



Risk Assessment of Type 2 Diabetes Mellitus Using Indian Diabetes Risk Score and Prevalence of High Risk Patients

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Abstract

Background

Diabetes is the most common endocrinological disorder globally and it will lead to life-threatening complications if not treated properly. Prevalence of type 2 Diabetes mellitus has increased drastically in India due to the changing lifestyle of the Indian population. The Indian Diabetes Risk Score (IDRS) is a

simple tool for estimating the risk for diabetes. The study aimed to assess the risk of type 2 Diabetes mellitus in study subjects using Indian Diabetes Risk Score and to estimate the prevalence of people at high risk for developing Diabetes.

Methods

A community based cross-sectional study was carried out using a predesigned questionnaire on 329 subjects aged above 18 years. IDRS of score <30 is categorised as low risk, 30-50 as medium risk and those with score >60 is categorized as high risk for diabetes.

Results

Out of 329 subjects, 155 subjects were under the high risk category, 115 subjects belonged to medium risk category and 59 subjects belonged to low risk category. The prevalence of people at high risk for developing type 2 diabetes mellitus in this study was found to be 471.1/1000.

Conclusions

The study data reveals that IDRS is a simple and cost-effective screening tool for the risk assessment of type 2 diabetes mellitus. The prevalence of people at high risk for developing type 2 diabetes mellitus in this study indicates the need for screening programs to identify the undiagnosed diabetic subjects.

Keywords

IDRS, Diabetes mellitus, Prevalence, Risk

Introduction

Diabetes mellitus is a group of metabolic disorders characterized by chronic hyperglycemia which results from defects in insulin secretion, insulin action or both. It is the epidemic of the century and without proper and early diagnosis at an early stage, diabetes will continue to increase rapidly all over the world [1].

India is the diabetic capital of the world, as it has the highest number of people living with diabetes. 6 Around 1 million people die from diabetes yearly in India, indicating the urgent detection of undiagnosed diabetic subjects in the country [2].

Indian Diabetes Risk Score (IDRS) developed by Mohan et al. at the Madras Diabetes Research Foundation, is a simple and validated tool to identify individuals with high risk of developing type 2 diabetes mellitus (T2DM) in the future and it can also be used to detect undiagnosed type 2 diabetes mellitus in the community. It consists of four risk factors- two modifiable risk factors and two non-modifiable risk factors. Waist circumference and physical activity are the modifiable risk factors and age and family history are the non-modifiable risk factors [3].

Table 1: Indian Diabetes Risk Score

CATEGORIZED RISK FACTORS	SCORE
Age (in years)	
<35	0
35-49	20
≥50	30
Abdominal obesity	
Waist circumference female <80cm, Male <90cm	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	12
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 parent diabetic	20
Total	100

Quality of life can be improved by diabetic screening using IDRS [5]. This screening tool has no cost and it is non-invasive and simple. These are the main advantages of this IDRS tool [4].

According to WHO, the prevalence of diabetes mellitus is 5.7%, with a slight difference between the women (5.9%) and men (5.5%).⁵Prevalence is more in low- and middle-income countries when compared to high-income countries. The increased prevalence of diabetes in developing countries is due to lifestyle changes like sedentary lifestyles and intake of foods that are high in sugar and fats [6].

Early identification of the individuals at high risk of developing diabetes helps in taking appropriate measures to prevent, or delay the onset of diabetes and its complications. The measures include lifestyle modifications like increasing physical activity and dietary changes. Hence, early detection of high risk individuals is extremely important to prevent type 2 diabetes in India [7].

This study was conducted for the risk assessment of type 2 diabetes mellitus using Indian Diabetes Risk Score (IDRS) and to find the prevalence of people with high risk for developing type 2 diabetes in our community.

