Int J Biol Med Res. 2011; 2(2): 556-560

BioMedSciDirect Publications

Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Original article

Obesity is becoming synonym for diabetes in rural areas of India also – an alarming situation

Dr.Hetal Pandya*[a], Dr. J D Lakhani [a], Dr. N Patel [b]

*[a]*Associate Professor, [a] Professor& Head & [b] Sr. Resident , S.B.K.S. Medical Institute & Research Centre, Sumandeep Vidyapeeth, At & Post Piparia, Dist: Vadodara, Gujarat, India*

ARTICLE INFO

Keywords:
Diabetes
Obesity
Diabesity
NCEP
Modified ATP III criteria

ABSTRACT

The prevalence of obesity amongst DM population is high; however the indicators to suggest obesity are based on western population. To determine prevalence of obesity amongst diabetic rural and urban population by taking Indian indicators (Modified ATP III criteria for South Asian population) for determining obesity, study was undertaken at rural based Medical college and hospital situated at Piparia, in Vadodara district, Gujarat, India. The obesity is determined by NCEP and IDF (Modified ATP III) criteria which is recommended to be used for South Asians. The study also aimed at finding out whether Waist Circumference (WC) is sufficient enough to measure obesity instead of BMI to detect obesity in Diabetic patients, when we use Modified ATP III criteria. A total of 350 patients attending the diabetes clinic were categorised in four sub groups: 1.Urban obese, 2.Urban Non-obese, 3.Rural obese, 4.Rural Non-obese, by using BMI and waist circumference criteria for South Asian phenotype in Modified ATP- lll and NCEP criteria. Around 70% of these diabetic patients were obese by the above mentioned criteria, making Diabesity a better terminology to define the Indian diabetic patients. Statistically significant increase in prevalence of obesity in diabetics (Diabesity) is noted when Indian indicators were used. This was true for both the indicators BMI as well as WC which noted 17% and 32% more obesity respectively. Further in our study, waist circumference (70%) is found to be marginally better indicator for diagnosis of obesity than BMI (68%). The present study emphasises on use of Modified ATP- III criteria for South Asian population for early detection of obesity, which is beneficial in starting primordial and primary preventive measures for Coronary Artery Disease. Our study also suggests that only a simple measurement of waist circumference can suffice detection of obesity in diabetics. Our study also highlights the alarming increase in the prevalence of obesity in even rural parts of developing countries, such as India due to effect of urbanization & changing lifestyle.

1. Introduction

Rapid globalization & industrialization occurring in developing countries has resulted in considerable increase in life style related diseases. South East Asian countries have the highest burden of diabetes including India & has 33 million cases.[1] Similarly prevalence of obesity is also rising rapidly in developing countries, including India.[2,3] Obesity in Type II diabetic patients is very common phenomenon and often termed as “Diabesity”. Diabetes, Obesity, Hypertension, Dyslipidemia are grouped under one name 'Metabolic syndrome'. The rising prevalence of these life style disorders in India is of concern as singly or in combination, which act as major risk factor for Coronary Artery Diseases (CAD).

Increased predisposition to diabetes & premature CAD in Indians has been attributed to the “Asian Indian Phenotype” characterized by less of generalized obesity measured by Body Mass Index (BMI) & greater central body obesity as shown by greater Waist Circumference (WC) & Waist to Hip Ratio (WHR). Many Indians fit into the category of metabolically obese, normal weight individuals. Despite having lean BMI an adult Indian has more chances of having abdominal obesity.[4,5] The body fat percentage of an Indian is significantly higher than a western counterpart with similar BMI and blood glucose level. It has beenhypothesized that excess body fat & low muscle mass may explain the high prevalence of hyperinsulinemia and the high risk of type 2 diabetes in Asian Indians.[2,6,7]

* Corresponding Author : Dr. Hetal Pandya
Associate Professor
S.B.K.S. Medical Institute & Research Centre, Sumandeep Vidyapeeth,
At & Post Piparia, Dist: Vadodara, Gujarat, India
E mail : drhetalpandya@gmail.com

