# DIABETES RISK ASSESSMENT AMONG RESIDENTS IN A GOVERNMENT MEDICAL COLLEGE USING INDIAN DIABETIC RISK SCORE AND CORRELATION OF THE SCORE WITH SELECTED ANTHROPOMETRIC PARAMETERS

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**Background: Diabetes Mellitus (DM) is a chronic disease which is one of the leading cause for morbidity and mortality. Indian Diabetic Risk Score (IDRS) is one of the tool which helps to assess the risk of developing diabetes. It is one of the simple, non-invasive and cost effective tools.**

**Objectives: To assess the risk of type 2 Diabetes mellitus among post graduate students of MMC&RI using IDRS score. To determine the Body Mass Index, Basal Metabolic Rate and Body fat percentage in the study population and Correlate the same with IDRS.**

**Methods : This is a Cross sectional study carried out on 128 Post graduate students of Mysore Medical College & Research Institute, aged between 24 to 30 years. IDRS scoring was done. BMI, BMR and BFP were determined using Omron HBF-306 Body fat monitor. Descriptive statistics done. Chi-square test of independence and Fischer's test were applied. Correlation coefficient was calculated between IDRS score and BMI,BFP and BMR. Level of significance was set at 0.05.**

**Results : Majority of the participants were under low risk category in both the non-modifiable factors of IDRS. In the modifiable risk factors, waist circumference about 57.8% males and 13.3% females were under moderate risk and 24% males and 11% females came under high risk. Physical activity, only 4.6% subjects were involved in regular vigorous physical activity like sports or gym, Other 45.31% were moderately active and 39.8% were active only mildly. 10.15% subjects had sedentary lifestyle. There was a positive correlation between BMR, BMI, BFP & IDRS Score.**

**Conclusion: Majority of the postgraduate residents at MMC&RI have low risk of diabetes mellitus. There is a strong positive correlation between the IDRS score with BMI, Body Fat Percentage and Basal Metabolic Rate.**

Diabetes Mellitus (DM) is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Type 2 DM is due primarily to lifestyle factors and genetics.

A number of lifestyle factors are known to be important to the development of Type

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2 DM, including obesity (defined by a body mass index of greater than 30), lack of physical activity, poor diet, stress and urbanization (Shlomo et al.2015). Excess body fat is associated with majority of cases. Even those who are not obese often have a high waist-hip ratio (Shoback 2011). Prevention involve maintaining a healthy diet, regular exercise ,a normal body weight and avoiding use of tobacco.

According to WHO, globally an estimated 422million adults were living with diabetes in 2014 and the prevalence is growing from 4.7% in 1980 to 8.5% in 2014 (Report 2016). India had 69.2 million people living with diabetes as per the 2015 data. Of these, it remained undiagnosed in more than 36 million people. A study by the American Diabetes Association reports that India will see the greatest increase in people diagnosed with diabetes by 2030 (Wild et al. 2004).

The etiology of diabetes in India is multifactorial and includes genetic factors coupled with environmental influence such as obesity associated with rising living standards, steady migration and lifestyle changes (Kaveeshwar & Cornwall 2014). Diabetes is also one of the leading cause for morbidity and mortality, including in the younger population. About 50% of diabetic population are unaware of their status ( Sharma et al. 2011).

Early detection of diabetes by suitable screening methods will help reduce the burden of the disease. Indian Diabetic Risk Score (IDRS) is one of the tool which helps to assess the risk of developing diabetes. It is one the simple, non-invasive and cost effective tool. There are many factors which influence the onset of the disease like obesity, genetic predisposition, lifestyle, stress and also dietary habits. The advantage of IDRS is that, it has two modifiable risk factors like physical activity and waist circumference, which can be altered on timely intervention. Studies have been carried out using IDRS to screen the population for diabetes.(Sharma et al. 2011, Nandeshwar et al. 2010, Achuth et al. 2015).

However limited studies are available correlating IDRS with other parameters, like Basal Metabolic Rate (BMR), Body Mass Index (BMI) and Body Fat Percentage (BFP). Hence, this study is taken up to assess the risk for developing DM, in young adults so that early intervention can be done in modifiable risk factors so as to prevent its occurrence.

## OBJECTIVES

To assess the risk of type 2 Diabetes mellitus among post graduate students of MMC&RI using IDRS score, and to determine the Body Mass Index, Basal Metabolic Rate and Body fat percentage in the study population and Correlate the same with IDRS.

## MATERIALS AND METHODS

This is a Cross sectional survey carried out among the Post graduate students of Mysore Medical College and Research Institute. About 128 Post Graduate students available during the period of study were included. Both male and female students aged between 24 to 30 years formed the study group. Institutional ethical clearance was obtained. A written informed consent was obtained from all the students willing to participate in the study, after explaining the procedure. Participants with known history of DM, hypertension, prolonged drug intake, thyroid disorders, women on Oral Contraceptive Pills or pregnant were excluded from the study.

