IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 4 Ser.1 (April. 2021), PP 31-37
www.iosrjournals.org

A Study on Significance of BMI in NIDDM Male and Females Patients in North India.

Shaily Saxena[1], Mansi Modi[2]
[1](Department of Anatomy, Subharti Medical College, Subharti University, Meerut, India)
[2](Department of Biochemistry, HIMSR, Jamia Hamdard University, New Delhi, India)

Abstract

Background: *Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion and insulin action or both. BMI is association between degree of obesity, body fat distribution and weight gain with subsequent consequence of Type II diabetes have been examined in several perspective studies. The present study aims to determine the BMI ranges in type II diabetic male and female subjects in North Indian.*

Materials and Methods: *This is a case control study was conducted in the Department of Anatomy and Medicine, IIMS & R, Integral University, Lucknow. The total subjects was 200 and categorized was divided in further groups to (a)To evaluate the gender distribution of cases and controls.(b) Comparison of BMI between cases and controls according to gender.(c) To evaluate the difference in the age groups between cases and controls.(d) To evaluate the Comparison of blood sugar level between cases and controls in both genders.*

Results: *The difference of BMI in male and females was found to be statistically significant in cases ($p<0.0001$) than controls. Moreover, There was insignificant ($p>0.05$) difference in the gender and age group (51-60 years) between cases and controls. The mean reduction of blood sugar level was found to be statistically significant ($p<0.0001$) higher in cases (305.07±60.80) than controls (113.81±12.40) in both genders.*

Conclusion: *In view of study outcome, we conclude that the major difference were found in BMI and blood sugar level between cases and controls in both genders of all the age groups.*

Key Words: *Body mass index; Diabetes mellitus; Non-insulin-dependent diabetes mellitus; Waist to hip ratio; Waist circumference.*

Date of Submission: 20-03-2021 Date of Acceptance: 04-04-2021

I. Introduction

Body mass index (BMI) is a measure of body fat based on height and weight that applies on adult men and women. The Quetlet's Index or Body Mass Index (BMI) is the most frequently used indicator of total body adiposity in epidemiological studies [1]. The association between degree of obesity, body fat distribution and weight gain with subsequent consequence of Type II diabetes have been examined in several perspective studies. BMI and both waist to hip ratio (WHR) and waist circumference (WC) are now well established independent risk factors for the development of Type II diabetes and has been shown to have a direct association with overall mortality in both men and women [2-3]. A WHO expert consultation addressed the debate about interpretation of recommended body mass index (BMI) cut-off points for determining over-weight and obesity in Asian populations, and considered whether population-specific cut-off points for BMI are necessary. They came to an opinion that the proportion of Asian people with a high risk of Type II diabetes and cardio-vascular disease is substantial at BMIs lower than the existing WHO cut-off points for over-weight (≥ 25 kg/m^2). The cut-off points for observed risk varies from 22 kg/m^2 to 25 kg/m2 in different Asian populations and for high-risk group it varies from 26 to 31 kg/m^2. Although the WHO consultation agreed that the present BMI cut-off points should be retained as the international classification, they recommended for the purpose of public health action, cut off points 23.0, 27.5, 32.5, and 37.5 kg/m^2 to be considered and proposed methods by which countries could make decisions for redefining obesity for the purpose of taking public health action in their population[4].Moreover, waist circumference cannot distinguish abdominal subcutaneous fat, total abdominal fat, and total body fat, and it is strongly correlated with body mass index. Body mass index has been shown to be a good indicator of general fatness (fat areas in the arm, thigh, and waist using computed tomography scans), muscularity (muscle area in the thigh), and frame size (bone area in thighs) [5]. The aim of this study was to determine the BMI ranges in type II diabetic male & female subjects and to compare the BMI in type II diabetes mellitus with normal population in North India.

II. Materials and Methods:

This case control study was conducted in the Department of Anatomy and Medicine, IIMS & R, Integral University, Lucknow, Uttar Pradesh from February 2016 to October 2016. The total 200 subjects of aged ≥ 35 years for this study. Further more, 100 males and females of diabetes mellitus (type II) were selected as test group and 100 control group from healthy population residing in Lucknow.

