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Using Indian Diabetes Risk Score to Identify Adult Women at Risk for Diabetes

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Abstract

India is emerging as the diabetes capital therefore there is a need for early diagnosis of diabetes. This study was conducted to identify risk of diabetes in women using Indian Diabetes Risk Score (IDRS). Seven hundred and fifty women between 21-40 years participated in the study. Socio-economic status of subjects was determined using the modified Kuppuswamy scale. Information about age, family history and physical activity was also obtained from the women. Waist circumference was measured. According to IDRS, a score was given to each risk factor and final score was calculated. According to the score, 28% subjects were at high risk, 70.9% were with moderate risk and only 1.1% was at a low risk of diabetes. Women who were at a low risk of diabetes had normal waist circumference. IDRS score had a significant correlation with waist circumference. The score was significantly higher for subjects in the older age group. Sedentary women had significantly higher IDRS score compared to moderate activity women. The study suggests that early diagnosis of Diabetes is necessary. Early diagnosis of diabetes will help people to tackle body weight with an appropriate diet and physical activity, thereby improve health.

Key words: Diabetes; IDRS; Obesity; Physical activity; Family history of diabetes; Age

Introduction

Prevalence of diabetes in the world has increased from 180 million people in 1980 to 425 million people in 2017. India is said to be the capital of diabetes with 72.9 million people living with diabetes. By 2045 prevalence of diabetes is expected to increase to 134.3 million [1]. ICMR study reported that in Maharashtra 6 million people are diabetic and 9.2 million are pre-diabetics. An urban survey conducted across metropolitan cities reported that prevalence of diabetes in Mumbai is 9.3% [2].

In India, 42.2 million people were undiagnosed diabetics. There is a need for early diagnosis of diabetes. Early diagnosis of diabetes or pre-diabetes helps people to manage their blood glucose levels effectively. Monitoring blood glucose levels will help prevent complications of diabetes. Early detection of diabetes will be helpful for patients as they can start with appropriate treatment of diabetes.

Indian Diabetes Risk Score helps in diagnosis of risk of diabetes. This score was developed by Dr. V. Mohan in 2005 [3]. Diabetes has several risk factors such as age, family history of diabetes, abdominal obesity, physical inactivity, high blood pressure, unhealthy eating, smoking, having history of gestational diabetes etc. The four important risk factors of diabetes- age, family history, physical activity and abdominal obesity are considered in IDRS. It is simple, cost effective and easily applicable. Therefore this study was conducted to identify the risk of diabetes in 21-40 years women in Mumbai by using Indian Diabetes Risk Score.

Method

Seven hundred and fifty women between 21-40 years of age from Mumbai belonging to various socio-economic categories were included in the study. Subjects were selected by snow ball sampling method from different housing societies and work places in Mumbai. These subjects were divided into two groups- 21-30 years of age and 31-40 years of age.

Inclusion Criteria

Women who were not already identified as diabetics were included in the study. And women with age more than 21 and less than 40 years were included in the study.

Exclusion Criteria

Subjects who were already diabetics were excluded from the study. Also, women with age less than 21 years and above 40 years were excluded from study.

Data collection

Data was collected by using a questionnaire. A detailed purpose of study was explained before asking any question to participants and their consent was also obtained. The interview with each subject took minimum 20 minutes. The questionnaire included general information, socio-economic status and IDRS risk factors.

Socio-economic status was assessed by using the modified Kuppuswamy Scale updated for 2018 [4]. The Kuppuswamy scale included occupation, education of the head of family and monthly income of the family. Total socio-economic score was calculated for each subject. According to the score they were divided into upper, upper middle, lower middle, upper lower and lower class.

IDRS risk factors included age, family history of diabetes, abdominal obesity and physical activity. Abdominal obesity was obtained by measuring waist circumference, recorded by using WHO guidelines. For assessing physical activity, a questionnaire was prepared using the WHO physical activity questionnaire as a guideline (WHO, GPAQ). The questionnaire included questions about various activities categorized as vigorous, moderate and sedentary activity. After collecting all information the IDRS score was calculated **(Table 1)** shows Indian Diabetes Risk Score. With the obtained score, subjects were categorised into low, moderate and high risk of diabetes. A score of <30 indicates low risk of diabetes, score 30-50 indicates moderate risk of diabetes and score > 60 indicates high risk of diabetes.