General information of the participants was taken along with anthropometric measurements. These included height, weight and waist circumference.

Weight was measured in kilograms using a standard weighing scale . Height in centimeters was measured using a non-stretchable tape fixed to a vertical wall, with the participant standing on a level surface without shoes. Waist circumference was measured with a non-stretchable tape to the nearest 0.1 cm at the midpoint between the lowest rib and the iliac crest after normal expiration in standing position with the feet together and arms by the side of the body. BMI, BMR and BFP were determined using Omron HBF-306 Body fat monitor.

All the participants were assessed using IDRS score developed by Dr. Mohan et.al.,(2005) which is a pre-tested and structured questionnaire comprising of age, physical activity, waist circumference and family history of DM .

## STATISTICAL METHODS

Data was entered in Microsoft excel (windows 7;version 2007)and analysis was done. Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical were determined. Comparison between groups were analyzed using chi-square test of independence and Fischer's test (when appropriate) for categorical variables and ANOVA was used to compare quantitative variables between low, medium and high IDRS categories. Correlation coefficient was calculated between IDRS score and BMI,BFP and BMR. Level of significance was set at 0.05.

## RESULTS

The study was carried out on 128 subjects of which 83(64.8%) were males and 45(35.2%) were females . All the participants were under 35 years of age with a mean of 27.46(Table 1). Since the study was done in a young population and age being one of the factors in IDRS, all the subjects in study group come under low risk category. When we took history of diabetes in parents of the study subjects into consideration, which is another component of IDRS, both the parents of only 10 participants had diabetes, which falls in the high risk category. One parent each of 45 participants had diabetes, whereas history of diabetes among parents of majority of participants had no diabetes comprising 72 numbers. Hence

**Table 2: Distribution of Study Subjects according to the Waist Circumference(N=128)**

| WC(in cms) | Male (n=83) n (%) | Female (n=45) n (%) |
|---|---|---|
| <80 | 8 (9.6) | 34 (75.6) |
| 80-89 | 48 (57.8) | 6 (13.3) |
| 90-99 | 20 (24.1) | 5 (11.1) |
| = 100 | 7 (8.4) | 0 (0.0) |

Chi-Square Test, P Value <0.001, Significant

**Table 3: Distribution of Study Subjects according to the BMI (N=128)**

| BMI | No | Percent |
|---|---|---|
| <18.5 | 1 | 0.8 |
| 18.5-22.99 | 47 | 36.7 |
| 23.0-24.99 | 42 | 32.8 |
| 25.0-29.99 | 30 | 23.4 |
| = 30.0 | 8 | 6.3 |
| **Range** | 24.15 (3.05) | |
| **Mean (SD)** | 16.9-32.5 | |

**Table 4: Distribution of Study Subjects according to the BFP (N=128)**

| BFP | No. | Percent |
|---|---|---|
| <25 | 48 | 37.5 |
| >25 | 80 | 62.5 |
| **Range** | 27.45 (6.68) | |
| **Mean (SD)** | 11.9-44.4 | |

**Table 5: Distribution of Study Subjects according to the IDRS Scoring (N=128)**

| IDRS Scoring | No. | Percent |
|---|---|---|
| Low | 105 | 82.0 |
| Medium | 22 | 17.2 |
| High | 1 | 0.8 |

**Table 6: Descriptive Statistics for Various Parameters in the Study (N=128)**

| Parameter | Mean (SD) | Range |
|---|---|---|
| Height | 169.38 (12.67) | 149-266 |
| WC | 83.32 (10.22) | 56-110 |
| BMR | 1552.55 (262.84) | 130-2296 |
| Weight | 67.83 (11.25) | 46-108 |

**Table 7: Association between BMI and IDRS Scoring (N=128)**

| WC(in cms) | IDRS Scoring | | |
|---|---|---|---|
| | Low | Medium | High |
| **<18.5** | **0 (0.0)** | **1 (100.0)** | **0 (0.0)** |
| **18.5-22.99** | **0 (0.0)** | **47 (100.0)** | **0 (0.0)** |
| **23.0-24.99** | **0 (0.0)** | **33 (78.6)** | **9 (21.4)** |
| **25.0-29.99** | **1 (3.3)** | **21 (70.0)** | **8 (26.7)** |
| **= 30.0** | **0 (0.0)** | **3 (37.5)** | **5 (62.5)** |
| Chi-Square Test, **P Value** = 0.001, Significant | | | |

**Table 8: Correlation between BMR, BMI, BFP & IDRS Scoring (N=128)**

| Parameter | Correlation Coefficient | P Value |
|---|---|---|
| BMR | 0.304 | <0.001 |
| BMI | 0.465 | <0.001 |
| BFP | 0.392 | <0.001 |

