Original article:

Indian Diabetic Risk Score (IDRS): A novel tool to assess the risk of Type 2 Diabetes Mellitus

Dr Shobha M.V[1], Dr Deepali A[2]

[1]Assistant Professor, Department of Physiology, Sri Devaraj Urs Medical College, Kolar

[2]Assistant Professor,Department of Physiology,Sri Siddharatha Medical College,Tumkur

Corresponding author: Dr Shobha M.V

Abstract

Introduction: Diabetes is one of the leading cause for morbidity and mortality whose prevalence is increased worldwide especially in developing countries like India. More than 50% of the diabetic subjects in India remain unaware of their diabetes status, which adds to the disease burden.

Aim: To asses risk of developing Type 2 Diabetes Mellitus using Indian Diabetic Risk Score.

Methods and Material: This is a cross-sectional study conducted in 216 subjects in the age group of 20-40 yrs in Sri Siddhartha Medical College, Tumkur. In this study, risk assessment of Type 2 DM (T2DM) among general population was done using the Indian Diabetes Risk Score that includes age, exercise status, waist circumference, and family history of DM.Statistical analysis used: Statistical analysis was carried by SPSS ver 18. Mean and SD was estimated for descriptive statistics. ANOVA with Bonferroni posthoc analysis was carried out for comparison of parameters across three groups.

Results: The risk of developing T2DM increased with age across the risk scores. The prevalence of participants at high risk was 24%,moderate risk 56% and low risk was 16%.Anthropometric parameters like BMI,WC,WHR and WHtR was higher in high risk compared to low and moderate risk group

Conclusions: IDRS can be used to assess the risk and to formulate strategies for future preventive efforts and delay the onset of T2DM.

Keywords: Type 2 Diabetes Mellitus, Indian Diabetic Risk Score, obesity

Introduction

Type 2 Diabetes mellitus (T2DM) is one of the most common non-communicable significant health problems present globally. (1) The prevalence of type 2 diabetes mellitus (T2DM) is increasing worldwide. It is estimated that the number of diabetic subjects will rise to 366 million by year 2030, of which the large proportion of burden will be from developing countries, and an estimated of 79.4 million diabetics will be from India .The increasing modernization, sedentary lifestyle and unhealthy dietary habits in rural and urban India has taken its toll on the health of the general public, especially the youth. Most of the diabetic are in the age group of 30 -40 which has greater impact on social and economic cost on the country.(2) More than 50% of the diabetic subjects in India remain unaware of their diabetes status, which adds to the disease burden.(3)

Obesity, specifically abdominal obesity is a major trigger factor for insulin resistance. The insulin receptor signaling pathway is altered in the presence of excessive free fatty acids and inflammatory substances, which further leads to metabolic alterations that comprise metabolic syndrome. Metabolic syndrome has been detected in the younger age group with increasing rate.(4) Evidences suggest that premature detection of diabetes by suitable screening methods, especially in subjects with elevated risk for diabetes will help to intercept or delay the vascular complications and thus reduce the clinical, social and economic burden of the disease.(5)Thus we used Indian Diabetes Risk Score", (IDRS) developed by Mohan etal has a part of CURES study is a simple, cost effective tool in screening the high risk group. The major parameters of this tool include two modifiable risk factors like physical activity.

(6) Since the burden of diabetes is more and more than 50% it is not diagnosed, early identification of high risk individuals using IDRS would help to take appropriate interventions in the form of dietary changes and increasing physical activity thus helps to prevent or delay the onset of diabetes.