Materials and Methods

Study Design and Setting

A community based cross-sectional study was carried out in Eraviperoor Gram-panchayat and Thiruvalla Municipality from Pathanamthitta District. The duration of the study was six months (January 2021- June 2021)

Sample size

The sample size has been calculated by the formula:

$$N = 4PQ / L^2$$

Where,

N=Sample size

P=Prevalence

Q=100-P L=Allowable error

Study criteria:

The study was carried out by considering the following criteria:

Inclusion Criteria:

- Age above 18 who are willing to participate in the study.
- Those who are not diagnosed with diabetes.

Exclusion Criteria:

- Those who are unwilling to participate in the study.
- Pregnant women and lactating mothers.
- Age below 18 years.

Study Questionnaire

Participants who are willing to participate and who have given informed consent were taken into the study and were asked to fill a semi-structured questionnaire to determine their risk of developing type 2 diabetes mellitus. The questionnaire was structured into 2 sections covering demographic data and the 4 categories of IDRS. The questionnaire was developed in English language.

Data Collection Procedure

The participants were asked to fill a semi-structured questionnaire in the form of a Google form to determine their risk of developing type 2 diabetes mellitus. Questionnaires were filled and data was collected. Two modifiable (waist circumference & physical activity) and two non-modifiable risk factors (age in years, family history) were used to obtain the score.

Data Analysis

The data was entered in Microsoft excel-2010 version and the results were presented in graphical and tabular

form as percentage and frequency.

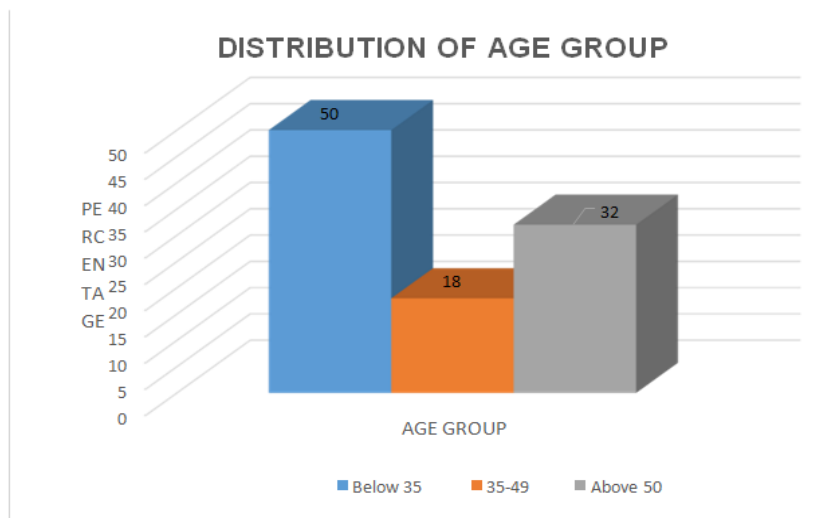
Ethical Considerations

The study was approved by the Institutional Review Board of Nazareth College of Pharmacy,

Results

Othera, Thiruvalla. Steps were taken to ensure confidentiality and privacy of the information provided by the participants.

Figure 1: Distribution of age group



The above graph reveals that the total population of 329 was divided into 3 groups based on their age, out of which the maximum respondents were from the age group below 35.

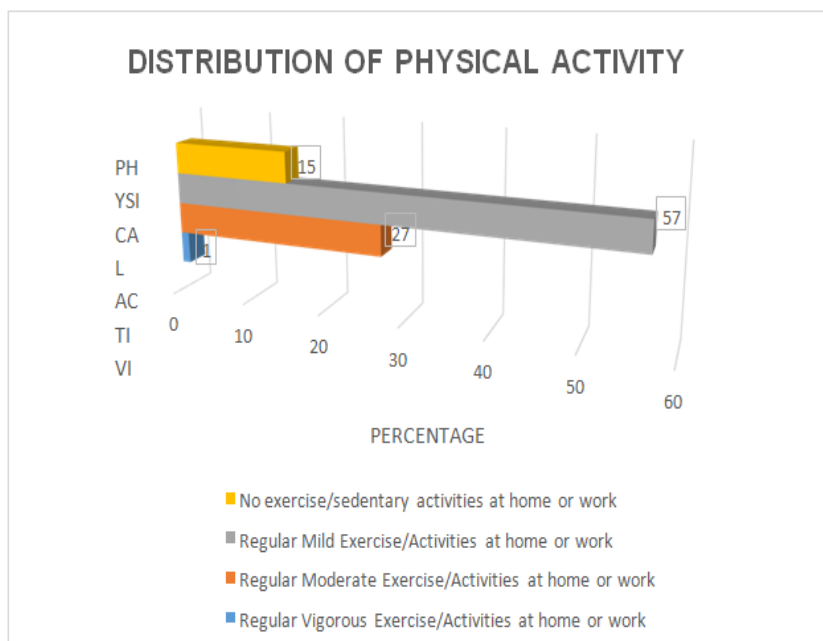
Table 2: Distribution of waist circumference in male and female

