Annals of Community Health (AoCH) pISSN 2347-5455 | eISSN 2347-5714

An Indexed (Index Medicus, DOAJ and More), Peer Reviewed, Quarterly, International Journal focusing exclusively on Community Medicine and Public Health

ORIGINAL ARTICLE

Screening for Undiagnosed Diabetic Subjects Using a Simplified Indian Diabetic Risk Score in Warangal District of Telangana State

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ABSTRACT

Background: There is an increasing global prevalence of Type 2 diabetes in the adult population. This is associated with rapid urbanization, the combination of overweight and obesity, poor lifestyle behaviors, and limited opportunity for improving health status. Close to half of the people with diabetes in India are not aware of their disease status, and a large subset of these people is at risk of poor detection. Hence, this study aims at using the Indian Diabetic Risk Score (IDRS) to assess the risk of developing Type 2 diabetes in the urban field practicing area of Kakatiya Medical College, Warangal, Telangana. **Materials and Methods:** A cross-sectional study was done in Ursu, in the urban field practice area of Kakatiya Medical College, Warangal, during the period of January to September 2020. A total of 220 study participants were interviewed for the risk of developing Type 2 diabetes using IDRS. A semi-structured questionnaire was used to collect data on sociodemographic profile. Data were entered in MS-Excel sheet and statistical analysis was carried out using SPSS software version-19. **Results:** We found that most of the study participants had a moderate risk of developing Type 2 diabetes (low risk-29%, moderate risk-50%, and high risk-21%). Age, body mass index, occupation, physical activity throughout the day, and family history of diabetes were significantly associated with increasing risk of developing Type 2 diabetes in the future. **Conclusion:** The results show that urban population is more prone to sedentary occupation, increased BMI and decreased physical activity. Early identification of high-risk individuals by screening and early interventions would help in the prevention of diabetes and its complications.

Key words: Indian diabetes risk score, Type-2 diabetes mellitus, urban population

INTRODUCTION

The global prevalence of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population.[1] According to the IDF update of 2020, the prevalence of diabetes in adults is 8.9%.[2] In the Chennai Urban Rural Epidemiology Study, the prevalence of known diabetes was 6.1% in the population studied, and for undiagnosed diabetes was 9.1%. Many such studies have reported a high prevalence of undiagnosed cases.[3]

The risk of Type 2 diabetes is determined by the interplay of genetic and metabolic factors. Diabetes of all types can lead to complications in many parts of the body and can increase the overall risk of dying prematurely. Ethnicity, family history of diabetes, and previous gestational diabetes combine with older age, overweight and obesity, unhealthy diet, physical inactivity, and smoking to increase risk.[1] People with Type 2 diabetes are at increased risk of many complications, which are mainly due to complex and interconnected mechanisms such as hyperglycemia, insulin-resistance, low-grade inflammation, and accelerated atherogenesis. Coronaropathy, stroke, heart failure, retinopathy, diabetic foot, microangiopathy, and neuropathy are other complications. Emerging complication of Type 2 diabetes includes cognitive

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How to cite: Dharmakari V, Jha PK, Manisha D. Screening for Undiagnosed Diabetic Subjects Using A Simplified Indian Diabetic Risk Score in Warangal District of Telangana State. Ann Community Health 2021;9(2):302-306.

decline, sleep apnea syndrome, mood disorders, and bone metabolism impairments.[4]

Close to half of the people with diabetes in India are not aware of their disease status, and large subsets of these people are at risk of poor detection.[5] Early diagnosis of diabetes and pre-diabetes is important so that patients can begin to manage the disease early and potentially prevent or delay the serious disease complications that can decrease quality of life. Early detection and treatment of diabetes can help to reduce the risk of serious complications such as premature heart disease and stroke, blindness, limb amputations, and kidney failure.[6]

The number of people living with diabetes in urban areas is expected to increase to 628.6 million in 2045 due mainly to global urbanization. While there are many factors that are contributing to the global diabetes epidemic, the combination of overweight and obesity, poor lifestyle behaviors, and limited opportunity for improving health status are defining characteristics of urbanization and these factors are also intertwined with an increased risk for Type 2 diabetes. Although the government hospitals do provide minimal care for diabetes, it becomes difficult for some people to access free or subsidized diabetes care.[7] Identification of high-risk individuals by screening and early interventions would help in the prevention of diabetes and its complications.[8]