Study Design: Case - control study.

Study Location: This study was done in the Department of Anatomy and Medicine, IIMS & R, Integral University, Lucknow, Uttar Pradesh.

Study duration: Uttar Pradesh from February 2016 to October 2016

Sample size: 200 subjects.

Sample size calculation: For each variable, values were expressed as Mean±SD. The statistical analysis was carried out in GraphPad Prism, ver.5.0 software using 'unpaired t-test' and ANOVA. At 95% confidence interval, p<0.05 was considered as statistically significant. Assuming 80% power, 5% significance level and expected standard deviation being 2, the calculated sample size was 98 in each group. We planned to include 200 subjects which is divided into 100 subjects of case and 100 controls.

Subjects and selection method: The study population was drawn from consecutive non insulin diabetic patients who presented to department of Medicine, Integral Hospital combine with University, Lucknow, Uttar Pradesh from February 2016 to October 2016.

Inclusion criteria:

1. Age group (diagnosed diabetes after 35 years).
2. Diabetic patients (Blood glucose) criteria for diagnosis: FBS: >=126mg/dl. PP sugar >=200mg/dl 2 hrs. after meal RBS >=200mg/dl and HBA1C >=7 unit[6].

Exclusion criteria

1. Gestational diabetes.
2. Patients who are physically inactive.

Procedure methodology:

MODY and LADA are used in this study. Mody is a rare form of diabetes which is different from both Type 1 and Type 2 diabetes, and runs strongly in families. It is caused by a mutation (or change) in a single gene. If a parent has this gene mutation, any child they have, has a 50% chance of inheriting it from them. Lada **is** Latent autoimmune diabetes in adults (LADA) is a slow progressing form of autoimmune diabetes. It is a kind of type 1 diabetes in adult. It occurs because the pancreas stops producing adequate insulin and normally in 25-30 years age group. Secondary form of diabetes such as pancreatic tumours, pseudocysts, cancers etc.Diabetes originating from drugs such as thyroid hormones, steroids, contraceptives, Thiazides etc.

BMI of each subject were calculated and categorized or divided in further groups to (a)To evaluate the gender distribution of cases and controls.(b) Comparison of BMI between cases and controls according to gender.(c) To evaluate the difference in the age groups between cases and controls.(d) To evaluate the comparison of blood sugar level between cases and controls in both genders.

Statistical analysis:

For each variable, values were expressed as Mean±SD. Chi-square test was used to compare the categorical variables between cases and controls. The statistical analysis was carried out in GraphPad Prism, ver.5.0 software using 'unpaired t-test' and ANOVA to compare BMI and blood sugar between cases and controls. .The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) with accuracy were calculated. The receiving operating curve (ROC) analysis was carried out.The receiving operating curve (ROC) analysis was carried out. The area under the curve (AUC) with its 95% confidence interval (CI) was calculated. The p-value<0.05 was considered significant.

III. Result

A total of 200 subjects was enrolled in this study and further divided in 100 cases and 100 controls were included. Furthermore, The objective of our study, to determine the BMI of each subject were categorized or divided in further groups to (a)To evaluate the gender distribution of cases and controls.(b) Comparison of BMI between cases and controls according to gender.(c) To evaluate the difference in the age groups between cases and controls.(d)To evaluate the Comparison of blood sugar level between cases and controls in both genders.

To determine the gender distribution of cases and controls is shown **(Table 1).** More than half of both cases (53%) and controls (57%) were males. There was not statistically significant (p>0.05) difference in the gender between cases and controls. Therefore, the higher percentage of male subjects of both cases and controls as compare to females is shown **(Figure.1)**

Table-1: Gender distribution of cases and control:

Gender	Cases (n=100)		Controls (n=100)		p-value[1]
	No.	%	No.	%	
Male	53	53.0	57	57.0	0.57(ns)
Female	47	47.0	43	43.0	

[1]Chi-square test, *p-value: (not significant) ns> 0.05, *<0.05, **<0.01, ***<0.001.

