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BODY MASS INDEX,TOTAL BODY FAT PERCENTAGE, VISCERAL FAT LEVEL AND SKELETAL MUSCLE PERCENTAGE DETERMINATION IN FEMALE PATIENTS

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ABSTRACT

OBJECTIVE: *To determine the frequency of obesity in female and the relation of BMI to visceral fat, total body fat and skeletal muscle percentage as measured by bioimpedence analysis (BIA).*
PLACE AND SETTING: *Medical OPD of Civil Hospital, Karachi from March - April, 2009.*
STUDY DESIGN: *Cross-sectional study.*
MATERIAL AND METHODS: *Female patients were randomly selected from Medical OPD. BIA was carried out in the morning after the subject had emptied their bladder. BIA was carried out by Omron Bioimpedence analyzer.*
RESULTS: *One hundred and twelve females were included in the study, Mean age was 42.06 ± 15.65 years. 29.5 % (33) females had normal BMI, 12.5 % (14) females had BMI in overweight range and 58 % (65) females had BMI in obese range. Mean BMI was 26.64 ± 6.01 kg /m². Mean total body fat was 36.98 ± 11.95 %, Mean visceral fat level was 7.38 ± 3.39, and mean skeletal muscle percentage was 25.52 ± 5.5 %.*
BMI was positively correlated with age and visceral fat level (r =0.23, r =0.80, p < 0.05, & p<0.01) whereas negatively correlated with skeletal muscle percentage (r = -0.528, p<0.01). Out of total 65 (58%) obese females 25 (38.5%) had normal visceral fat. Whereas 40 (61.5%) had high visceral fat level (P value <0.001). Patients having age above 45 years had high visceral fat level p<0.001.
CONCLUSION: *Obesity is highly prevalent in our female population which shows a linear increase with age. For epidemiologic and field studies bioimpedence Analysis for visceral fat may be used a cheaper method of evaluation.*

INTRODUCTION:

Obesity is a major risk factor for insulin resistance and type-2 diabetes. Body mass index is the most commonly used measure of obesity. BMI is easy to measure in clinical and epidemiological studies but it does not directly measure fat. Prevalence of obesity in a population is determined as the proportion above a BMI cut point. This is thought to represent number of individuals with excess amount of body fat, the relationship between BMI and total body fat differs in different populations.

Cardiovascular diseases remain a leading cause of morbidity and mortality. Besides other risk factors like hypertension, dyslipidemia and history of smoking, an android distribution of adipose tissue has been identified as correlated to incidence of cardiovascular complications.[1, 2]

Computed tomography (CT) scan is considered to be the standard method for visceral fat evaluation, but it is not used as a routine procedure. Ultrasonograpy is a safe method fairly inexpensive and widely available modality for measuring abdominal fat thickness. The whole body bioelectrical impedance analysis approach for estimating adiposity and body fat is based on empirical relations established by many investigators. Properly used, this noninvasive body composition assessment approach can quickly, easily and relatively inexpensively produce accurate and reliable estimates of fat free mass and total body water in healthy populations. The estimated fat free mass or total body water values are used to calculate absolute and relative body fat amounts. The bioimpedence analysis approach is most appropriate for estimating adiposity of groups in epidemiologic and field studies but has limited accuracy for estimating

TABLE: 1

CORRELATION OF BMI WITH AGE, TOTAL BODY FAT PERCENT (TF), VISCERAL FAT LEVEL (VF), SKELETAL MUSCLE PERCENT (SK) N = 112

		Age	BMI	TF	VF SK
Age		r = 0.238 P value 0.012	r = 0.177 P value 0.063	r = 0.618 P value <0.001	r = -0.207 P value 0.028
BMI	r = 0.238 P value 0.012		r = 0.857 P value <0.001	r = 0.803 P value <0.001	r = -0.528 P value <0.001
Total body Fat	r = 0.177 P value 0.063	r = 0.857 P value <0.001		r = 0.67 P value <0.001	r = -0.801 P value <0.001
Visceral fat	r = 0.618 P value <0.001	r = 0.803 P value 0.001	r = -0.398 P value 0.001		r = 0.679 P value <0.001
Skeletal muscle	r = -0.207 P value 0.02	r = -0.528 P value 0.001	r = -0.398 P value 0.001	r = -0.39 P value <0.001	

body composition in individuals. When used as a simple index (strature 2 / resistance), BIA is more sensitive and specific for grading average adiposity in groups than some other anthropometric indexes such as the BMI.[3] Our aim is to determine visceral fat level, total body fat percent and skeletal muscle percent by BIA in our female patients and its relation to BMI.

PLACE AND SETTING:

Medical OPD of Civil Hospital, Karachi from March - April, 2009.

MATERIAL AND METHODS:

Female patients were randomly selected from Medical OPD. BIA was carried out in the morning after the subject had emptied their bladder. BIA was carried out by Omron instruction manual composition monitor HBF 500. The BF500 estimates the body fat level by the bioelectrical impedence methods. The BF 500 sends an extremely weak electrical current of 50 KHZ and less than 500 MA through the body to determine the amount of fat tissue. Visceral fat level = 9 is interpreted as normal and = 10 is high. Normal skeletal muscle percent in women is 27-33% and in men 37-43%.

STASTICAL ANALYSIS:

SPSS version 15 used for data analysis. Mean ± SD of variables calculated. Chi square used to see the relation of visceral fat to age. Regression coefficient used to correlate the different variables.

RESULTS:

One hundred and twelve females were included in the study, Mean age was 42.06 ± 15.65 years and Mean height was 153.43 ± 7.28 cm.