Indian diabetes risk score (IDRS), devised and developed by Mohan *et al*. at the Madras Diabetes Research Foundation, is a validated tool to identify individuals with a high risk of developing Type 2 diabetes mellitus (T2DM) in the future.[9] This study aims to estimate the risk of developing Type 2 diabetes among the adults living in Urdu, the urban field practicing area of Kakatiya Medical College (KMC), Warangal, Telangana and to identify high-risk population using IDRS.

MATERIALS AND METHODS

A community-based cross-sectional study was conducted among 220 participants in Ursu, the urban field practicing area of KMC, Warangal, Telangana, from January 2020 to September 2020. Informed consent was obtained from the participants, and approval from the Institutional Ethics Committee of Kakatiya Medical College was obtained before the commencement of the study. Adults who are 30 years of age and above, who are not known diabetics and who are willing to participate have been included in the study. People who are <30 years of age, who are known diabetics, and those who are not willing to participate in the study have been excluded from the study.

The sample size is calculated using the formula

$$n = Z^2 \times P \times Q/L^2$$

Following a pilot study done in Ursu, the urban field practicing area of Kakatiya Medical College, Warangal, prevalence of risk of developing Type 2 diabetes (P) was estimated to be 45%, Q = (1–P) = 55%, with acceptable error (e) of 10% and level of significance α = 5%, Z = 1.96 at 95% confidence interval and L (allowable error) = 15% of the prevalence, that is, 7 (L = 7).

By applying the formula n = 194 and by adding the non-response rate of 13%, that is, 26, we get the final sample size as 220 (194 + 26 = 220).

Therefore, the final sample size was n = 220.

Simple random sampling was done and the study subjects were recruited from the community accordingly. A validated IDRS scoring tool and a pre-designed, pre-tested, and semi-structured questionnaire were used for data collection. The data comprised sociodemographic variables and variables related to IDRS. Education and occupation status were classified as per the modified Kuppuswamy's method of social classification. The waist circumference was measured by following the WHO standardized method and body mass index (BMI) modified for the Asian population was used.[10,11] Definitions of vigorous, moderate, and sedentary activity have been taken from WHO steps to prevent NCDs.[12]

Data were entered in MS-Excel sheet and statistical analysis of data was carried out using SPSS version-19 and Chi-square test was applied to analyzed variables. $P < 0.05$ was considered as significant.

The IDRS components were scored as follows[13]

Variables		Score
Age in years		
<35 years		0
35–49 years		20
>50 years		30
Abdominal obesity		
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 activity at work		0
Moderate exercise at home or work		10
Mild exercise at home or work		20
No exercise and sedentary at home or work		30
Family history		
No diabetes in parents		0
One parent is diabetic		10
Both parents are diabetic		20

It is interpreted as follows:

Risk	IDRS score
High risk	≥60
Moderate risk	30–50
Low risk	<30

RESULTS

As seen from Table 1 that the study comprised of 220 study participants (132, 60%) of the subjects were males and (88, 40%) were females. The mean age of participants was 42.4 ± 1.61. The overall IDRS risk score was (45, 20.55%) of people had a high risk of developing T2DM in the future, while (110, 50%) had moderate risk and (65, 29.4%) had a low risk of developing T2DM in future. There is a higher risk of developing Type 2 diabetes among males compared to females. Economic status wise lower middle class (25.90%), literacy status wise literate (66%), family history wise-71% people have one parent diabetic, physical activity-wise most of the study subjects belong to moderate physical activity (50.7%). Occupation wise unskilled (31%) study subjects are more.

As seen from Table 2 that most of the study subjects have a moderate risk (50%) to develop diabetes in future followed by low risk (29.45%) and high risk (20.55%) to develop diabetes in the future, according to IDRS scale.