Usual anthropometric parameters used to measure obesity are BMI, WC & WHR. The most commonly used criteria to diagnose obesity is National Cholesterol Education Program (NCEP), ATP III criteria.[8] Various studies found a need for ethnic based criteria as various ethnic population are showing different body fat distribution. IDF (International Diabetes Federation) had suggested ethnic based criteria of WC & BMI for metabolic syndrome (Modified ATP III criteria).[9] Several studies had been done to suggest appropriate cut out points to define obesity by BMI & WC parameters for Indian population. Most of these studies had used western or their own criteria for obesity analysis.[3,10,11]

India has diverse lifestyle pattern and ethnic variations, thus epidemiological profile of diabetes mellitus may be different in different geographical areas. Gujarat is considered as one of the rich & developed state of India. Ethnic Gujarati people are presumed to have high prevalence of CAD risk factors - obesity, metabolic syndrome, diabetes, hypertension, dyslipidemia because of traditional fat & sugar rich Gujarati food and less physically active life style.

Though burden of diabetes in India is mainly contributed by urban population, the increasing trend of diabetes & obesity may also be present in rural population because of urbanization & changing life style & food habits. There are very few data available for prevalence of obesity & diabetes from Indian continent, which is mainly from South Indian urban population & also from North Indian urban population. [2,3,6,7] Very few studies are done on prevalence of obesity & DM in Gujarati population and also comparative study on Diabesity in urban and rural population is lacking.[12]

The aim of our study is to know the prevalence of obesity in diabetic population - "Diabesity" & to compare the prevalence of Diabesity in urban vs. rural Gujarati population. In this study, BMI & WC are measured and quantified by western criteria (NCEP) & South Asian criteria (IDF). The purpose of using both the criteria was that the magnitude of problem of obesity in diabetic patients may appear less if western criteria is used. We also compared the sensitivity of the two parameters, BMI & WC to detect obesity in Gujarati population – both in rural and urban population.

2.Material & Method

As S.B.K.S. Medical College is situated in the periphery of Vadodara city, we receive patients both from urban (> 1 lac population) & rural areas. Diabetes Clinic is run by Dept. of Medicine on every Tuesday since last more than two years. A total of 350 consecutive diabetic patients attending Diabetes Clinic from March' 09 to Aug'10 (Period of 15 months) were included for this study. Besides their detailed history & examination, their anthropometric measurement (Weight, Height, Waist Circumference & Hip Circumference) were taken using standard methods.

Subjects wore light clothes during weight measurement, done with a calibrated weighing machine. Height was measured with calibrated fixed scale with bare feet. Waist Circumference (WC) was measured as maximum diameter at the level between the lowest rib margin & iliac crest & Hip Circumference (HC) wasmeasured at the widest points of two trochenters using a measuring tape. Then BMI was calculated for each patient by using standard formula.

All diabetic patients were then categorized as obese or non-obese using BMI & Waist Circumference (WC) as diagnostic parameters used in two different Criteria: National Cholesterol Education Program (NCEP) Criteria of (a) BMI: >25 (b) WC: > 120 cm (Male), >88 cm (Female) and International Diabetes Federation (IDF) - Modified ATP lll criteria of (a) BMI : >23 (b) WC : >90cm (M), > 80cm (F).

Further these patients are divided in four subgroups: 1. urban obese 2. urban non obese 3. rural obese 4. rural non obese.

The data so collected from urban (male & female) & rural (male & female) patients were analyzed separately using various statistical methods like calculation of mean, standard deviation of mean, paired t test, chi-square test & confidence interval. P Value equal to or less than 0.05 was considered as significant.