29.5 % (33) females had normal BMI, 12.5 % (14) females had BMI in overweight range and 58 % (65) females had BMI in obese range. Mean weight was 62.14 ± 14.165 kg. Mean BMI was 26.64 ± 6.01 kg /m². Mean total body fat was 36.98 ± 11.95 %, Mean visceral fat level was 7.38 ± 3.39, mean skeletal muscle percent was 25.52 ± 5.5 %.

TABLE: 2

RELATIONSHIP OF BMI TO VISCERAL FAT LEVEL

BMI	Visceral fat		P value
	Normal	High	
Normal 18.5- 22.9	31 (93.9%)	2 (6.1%)	0.001
Overweight 23-24.8	12 (85.7%)	2 (14.3%)	0.001
Obese =25	25 (38.5%)	40 (61.5%)	0.001

TABLE: 3

RELATIONSHIP OF AGE TO VISCERAL FAT LEVEL

Age Range	Visceral fat		P value
	Normal	High	
15-30	31 (91.17%)	3 (8.8%)	0.001
31-45	21 (61.8%)	13 (38.2%)	0.001
46-75	16 (36.3%)	28 (63.631%)	0.001

Correlation between the variables is shown in Table 1. BMI was positively correlated with age and visceral fat level (r =0.23, r =0.80, p < 0.05, & p<0.01) whereas negatively correlated with skeletal muscle percent (r = -0.528, p<0.01). Out of total 65 (58%) obese females 25 (38.5%) had normal visceral fat. Whereas 40 (61.5%) had high visceral fat (P value <0.00) . On the other hand 14 (12.5%) over weight females, only 2 (14.3 %) had high visceral fat as compared to normal in 12 (85.7%) females (P value 0.001) as shown in Table 2. Patients having age above 45 years had high visceral fat p<0.001 as shown in Table 3.

DISCUSSION:

Obesity is a major risk factor for insulin resistance, Type 2 diabetes mellitus, heart disease, orthopedic problems and many other chronic diseases. The incidence of obesity has dramatically increased and has become epidemic in the western world.[4] The etiology is multifactorial, with genetic, environmental, socioeconomic and behavioral or psychological influences with an increase in the related morbidity and mortality.[5]

Central obesity is a reflection of visceral obesity and the risk of cardio vascular disease.[6] Importantly, both cardiovascular and metabolic health, including evaluation of adiponectin levels, are enhanced following removal of visceral but not subcutaneous

fat.[7]

Higher BMI was seen in females of increasing age groups. Most overweight women gain their excess weight after puberty. This weight gain may be precipitated by a number of events including pregnancy, oral contraceptive therapy and menopause. In man transition from an active life style during the teens and early 20s' to a more sedentary life style thereafter is associated with weight among many men. In a cohort of Norwegian men and women across an 11 year period demonstrated a significant increase in BMI and prevalence of obesity. The proportion of normal weight individuals fell from 66% to 47 %, while % overweight increased from 27 % to 40 % and percent obesity increased from 4-12 %.[8] Similarly in another Norwegian study initiated in the mid 80s' found that men and women aged 20-29 years gained an average of 7.9 Kg and 7.3 Kg across an 11 year period.[9]

With increasing age and BMI total body fat and visceral fat showed significant increase whereas skeletal muscle percent showed significant decrease. Epidemiological studies suggest that distribution of fat, especially visceral obesity, may be a more important determinant of insulin resistance, diabetes and cardiovascular disease than generalized obesity.[10] Asian Indian have an unexpectedly high percentage of body fat relative to body mass index and muscle mass; this is associated with a proportional increase in visceral fat. They are markedly insulin resistant and hyperinsulinemic. Insulin resistance is correlated with total visceral not subcutaneous adipose tissue volume.[11] Adams TD et al data of large cohort of severely obese individuals demonstrated a linear association between BMI and percent fat for men and curvilinear association between BMI and percent percent fat for women measured by bioimpedence.[12]

Obese are the patients who have increased risk of developing DM & metabolic syndrome .Data suggest that BMI and waist circumference do not adequately mirror visceral fat accumulation in different racial / ethnic groups.[13] Normal and overweight patients had normal visceral fat level but the obese patients had significant increase in visceral fat level (P value 0.000) and above 45 years the visceral fat level showed significant increase (P value <0.001). Asian Indians are known to have lower BMI than Europeans. However for any given BMI, Asian Indian have greater waist to hip ratio and abdominal fat than Europeans .[14,15] Earlier studies on Asian Indians have reported an association of waist circumference with diabetes, suggesting that increased accumulation of fat in the abdominal cavity may be one of the contribution to diabetes in this ethnic group.[16] Viswanathan et al showed that BMI had a correlation with central abdominal fat in both diabetic and non-diabetic subgroups but failed to show an associatian with visceral fat in the diabetic groups, suggesting that BMI is not as good as waist circumference as saggital abdominal diameter by CT scan in predicting visceral adiposity in diabetic subjects .[17]

Obesity in females is increasing to a great extent particularly the visceral obesity is more profound , this requires great concern because of great increase in incidence in diabetes mellitus; metabolic syndrome and other consequences of obesity. Females in our country particularly 40 and above are more confined to their home and also there is no concept of regular physical exercise because of our customs, so programmes for encouraging regular physical exercise and diet are needed through media as well as seminars.

One limitation of this study is that bioimpedence analysis for visceral fat is not equivalent to CT scan and ultrasound techniques but this is cost effective method for epidemiologic and field studies there is need for a more population based studies to see the prevalence of visceral obesity as anthropometric measures do not clearly define the extent of visceral obesity.

CONCLUSION:

Obesity is highly prevalent in our female population which shows a linear increase with age. For epidemiologic and field studies bioimpedence

Analysis for visceral fat may be used a cheaper method of evaluation. As visceral fat percent is significantly increased in obese females, proper physical exercise and diet programmes are needed to overcome this problem and its morbid consequences.

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