International Journal of Biomedical Research

ISSN: 0976-9633 (Online)
Journal DOI:10.7439/ijbr
CODEN:IJBRFA

Research Article

Comparison of anthropometric parameters between Obese and Non-obese women of Western Rajasthan

Seema Dhuria*

Tutor, Department of Anatomy, Jodhpur Medical College& Hospital, Jodhpur, Rajasthan

***Correspondence Info:**
Dr. Seema Dhuria
New Abadi, Street No: 13
Hanumangarh town (Raj.) 335513 India
E-mail: seema.hmo@gmail.com

Abstract
Obesity is a public health and policy problem because of its prevalence, costs and health effects.
Aims & objective: The present study was conducted to compare anthropometric measurements between obese and non-obese western women.
Material and method: The present study (cross sectional study) was carried out at Department of Anatomy, Dr. S.N. Medical College, Jodhpur, Rajasthan, among 100 women age ranging from 21 to 45 years. Participants were classified into two groups obese and non-obese based on BMI (WHO). Body height, body weight, BMI, chest circumference, Waist circumference, Hip circumference, waist hip ratio and skin fold thickness (biceps, triceps, sub scapular & Suprailiacal) were measured. Arithmetic mean, standard deviation, p-value and t-value were calculated for all the parameters studied.
Results: Observation shows of this study that all anthropometric parameters of obese women were highly significant as compared to non-obese women, except body height.
Keywords: height, weight, Body mass index (BMI), chest circumference, Hip circumference, Waist circumference, Waist hip ratio, Skin folds.

1. Introduction

Obesity is stigmatized in much of the modern world (particularly in the Western world), though it was widely perceived as a symbol of wealth and fertility at other times in history, and still is in some parts of the world. Obesity is from the Latinobesitas, which means "stout, fat or plump". Obesity is a major health issue worldwide. The trends in the prevalence of obesity documented over the last few decades in our country have been alarming, with morbid obesity affecting 5% of Indian population. Obesity occurs is incomplete; however, it involves the integration of social, behavioural, cultural, physiological, metabolic and genetic factors. In 2013, the American Medical Association classified obesity as a disease. Usually BMI has been used as a measure to diagnose obesity. Other types of anthropometric measures like WC, HC, skin folds and waist to hip ratio (W/H) have all been associated with increased body fat and have predicted the distribution of body fat. International criteria for body mass index (BMI) suggest the following: Underweight (<18.5 kg/m^2), normal weight (18.5-24.9 kg/m ^{2}), overweight (25-29.9 kg/m^2) and obesity (>30 kg/m^2)[1]. But the revised guidelines for diagnosis of obesity in Asian Indian populations are: A normal BMI of 18.0-22.9 kg/m ^{2}, an overweight BMI of 23.0-24.9 kg/m ^{2}, and obesity of BMI greater than or equal to 25 kg/m^2. Mean value of hip circumference is significantly higher in women than in men reflecting the thicker gluteal subcutaneous fat in women[2]. In females, fat content estimation by skin fold thickness is a far better indicator both overweight and obese[3].The proportion of the population that is obese increases steadily with each decade of life until about the age of 60 years in Western countries. Objective of the present study is to compare anthropometric measurements between obese and non-obese western women aged 21-45 years by measuring body weight, body height, chest circumference, mid upper arm circumference, waist circumference, hip circumference and calculation of body mass index and waist/hip ratio.

2. Material and Method

The present (A cross-sectional study) study was carried out at Department of Anatomy, Dr. S.N. Medical College, Jodhpur, Rajasthan, among 100 women age ranging from 21 to 45 years.

2.1 Instruments

Following Instruments were used in present study:

- Measuring tape
- Weighing machine
- Skin fold measuring calipers.

