ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 4(E), pp. 25864-25867, April, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

CORRELATION BETWEEN ABNORMAL BODY MASS INDEX AND PREVALENCE OF THE TYPE 2 DIABETES MELLITUS IN THE AREA OF KANPUR (NORTH INDIA)

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DOI: http://dx.doi.org/10.24327/ijrsr.2018.0904.1943

ARTICLE INFO

Article History:
Received 17th January, 2018
Received in revised form 21st February, 2018
Accepted 05th March, 2018
Published online 28th April, 2018

Key Words:

Prevalence of the Type 2 Diabetic mellitus, Obese, over weight

ABSTRACT

The type 2 diabetes mellitus in India are a result of societal influences and changing of life style. Diabetic patients have been known in the India as a disease of affluent class. The purpose of this study was to determine the relationship between BMI and type 2 diabetes mellitus. Data on body mass index is calculated by using the formula Weight (Kg)/Height (mt^2) and using the HBA1C test for determining the type 2 Diabetic patients were collected from 160 subjects having abnormal BMI, age between 35-60years. The subjects were examined in the Rama Medical College Hospital and Research Centre, Kanpur. BMI and sugar level showed a corresponding increase for both male and female subjects although values were proportionately higher for the female subjects

INTRODUCTION

Body mass index (BMI) is a good measure of general adiposity [1]. A person can be categorized as underweight if his/her BMI is <18.5, as normal weight if his/her BMI is in the range of 18.5-24.9, as overweight if his/her BMI is between 25 to 29.9 and as obese if his/her BMI is ≥30[2]. An elevated BMI value is an established risk factor for ischemic heart disease, stroke and many cancers [3]. The global epidemic of obesity is fast becoming a major public health problem and is worsening. In many populations, the average BMI has been rising by some percent per decade, thereby increasing concerns about the effects of increased adiposity on health [4]. A number of large studies have proved that mortality increases with obesity [5-7].

Obesity is one of the most important modifiable risk factors in the pathogenesis of type 2 diabetes [8, 9]. The mechanism by which obesity induces insulin resistance is poorly understood. Adipocytes secrete a number of biological products (leptin, TNF-alfa, free fatty acids, resistin, and adiponectin) that modulate insulin secretion, insulin action and body weight and may contribute to insulin resistance [10]. The insulin resistant state that should enhance the regulation of calorie and fat metabolism during famine and prolonged periods of fasting can be deleterious. A positive correlation is assumed to exist between BMI and blood sugar levels. Population based preventive measures for the control of the DM epidemic must therefore include avoidance of adiposity through physical activity and regulated caloric intake [11, 12]. A positive correlation is thought to exist between random blood glucose and obesity.

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The connection between raised BMI and an raised risk for type 2 diabetes has been showed in various populations, including those with both high rates of diabetes and traditionally low. Type 2diabetes was formerly known adult-onset diabetes, an appellation no longer applicable like it is now being diagnosed with alarming frequency among young adults and adolescents as well as younger children [13].

This study was conducted to found correlation between abnormal Body Mass Index and prevalence of the Type2 Diabetic mellitus in the area of Kanpur.

MATERIAL AND METHOD

A cross sectional study was designed in the Kanpur (UP) urban population. In this study, the total numbers of subjects are 320 in which 160 subjects are test and 160 subjects are control. Out of 160 test subjects, there are 95 male's subjects and 65 female subjects. The subjects were having the age between 35-60 years. The subjects were examined in the Rama Medical College Hospital and Research Centre, Kanpur. Subjects having BMI more than 24.9kg/m^2 and hereditary indisposition were included in this study. The exclusion criteria were the subjects having severe cardiac anomalies, pregnant and lactating women, obesity produced due to certain secondary cause., Subjects suffering from any grave disease and hospitalization in last 3 months, Endocrinal origin obesity.

Collection of Blood Specimen

About 2ml fasting whole blood was collected from each consenting subject into fluoride oxalate bottle using the vene puncture technique. The whole blood was then centrifuged at 1200xg for 5mins at room temperature (29-310 C) to separate the plasma.