SL.NO	CATEGORY	WAIST CIRCUMFERENCE	NO. OF SUBJECTS	PERCENTAGE
1	Male	Less than 90 cm	17	11
		90-99 cm	74	47
		More than 100 cm	65	42
2	Female	Less than 80 cm	50	29
		80-89 cm	86	50
		More than 90 cm	37	21

The above table shows the distribution of waist circumference in males and females. In males, the waist circumference is divided into 3 groups: less than 90 cm, 90-99 cm and more than 100 cm. In females, it is divided into 3 groups: less than 80 cm, 80-89 cm and more than 90 cm. In this study, 11% of males had waist

circumference less than 90 cm, 47% of males had waist circumference between 90-99cm and 42% of males had waist circumference of more than 90 cm. In females, 29% of subjects had waist circumference less than 80 cm, 50% of subjects had waist circumference between 80-89 cm and 21% of subjects had waist circumference more than 90 cm.

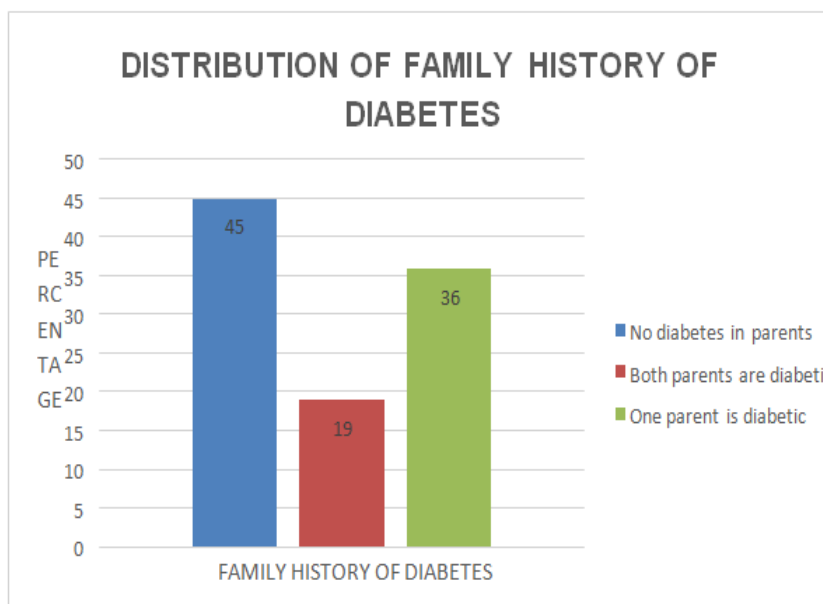
Figure 2: Distribution of physical activity



This graph illustrates that out of total study population of 329, 1% of them had regular vigorous exercise/ activities at home or work, 27% of them had moderate regular exercise / activities at home or

work, 57% of them had regular mild exercise / activities at home or work and 15% of them had no exercise/ sedentary activities at home or work.

Figure 3: Distribution of family history of diabetes



The above graph illustrates the distribution of family history of type 2 diabetes. Out of 329 total population, the parents of 45% of subjects had no

diabetes, both the parents of 19% of subjects had diabetes and 36% of them had one diabetic parent.