**Table 9.1: Correlation between BMR & IDRS Scoring (N=128)**

| IDRS Scoring | Mean (SD) | P Value |
|---|---|---|
| Low | 1511.53 (254.67) | <0.001 |
| Medium | 1718.59 (197.29) | |
| High | 2207 (-) | |

**Table 9.2: Correlation between BMI & IDRS Scoring (N=128)**

| IDRS Scoring | Mean (SD) | P Value |
|---|---|---|
| Low | 23.54 (2.51) | <0.001 |
| Medium | 26.81 (2.99) | |
| High | 29.90 (-) | |

**Table 9.3: Correlation between BFP& IDRS Scoring (N=128)**

| IDRS Scoring | Mean (SD) | P Value |
|---|---|---|
| Low | 26.60 (6.26) | <0.008 |
| Medium | 31.24 (7.46) | |
| High | 33.40 (-) | |

majority of the participants come under low risk category in both the non-modifiable factors of IDRS.

In Table 2 we can see the distribution of study subjects according to the modifiable risk factor of waist circumference. About 57.8% males and 13.3% females are under moderate risk and 24% males and 11% females with waist circumference of 90-99cms come under high risk of developing diabetes.

In the other modifiable risk factor that is physical activity, only 6(4.6%) subjects are involved in regular vigorous physical activity like sports or gym. Other 58(45.31%) are moderately active and 51(39.8%) are active only mildly. 13 (10.15%) subjects have sedentary lifestyle. This study shows that according to the modifiable risk factors of IDRS, more than 50% are at a high risk of developing diabetes at a later stage unless they change their habits in diet and exercise.

There was a positive correlation between BMR, BMI, BFP & IDRS Scoring Table 8

## DISCUSSION

Indian Diabetic Risk Score is proven to be a simple non invasive tool for assessing the diabetic risk. The present study revealed that the participants who were all less than 30 years of age have moderately active lifestyle. Though two of the component of IDRS which are non-modifiable like age and family history of diabetes seems to offer low risk of developing diabetes in the study group, the modifiable factors of physical activity and waist circumference seem to pose a moderate risk of developing diabetes at a later stage, wherein the chances increase as the person age. The prevalence of Type 2 DM and hypertension increases with increasing weight of individuals (Mandal 2014).

About 50% of participants have a waist circumference more than 80cms. Waist circumference is a good indicator of visceral fat, which poses more health risks than fat elsewhere. According to the US National Institutes of Health (NIH), waist circumference in excess of 102 centimeters (40 inches) for men and 88 centimeters (35 inches) in non-pregnant women is considered to infer a high risk for type 2 diabetes, dyslipidemia, hypertension, and CVD. Type 2 DM , CVD and increased mortality are the most important sequel of obesity and abdominal fatness (Chizuru Nishida 2004). There is a strong association of body weight with insulin resistance, higher BMI is associated with hyperlipidemia and insulin resistance. Insulin resistance is one of the major etiological factors for diabetes and the risk association of obesity with diabetes is greatly mediated through insulin resistance. (Ramachandra 2004)

This study demonstrated a positive correlation between BMR and IDRS Table 9.1. Generally BMR decreases as age increases due to physical deterioration. Obese individuals with higher BMR adjusted to weight are considered hyper-metabolizer individuals. These individuals are considered to support metabolic adaptation for reduction of further weight gain . This category was often associated with more diabetes. (Rodica Doros *et al* 2015)

It was found that there is a positive correlation between the IDRS and BMI and BFP. More than 50% of the participants come under moderate to high risk values of BMI and BFP which increases the chances of developing diabetes.

The risk of becoming a diabetic for an individual with a positive family history of diabetes increases by two to four-fold an offspring's chance and individuals with a positive family history of diabetes have higher body mass index (Padaki *et al* 2011). There is a

positive correlation between the IDRS score and the BMI as depicted in Table 9.2.

Among the students who are latent obese with a BMI of less than 30, 21 participants have medium risk and 9 participants have high risk IDRS scoring. Out of 8 participants who are obese with a BMI of greater than 30, 3 have moderate and 5 have high IDRS scoring, which shows a significant correlation. Majority of the participants come under moderate risk with a BMI of 18 to 25. Another study showed that in the obese and overweight group the risk of having diabetes is increasing as BMI is increasing (Acharya *et al* 2017).

The present study shows that over 80 participants which amounts to 62.5% have a body fat percentage of >25 whereas 48 (37.5%) have <25 body fat. This correlates as majority participants who have >25% Body fat have moderate to high IDRS scoring. There is a significant correlation between BFP and IDRS scoring as shown in Table 9.3. This study is consistent with another study which observed the presence of risk factor for DM and HTN with normal limits of BMI and higher body fat percentage (Kesavachandran *et al* 2012).

## CONCLUSION

Majority of the postgraduate residents at Mysore Medical college have low risk of diabetes mellitus. There is a strong positive correlation between the IDRS score with BMI, Body Fat Percentage and Basal Metabolic Rate.

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