3.Results

Out of 350 diabetic patients enrolled in study, 151 were urban (83 male & 68 female) & 199 were rural (122 male & 77 female). Mean age of urban patients was 55.6 ± 10.7 & that of rural patients was 58.2 ± 10.8. Mean BMI of urban patients was 26.6 ± 3.36 (male: 25.3 ± 4.55 & female: 28.2±5.87) & that of rural patients was 24.2 ± 4.82 (male: 22.8 ± 3.82 & female: 26.4±5.41). Mean waist circumference of urban patients was 95.7± 12.69(male: 95.5±11.75 & female: 95.9±13.83) & that of rural patients was 90.9±13.24 (male: 90.4±12.29 & female: 91.8±14.66) respectively. (Table 1)

When NCEP criteria of BMI >25 is used, only 62.3% of urban & 43.2% of rural DM patients were found to have obesity, while by using IDF (Modified III criteria for south Asian Population) criteria of BMI >23, 78.8% of urban & 61.3% of rural DM Patients were categorized as obese. So almost 16.5% of urban & & 18.1% of rural DM Patients were considered as non-obese or healthy if we follow the obesity criteria for western countries. ($p < 0.001$) (Chart 1, Table 1, 2). Similarly when we used WC criteria specified for South Asian population (WC > 90 cm in males & > 80 cm in Female) as parameter for obesity detection, almost 30.4% of urban & 33.1% of rural diabetic patients having central obesity could be diagnosed early ($p < 0.001$) (Table 2 & Chart 2).

Moreover, in our study, we found that WC of >90 cm is highly sensitive parameter to detect central obesity in males, the difference in percentage between of obesity by NCEP & IDF criteria is almost 40% which is highly significant, but same is not observed for female patients.

Another surprising result was the higher prevalence of obesity in female diabetic patients. Almost 84% of female diabetic patients were obese, while only 58% of male diabetic patients were found to be obese. And this trend is seen in both urban (M: 71%, F: 88% by BMI & M: 66%, F: 92% by WC) and rural population (M: 49%, F: 80% by BMI & M: 52.5%, F: 81.8% by WC). (Table No. 2)

68.8% of DM patients (78.8% of urban & 61.3% of rural) were obese by BMI parameter, while 70% (78% of urban & 63.8% of rural) were obese by WC criteria, showing almost similar results. (Chart: 3,4)

TABLE 1. Mean & S.D. for indicators of obesity in various subgroups

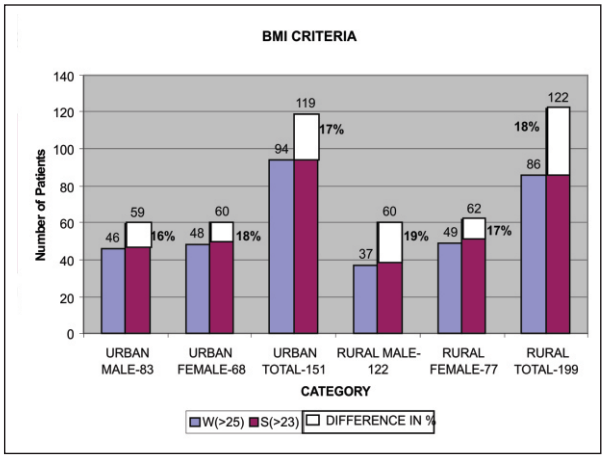
	Urban Population (N1 :151)			Rural Population (N2 : 199)		
Parameter	Male (83)	Female(68)	Total(151)	Male(122)	Female(77)	Total(199)
AGE	56.3 ± 10.8	54.7 ± 10.4	55.6 ±10.7	58.5 ± 11.6	57.9 ± 9.4	58.2 ±10.8
BMI	25.3 ± 4.6	28.1 ± 5.9	26.6 ± 5.3	22.8 ± 3.8	26.4 ± 5.4	24.2 ± 4.8
WC	95.5 ± 11.8	95.9 ±13.8	95.7 ± 12.7	90.4 ± 12.3	91.8 ± 14.7	90.9 ± 13.2

TABLE 2. Difference (%) between western & south asian criteria for BMI & WC.