Statistical analysis

SPSS version 22 was used to conduct appropriate statistical tests.

Results

Out of 750 women, 401 women were in the 21-30 years age group and 349 in 31-40 year age group. The mean age of subjects was 30.22 years. In this study, majority women were housewives (63. 2%) belonging to upper and lower middle socio-economic class (71.7%). Family history of diabetes was seen in 25.7% women. Out of that 10% subjects had a diabeticmother, 12.5% had a diabetic father and 3.1% had both parents suffering from diabetes. Maximum of the subjects (97.9 %) had a sedentary lifestyle and only 2.1% were involved in moderate activity. More than half women had high waist circumference (53.7%) and the rest had a normal waist circumference. According to IDRS score, 8 women (1.1%) were at low risk, 532 women (70.9%) were at moderate risk and 210 women (28 %) were at high risk of developing diabetes. Table 2 shows distribution of subjects in IDRS categories.

There was a significant difference between age groups and IDRS categories (χ2= 205.513, p= 0.000). The lower age group had fewer at high risk (6.20%), however in the higher age group more than 50% were at a high risk of diabetes. This suggests that risk of diabetes increases with age. There were 49% women who had a family history and were at high risk of diabetes. A little less than 20% had a family history of diabetes and they were at moderate risk of diabetes.

In subjects who were in the high risk category, 99.5% women had sedentary lifestyle and only 0.5% women were involved in moderate physical activity. There was a significant difference between physical activity and IDRS score (χ2=371.465, p= 0.000). Among the high risk category women, 91% had high waist circumference and only 9% women had normal waist circumference.

In the moderate risk category, 60.2% women had normal waist circumference and all women who were at low risk of diabetes had a normal waist circumference. The differences between waist circumference and IDRS score were significantly different in the risk categories (χ2=167.554, p=0.000) **(Table 2)**.

Socio-economic status plays an important role in development of non-communicable diseases like diabetes. In this study, risk of developing diabetes among different socio-economic groups were studied and it showed a significant difference between IDRS score and socio-economic status (χ2= 22.352, p= 0.001). In the upper lower group, 22% women were at moderate risk and 24.3% women were at high risk of diabetes. Among lower middle group, 37.4% women were at moderate risk and 32.4% women were at high risk of diabetes. There were no women with a low risk of diabetes in the upper lower and lower middle group. In the upper middle group, 62.5% women had low risk, 34.8% had

Table 1: Indian Diabetes Risk Score.

Particulars	Score
Age (years)	
<35	0
35-49	20
≥ 50	30
Abdominal obesity	
Waist <80 cm (female), <90 cm (male) [reference]	0
Waist ≥ 80-89 cm (female), ≥ 90-99 cm (male)	10
Waist ≥ 90 cm (female), ≥ 100 cm (male)	20
Physical activity	
Exercise [regular] + strenuous work [reference]	0
Exercise [regular] or strenuous work	20
No exercise and sedentary work	30
Family history	
No family history [reference]	0
Either parent	10
Both parents	20

Table 2: Distribution of Subjects in IDRS category and Parameters of IDRS Risk Factors.

Parameters	Low risk (n= 8)	Moderate risk (n= 532)	High risk (n=210)	χ2, p
Age				
21-30 years	2%	91.80%	6.20%	χ2= 205.513
31-40 years	0%	47%	53%	p= 0.000
Family history of diabetes				
Yes	0%	17%	49%	χ2=84.135
No	100%	83.1%	51%	p= 0.000
Physical Activity				
Moderate activity	100%	1.3%	0.5%	χ2= 371.465
Sedentary activity	0%	98.7%	99.5%	p= 0.000
Waist circumference				
Normal (<80 cm)	100%	60.2%	9%	χ2= 167.554
High (>80 cm)	0%	39.8%	91%	p= 0.000

moderate risk and 38.6% had high risk of diabetes. In upper SES group, 37.5% women were at low risk, 5.8% at moderate risk and 4.8% were at high risk of diabetes.