Table 3: Distribution of IDRS score

SL.NO	RISK	SCORE	NO. OF SUBJECTS	PERCENTAGE
1	Low Risk	Less than 30	59	18
2	Medium Risk	30-50	115	35
3	High Risk	Greater than or equal to 60	155	47
	Total		329	100

The total population is divided into 3 groups based on the Indian Diabetes Risk Score (IDRS) as low risk, medium risk and high risk. According to IDRS subjects with score less than 30 falls under the low risk category, subjects with score between 30-50 falls under the medium risk and subjects with score greater than or equal to 60 falls under the high risk category. Out of the total population, 18% of subjects had low risk for developing type 2 diabetes, 35% of subjects had medium risk and 47% had high risk for developing type 2 DM.

The prevalence of people at high risk for developing type 2 diabetes mellitus in this study was found to be 471.1/1000.

Discussion

This study was conducted among 329 subjects for the risk assessment of type 2 diabetes mellitus using IDRS and to estimate the prevalence of people at high risk for developing diabetes. The IDRS scoring system clearly indicates that the risk of development of

diabetes can be minimized by modifying the modifiable risk factors.

In this study, out of 329, 59(18%) were in the low risk, 115(35%) were in medium risk and 155 (47%) were in high risk category. Similarly, in the studies done by Mohan V et al in Chennai city, the study subjects in high risk group was 43% [7].

The majority of the subjects in our study were females(53%) as compared to males(47%) and similar findings were seen in study carried out by Choudhary et al [8].

Age is a non-modifiable risk factor of diabetes. This study showed that subjects with a high IDRS score were older in age when compared to those subjects with moderate and low IDRS scores. So our study implied that the risk of diabetes increases as the age increases. Similar findings have been revealed in a study conducted by Patil et al who found that risk of diabetes was significantly associated with increase in age [9].

Usually elderly people become physically less active as they age and they also have increased fat mass and decreased lean body. All these factors will lead to abdominal obesity[10]. Elderly people also have increased insulin resistance and they also show changes in insulin secretion due to their increased age and increased fat mass in their body [11]. The risk of diabetes increases with increasing waist circumference. Abdominal obesity is one of the modifiable risk factors for diabetes. In this study, abdominal obesity was seen in 63% of the subjects. A similar study conducted by Brinda et al reported abdominal obesity in 53.5% subjects [12]. This study also showed that waist circumference was lower in low risk subjects when compared to high risk subjects similar to the study conducted by Goblan et al[13].

Sedentary lifestyle increases the risk of development of diabetes. In this study, 15% of the subjects had a sedentary lifestyle, 57% of them had regular mild activities, 27% of the subjects had regular moderate activities and only 1% of the subjects had regular vigorous activity. Sedentary lifestyle leads to increased IDRS score and thus having an increased risk for developing diabetes [14,15].

In this study, 55% of the subjects had a positive family history of diabetes and 45% of the subjects had no family history. Diabetes is a hereditary disease and having a family history of diabetes increases the risk of developing this condition. If any one member in the family has diabetes, the risk of developing diabetes increases by 2.5 folds [16]. The present study reported that subjects who had a family history of diabetes were at high risk of diabetes. Also, a study conducted by Nagalingam et al reported family history of diabetes in 57.1% high risk subjects [17].

Conclusion

In the present study, majority of the participants were in medium and high risk categories based on IDRS scores. Both the non-modifiable risk factors and modifiable factors were found to have higher association with the risk. The study data reveals that IDRS is a simple and effective screening tool for the risk assessment of type 2 diabetes mellitus. By using IDRS, mass screening can be conducted for detecting undiagnosed diabetes in people at an early stage cost-effectively as it uses simple, inexpensive and safe measures. The prevalence of type 2 diabetes mellitus can be reduced by raising proper awareness regarding the lifestyle modifications and risk factors of disease to prevent or delay the disease occurrence. People above 25 years of age should undergo diabetic screening by using this simple screening tool called IDRS. Those who belonged to moderate and high risk categories based on IDRS scores were advised lifestyle modifications and dietary changes. Those who were in the low risk category were advised health promotion activities.