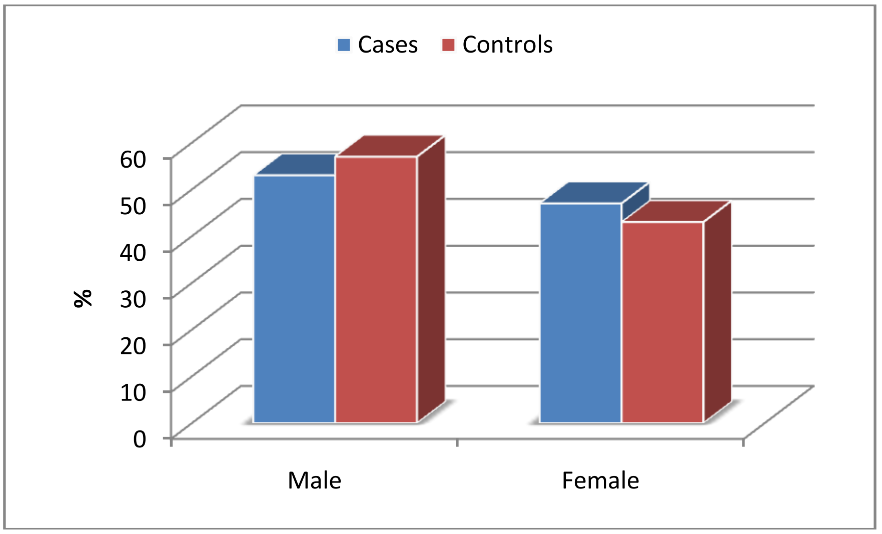

Fig.1: Gender distribution of cases and controls

In **(Table 2)** shows the comparison of BMI between cases and controls according to gender. The BMI of males in cases was 26.81±1.60 and controls was 22.73±1.58. However, BMI of females in cases was 27.09±1.54 and controls was 24.59±1.84. Therefore, the statistically significant (p<0.0001) difference of BMI in males and females between cases and controls. Moreover, there is higher reduction in BMI of both cases and control in males and females is shown in **(Figure 2)**

Table-2: Comparison of BMI between cases and controls according to gender

Gender	Cases	Controls	p-value[1]
Male	26.81±1.60	22.73±1.58	0.0001***
Female	27.09±1.54	24.59±1.84	0.0001***

[1]Unpaired t-test, *p-value: (not significant) ns> 0.05, *<0.05, **<0.01, ***<0.001.

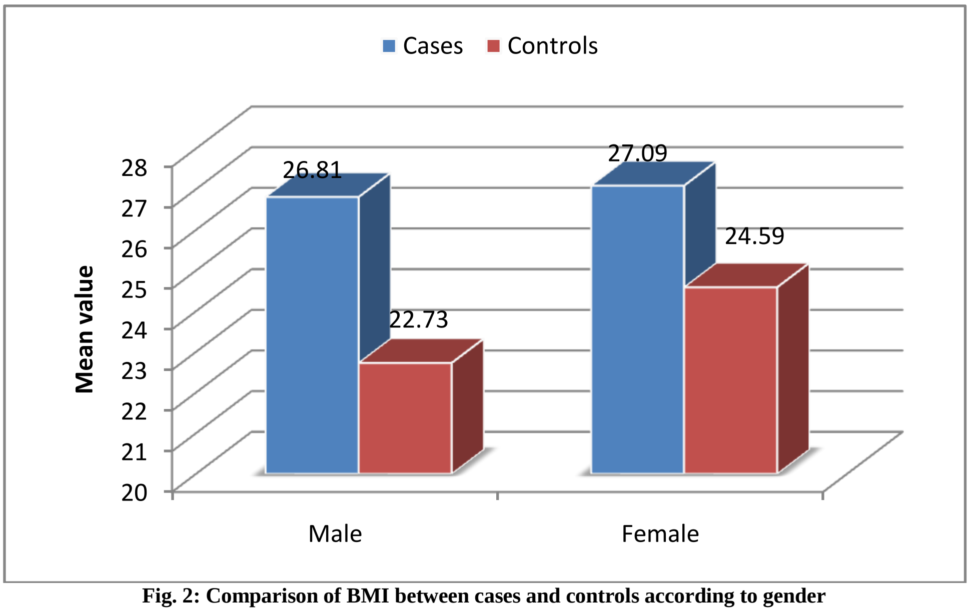

Fig. 2: Comparison of BMI between cases and controls according to gender

The BMI differences in the age groups between cases and controls is shown in **(Table-3)**The mean BMI was found to be statistically significant (p<0.0001) in cases than controls in all the age groups. Furthermore, In **(Figure 3)** shown that the higher reduction of BMI in different age groups in control than cases,