When age groups were compared, there was significant difference between age and risk categories (F= 207.553, p= 0.000). Women with high risk were much older in age followed by moderate risk and low risk (Low =21.88 ± 1.12^{a} years, Moderate = 28.02 ± 5.24^{b} years and High= 36.11 ± 4.44^{c} years). When IDRS was compared between the two age groups, IDRS score was significantly higher for subjects in the older age group (F= 393.934, p= 0.000). As the risk of diabetes increases with increased age, IDRS score may be higher in older subjects in this study.

Waist circumference (WC) was significantly lower in low risk subjects compared to high risks subjects. There was no significantly difference between low and moderate risk and moderate and high risk categories. A significant positive correlation was observed between IDRS and waist circumference (r= 0.649, p=0.000).

In the present study, IDRS score was compared between women involved in sedentary and moderate physical activity and there was a significant difference observed between them (F=22.580, p= 0.000). Sedentary women had a significantly higher IDRS score (46.83 ± 15.10) compared to moderate activity women (28.75 ± 12.04)

Discussion

The present study was conducted with 750 subjects between 21-40 years of age. Most of the studies conducted earlier had a lesser sample size [5]. Only, conducted their study with a sample size of 850 subjects. In the present study, only 1.1% subjects reported a low risk of diabetes. Similar findings were reported by who reported 2.8% subjects at low risk of diabetes [6].

The observation of 70.9% subjects being at moderate risk of diabetes is close to the study of who reported 67.7% having moderate risk of diabetes. Similarly, another study conducted by found 74.7% subjects who had moderate risk of diabetes and who reported 73.19% subjects with moderate risk of diabetes [7, 8].

In the present study, 28% subjects were at a high risk of diabetes also reported their study where 24.5% subjects were at high risk [9]. Also in the study 31.5% subjects were at high risk of diabetes and too have reported high risk of diabetes in 22% and 24% subjects respectively [10-12].

Overall this study had 98.9 % subjects with a moderate to high risk of diabetes. This is an alarming figure. In 2010, a study conducted had reported similar findings with 97.2% subjects at moderate to high risk of diabetes. The results of our study suggest that after 8 years, the risk of diabetes in India continues to increase. India being a developing country has seen a lot of development in the past years. People from rural areas are migrating to towns and cities in search of employment leading to rapid urbanization. Thus there are major changes in the diet and lifestyle of people. It has been noticed that consumption of traditional Indian food has decreased among people and consumption of convenience foods, street foods and packaged foods has increased.

Sedentary lifestyle has increased today. Due to rapid development and advanced technology use of the mobile phones and laptops has increased. Using phone and laptops for longer hours leads to sedentary activity. Also, now a day's people walk less and use a private or public transport system to travel.

Age is a non-modifiable risk factor of diabetes. As age increases, risk of diabetes increases. The present study reported that women with high risk of diabetes were much older in age compared moderate and low risk women. Similarly study also reported that subjects with a high IDRS score were older in age compared to those with low and moderate IDRS score. This supports the fact that risk of diabetes increases with increased age. Older age people become physically less active. They also have decreased lean body mass and increased fat mass, which may increase the risk of developing abdominal obesity [13]. Due to obesity and age older people may show changes in insulin secretion and increased insulin resistance [14].

Diabetes is hereditary and a family history of diabetes increases the risk of developing diabetes. If any one member in family has diabetes, the risk of developing diabetes increases by 2.5 folds. Having diabetes in 2 or 3 family members is associated with a higher risk of developing diabetes [15]. The present study reported a family history of diabetes in 25.7% women. A study in Chennai and reported that, out of three hundred and four participants, 25% had family history of diabetes. Similarly a study in Kerala with 1645 subjects over 18 years reported family history of diabetes to be 24.2% in subjects. The present study reported that 49% women who had a family history of diabetes were at high risk of diabetes. Also study in Pune reported family history of diabetes in 57.1% high risk subjects [16-18].