Material and methods

This is a cross sectional study done in general population of Sri Siddhartha Medical College Tumkur. The study population consists of total 216 subjects which includes both males and females in the age group of 20-40yrs.All the subjects were healthy and non diabetic. Institutional ethical clearance was obtained. Experimental protocol was explained and written informed consent was obtained. Subjects with history of hypertension, coronary heart disease, thyroid dysfunction, liver/renal disease and intake of corticosteroid and OCPs were excluded from the study

General information was obtained with regard to age, gender, educational qualification, socio economic status, tobacco consumption/smoking and alcohol intake. A detailed family history of diabetes was obtained by putting pedigree chart. Anthropometric measurements were carried out with minimal clothing without shoes. Weight in kilograms was measured using standard calibrated balance scale with sensitivity to the nearest 0.1 kg. Height in centimeters was measured against a non stretchable tape fixed to a vertical wall, with the participant standing on a level surface and it was measured to the nearest 0.5cm and BMI was calculated using formula weight in kg / height in m square. Waist circumference (WC) was measured with a non stretchable tape to the nearest 0 .1cm at the midpoint between the lowest rib and the iliac crest after normal expiration in standing position with feet together and arms by the side of the body. Hip circumference(HC) was measured with a non stretchable tape to the nearest 0.1 cm at the widest part of the hips usually this corresponds to the groin level for women and about 2-3 inches below the navel in men. Waist to hip ratio (WHR) was calculated by dividing waist circumference by hip circumference. Waist to height ratio (WHtR) was calculated by dividing waist circumference by height. Physical activity of the subject is assessed .

Indian Diabetic Risk Score was assessed based on the basic data obtained which compromises of two modifiable (Waist circumference and Physical activity) and two non modifiable risk factors (age and family history of T2DM). Waist circumference <80 cm for female and <90 cm for male scored as 0, WC >80-89 for females and >90-99cm for male score is 10 and WC >90 cm for female and >100cm for male scored as 20. The type of physical activity carried by subject is categorized and scored as vigorous exercise/strenuous (score =0), moderate exercise work/home (score=10), no exercise and sedentary work (scored=30). Scoring for different age groups is as follows, age < 30years , 35-49 years and more than 50 years is scored as 0, 20 and 30 respectively. Family history of T2DM scoring includes viz with no family history=0, positive family history in either parent =10 and both parent =10. Sum of all the scores gives IDRS which categorizes the risk for T2DM as follows i.e. <30 is low risk, 35-50-moderate risk and IDRS >60 is high risk. The subjects were categorized into three groups based on T2DM risk as per IDRS score. The data was compared between these three groups.

Statistics

Statistical analysis was carried by SPSS ver 18. Mean and SD was estimated for descriptive statistics. ANOVA with Bonferroni posthoc analysis was carried out for comparison of parameters across three groups

Results

The present study is a cross sectional study among healthy subjects (n=216) who were at risk for becoming diabetic as scored by Indian diabetic risk score viz., group 1(n=36,) -low risk (IRDS < 30), group 2 (n=126) -moderate risk (IRDS 35-50) and group 3 (n=54) - high risk (IRDS > 60) accounting for 16%, 56% and 24% respectively among the total subjects.

Age of the participants belonging to group 1 and group 2 were comparable, whereas, group 3 subjects were significantly (p=0.00) older than the other two groups [group 1 = 21.88±3.75 years, group 2 = 23.44±5,54 years, group 3 = 34.38 ±10.59 years, F (2,213)=54.12,p=0.00].The IRDS scores respectively were - group 1 - 14.72 ±8.1, group 2- 37.53±7.96 and group 3 - 64.81±10.04 and the scores increased linearly from group 1 to group 3 and was significantly (p=0.00) different, [F (2,213)=389.23,p=0.00] . Accordingly, group 1 were low risk, group 2 moderate risk and group 3 high risk category as per IDRS classification.

