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# Obesity Analysis of Prime Body Composition Parameters with Respect to Waist to Hip Ratio: A South Indian Perspective

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## Abstract

***Background****: Obesity is an ailment which would arrive at gruesome stages, if not attended in due course. The management of this disorder should pave the way by appropriate and precise evaluation of the extent of obesity.* ***Objectives:*** *The major motive is the analysis of Obesity based on prime body composition parameters with respect to Waist to Hip Ratio (WHR).* ***Materials and Methods:*** *The cross-sectional propose was implemented in the current cohort, in which 167 contestants from south India were engaged. The estimation of body composition parameters were obtained on the studied population.* ***Results:*** *The elevated noteworthy statistical difference of ≤0.001 was confirmed in all studied population in the prime body composition parameters as well as WHR measured by DXA (Dual X-ray Absorptiometry) and low cost BIA (Bioelectric Impedance Analyzer).* ***Conclusion:*** *The Prime Body Composition Parameters such as PBF (Percent Body Fat), BFM (Body Fat Mass), VFA (Visceral Fat Area) exhibited Positive Correlation with respect to WHR*

**Keywords:** *Obesity, BFM, PBF, VFA, WHR, DXA, BIA.*

## Introduction

Obesity is a disorder which specifies surplus body fat directly related to decreased life expectancy. Obesity has been regarded as one of the major outbreaks experienced in the present century. Overall, obesity affects 5% of the Indian population. Indian BMI standards were utilized for classification into three groups [1, 2]. Obesity-centered effort has potentially envisaged the importance of energy disparity to be the chief abnormal means of obesity [3]..Hence the obesity has to be reserved in ensure by way of weight condition watching, weight loss treatment etc... Already, state of art anthropometric indices such as BMI, Waist Circumference, Waist-to-hip ratio and Waist-to-height ratio have been considered in medical occupation owing to their economical nature (4).The noteworthy involvement of Cardiovascular Diseases with Obesity was noticed particularly by cumulative metabolic interference due to unwholesomeness and death rate for cardiovascular diseases(5). In the brink of decreased contagious ailments, affinity of decreased life hazard goes high in well established urban population of India. Proficient addiction by evasion decreased the contemplation of body fat related risks which have their base by means of having energy rich spicy foodstuff of Indian origin. Asian Indians contrasted with White population had the related BMI but considerably high body fat percentage (6). By default, Asian men possessed more than 30% of fat in the body contrasted with white population who suffered from diabetes however expressed in terms of BMI, total body volume or total muscle volume (7). Prospective Cohort assembles with the data of nutrition foundation of India, that middle socio-economic category possessed 50% of obese females and 32.2% obese males (8). Epidemiological outlook proclaims that visceral fat is the prime reason of insulin resistance, diabetes and cardiovascular disease when compared to other types of fat (9-11).Variation Analysis of various body composition parameters is the need of the hour.

## Materials and Methods

### Study Design and Population

The cross-sectional design was adopted for the

present study. A total of 175 urban people from south Indian community participated, out of which 8 over-extreme obese persons were excluded from the study (BMI≤41). Lactation and Pregnancy were the exclusion criteria, implemented. The studied population was cautiously chosen based on the condition that all the subjects were not suffering from any systematic disease. The informed consent was taken from all the participants. The SRM University, Kattankulathur, Chennai institutional ethical clearance committee approved the study (IEC/273/2012).The informed approval was obtained from each participant and then the measurements were acquired. An obesity free camp was arranged at SRM Hospital and medical research Centre, SRM University, where all the following measurements were taken: Anthropometry, Body Composition Analysis.