Table-3: Comparison of BMI between cases and controls according to age groups

Age in years	Cases	Controls	p-value[1]
<40	26.46±1.55	23.10±1.52	0.0001***
41-50	26.85±1.62	22.93±1.90	0.0001***
51-60	27.33±1.79	23.93±1.82	0.0001***
>60	26.57±1.01	24.79±1.95	0.0001***

[1]Unpaired t-test, *p-value: (not significant) ns> 0.05, *<0.05, **<0.01, ***<0.001.

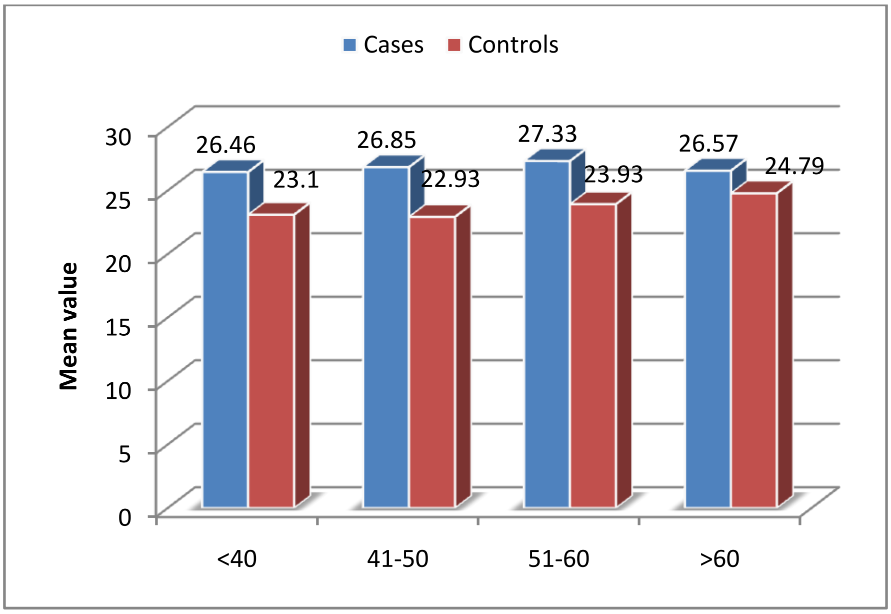

Fig. 3: Comparison of BMI between cases and controls according to age groups

In the **(Table-4)**&**(Figure 4)** shows the comparison of blood sugar level between cases and controls. The mean blood sugar level was found to be statistically significant (p<0.0001) in cases (305.07±60.80) than controls (113.81±12.40).Therefore, In Figure 4 shows that the higher blood glucose level in cases than control.

Table-4: Comparison of blood sugar level between cases and controls

	Blood sugar (mg/dl) (Mean±SD)
Cases	305.07±60.80
Controls	113.81±12.40
p-value[1]	0.0001***

[1]Unpaired t-test, *p-value: (not significant) ns> 0.05, *<0.05, **<0.01, ***<0.001.