2.2 Anthropometric parameters:

Following anthropometric measurements were taken on the all subjects:

Height (Meter): Height was measured in the standing position, without shoes by using a measuring tape while the shoulders were in a normal state.
Weight (Kilogram): The body weight was measured of the subjects wearing light clothing and without shoes using a calibrated weighing machine.
Body mass index (BMI) (Kg/m²): BMI was calculated using following formula [Garrow JS and Websler J, 1985]

BMI (Kg/m²) = Weight (Kg)/ Height (m²)

Proposed classification of BMI for Asians [WHO]

Class	BMI (Kg/m²)
Underweight	<18.5
Normal	18.5-23
Overweight	23-25
Obese	>25

[Tyrrell VT *et al*, 2001]

Chest circumference (CC) (cm): CC was measured by using a measuring tape. The tape was held horizontally at the level of nipple passing over the lower sub scapular angle.
Mid arm circumference (cm): Using measuring tape, mid arm circumference was taken at maximum girth of arm.
Waist circumference (WC) (cm): WC was measured at most lateral contour of the abdomen by a measuring tape.
Hip circumference (HC) (cm): HC was measured at the widest portion of the hips by a measuring tape.
Waist to hip ratio (W/H): W/H was calculated by dividing Waist circumference by Hip circumference.
Skin fold thickness (mm): Skin fold measurements were also taken at the following sites by using skin fold measuring calipers:
✓ Biceps (BI) - front of arm.
✓ Triceps (TRI) - On the back of arm.
✓ Suprailical (SI)-Above iliac crest, at the level of umbilicus.
✓ Sub scapular (SS) - below inferior angle of scapula.

2.3 Statistical analysis

Arithmetic mean, Standard deviation was calculated for the statistical analysis of all the Anthropometric parameters.

3. Results

Height: Mean height (in meter) of the obese subjects and non-obese subjects in the present study was 1.588 ± .070 and 1.593 ± 0.05 meter, respectively. A statistically non-significant relation (t=.3925; p=0.6955) was observed. [Table 1]
Body weight: Mean weight (in kg) of the obese subjects and non-obese subjects in the present study was 74.14 ± 7.47 and 54.39 ± 7.48 kilograms, respectively. A statistically highly significant relation (t=13.16; p<0.0001) was observed. [Table 1]
Body mass index (BMI): Mean BMI (in kg/m²) of the obese subjects and non-obese subjects in the present study was 29.03 ± 3.73 and 21.29 ± 2.61 (kg/m²), respectively. A statistically highly significant relation (t=12.15; p<0.0001) was observed. [Table 1]
Mid arm circumference: Mean mid arm circumference (in cm) of the obese subjects and non-obese subjects in the present study was 30.01 ± 3.17 and 25.37 ± 3.42 cm, respectively. A statistically highly significant relation (t=6.988; p<0.0001) was observed. [Table 2]
Chest circumference (CC): Mean CC (in cm) of the obese subjects and non-obese subjects in the present study was 99.28 ± 6.53 and 82.65 ± 11.47 cm, respectively. A statistically highly significant relation (t=8.704; p<0.0001) was observed. [Table 3]
Waist circumference (WC): Mean WC (in cm) of the obese subjects and non-obese subjects in the present study was 96.58 ± 9.43 and 78.37 ± 13.77 cm, respectively. A statistically highly significant relation (t=7.585; p<0.0001) was observed. [Table 3]
Hip circumference (HC): Mean HC (in cm) of the obese subjects and non-obese subjects in the present study was 103.35 ± 7.28 and 94.61 ± 7.49cm, respectively. A statistically highly significant relation (t=5.89; p<0.0001) was observed. [Table 3]
Waist to Hip ratio [W/H]: Mean W/H of the obese subjects and non-obese subjects in the present study was 0.93 ± 0.06 and 0.84 ± 0.73, respectively. A statistically highly significant relation (t=6.672; p<0.0001) was observed. [Table 4]
Skin fold thickness: The mean Biceps, Triceps, Subscpular and Suprailiac thickness (in millimeter) of the obese subjects and non-obese subjects in the present study was 27.17 ± 5.24(BI), 31.89 ± 6.33(TRI), 30.14 ± 6.13(SS), 32.11 ± 5.06(SI) mm, and 22.31 ± 5.37(BI), 24.65 ± 7.52(TRI), 21.34 ± 6.39(SS), 18.94 ± 7.24(SI) mm, respectively. A statistically highly significant relation for biceps (t= 4.566; p<0.0001), triceps (t=5.156; p<0.0001), subscpular (t=6.99; p<0.0001) and for Suprailiac (t=10.36; p=0.0002) was observed. [Table 5]