## Anthropometry

Participant's weight was measured to a point nearest to 0.1kg by a weight scale; height was gauged using stadiometer to the proximity of 0.5cm.The concern was adopted to see that, the participants avoided wearing shoes, while acquiring height and weight measurements. The Body Mass Index (BMI) was calculated for all the participants based on formula: $kg/mt^2$

## Body Composition Analysis

The economical Bioelectric Impedance Analysis based body composition analyzer, MI-105(Meditech International Inc, India) was utilized to take the measurements of major body composition parameters such as PBF (Percent Body Fat); BFM (Body Fat Mass); FFM (Fat Free Mass); WHR (Waist to Hip Ratio); Muscle Mass; VFA (Visceral Fat Area) etc.The standard technical protocol for data acquisition and the definition of the parameters were detailed by K.B.Kishore Mohan et al (12, 13).

## Statistical Analysis

The data were evaluated by the SPSS Software Package Version 10.0(SPSS Inc.Chiago USA).The measured mean values of assorted main body composition parameters were obtained by descriptive statistics test. The Multivariate analysis was used to find out the correlation between PBF (BIA), BFM (BIA), and VFA (BIA) against WHR (BIA) in total studied population (male and female studied population).The significance between various parameters was sought by T-test.

## Results

Table1 exhibits the major body composition variables measured by cost effective Bioelectric Impedance Analysis (BIA) based body composition analyzer (MI-105(Meditech International Inc, India).The BIA-gauged parameters such as body fat mass(BFM), percent body fat(PBF), fat free mass(FFM), waist to hip ratio(WHR),muscle mass(MM),visceral fat area(VFA),anthropometrically calculated BMI from participants' height and weight and also the WEIGHT parameter displayed high significance of ≤0.001 in total, male and female studied population.

**Table1.** *Descriptive Stististics According To Gender*

| Description of parameters | Overall(n=167) | | | Male(n=80) | | | Female(n=87) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | (Sig) | Mean | SD | (Sig) | Mean | SD | (Sig) |
| Weight(kg) | 65.86 | 13.20 | 0.0000 | 66.27 | 13.35 | 0.0000 | 65.48 | 13.12 | 0.0000 |
| BMI($kg/mt^2$) | 25.51 | 4.63 | 0.0000 | 24.55 | 4.29 | 0.0000 | 26.40 | 4.78 | 0.0000 |
| BFM(kg) | 22.31 | 9.11 | 0.0000 | 18.71 | 8.17 | 0.0000 | 25.62 | 8.70 | 0.0000 |
| FFM(kg) | 43.46 | 10.91 | 0.0000 | 50.23 | 9.94 | 0.0000 | 37.24 | 7.58 | 0.0000 |
| PBF (%) | 33.55 | 10.99 | 0.0000 | 26.19 | 8.29 | 0.0000 | 40.32 | 8.57 | 0.0000 |
| WHR (Constant) | 0.88 | 0.07 | 0.0000 | 0.86 | 0.07 | 0.0000 | 0.89 | 0.06 | 0.0000 |
| MUSCLE MASS(kg) | 40.76 | 9.79 | 0.0000 | 47.34 | 7.95 | 0.0000 | 34.70 | 7.06 | 0.0000 |
| VFA($cm^2$) | 89.92 | 46.68 | 0.0000 | 80.56 | 50.04 | 0.0000 | 98.52 | 41.82 | 0.0000 |

Higher Significant Value observed in all Variables w.r.t. Overall, male and female subjects (p=0.0000)

Table2 displays significant high correlation with significance of ≤0.001 for WHR w.r.t.PBF, BFM, VFA in total studied male population.

*Multivariate Analysis for WHR with risk identifying factors in total studied male population*

| Correlations | PBF | BFM | VFA |
|---|---|---|---|
| Pearson correlation | 0.568** | 0.880** | 0.882** |
| WHR Sig (2-tailed) | 0.000 | 0.000 | 0.000 |

** Correlation is significant at the 0.01 level(2-tailed)

Similarly, Table3 displays significant high correlation with significance of ≤0.001 for WHR w.r.t.PBF, BFM, VFA in total studied female population.

