

Body mass index and body fat and its correlation with various disorders among obese females

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Objective: To assess effects of body mass index (BMI) and body fat (BF) and its correlation with various disorders among obese females.

Methodology: This descriptive study was conducted on 320 females with ages range from 20 years to 55 years selected by simple random sampling from different hospitals of Punjab Pakistan. Their BMI was calculated using formula. Height, weight, skin fold thickness of Tricep, Suprailiac and thigh area were measured using skin fold caliper.

Results: BMI was positively correlated with body fat ($r = .51, p < 0.001$). Body Fat was positively correlated

with cardiovascular ($r = .45, p < 0.01$), diabetes mellitus type II ($r = .77, p < 0.001$), gynecological problems ($r = .68, p < 0.001$) and other problems ($r = .32, p < 0.01$).

Conclusion: Positive correlation between BMI and BF but people with high body fat seems to be at more risk for Cardiovascular, diabetes mellitus type 2 and gynecological problems in females when compared with BMI.

Keywords: Body mass index, body fat, obese females.

INTRODUCTION

Obesity is defined as abnormal and extensive fat accumulation that negatively affects health.¹ It is increasing and contributes to burden of chronic diseases.^{2,4} International bodies develop certain guidelines for overweight and obesity.⁵ Body mass index (BMI) in kg/m^2 with values 25 – 30 are consider as overweight while values > 30 BMI are considered as obese and a healthy BMI limit is 18.5.⁶⁻¹⁰ Risk factor for comorbidities increased with increasing BMI values.¹¹ Total body fat (BF) can be measured by different ways (skin fold thickness, bioelectrical impedance, underwater weight), and the better way to understand obesity is to measure BF that is rarely used in clinical practice because of inconvenience and cost.¹² The distribution of BF is very important in determining the cause of various metabolic disorders i.e. Diabetes mellitus (DM), Atherosclerosis.^{13,14} Adiposity in midlife is highly related to reduced probability of healthy life and long-term survival among women.¹⁵ National guidelines endorse weight loss for overweight or obese.¹⁶

Normal weight obesity is one having normal BMI but having high BF percentage is associated with cardiovascular (CV) risk factors, metabolic syndromes and cardio metabolic dysregulation.¹⁷ Among women, obesity is increasing with age but loss of muscle mass leading to sarcopenia, BMI does not acknowledge this factor.¹⁸ Due to certain limitations, BMI values aren't taken as standard to measure obesity while BF values is

consider as more accurate for measuring obesity.^{2,19} In this study, our aim was to find the impact of increasing BMI and BF on CVD, DM and gynecological problems among females and to find out the correlation between BMI and BF.

METHODOLOGY

This study was conducted on sample of 320 women selected by simple random sampling from DHQ teaching hospital Sargodha, DHQ Hospital Sahiwal, Allied Hospital Faisalabad, DHQ Hospital Hafizabad and PSRD Hospital Lahore. Their age ranged from 20 to 55 years. Those females having BMI < 25 , females, who were pregnant, those having history of recent acute illness (e.g. pneumonia or myocardial infarction), had a chronic condition (e.g. cancer, uncontrolled high blood pressure, or any vascular disorder) were excluded from the study. An informed consent was taken from all subjects.

Interviews were conducted on their places and Obesity based Questionnaires have been filled by each subject. Along with questionnaires, subjects height, weight, skin fold thickness of Tricep, Suprailiac and thigh area were measured using skin fold caliper.

Skin fold thickness was measured to the nearest mm, except for low values when it was taken to the nearest 0.5 mm. It was measured by using skin fold caliper made at three different sites; Tricep, Suprailiac and Thigh area. Three readings were taken and using the average value for our data.

BMI was calculated using formula; weight (kg)/ [height (m)].² Height was measured using measuring tape while subject were in relaxed standing position with heels removed. Weight was measured using digital weight machine. NIH and WHO criteria for classification of BMI were used to classify individual as overweight (BMI > 25) and obesity (BMI ≥ 30).⁷ ASBP guidelines for BF % was used to classify women as obese when BF ≥ 30%.¹⁸

Statistical Analysis: Data were collected and analyzed by using SPSS version 20. BF values were than compared with BMI to find out its correlation. Pearson correlation was used in data analysis for correlation among the variables.

RESULTS

Mean values of BMI and BF among these 320 subjects were 34.5 and 37.33, respectively. Out of 320 females, 140 had cardiovascular problems, 120 diabetes mellitus, 45 gynecological problems and 15 had other problems (Table 1).

Table 1: Correlation between various disorders in obesity (n = 320).

Variable	Number	Mean ± SD (BMI)	α
Cardiovascular problems	140	23.18 ± 7.63	.71
Diabetes Mellitus	120	23.19 ± 7.47	.75
Gynecology problems	45	19.68 ± 6.82	.72
Others	15	26.33 ± 7.86	.77

Table 2: Pearson correlation analysis.

Variable	BMI	BF
BMI		0.45
BF	0.45	
Cardiovascular problems	0.21	0.51
Diabetes Mellitus	0.6	0.77
Gynecology problems	0.9	0.68
Others	0.1	0.32

BMI was strongly correlated with cardiovascular, diabetes mellitus, gynecological problems i.e. $\alpha = 0.71$, 0.75, 0.72, respectively. Pearson correlation among

study variables indicates that body mass index has positive correlation with body fat ($r = .45$, $p < 0.001$) (Table 2).

DISCUSSION

In the United States, annual death rate due to obesity and related disease is 5 – 15%.²⁰ This has warned us to necessary steps to control obesity.¹⁶ In our study, BMI had weak correlation with CVD ($r = 0.06$) while BF had more strong correlation with CVD ($r = 0.77$) when compared with BMI.

Obesity represents an excess of BF and it is the major risk factor for type II DM.²³ Our study showed that those with high BF were at more risk of developing Type II DM than those with high BMI and it was seen that those having DM were also have some CV problems or they may be at risk of developing such problems.

Gómez-Ambrosi et al reported that high BF% was risk for Type II DM even in those having normal BMI.²¹ Other studies reported that individuals with a high BF content but a normal BMI (i.e., normal weight obesity) were more predisposed to type II DM and CVD.²² Our results also show that the actual amount of BF is playing a key role in DM.

Many participants were not cooperating and it was difficult to convince for measurement procedures. Time estimation of single measurement was longer than the expectation, that's why investigator invests a lot of more time on measurement procedures in participants.

CONCLUSION

There was a positive correlation between BMI and BF but people with high body fat seems to be at more risk for Cardiovascular disease, diabetes mellitus type 2 and gynecological problems in females when compared with BMI.

Author Contributions:

Conception and design: Mohsana Tariq.
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