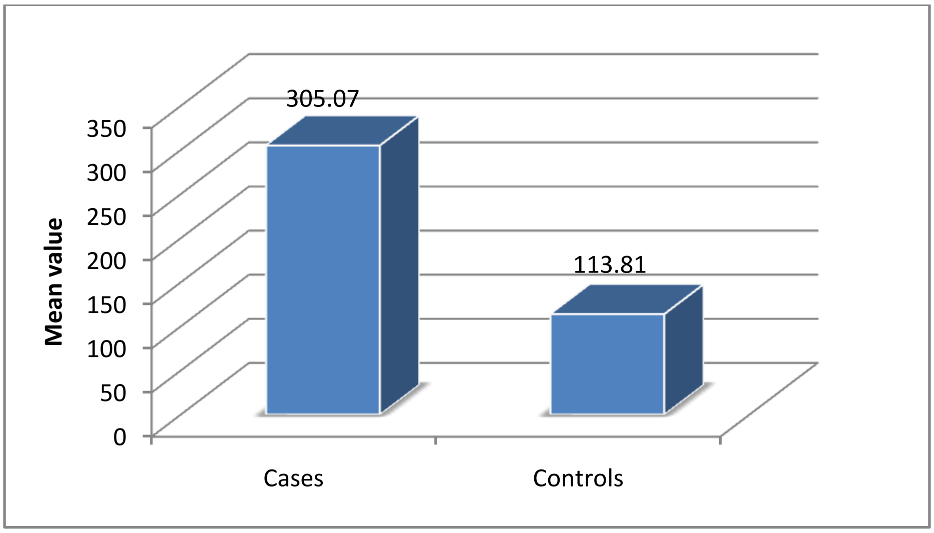

Fig. 4: Comparison of blood sugar level between cases and controls

IV. Discussion

Obesity has been recognized as a major health problem, in the past two to three decades. Obesity, especially central obesity, is an important risk factor for the high prevalence of type II diabetes mellitus. "Diabetes Mellitus", is a chronic disease which requires long standing medical attention, is a leading cause of death in the developing countries. WHO estimates that by 2010 there will be nearly 221 million diabetics all over the world[7].Moreover, Type II diabetes is the most common type of diabetes, and is usually associated with obesity. It usually develops after the age of 40 and is not associated with total loss of ability to secrete insulin. Type II diabetes was once called adult onset diabetes. Now, because of the "epidemic" of obesity and inactivity in children, type II diabetes is occurring at younger ages. It is characterized by impaired insulin secretion, with progression towards insulin deficiency and insulin resistance. The association between degree of obesity, body fats distribution and weight gain with subsequent occurrence of Type II diabetes has been examined in several prospective studies. Increased BMI is now a well established independent risk factor for the development of Type II diabetes [2-3].

In the present study was conducted in the Department of Anatomy and Medicine, IIMS & R, Integral University, Lucknow with the objective to determine the BMI ranges in type II diabetic male and female subjects. A total subject were 200 which is further divided into 100 cases and 100 controls were included in the study. In this study we found that, More than one third of cases (38%) and (19%) of controls were in the age group 51-60 years. The mean age of cases and controls was 53.62±10.19 and 48.76±10.87 years respectively. There was insignificant ($p>0.05$) difference in the age groups between cases and controls. Furthermore, More than half of both cases (53%) and controls (57%) were males. There was insignificant ($p>0.05$) difference in the gender between cases and controls, But the body mass index (BMI) of the cases was found to higher than control subjects. BMI was 26.91±1.57 in cases and 23.53±1.94 in the controls. BMI was found to be in borderline of obesity in cases and within normal range as per WHO recommendations [8]. Furthermore, the BMI of males in cases was 26.81±1.60 and controls was 22.73±1.58. However, BMI of females was 27.09±1.54 and controls was 24.59±1.84. In the past study , BMI of non-diabetic male and female were found to be around 22 kg/m[29].

In the result of our study, the percentage of overweight was higher among the cases (93%) than controls (12%). However, the percentage of normal was found to be lower in cases (3%) than controls (88%). In the previous study , obesity accounts for 64% of cases of diabetes in men and 74% in women, though many cases of diabetes were observed in relatively lean individuals [9-11]. .Moreover, BMI was described as the strongest predictor of type II diabetes. It is clear from the present study that BMI increases with age and BMI of case and controls was positively correlated with age. An Indian study showed that diabetes has a positive and independent association with age and BMI [12]. Furthermore, The diabetics were not classified separately by their types, so it is not possible to comment about relation between obesity and type II diabetes specifically. But obesity is mostly related to Type II diabetes [1,3,13]. Obesity, in particular abdominal or central obesity, is closely linked with insulin resistance. Among obese individuals, enhanced lipolysis and release of free fatty acids inhibits insulin stimulated peripheral glucose uptake in dose dependent manner while simultaneously inhibiting insulin secretion [3]**.**The risk of developing type II diabetes and cardiovascular diseases is high at relatively low