Physical inactivity increases the risk of development of diabetes. Physical activity benefits in many ways, it reduces body fat, increases muscle mass, helps in maintaining weight, reduces the risk of obesity, relives stress and tension [19]. Remaining physically active will prevent or delay the development of diabetes. A study showed that women who were physically inactive had two and half times higher risk for developing of diabetes compared to women who were involved in vigorous activity [20]. A study in Karnataka reported that subjects with high risk of diabetes had sedentary lifestyle. Another study reported most women in their study were physically inactive. ICMR-INDIAB study reported that 83.2% women were physically inactive in Chandigarh, 55.3% in Jharkhand, 68.5% in Maharashtra and 77.4% in Tamil-Nadu [21]. In this study, majority women had a sedentary lifestyle and a higher IDRS score was seen in sedentary women compared to those with moderate activity.

Waist circumference is an indicator of abdominal obesity and abdominal obesity is one of the risk factors for diabetes. In this study, abdominal obesity was seen in 53.7% women and 91% women with high waist circumference were at high risk of diabetes. Similarly study in Karnataka reported abdominal obesity in 53.5% subjects [22]. In a study by in Pune it was reported that 51.4% subjects had high waist circumference. They also found that 55.8% high risk subjects, 42.1% moderate risk subjects and 2% low risk subjects had high waist circumference. This indicates that risk of diabetes increases with increasing waist circumference.

This study reported significantly lower waist circumference in low risk subjects compared to high risk subjects. Similar findings were reported. Abdominal obesity increases the risk of type 2 diabetes mellitus by increasing the insulin resistance. Insulin resistance is important factor in development of type 2 diabetes mellitus [23]. Also visceral adipocytes release pro-inflammatory cytokines which increases insulin resistance and also causes beta cell dysfunction [24]. Thus there is an increased risk of diabetes with increase in abdominal obesity.

In this study IDRS score was negatively correlated with socio-economic status. This indicated that IDRS score increased in low socio-economic groups. Education increases awareness. The influence of education and awareness on dietary choices is more than that on physical activity. Physical activity patterns are more dependent on other factors like SES, occupation, affordability etc. People of lower socio-economic status are not highly educated and thus may be lack of awareness particularly about healthy diet and physical activity. People belonging to the higher socio economic status understand the importance of regular medical checkups and affordability may not be an issue for them. They also have easy access to various health care systems compared to people in the low socioeconomic status. In rural and urban poor India, there is lack of awareness of regular health checkups and thus many diabetics may remain undiagnosed. Affordability is also an issue for the lower socio-economic group. Most of these people go to the doctor only when they are ill. They may not know about diabetes and the importance of regular checkup of blood sugar. Even if diabetes is diagnosed, many of them neglect the treatment of diabetes because of poverty and lack of knowledge about diabetes and its consequences.

Healthy foods such as fruits, vegetables and low fat dairy products are more expensive compared to unhealthy foods such as chips, farsan, vada pav, biscuits, samosa, Chinese bhel, bhajia etc. Hence people of lower socio economic status are more likely to select these cheaper foods and street foods which are very high in calories and fats while being low in fiber and protein. People with higher socioeconomic status can afford to buy healthier food products. Therefore, the risk of diabetes may increases for people in low socio-economic status. The changing food habits and lifestyle are associated with the increased risk of diabetes in India. Therefore, India seems to be emerging as the capital of diabetes.

Conclusion

IDRS has been used in diagnosis of diabetes. It is simple, easily applicable, and cost effective and it requires less time. Thus, it is very useful in community to know the risk of diabetes. Other diagnostic tests for diabetes are expensive and because of high cost many people from low socio-economic population may remain undiagnosed. IDRS also helps people belonging to upper and middle socio-economic class population to know the risk of diabetes. The knowledge of diabetes will motivate people for further diagnosis. Early diagnosis and treatment is very important to prevent the complications of diabetes. If undiagnosed and untreated, then there are more chances of developing complications of diabetes.

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