Declarations

The authors have no conflict of interest to declare that are relevant to the content of this article.

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References

1. Kharroubi AT, Darwish HM. Diabetes mellitus: The epidemic of the century. *World journal of diabetes*. 2015 Jun 25; 6(6):850.
2. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, Bhansali A, Joshi SR, Joshi PP, Yajnik CS, Dhandhanika VK. Prevalence of diabetes

- and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase I results of the Indian Council of Medical Research-IndiaDIABetes (ICMR-INDIAB) study. *Diabetologia*. 2011 Dec;54(12):3022-7.
3. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A simplified Indian Diabetes Risk Score for screening for undiagnosed diabetic subjects. *Journal of the Association of Physicians of India*. 2005;53:759-63.
 4. Singh MM, Mangla V, Pangtey R, Garg S. Risk assessment of diabetes using the Indian diabetes risk score: A study on young medical students from Northern India. *Indian journal of endocrinology and metabolism*. 2019 Jan;23(1):86.
 5. Diabetes mellitus- WHO. Available from <http://www.who.int>
 6. Hu FB. Globalization of diabetes: the role of diet, lifestyle, and genes. *Diabetes care*. 2011 Jun 1; 34(6):1249-57.
 7. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of Type 2 diabetes: Indian scenario. *Indian J Med Res*. 2007;125(3):217-30.
 8. Chowdhury R, Mukherjee A, Lahiri SK. A Study on Distribution and Determinants of Indian Diabetic Risk Score (IDRS) among Rural Population of West Bengal. *National J Med Res*. 2012;2(3):282-6
 9. Patil RS, Gothankar JS. Assessment of risk of type 2 diabetes using the Indian Diabetes Risk Score in an urban slum of Pune, Maharashtra, India: A cross-sectional study. *WHO South East Asia J Public Health* 2016;5:53-61.
 10. Amarya S, Singh K, Sabharwal M. Health consequences of obesity in the elderly. *Journal of Clinical Gerontology and Geriatrics*. 2014 Sep 1;5(3):63-7.
 11. Gong Z, Muzumdar RH. Pancreatic function, type 2 diabetes, and metabolism in aging. *International journal of endocrinology*. 2012 May 17;2012.
 12. Brinda P, Santosh A. A study to determine the hidden part of the iceberg of diabetes, using Indian diabetes risk score as a screening tool in rural population of Bangalore, Karnataka, India. *Int J Community Med Public Health*. 2016 Nov;3(11):3076-80.
 13. Goblan A, Mohammed A, Khan M (2014) Mechanism linking diabetes mellitus and obesity. *Diabetes, Diabetes MetabSyndrObes* 7: 587-591.
 14. Khan MM, Sonkar GK, Singh S, Sonkar SK. Importance of the Madras Diabetes Research Foundation-Indian Diabetes Risk Score (MDRF-IDRS) for mass screening of type 2 diabetes and its complications at primary health care centers of North India. *International Journal of Diabetes in Developing Countries*. 2019 Jul;39(3):419-25.
 15. Sarada V, Subbarayudu B, Rajyalakshmi C. Assessment of Diabetes Risk and the Factors Associated in Adult Population Using Indian Diabetes Risk Score: A Community Based Study in Coastal Andhra Pradesh. *Indian Journal of Public Health*. 2020 Mar;11(03):925.
 16. InterAct Consortium robert. scott@ mrc-epid. cam. ac. uk. The link between family history and risk of type 2 diabetes is not explained by anthropometric, lifestyle or genetic risk factors: the EPIC-InterAct study. *Diabetologia*. 2013 Jan;56:60-9.
 17. Nagalingam S, Sundaramoorthy K, Arumugam B. Screening for diabetes using Indian diabetes risk score. *Int J Adv Med*. 2016 May;3(2):415-8.