Blood glucose level

Blood glucose level were determined by HbA1c

Body Mass Index (BMI) Estimation

BMI was calculated for each subject using the standard formula; weight/square height (kg/m^2). Body Mass Index were calculated by using following formula-

$$\text{BMI (kg / m2)} = \frac{\text{Weight (kg)}}{\text{Height (m) 2}}$$

BMI (kg/m2)	Weight Status
Below 18.5	Underweight
18.5 to 24.9	Healthy weight
25.0 and above	Overweight
30.0 and above	Obese

Inclusion Criteria

1. Subjects of either sex having age in between 35 to 60 years.
2. Subjects having BMI more than 24.9kg/m^2
3. Hereditary indisposition.

Exclusion Criteria

1. Subjects below 35 years and more than 60 years.
2. Subjects having severe cardiac anomalies.
3. Pregnant and lactating women.
4. Obesity produced due to certain secondary cause.
5. Subjects suffering from any grave disease and hospitalization in last 3 months.
6. Endocrinal origin obesity.
7. Subjects who are not wanting to participate in the study.

Statistics

The Pearson's correlation coefficient was used to analyze data and level of significance was set at $\alpha \leq 0.05$ ($P \leq 0.05$). The Data were entered into a computer and Statistical analysis was done using the SPSS 21.0 and WHO Anthro. Continuous variables were reported ad Means ± Standard deviation.

RESULTS

A total of 160 individuals, 95 (59.73%) males and 65 (40.62%) females were examined. The mean BMI was 28.71±2.83 Kg/m2. Comparison of these parameters between males and females showed that BMI was significantly higher in females (Table 1) Mean HbA1c was 6.11±1.502 mg/dl. Distribution of HbA1c among male and female has mentioned in table 2. Out of 160, 44 and 28 were overweight male and female respectively. 21 and 28 subjects were obese male and female respectively. Among these 45.0% were diabetic followed by diabetic (34.3%) and prediabetic (20.6%). [Table 3] Pearson correlation coefficient of HbA1c in diabetic patients with BMI was 0.036, which shows a positive correlation. (Fig 1) BMI and sugar level showed a corresponding increase for both male and female subjects although values were proportionately higher for the female subjects.

Table 1 Gender differences in BMI for all the subjects.

S.N.	BMI	No. of test patients	Male [n(mean ± SD)]	Female [n(mean ± SD)]	P value	T test
1.	>=25.0 - 29.9 (Overweight)	111	44 (27.04 ± 0.18)	67 (27.18 ± 0.16)	0.0001*	4.2901
2.	>=30.0 - 39.9 (Obese)	49	21 (32.44 ± 0.49)	28 (32.20 ± 0.33)	0.0461	2.0484
	Mean ± SD	28.71 ± 2.83				

Table 2 Distribution of HbA1c among male and female

S.N.	HbA1c	No. of patients	Percent	Male [n(mean+SD)]	Female [n(mean+SD)]	t test	P value
1.	5.7 and 6.4 (prediabetes)	33	20.6%	10 (5.93 ± 0.08)	23 (5.94 ± 0.04)	0.4825	0.6328
2.	>6.5 (diabetic)	55	34.3%	24 (7.9 ± 0.21)	31 (7.85 ± 0.17)	0.9761	0.3335
	Mean ± SD	6.11 ± 50					

Independent sample t-test used for comparing means

Table 3 Distribution of abnormal BMI and diabeties among male and female

Sex	BMI	Non Diabetic	Prediabetic	Type 2 Diabetic	Total
Male	Over weight	20 (45.45%)	6 (13.60%)	18 (41%)	44
	Obese	11 (52.38%)	4 (19.00%)	6 (28.5%)	21
Female	Over weight	29 (43.28%)	16 (23.80%)	22 (32.80%)	67
	Obese	12 (42.85%)	7 (25.00%)	9 (32.10%)	28
Total		72 (45.00%)	33 (20.60%)	55 (34.30%)	160

Table 4 Differences in BMI and HbA1c for all the subjects

S.N.	HbA1c BMI	Non-diabetic	Prediabetes	Diabetic	P value
1.	Overweight	49 (4.9+0.07)	22 (5.9+0.04)	40(7.79+0.15)	< .00001
2.	Obese	23 (4.71 + 0.08)	11 (5.93 + 0.07)	15 (8.1 +0.28)	< .00001