*Multivariate Analysis for WHR with risk identifying factors in total studied female population*

| Correlations | PBF | BFM | VFA |
|---|---|---|---|
| Pearson correlation | 0.491** | 0.827** | 0.895** |
| WHR Sig (2-tailed) | 0.000 | 0.000 | 0.000 |

** Correlation is significant at the 0.01 level(2-tailed)

Figure1 presents the Specification of high Significance with noteworthy correlation of 0.568, when WHR was compared with PBF in total studied male population.

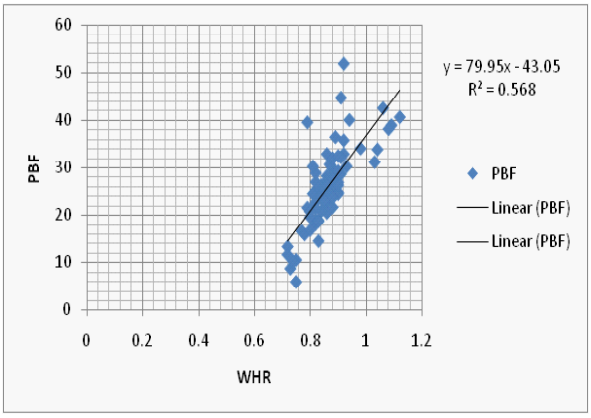


**Figure1.** *Plot of WHR against PBF in total studied male population.*

Figure3 presents the Specification of high Significance with noteworthy correlation of 0.882, when WHR was compared with VFA in total studied male population.

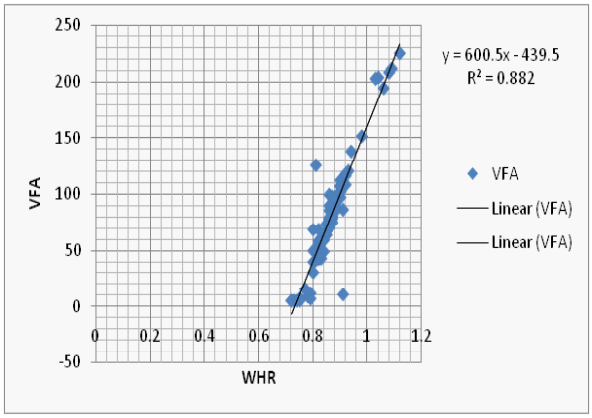


**Figure3.** *Plot of WHR against VFA in total studied male population*

Figure2 presents the Specification of high Significance with noteworthy correlation of 0.880, when WHR was compared with BFM in total studied male population.

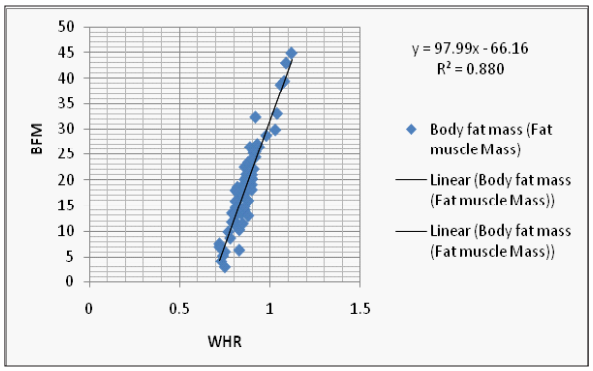


**Figure2.** *Plot of WHR against BFM in total studied male population*

Figure4 presents the Specification of high Significance with noteworthy correlation of 0.491, when WHR was compared with PBF in total studied female population.

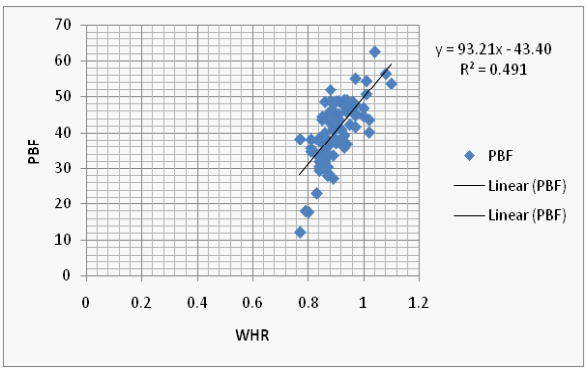


**Figure4.** *Plot of WHR against PBF in total studied female population*

Figure5 presents the Specification of high Significance with noteworthy correlation of 0.827, when WHR was compared with BFM in total studied female population.