The mean and standard deviation of anthropometric measure of all the three groups is provided in Table 1. The high risk group weighed significantly (p=0.00) more than other two groups [F = (2,213) =31.69, p=0.00], however, the height of the all the three groups was comparable [F=(2, 213) =1.46,p=0.23]. Correspondingly, BMI also varied significantly across the three groups [F = (2,213) =27.72, p=0.048], the high risk group having significantly (p=0.02) higher index compared to other two groups. The waist circumference and hip circumference was significantly (p=0.00) more in the high risk group when compared to other two groups. The F value were (2, 213) =53.65, p=0.00 and (2, 213)=23.05,p=0.00 respectively for waist and hip circumference. Waist hip ratio [F=(2,213)=24.7,p=0.04] and waist height ratio [F=(2,213)=32.38,p=0.00] was also significantly (p=0.00) more in high risk group when compared to other groups. Thus, in summary about 80% of the individuals are at moderate to high risk for development of T2DM. Age and obesity increased linearly across the groups.

Table no 1: Comparison of Anthropometric parameters in relation to IDRS score

Variables	Group 1	Group 2	Group 3
Weight	54.66±12.19	56.99 ±12.50	71.46± 11.90[#]
Height	163.13±9.40	162.36±9.05	165.00±10.43
BMI	20.44±3.24	28.24±3.7[*]	37.24±6.0[#]
Waist Circumference	76.15±7.80	78.24±10.03	92.89±8.56[#]
Hip Circumference	92.65±6.28	94.90±7.75	102.54±8.74[#]
Waist hip ratio	0.82±0.04	0.82±0.06	0.90±0.08[#]
Waist height ratio	0.47±0.05	0.48±0.06	0.51±0.05[#]

Values are depicted in mean and SD, one way ANOVA with bonferroni post hoc test for multiple comparisons was applied. P < 0.05 is significant level. *comparison between group 1 and group 2, # comparison between group 2 and group 3.

Discussion

Indian diabetic risk score is the screening tool widely used to assess the risk of diabetes among general population. It is 72.5 sensitivity and 60.1% specificity in predicting diabetes. [3 7] In the cohort of present study, 56% had moderate risk (IDRS 30-60) and 24% were in high risk (IDRS > 60) category and the percentage of risk distribution in the present sample fits in statistics from large population reported elsewhere (8). Age and anthropometric measurements showed a significant linear increase with IDRS scores. This observation is quite logical as age and anthropometric measurements are important components for IDRS scoring. We have reported that the change in anthropometric variables precedes the changes in lipid among risk group who are healthy, non-diabetic (9) and the same trend was reported earlier linking modifiable risk factors like obesity and physical inactivity as risk for developing diabetes in the span of five years. (10) In our study the high risk group individuals weighed more compared to other groups. Studies have shown that obesity plays a major factor in the development of diabetes. Obesity and diabetes are interrelated and the term diabesity has been coined to describe the relationship between obesity and diabetes.(11) The progression from obesity to diabetes is made by a progressive defect in insulin secretion coupled with a progressive rise in insulin resistance, both can appear early in obese subjects and leads to early

108

development of the disease. The physiological mechanism linking obesity with diabetes is the adipose tissue especially the visceral fat that is deposited in the abdomen can alter the metabolism by increasing the release of proinflammatory markers, fatty acids, glycerol which decrease the sensitivity of insulin. This insulin insensitivity with failure of pancreas to release insulin together constitutes the development of T2DM.(12) In our study the high risk group's individuals were overweight and since obesity is a modifiable risk factor intervention in the form of physical activity and dietary restriction can prevent the early onset of the disease. Apart from obesity the other risk factors for type 2 DM are age, life style factors like sedentary life style, smoking and alcohol consumption and the most important risk factor is family history of type 2 dm which has a critical role in the development of the disease. (13) In our study the mean age of the individuals in high risk group is more compared to other two groups. Thus showing that as age increases the risk is more. Since age is a non modifiable risk factor we can prevent the diabetes only by altering the modifiable risk factors.