Table No. 1 Shows mean Height (m), Weight (kg) & BMI (kg/m²) of the subjects

Group	Height (m) Mean ± S.D	Weight (kg) Mean ± S.D	BMI (Kg/m²) Mean ± S.D
Obese	1.588 ± .070	74.14 ± 7.47	29.03 ± 3.73
Non-obese	1.593 ± 0.05	54.39 ± 7.48	21.29 ± 2.61
p value	(0.6955) NS	(<0.0001) HS	(<0.0001) HS
t value	0.3925	13.16	12.15

*NS= Non Significant; *HS = Highly Significant

Table No. 2 Shows mean mid arm circumference (cm) of the subjects

Group	Mid arm circumference (cm) Mean ± S.D
Obese	30.01 ± 3.17
Non-obese	25.37 ± 3.42
p value	(<0.0001) HS
t value	6.988

Table No. 3 Shows mean Chest circumference [CC (cm)], Waist circumference [WC (cm)], and Hip circumference [HC (cm)] of subjects

Group	CC (cm) Mean ± S.D	WC (cm) Mean ± S.D	HC (cm) Mean ± S.D
Obese	99.28 ± 6.53	96.58 ± 9.43	103.35 ± 7.28
Non-obese	82.65 ± 11.47	78.37 ± 13.77	94.61 ± 7.49
p value	(<0.0001) HS	(<0.0001) HS	(<0.0001) HS
t value	8.704	7.585	5.89

Table No. 4 Shows mean waist to hip ratio [W/H] of subjects

Group	[W/H] Mean ± S.D
Obese	0.93 ± 0.06
Non-obese	0.84 ± 0.73
p value	(<0.0001) HS
t value	6.672

Table No. 5 Shows mean skinfold thickness at Biceps (BI), Triceps (TRI), Subscpular (SS), Suprailiac (SI) of subjects

Group	BI (mm) Mean ± S.D	TRI (mm) Mean ± S.D	SS (mm) Mean ± S.D	SI (mm) Mean ± S.D
Obese	27.17 ± 5.24	31.89 ± 6.33	30.14 ± 6.13	32.11 ± 5.06
Non-obese	22.31 ± 5.37	24.65 ± 7.52	21.34 ± 6.39	18.94 ± 7.24
p value	(<0.0001) HS	(<0.0001) HS	(<0.0001) HS	(<0.0001) HS
t value	4.566	5.156	6.99	10.36

4. Discussion

Comparing of the anthropometric measurements of One hundred western non-obese and obese women participated in this study, revealed highly significant ($p<0.0001$) of all estimated anthropometric parameters, which were expressed as body weight, body mass index, waist circumference, hips circumference, mid upper-arm circumference , waist hip ratio (WHR) and skin folds. These findings might be explained by the direct effect of obesity and the positive correlation of the anthropometric measurements with each other. These results were agreed with that obtained by Jia *et al*. (2003)[4]. The cut off values in Asian Indian Adults for WC and WHR was lower in women (80 cm, 0.81) than in men (85 cm, 0.88) respectively[5]. The result Observed in other study that WC exceeding 80 cm was associated in women with BMI > 25kg/m² (84.3 cm in overweight and 93.9 cm in obese women)[6]. In other study found WC and HC were the strongest correlated ($p<0.001$) with body fat ($r=0.85$) and fat mass ($r=0.86$)[7].In males, the best indicators of overweight and obesity were waist circumference and BMI respectively[3]. Skin-Fold Thickness (SFT) significantly related to higher prevalence rate of obesity as compared to BMI[8]. One another study shows that the mean values of the four skin fold thicknesses were significantly (P<0:001) higher in women than in men (triceps, subscapular, suprailiac, thigh). In both genders the age-related reduction was statistically significant (P<0:01)[2].

WHO reported that, the body mass index (BMI), waist circumference (WC) and waist hips ratio (WHR) can be used in the prediction of abdominal visceral obesity, which are positively correlates with each anthropometric variable. Waist circumference, hip circumference and waist hip ratio were greater in obese women compared to non-obese ones. These findings might be explained by the facts that: obese women trend to accumulate fat in the visceral region[10]. Thus, increasing WC and WHR, making women more predispose to metabolic syndrome and its related complications. These findings were also similar to that obtained by Ascaso *et al*. (2003).[9]

5. Conclusion

Observation shows of this study that all anthropometric parameters of obese women were highly significant as compared to non-obese women, except body height.

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