It was observed from Table 3 that the age, occupation, BMI, family history, and physical activity of the study participants have a significant association with the IDRS. Physical and family history highly significant in this study ($P < 0.001$), Occupation and BMI also show significance ($P < 0.05$) in this study.

DISCUSSION

In our study, we used the IDRS risk score to identify individuals with a high risk of developing T2DM. The study participants with low risk were 29%, moderate risk was 50%, and 21% had high risk. When we compare this to a study done by Nittoori and Wilson,[7] majority ($n = 101$, 74.3%) were at a high risk of developing T2DM followed by 23.5% ($n = 32$) at moderate risk and only 2.2% ($n = 3$) were at low risk. Another study also showed that majority of the study population under high risk for developing T2DM.[14] In another study done by Oruganti *et al*.[15] found that 28 (7.0%) of them had a low risk of developing DM; most of them, that is, 252 (63.0%) were in the moderate risk category, and 120 (30.0%) of them were in the high-risk category.

In our study, males were found to be at a higher risk (21.20%) of developing T2DM compared to females (19.30%) and we found no significant association between gender and IDRS. Similarly, a study done by Singh *et al*.[8] found that females were to be at a higher risk but no significant association between gender and IDRS has been found.

In the present study, participants <35 years were 15.4%, 35–49 years were 48.3% and >50 years were 36.3% and risk of diabetes increases with age and there was a significant association between age and IDRS. Similarly, in a study conducted by Dudeja *et al*.[16] also found a significant association ($P < 0.01$) between age and IDRS.

Table 1: Demographic characteristics of study participants

Demographic characteristics	Frequency	Percentage
Gender		
Male	132	60
Female	88	40
Socioeconomic status		
Upper class	22	10
Upper middle class	48	21.81
Middle class	66	30
Lower middle class	57	25.90
Lower class	27	12.27
Literacy status		
Illiterate	75	34
Literate	145	66
Occupation		
Unemployed	13	6
Unskilled	68	31
Semi-skilled	38	17
Skilled	24	11
Housewife	77	35.0
Body mass index		
<18.5	43	19.5
18.5–22.9	90	41.1
23–24.9	68	30.8
≥25	19	8.6
Family history		
No diabetes in parents	25	11.4
One parent is diabetic	156	71.0
Both parents are diabetic	39	17.6
Physical activity		
Strenuous	44	19.8
Moderate	112	50.7
Sedentary	65	29.4

Table 2: Distribution of Indian diabetes risk score among study participants

High risk (≥60)	Moderate risk (30–50)	Low risk (<30)	Total
45 (20.55%)	110 (50%)	65 (29.45%)	220 (100%)

Table 3: Association of demographic characteristics with Indian diabetic risk score

Variable	High risk (%) (≥60)	Moderate risk (%) (30–50)	Low risk (%) (<30)	Total (%)	*P*-value
Age					
<35 years	1 (3)	16 (46)	17 (51)	34 (15.4)	*P*<0.001*
35–49 years	26 (24.9)	77 (73)	2 (2.2)	106 (48.3)	
>50 years	52 (64.6)	24 (29.4)	5 (6)	80 (36.3)	
Gender					
Male	37 (21.20)	67 (50.75)	28 (28.05)	132 (60)	*P*>0.05
Female	28 (19.30)	43 (48.80)	17 (31.90)	88 (40)	
Socioeconomic status					
Upper class	5 (2.27)	11 (5)	6 (2.72)	22 (10)	*P*>0.05
Upper middle class	10 (5.54)	24 (10.9)	14 (6.36)	48 (21.81)	
Middle class	14 (6.37)	33 (15)	19 (8.63)	66 (30)	
Lower middle class	12 (5.45)	28 (12.7)	17 (7.71)	57 (25.90)	
Lower class	06 (2.7)	13 (5.9)	8 (3.63)	27 (12.27)	
Literacy status					
Illiterate	32 (42.9)	17 (23)	26 (34.1)	75 (34)	*P*>0.05
Literate	76 (52.5)	38 (27.5)	29 (20)	145 (66)	
Occupation					
Unemployed	7 (54)	2 (15)	4 (31)	13 (6)	*P*<0.05*
Unskilled	21 (31.3)	40 (59)	7 (9.7)	68 (31)	
Semi-skilled	2 (5.5)	23 (60)	13 (34.5)	38 (17)	
Skilled	2 (8.6)	12 (47.6)	10 (43.8)	24 (11)	
Housewife	47 (60.9)	19 (25)	11 (14.1)	77 (35)	
Body mass index					
<18.5	8 (19.4)	15 (34)	25 (58)	43 (19.5)	*P*<0.05*
18.5–22.9	38 (42.1)	16 (17.9)	36 (40)	90 (41.1)	
23–24.9	47 (68.6)	16 (23.7)	5 (7.7)	68 (30.8)	
≥25	14 (71.9)	4 (19.1)	2 (9)	19 (8.6)	
Family history					
No diabetes in parents	6 (25.6)	17 (68)	2 (6.4)	25 (11.4)	*P*<0.001*
One parent is diabetic	42 (27)	97 (62)	17 (11)	156 (71)	
Both parents are diabetic	28 (72)	7 (18)	4 (10)	39 (17.6)	
Physical activity					
Strenuous	13 (28.9)	13 (30)	18 (41.1)	44 (19.8)	*P*<0.001*
Moderate	85 (75.4)	15 (12.5)	13 (12.1)	112 (50.7)	
Sedentary	57 (87.5)	5 (7.5)	3 (5)	65 (29.4)	