Studies show that obesity a major factor in the disease onset is closely related to unhealthy eating habits and sedentary life styles.(14) Our study shows that most of them in high risk group are practicing sedentary life style which adds on to obesity thereby leading to early onset of the disease. Thus implementation of exercise regimen and healthy eating habits can delay progression to the disease onset. The most important independent risk factor for the diabetes is family history. Studies have shown that the risk of developing the diabetes is increased with number of family members affected with the disease. There are studies showing that family history itself increasing the risk to 4-6 times.(13) Thus with family history and other above said risk factors can make individual at higher risk for the development of diabetes. Since family history is a non modifiable risk factor effort like reducing weight with intense physical activity form one of the most important strategies towards preventing the development of diabetes. Thus IDRS screening tool can be used to identify the subjects at risk of developing T2DM.

References

1. Ranadip C, Abhijit M, Saibendu KL. A study on distribution and determinants of Indian diabetic risk score (IDRS) among rural population of, West Bengal.National journal of medical research.2012;2:282.

2. Wild S, Bchir MB, Roglic G,Green A, Sicree R, King H. Global prevalence of diabetes. Diabetes care.2004; 27:1047–53

3. Sharma KM, Ranjani H, Nguyen H, Shetty S , Datta M, Venkat Narayan K etal. Indian Diabetes Risk Score Helps to Distinguish Type 2 from Non-Type 2 Diabetes Mellitus (GDRC-3).JDST 2011;5(2):419-25

4. Achuth KS ,Mangala S , Pradeep C, Mini J , Subrahmanyam G. Risk of Type 2 Diabetes Mellitus in Adolescents in a Medical College in Bangalore, India. International Journal of Scientific Study .2015;3:86-89

5. Tarun Bhatia T , Maitreyi Oka M, Vimisha DharamdasaniV , Sonalika Bhattaccharjee S , Gerhard Fortwengel G , Vaidehi Limaye V etal. Type 2 Diabetes Mellitus: Risk Evaluation and Advice in undergraduate students in Mumbai. International Journal of Pharmaceutical.2014; 4:37-40 .

6. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A Simplified Indian Diabetes Risk Score for Screening for Undiagnosed Diabetic Subjects. JAPI. 2005; 53:.759-63.

7. Stanley L, Elantamilan D, Mohanasundaram K , Kumaravel TS.Evaluation of Indian diabetic risk score for screening undiagnosed diabetes subjects in the community. Indian Journal of Science and Technology.2012;5(6):2798-99

8. Taksande B, l Ambade M, h Joshi R.External validation of Indian diabetes risk score in a rural community of centra.l India Journal of Diabetes Mellitus. 2012; 2:109-113

9. Shobha MV,Ravindra PN,Deepali A. Anthropometric changes preceed the changes in lipid profile among healthy young individuals with family history of type 2 diabetes mellitus. Indian Journal of Physiol and Pharmacol.2013; 57:337- 41.

10. Padaki S, Vijayakrishna K, Dambal A, et al.Anthropometry and physical fitness in individuals with family history of type 2 Diabetes mellitus: A comparative study. Indian Journal of Endocrinology and Metabolism. 2011;15:327-30.

11. Hetal Pandya H , Lakhani JD , Patel N. Obesity is becoming synonym for diabetes in rural areas of India also – an alarming situation. Int J Biol Med Res. 2011; 2(2): 556-560.

12. Kahn   SE,Hull   RL,Utzschneider   KM.Mechanisms   linking   obesity   to   insulin   resistance   and   Type   2   Diabetes Mellitus.Nature.2006;444:840-6.

13. Anjana RM, Lakshminarayanan S, Deepa M, Farooq S, Pradeepa R and et al. Parental history of type 2 diabetes mellitus, metabolic syndrome, and cardio metabolic factors in Asian Indian adolescents. Metabolism Clinical and Experimenta. 2009; 58:344–350.

14. Nyholm B, Nielsen MF, Kristensen K, Nielsen S, Østergard T and et al. Evidence of increased visceral obesity and reduced physical fitness in healthy insulin-resistant first- degree relatives of type 2 diabetic patients. European Journal of Endocrinology 2004; 150: 207–214.