	BMI				WC			
	W(>25)	S(>23)	DIFF (%)	P Value	W(M:102,F:88)	S(M:90,F:80)	DIFF (%)	P Value
U-M(83)	46(55.4%)	59(71.1%)	13(15.7%)	<.001	22(26.5%)	55(66.3%)	33(39.8%)	<.001
U- F(68)	48(70.6%)	60(88.2%)	12(17.6%)		50(73.5%)	63(92.6%)	13(19.1%)	
U-T(151)	94(62.3%)	119(78.8%)	25(16.5%)		72(47.7%)	118(78.1%)	46(30.4%)	
R-M(122)	37(30.3%)	60(49.2%)	23(18.9%)	<.001	14(11.5%)	64(52.5%)	50(41%)	<.001
R- F(77)	49(63.6%)	62(80.5%)	13(16.9%)		49(63.6%)	63(81.8%)	14(18.2%)	

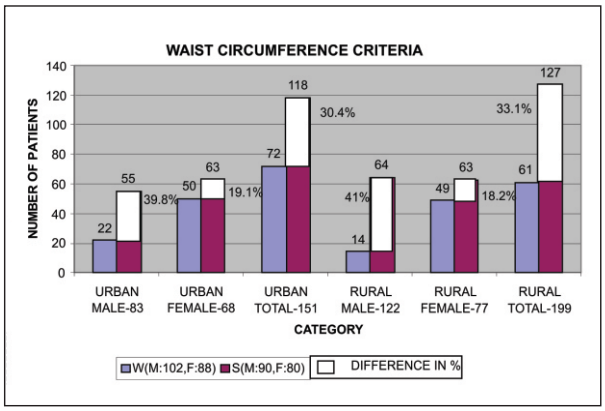
U-M : Urban Male, U-F : Urban Female, U-T : Urban Total, R-M : Rural Male, R-F : Rural Female, R-T : Rural Total, W : Western Criteria, S : South Asian Criteria, DIFF : Difference between Western & South Asian criteria

Chart 1 .Difference(%) between Western & South Asian Criteria for BMI



W: Western criteria, S: South Asian criteria

Chart 2. Difference (%) between Western & South Asian Criteria for WC



W: Western criteria, S: South Asian criteria

Chart 3. Comparison of Prevalence of Obesity (BMI vs. WC)

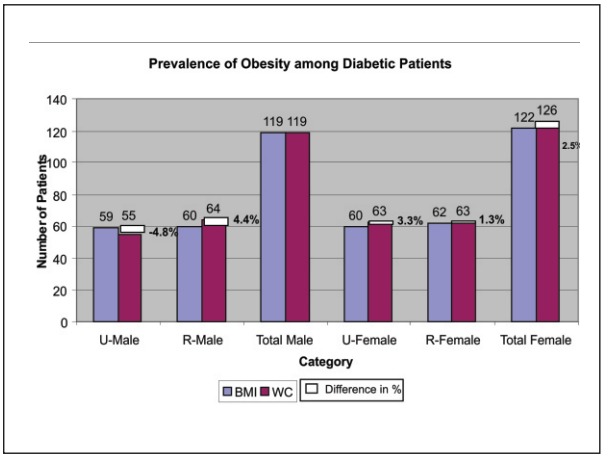
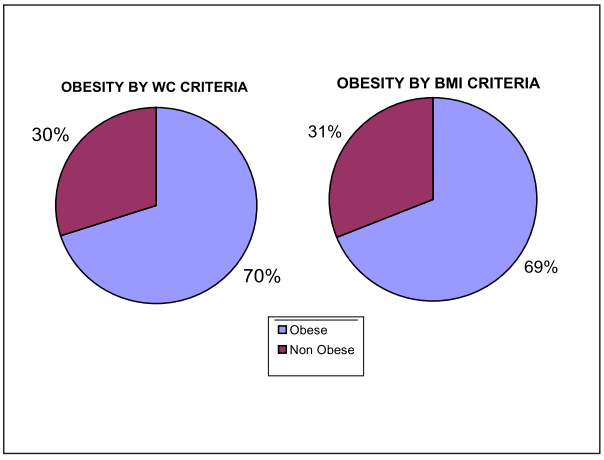