In our study, there were 35% housewives, 31% unskilled workers, 17% semi-skilled workers, 11% skilled workers, and 6% unemployed. There was a significant ($P < 0.05$) association between occupation and increased score for IDRS. According to BMI, there were 19.5% of subjects were underweight, 41.1% belonged to normal BMI, 30.8% were overweight, and 19% were obese. There was a significant ($P < 0.05$) association between BMI and IDRS. Similarly, in previous studies, overweight and obesity constituted important risk factors for diabetes and were assessed using BMI categories. Moreover, 36.5% of them were obese, 23.0% of them were overweight, 33.0% of them had normal weight, and 7.5% of them were underweight and showed a significant association between BMI and IDRS,[15,16]

In our study, family history has a significant association with IDRS. About 71% of the participants had one parent with diabetes, 17.6% had both diabetic parents, and 11.4% had non-diabetic parents. Similarly, in a study conducted by Gore[17] statistically significant association was found between IDRS and family history of DM among parents.

In our study, 58% of study participants had a moderate level of physical activity, 29.4% were sedentary, and 19.8% did

strenuous activities. There was a significant association ($P < 0.05$) between IDRS and physical activity. In a study conducted by Dasappa *et al*.[18] revealed the odds of developing pre-diabetes were 1.4 times more among those who were above the age of 45 years and 1.5 times more in those who were physically inactive. Other studies by Acharya *et al*.[19] and Patil and Gothankar[20] have also shown an association of IDRS with education level, socioeconomic status, and gender, but such an association was not found in our study.

CONCLUSION

This study estimates the usefulness of simplified IDRS for identifying undiagnosed high-risk diabetic subjects in India. This simplified diabetes risk score has categorized the risk factors based on their severity. Use of IDRS can make mass screening for undiagnosed diabetes in India more cost-effective. In our study, the overall risk for developing Type 2 diabetes was higher in males than females. The study had a higher prevalence among participants with moderate risk. 29% had low IDRS, 50% had moderate and 21% had high risk. There is an increased risk in participants with a more sedentary occupation, less physical activity throughout the day, with a family history of diabetes, and increased BMI. The association was significant.

Recommendations

Rapid changes in lifestyle in India following economic growth and improvement of standards of living with an inclination towards Western culture has led to a dramatic rise in the burden of T2DM and various other non-communicable diseases. A significant issue is the unawareness of the population regarding their diabetes status. Early detection of the risk of diabetes by periodic screening and appropriate behavioral change communication for adopting a healthy lifestyle might control the diabetes crisis of the country in the future.

CONFLICTS OF INTEREST

There are no conflicts of interest.

SOURCE OF FUNDING

Nil.

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