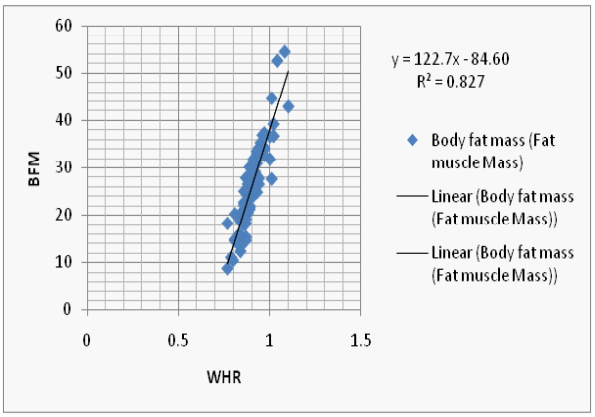


**Figure5.** *Plot of WHR against BFM in total studied female population*

Figure6 presents the Specification of high Significance with noteworthy correlation of 0.895, when WHR was compared with VFA in total studied female population

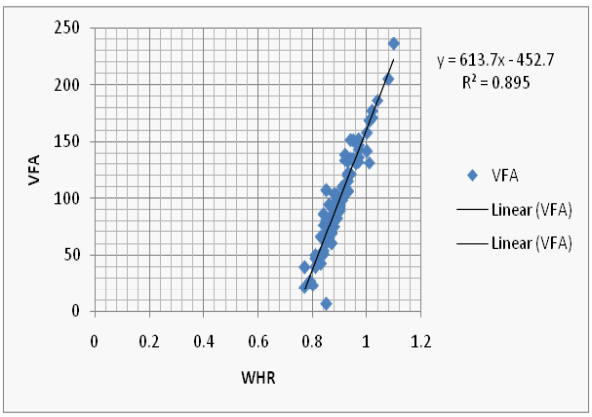


**Figure6.** *Plot of WHR against VFA in total studied female population*

## Discussion

This paper is an attempt to present the variation analysis of various body composition parameters. The Community specific BMI cutoff points were derived because WHO-accepted universal BMI criterion has been providing contradictory results (e.g., body builders who have more BMI have low PBF (12, 14). In Thai population, where middle aged people were participated, WC of 84 cm for men and 80 cm for women was suggested and a BMI of 23 kg/ $m^2$ was advocated for both sexes (15). In Fiji, a experiment was performed to observe the distribution and sociodemographic association of BMI among Melanesians and Indian Fijians aged≥40 years. Melanesians possessed the BMI within the range of 25–35 kg/$m^2$ and above (16). In Dzong village, Nepal, it was found that the mean BMI was less than 21 for both the genders, but mean PBF of females ranged from 25.8% to 31% for all age groups (17). Wen et al. advocated that different BMI cutoffs are utilized for Asian Indian and Chinese population and asserted the disparity between these Asian ethnic groups and Europeans with respect to PBF-BMI association (18). Rush et al. proclaimed the disparity of PBF and BMI relationship for European, Pacific island, and Asian Indian men (19). In all the discussions above, we observe that emphasis has been given for Body mass index as a main index of obesity .In our study, we have proved that WHR is yet another prime body composition parameter which can be utilized as a main index of obesity, as it has positively correlated with other chief body composition variables such as PBF, VFA, and BFM (Tables 2 and 3).

## Conclusion

We conclude that the current work clearly demonstrates the efficacy of the waist to hip ratio on par with body mass index as waist to hip ratio exhibits positive agreement with prime body composition parameters and it can be yet another index of Obesity as aids in precise evaluation of Obesity like body mass index.

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