Chart 4. Diabesity



4. Discussion

Obesity & diabetes (Diabesity) have much of its effect on CAD through measurable risk factors such as elevated total plasma cholesterol, elevated LDL cholesterol and hypertension. Thus having a positive correlation with morbidity & mortality from CAD.[13] This has been shown unequivocally amongst Gujarati populations living outside Gujarat.[14] The present study has also clearly shown that obesity calculated by raised BMI (>23) and WC (M: >90 cm, F: >80 cm) is associated with diabetes mellitus. Almost 70% of diabetic patients were obese and we can use the word "Diabesity" as synonym for diabetes in Gujarati population.

The Very High prevalence of Obesity in urban DM population (78.8%) was found as expected from changed urban lifestyle of less physical exercise & more consumption of unhealthy, junk food. But contrary to normal belief of less obesity in rural population because of healthy life style of more strenuous work & simple, healthy & nutritious food, we found the same dangerous trend of increasing obesity in rural population of Vadodara District of Gujarat. 61.3% of rural DM patients were obese. Both male & female patients were found to obese. Surprisingly, more female diabetic patients (84%) were found to be obese than male diabetic patients (58%), and this trend is seen in both urban (M: 88%, F: 71%) as well as rural area also (M: 49%, F: 80.5%). So doing routine household work for whole day may not be enough for control of obesity.

Various criteria were used in many different studies for detection of obesity. In our study, we had used two widely accepted & used criteria (1.NCEP, ATP III criteria & 2.IDF, Modified ATP III criteria) to diagnose obesity in DM patients. Almost 16 to 18 % of patients were categorized as healthy weight if we follow obesity criteria for western population (NCEP - BMI: >25, WC: M >102cm & F >88cm), so diagnosing gross obesity – the tip of obesity iceberg, missing out the huge burden of overweight or centrally obese persons, in whom the primary prevention measures for CAD could have been started at very early stage. Thus we would like to emphasize on use of parameters based on Modified ATP III criteria for South Asian population (BMI : >23, WC: M >90cm, F >80cm) to provide primordial & primary comprehensive care (both life-style modification & medication if required) to patients of Diabesity.

We also compared the sensitivity of Waist Circumference (WC) with BMI (standard parameter) for diagnosis of obesity. As we can see from the Table 2, WC is almost same or rather marginally better indicator than BMI in detecting obesity when we use Modified ATP III criteria given by IDF, 68.8% of DM population (78.8% of urban & 61.3% of rural DM patients) were obese by BMI criteria, while 70% of DM population (78% of urban & 63.8% of rural DM patients) were obese by WC criteria with marginal difference. But this is not true if we use NCEP criteria as it is more relaxed for WC measurement. As Indians are more prone to have central obesity & have more body fat at comparatively less body weight, we would like to recommend strongly the use of Waist Circumference by Modified ATP III criteria (WC : M >90cm, F > 80cm) as the best parameter to be used to detect obesity in diabetic patients.

5. Conclusion

The present study suggests a significant difference between prevalence of obesity by using Western (NCEP, ATP III) and South-Asian criteria (IDF, Modified ATP III), emphasizing on use of Modified ATP III criteria for Indian population to enable early diagnosis of obesity in diabetic population. The present study also suggests use of Waist Circumference as indicator of obesity as it is very easy method, can be used in clinical practice as outpatient measurement without spending any time & without any special training. Contrarily to common belief, even rural underdeveloped areas of developing country like India is showing changing trend towards obesity from under-nourishment as reflected in our study – an alarming situation to be dealt with as early as possible. Further, it is the need of the hour to set guidelines for detection of obesity in Indian population to enable early detection of obesity, so that early & prompt treatment or prevention measures can be started & huge hidden burden of future CAD can be reduced.