BMI values in subjects who is originating from South East Asian countries and as compared to white population 14-15. Other past studies from northern parts of India had also shown that the normal BMI for an Indian was < 22 kg/m^2 [(16-17)]. The relationship of Diabetes and impaired glucose tolerance (IGT) for BMI value of >22 kg/m^2 had been established in Asian countries [18-19]. So, it is likely that the South Asian people have BMI cut-off value lower than Westerners. BMI might not correspond to the same body fat in different populations because of variations in body proportions, which can be the reason for lower BMI in Asians [20]. It has been observed that normal cut-off value for BMI in Asian Indian adults is <23 kg/m^2[21]**.**

In 2002 WHO expert consultation was made to recommend body mass index (BMI) cut-off points for determining over-weight and obesity in Asians populations. They noted that the number of Asians with a high risk of Type II diabetes and cardiovascular disease is substantial at BMIs lower than 25 kg/m^2. The cut-off points for observed risk varies from 22 kg/m^2 to 25 kg/m^2 in different Asian populations and for high risk it varies from 26 kg/m^2 to 31 kg/m^2. WHO consultation proposed that further study is required in different Asian countries to find out BMI cut-offs to assess potential risk in overweight population for diabetes and cardiovascular diseases[22].

In the present study, The sensitivity and specificity of BMI with cutoff value ≥25.99 was 69% and 91%. PPV and NPV was 88.5% and 74.6% with accuracy being 80%. In a past study, for the definition of overweight, ROC curve analysis suggested optimal BMI cut-offs of 28.50 to 29.50 in men and 30.50 to 31.50 in women, but the levels of sensitivity and specificity were too low to be of clinical value and the overall misclassification was unacceptably high across all the selected BMI values (>0.80)[23]. In another previous study, for different BMIs, sensitivity and specificity for percentiles 25, 50, 75, 90 and 95 were obtained. Increased odds ratios for diabetes mellitus and hypertension were observed with BMI values ≥ 25kg/m^2. The 50th percentile corresponded to the highest sensitivity and specificity for the identification of risk for both diseases[24].

V. Conclusion

The difference of BMI in male and females was found to be statistically significant (p<0.0001) between cases and controls and BMI was found to be statistically significant (p<0.0001) higher in cases than controls in all the age groups. Moreover, The BMI of NIDDM of males were higher in both cases and control than females and it is more statistically significant 51-60 years.

References:

[1]. Aruna D Pradhan, Patrick J, Skerrett John E Manson. Obesity, Diabetes and Coronary risk in women. Journal of cardiovascular risk 2002; 9: 323-30.

[2]. Bertin E, Marcus C, Ruiz JC, Eschard JP, Leutenegger M. Measurement of visceral adipose tissue by DXA combined with anthropometry in obese humans. Int J ObesRelatMetabDisord 2000; 24: 263-70.

[3]. Boden G. Role of fatty acids in the pathogenesis of insulin resistance and NIDDM. Diabetes 1997; 46: 3-10.

[4]. WHO expert consultation. Appropriate Body Mass Index for Asian populations and its implications for policy and intervention strategies. Lancet 2004; 363: 157-63

[5]. Seidell JC, Bjorntorp P, Sjostrom L, et al. Regional distribution of muscle and fat mass in men—new insight into the risk of abdominal obesity using computed tomography. Int J Obes1989;13:289-303.

[6]. American Diabetes Association, "Diagnosis and classification of diabetes mellitus," Diabetes Care, vol. 35, no. 1, pp. S64–S71, 2012.

[7]. Anita P. Mandare, Dr. Neelam Deokar, Patil Smita V., Gaikwad Pandurang B.Comparison of body mass index, waist hip ratio and percentage body fat in type ii diabetes mellitus and in control group.EJPMR, 2016,3(8), 546-549

[8]. World Health Organisation. Obesity: Preventing and managing the global epidemic. Report of WHO consultation. WHO Tech Rep Ser 2000; 894: 1-253.