Differences between BMI groups compared using one way ANOVA

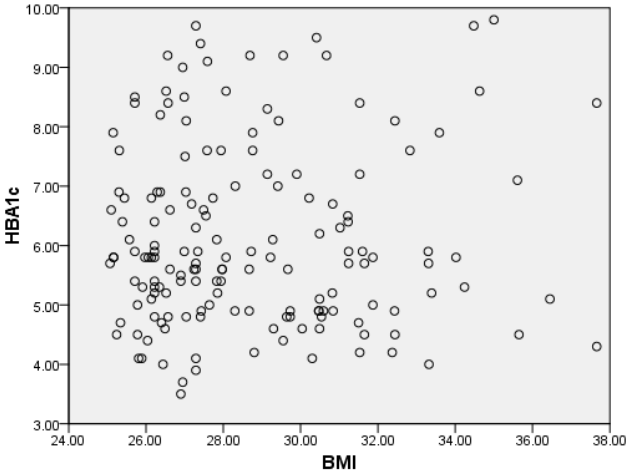

Fig 1 Correlation between abnormal BMI and HbA1c

DISCUSSION

In the present study among 160 individuals, 59.73% were males and 40.62% were females similarly Samita patil *et al*. observed 54% and 46% of male and female respectively. While Olumide A Abiodun *et al*, (2014) have taken 25.8% males and 74.2% females were examined. The mean BMI was 28.71±2.83 Kg/m2. Comparison of these parameters between males and females showed that BMI was significantly higher in females. Fourty four and 28 were overweight male and female respectively. 21 and 28 subjects were obese male and female respectively.

Smita patil *et al*, (2012) reported 18 to 22.9 kg/m BMI among 39 patients (19%), 114 patients (58 %) were overweight (23-24.9 kg/m) and 51 patients (23%) were obese BMI >25 kg/m. [14]. Olumide A Abiodun *et al*, (2014) have recorded 29.9% were overweight and 17.5% were obese while, 3.6% were underweight [15]. Mokdad *et al*. (2003) also found statistically significant and increasingly among overweight adults, adults with BMI between 30 and 39.9 kg/m^2, and adults with BMI≥40 kg/m^2 relative to adults with normal BMI.

In the present study mean HbA1c was 6.11±1.502 mg/dl. Among these 45.0% were diabetic followed by diabetic (34.3%) and prediabetic (20.6%). Pearson correlation coefficient of HbA1c in diabetic patients with BMI was 0.036, which shows a positive correlation. BMI and sugar level showed a corresponding increase for both male and female subjects although values were proportionately higher for the female subjects. A cross-sectional study carried out in Spain showed that the prevalence of DM in overweight or obese patients was 23.6%, and the higher the BMI, the higher the prevalence of DM [16]. Arshad Parvez *et al*, (2010) have also taken diabetic patients and found , there were 55% having <110 serum glucose, 8.3% having 110-126 serum glucose,36.6% Having>126 serum glucose and in the non obese diabetics, there were 32.5% having<110 serum glucose,5% having 110-126 serum glucose,62.5% having >126 serum glucose[13].

The mean BMI found in Agrawal, *et al*. study was in the overweight range and is higher in females [19]. This is similar to findings of our study. High average BMI has been reported by research workers in many studies in Asia.[16,17]. The finding of an average BMI that is in the overweight suggests a possible interplay of genetic factors, sedentary lifestyle and lack of exercise among Indians. Researcher from A study reported by Bakari and his colleagues showed positive correlation of BMI with RBS in females but not significant correlation in males [18.] In most Indians, BMI more than 23 kg/m2 is associated with central obesity and coronary risk.

CONCLUSION

In the present study, we have found a positive correlation between fasting blood glucose level and BMI. Food habits, intensive lifestyle modifications and regular exercise may prevent new-onset of diabetes, especially in patients with high BMI and high glucose level. This may help in prompt treatment or preventive measures to avoid future complications. The incremental association of BMI category on the risk of T2D is stronger for people with a higher BMI relative to people with a lower BMI.

Aknowledgement

The Authors are grateful to the principal of Rama Medical College, Hospital and Research Centre, Kanpur for his kind consideration and permission of the original research work at this centre and for the financial assessment.