6. Reference

[1] Health situation in the South East Asia Region 1998-2000. WHO Regional office for South East Asia 2002; New Delhi.

[2] Misra A, Pandey RM, Devi J R, Khannav N, Sharma R. High prevalence of diabetes, obesity and dyslipidemia in urban slum population in northern India. Int obes Relat Metab Disord. 2001; 25: 1722-9

[3] Mishra A. Khurana L. obesity and metabolic syndrome in developing countries. J Clin Endocriol Metab. 2008; 93: 59-30.

[4] Carly VJ, Wlaters EE, Colditz GA, Solomon CG, Willet WC, Rosner BA, Speizer FE, Manson JE. Body fat distribution and risk of non-insulin deponent diabetes mellitus. The nurses' health study. AM J Epidemiol. 1997; 145:614-619

[5] Banerji MA, Faridi N, Alturi R. Body composition visceral fat, leptin and insulin resistance in Asian Indian men. J clin Endocrinal and metab. 1999; 84:1137-44

[6] Ramachandran A, Snehalatha C, Satyavani K, Vijay V. Metabolic syndrome in urban Asian Indian adults – A population study using modified ATP III criteria. Diab Res Clin Pract. 2003; 60:199-204

[7] Mohan V, Shanthirani S, Deepa R, Deepa M. Intra-urban differences in the prevalence of metabolic syndrome in southern India the Chennai Urban population study. Diabetic Medicine.2005; 18:280-7

[8] Expert panel on Defection, Evaluation and Treatment of High Blood Cholesterol in Adults. Executive Summary of the Third Report of the National Cholesterol Education program (NCEP) Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) JAMA 285 : 2486-2497,2001

[9] The IDF consensus worldwide definition of the metabolic syndrome. International Diabetes Federation. http://www.idf.org/webdata/docs/IDF_Metasybdrome_definition.pdf Accessed May 2006

[10] Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiologist and causation of coronary arties diseases and stroke in India. Heart. 2008; 94:16-26

[11] Snehalatha C, Vishwanathan V, Ramachandran A. Cut off values for normal anthropometric variables in Asian Indian adults. Diabetes care. 2003; 26:1380-4.

[12] Joshi A, Bhugra P, Lakhani J, Desai S. Body mass index and central obrsity in Hypertensive patients. Guj Med Jr. Vol :61. No:03 33-36

[13] Donohue RP; Abbot RD. Central obesity and coronary health disease: Lancet. 1987; 2:1215.

[14] Chadha SL, Gopinath N, Ramachandra K- Epidemiological study of Coronary Heart Disease in Guajarati in Delhi (India). Indian & Med Res. 1992; 96:115-21.

[15] Deepa R, Sandeep S, Mohan V. Abdominal obesity, visceral fat and type 2 diabetes – Asian Indian phenotype. Jaypee Brothers Medical publishers. 2006; 138-52.

[16] Alberti KG, Zimmet P, Shaw J. For the IDF Epidemiology Task Force Consensus Group. The metabolic syndrome – a new worldwide definition. Lanet. 2005;366:1059-62.

[17] Dudeja C, Mishra A, Pandey R.M. High body fat with relatives lowers BMI in Asians Indians in Northern India. British J Nutrition. 2001

[18] National Heart, Lung and Blood Institute, North American Association for study of obesity. Practical guide Identification evaluation and treatment of overweight and obesity in adults. Betherda, M.D., National Institutes of Health Pub number. 00-4084, Oct 2000.

[19] The IDF consensus worldwide definition of the metabolic syndrome. International Diabetes Federation. http://www.idf.org/webdata/docs/IDF_Metasybdrome_definition.pdf Accessed May 2006

[20] P Segal, Paul Z Zimmet.Congress on Prediabetes and the Metabolic Syndrome – A Definitive Definition? Medscape Diabetes &Endocrinology. 2005; 7(2)

[21] World Health Organization Measuring Obesity's Classification and Description of Anthropometric Data. Copenhagen WHO 1989; NutrUD, HUR/ICP/Nut 125.