cutoff value was approximately 12% of men and 15% of women. Increasing the cutoff value of the score to 15 changed the sensitivity to 30% and 38%, and the false positive rates to 9% and 15%, in men and women, respectively.[5]

Schulze MB et al (2007) developed a German diabetes risk score using he German Diabetes Risk Score included information on age, height, waist circumference, history of hypertension, physical activity, smoking, and consumption of red meat, whole-grain bread, coffee, and alcohol.[6,7]

However these scores cannot be applied on the Indian population as these score includes the dietary intake of fruits vegetables and berries as a parameter, the dietary profile in India is highly variable in different areas and dietary parameters cannot be generalized all over the country. Moreover the socioeconomic profile of the rural population precludes the use of fruits and berries as a regular component of their diet. Also the increased litracy and increased awareness about the health oriented lifestyle precludes the use of these scores on Indian population.

Table 2: Sensitivity, Specificity, Positive Predictive Value (NPV), Negative Predictive Value (NPV) calculated for each risk score category

Risk score	Sensitivity	Specificity	NPV	PPV	Accuracy
10	100	0.6	15.05	100	19.89
20	100	5.21	17.33	100	20.03
30	100	14.96	17.08	100	29.6
40	90	20.98	18.64	91.25	32.5
50	85.48	45.83	28.96	92.44	53.9
60	65.79	73.91	45.45	86.73	71.78
70	31	90.62	57.43	75.11	72.09
80	6.12	99.32	67.22	76.44	75.75

NPV: Negative predictive value; PPV: Positive predictive value

Thus a need was felt for developing an Indian diabetes risk scores which could be more practical taking in consideration the profile of Indian population.

The Indian diabetes risk score was formulated by V. Mohan et al (2005) through the CURES study conducted in Chennai. The CURES study conducted by V. Mohan et al (2005) in Chennai showed that Overall, 365 of the 2350 study subjects had 53 diabetes (overall prevalence: 15.5%, males:18.0%, females:13.4%) according to WHO criteria. An IDRS value of 60 detected 1008 subjects (42.8%) and had an optimum sensitivity (72.5%) and specificity (60.1%) for determining diabetes. The positive predictive value was 17.0%, negative predictive value, 95.1% and the accuracy, 61.3%. Another study conducted by S. Nandeshwar in Bhopal (2010) showed that Out of 250 subjects (2.80%) were in low risk, (28.40%) in moderate risk and (68.80%) were in high risk group as per the IDRS. No diabetic subject was observed in low risk group, 8.40% in moderate risk group and 51.16% were diagnosed as diabetes in the high risk. Taking a cut of value of IDRS as 60, detected 175 subjects (70%) with a sensitivity of 94.68%, specificity of 44.87%, PPV 50.85%, NPV of 93.33%.[8]

The National Urban Diabetes Survey (NUDS), a population based study conducted across India and studied 11,216 subjects aged 20 yr and above representative and demonstrated that the age standardized prevalence of type 2 diabetes was 12.1 per cent. This study also concluded that there was significant difference between prevalence of diabetes in northern India

(Delhi 11.6 %) and southern India i.e. 13.5 % in Chennai, 12.4 % in Bangalore and 16.6 % in Hyderabad. The study also showed that there was a large subset of population with impaired glucose tolerance (IGT), 14 % with a high risk of conversion to diabetes. Since this score was formulated by a study done on south Indian population we applied this score on Indian population in and around Agra and checked the validity of the same on this population.

Thus a need was felt to check the validity of this score in north Indian population. In our study the Indian diabetes risk score diagnosed diabetes subjects with sensitivity of 65.79%, specificity of 73.91%, PPV of 45.45%, NPV 86.73%, and an accuracy of 71.78% when the score is 60 and above.[8]

Conclusion

As per the study of V Mohan et al Indian diabetes risk score applies well to the south Indian population. We applied the same criteria for the population in and around Agra and found out the similar results. With our study it can be concluded that Indian Diabetes Risk Score can be applied as a screening test in our country regardless of the demographic variation in the prevalence of diabetes. Thus IDRS is a helpful tool for mass screening of the high risk individual of Diabetes. IDRS is simple to administer and its accuracy helps us to screen the diabetes in a bigger population. Use of this Indian Diabetic Risk score can craft mass screening for diabetes at grass root level more convincing and cost effective where laboratory resources are inadequate.

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