References

1. Hu F. Obesity epidemiology. Oxford: Oxford university press, 2008;87-97
2. World Health Organization Obesity: Preventing and Managing the Global Epidemic. World Health Organization Geneva, Switzerland,1997;786-987
3. Prospective Studies Collaboration, Whitlock G, Lewington S, Sherliker P, Clarke R, Emberson J, Halsey J, Qizilbash N, Collins R, Peto R. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. *The Lancet* 2009; 373(9669): 1083-96.
4. WHO Global InfoBase team. Surveillance of chronic diseases and risk factors: Country level data and comparable estimates. Geneva: World Health Organization, 2005.
5. Freedman DM, Ron E, Ballard-Barbash R, Doody MM, Linet MS. Body mass index and all-cause mortality in a nationwide US cohort. *Int J Obes (Lond)* 2006; 30:822-9.
6. Price GM, Uauy R, Breeze E, Bulpitt CJ, Fletcher AE. Weight, shape and mortality risk in older persons: elevated waist hip ratio, not high body mass index, is associated with greater risk of death. *Am J Clin Nutr* 2006; 84:449-60.
7. Pischon T, Boeing H, Hoffmann K, Bergmann M, Schulze MB, Overvad K, *et al*. General and abdominal adiposity and risk of death in Europe. *N Engl J Med* 2008; 359:2105–20.

8. World Health Organization Expert committee: Physical status; the use and interpretation of anthropometry. Report of a WHO expert committee. Technical report series 854, WHO Geneva, 1995.
9. Bakari AG and Onyemelukwe GC. Aetiopathogenesis of type-2 diabetes mellitus. *Diabetes International* 2005; 13:7-9.
10. Steppan CM, Bailey ST, Bhat S, Brown EJ, Banerjee RR, Wright CM, Patel HR, Ahima RS, Lazar MA. The hormone resistin links obesity to diabetes. *Nature* 2001; 409(6818):307-12.
11. Khan LK, So bush K, Keener D, Goodman K, Lowry A, Kakietek J, Zaro S. Recommended Community Strategies and Measurements to Prevent Obesity in the United States. MMWR. Recommendations and Reports July 24, 2009 / 58(RR07);1-26
12. Das S. Introduction, low body weight type2 Diabetes Mellitus Patients. Technical series of Indian College of Physicians 2005.
13. Arshad Parvez, Ihsanullah, *et. al*. Relationship of glycaemia and triglycerides with bmi in diabetic patients. *J Ayub Med Coll Abbottabad* 2010; 22 (2):164-6.
14. Smita T patil *et.al* Correlation of Blood Sugar with Waist Circumference and Body Mass Index in an Indian Population.2012 Global Journal of Pharmacology 6 (1): 8-11.
15. Olumide A Abiodun *et.al*. Correlation between Body mass index, Waist Hip ratio, blood sugar levels and blood pressure in apparently healthy adult Nigerian*s Journal of Dental and Medical Science*.2014;12(11):56-61.
16. Sendhu HS, Koley S, Sandhu KS. A study of correlation between lipid profile and BMI in patients with diabetes mellitus. *J Human Ecol*. 2008; 24:227-9.
17. Hussain S, Hussain I, Sana B, Waheed K, Qaisera S. Association of type 2 diabetes mellitus with biometric variable: A study in Sir Ganga Ram Hospital, Lahore. *Ann King Edward Med Uni*. 2009; 15:48–53.
18. Bakari AG, Onygemelukwe GC, Sani BG, Aliyu IS, Hassan SS, Aliyu TM. Relationship between random blood sugar and body mass index in an African population. *Int J Diabetes Metab*. 2006;14:144–5
19. Praween Agrawal, Kamla Gupta, Vinod Mishra, and Sutapa Agrawal. The Psychosocial Factors Related to Obesity: A Study Among Overweight, Obese, and Morbidly Obese Women in India. *Women Health*. 2015 Aug 18; 55(6): 623-645.

How to cite this article:

Anant Sachan *et al.*2018, Correlation Between Abnormal Body Mass Index And Prevalence of the Type 2 Diabetes Mellitus In The Area of Kanpur (North India). *Int J Recent Sci Res.* 9(4), pp. 25864-25867.
DOI: http://dx.doi.org/10.24327/ijrsr.2018.0904.1943

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