[9]. Shah A, Parthasarathi D, Sarkar D, Saha CG. A comparative study of body massindex (BMI) in diabetic and non-diabetic individuals in Nepalese population. Kathmandu University Medical Journal (2006), Vol. 4, No. 1, Issue 13, 4-10.

[10]. Colditz GA, Willett WC, Rotnitzky A, Manson JE. Weight gain as a risk factor forclinical diabetes mellitus in women. Ann Medicine 1994; 122: 481-6.

[11]. Chan JM, Stampfer MJ, Ribb EB, Willett WC, Colditz GA. Obesity, fat distribution and weight gain as risk factors for clinical diabetes in man. Diabetes Care 1994; 17: 961-9.

[12]. Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, Yajnik CS, Prasanna Kumar KM, Nair JD. Diabetes Epidemiology Study Group in India (DESI). High prevalence of diabetes and impaired glucose tolerance in India. National Urban Diabetes Survey. Diabetologia 2001; 44: 1094-101

[13]. Guyton C, Hall JE. Insulin, Glucagon and Diabetes Mellitus. In: Text Book of Medical Physiology 10th ed. Philadelphia: W. B. Saunders company, 2003: 884-98

[14]. Moon OR, Kim NS, Jang SM, Yon TH, Kim SO. The relationship between body mass index and the prevalence of obesity-related diseases based on 1995 National Health Interview Survey in Korea. Obes Rev 2002; 3: 191-6

[15]. Ito H, Nakasuga K, Ohshima A, Maruyama T, Kaji Y, Harade M, et al. Detection of cardiovascular risk factors by indices of obesity obtained from anthropometry and dual-energy X-ray absorptiometry in Japanese individuals. Int J ObesRelatMetabDisord 2003; 27: 232-7

[16]. Singh RB, Balaji S, Niaz MA, Rastogi SS, Moshiri M. Prevalence of type II diabetes mellitus and risk of HTN and coronary artery disease in rural and urban population with low rates of obesity. Int J Cardiol 1992; 66: 65-72.

[17]. Dudeja V, Misra A, Pandey RM, Devian G, Kumar G, Vikram NK. BMI does not accurately predict overweight in Asian Indians in northern India. Br J Nutr 2001; 86: 105-12.

[18]. Akanuma Y. NIDDM in Japan. Diabet Med 1996; 13: 511-12.

[19]. Zhou BF. Co-operative Meta analysis Group of the working Group on obesity in China. Predictive values of BMI and waist circumference for risk factors of certain.related diseases in Chinese adults-study on optimal cutoff points of body mass index and waist circumference in Chinese adults. Biomed Environ Science 2002; 15: 83-96
[20]. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care 1998; 1414-413.
[21]. Snehalatha C, Vijay V, Ramachandran A. Cutoff values for normal anthropometric variable in Asian Indian adults. Diabetes Care 2003; 26: 1380-84.
[22]. WHO expert consultation. Appropriate Body Mass Index for Asian populations and its implications for policy and intervention strategies. Lancet 2004; 363: 157-63.
[23]. Ali M. Almajwal, Nadira A. Al-Baghli, Marijka J. Batterham, Peter G. Williams, Khalid A. Al-Turki, and Aqeel J. Al-Ghamdi. Performance of body mass index in predicting diabetes and hypertension in the Eastern Province of Saudi Arabia. Ann Saudi Med. 2009 Nov-Dec; 29(6): 437–445.
[24]. Rosana Farah Simony; Suely Godoy Agostinho Gimeno; Sandra Roberta Gouveia Ferreira; Laércio Joel Franco; Japanese-Brazilian Diabetes Study Group. Which body mass index is best associated with risk of diabetes mellitus and hypertension in a Japanese-Brazilian population? Cad. SaúdePública vol.23 no.2 Rio de Janeiro Feb. 2007.

.

Shaily Saxena, et. al. "A Study on Significance of Bmi in Niddm Male and Females Patients in North India."*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS),* 20(04), 2021, pp. 31-37.