

MEASUREMENT OF BODY FAT USING GIRTH MEASUREMENT AND SKINFOLD CALIPER IN YOUNG INDIVIDUAL: A CORRELATIONAL STUDY

¹Drashti Jodhani, ²Dr. Mansi Shingala, ³Dr. Dinesh Sorani, ⁴Darshan Parmar

¹Final Year Student, ²Tutor cum Physiotherapist, ³Principal, ⁴Final Year Student
Government Physiotherapy College, Jamnagar, India

Abstract: Assessment of body fat is an important measure of the nutritional status as it is directly related to obesity and other health related diseases. Skinfolds are often used method for (%) body fat measurements. Many times it is found to be difficult compared to Girth measurement technique. So, this study was conducted to find correlation between both the techniques and also using different equations for skinfold calipers. 30 Participants were evaluated for Body fat % with skinfold caliper and inelastic tape measure. All the measurements were taken on the right side of body with the subject standing upright. Average of two measurements was taken for analysis. Significant Positive correlation was found for Girth measurement and skinfold technique. Being a quick and easy administered method, Girth measurement technique can be used for assessment of body fat like skinfolds.

Index Terms: Body fat, Girth measurement, Skinfold calliper.

INTRODUCTION

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have adverse effect on health. Assessment of body fat is an important measure of the nutritional status as it is directly related to obesity and other health related diseases ^{[1], [8]}. Most body composition analysis is based on seeing the body as consisting two separate compartments, fat and fat-free mass ^[1]. Thus, body composition is often defined as the ratio fat to fat-free mass ^[1]. Out of many methods, the most common methods to assess body fat are anthropometric test, especially skinfolds thickness measure, which provides an estimate of the subcutaneous fat deposition, recalculated for the total body fat or body density ^{[1], [7]}. Determination of body composition from skinfolds measurement is based on the fact that a large proportion of total body fat is stored directly underneath the skin. ^[2] Girth measurements offer an easily administered, valid and attractive alternative to skinfolds. Along with predicting percentage body fat, girth measurements can also be used to analyze patterns of body fat distribution. ^{[1] [2], [7]}

NEED OF STUDY

Many times it is difficult to use skinfold caliper compared to Girth measurement technique. So, this study was conducted to find correlation between both the techniques and also using different equations for skinfold caliper.

AIM

To measure and correlate body fat using both Skinfold caliper method and Girth measurement method.

MATERIALS AND METHODOLOGY

This Correlation study was conducted on 30 (Male =15, Female=15) young individuals according to the inclusion and exclusion criteria. Individuals were recruited from Physiotherapy College and OPD. Inclusion criteria were kept as age of 18-25 years and who were willing to participate. The criteria for exclusion were any pathological conditions affecting the whole body (Orthopaedic, Cardio respiratory, Neurological and/or surgical conditions). After taking the informed consent participants were explained the procedure. Skinfold Caliper (Saehen), paper, Pen, Inelastic Measure Tape was used for the assessment ^[6].

PROCEDURE

After explaining the procedure, Skinfold measurement and Girth measurement were taken in all subjects using Saehen Skin fold Caliper and measure Tape respectively. Participants were randomly undergone for both the measurement technique. Skin fold measurements taken were chest, midaxillary, triceps, subscapular, abdomen, suprailiac and thigh. ^{[4], [6]} All the folds were measured on right side of body with the subject standing upright. Measurement was taken twice for each site and average measurement was considered and Siri's equation was used for calculation of Body fat %. $[\% \text{Fat} = 495 / \text{Body density} - 450]$ ^{[3], [7]}. For Girth measurement inelastic tape measure was used. ^{[4], [5], [6]} The tape was placed on the skin surface without compressing the subcutaneous adipose tissue. ^[5] **Figure 1 & 2** shows the technique of measurement. Formulas used in the present study were:

Three different formulas are there to calculate body density, different for men and women. ^[3]

Skinfold measurement- Men

1. Seven-Site Formula (chest, midaxillary, triceps, subscapular, abdomen, suprailiac, thigh)

Body density = $1.112 - 0.00043499 (\text{sum of seven skinfolds}) + 0.00000055 (\text{sum of seven skinfolds})^2 - 0.00028826 (\text{age})$

2. Equation 1: Three-Site Formula (chest, abdomen, thigh)^[3]

Body density = $1.10938 - 0.0008267 (\text{sum of three skinfolds}) + 0.0000016 (\text{sum of three skinfolds})^2 - 0.0002574 (\text{age})$

3. Equation 2: Three-Site Formula (chest, triceps, subscapular)^[3]

Body density = $1.1125025 - 0.0013125 (\text{sum of three skinfolds}) + 0.0000055 (\text{sum of three skinfolds})^2 - 0.000244 (\text{age})$

Skinfold measurement- Women

1. Seven-Site Formula (chest, midaxillary, triceps, subscapular, abdomen, suprailiac, thigh)^[3]

Body density = $1.097 - 0.00046971 (\text{sum of seven skinfolds}) + 0.00000056 (\text{sum of seven skinfolds})^2 - 0.00012828 (\text{age})$

2. Equation 1: Three-Site Formula (triceps, suprailiac, thigh)^[3]

Body density = $1.099421 - 0.0009929 (\text{sum of three skinfolds}) + 0.0000023 (\text{sum of three skinfolds})^2 - 0.0001392 (\text{age})$

3. Equation 2: Three-Site Formula (triceps, suprailiac, abdominal)^[3]

Body density = $1.089733 - 0.0009245 (\text{sum of three skinfolds}) + 0.0000025 (\text{sum of three skinfolds})^2 - 0.0000979 (\text{age})$

Girth Measurement Method: ^{[2], [4], [5], [9]}

1. For Young Men (18-26 years):

Percent Fat = Constant A + Constant B – Constant C – 10.2
(A=upper arm, B=abdomen, C=forearm)

2. For Young Women (18-26 years):

Percent Fat = Constant A + Constant B – Constant C – 19.6
(A=abdomen, B=thigh, C=forearm)



Fig.1: Skinfold technique

Fig. 2: Girth measurement (Measurement of triceps fold)
(Abdominal Girth)

RESULT

Data of 30 (Male =15, Female =15) participants was evaluated with SPSS 16 and Microsoft Excel 2007. Mean Age of participants' was 19.87 ± 1.00 . Pearson's correlation test was used to find out correlation. Table shows Pearson Correlation values among % fat calculated using 3 different formulas for skinfold and girth measurement technique. All the Correlations were significant at 0.01 levels.

Table : Correlation values among % fat calculated using two different methods

Skin Fold Technique				Girth Measurement Technique
	<i>Seven site</i>	<i>Equation 1 (3 sites)</i>	<i>Equation 2 (3 sites)</i>	<i>Girth Measurement</i>
Seven site	-	0.955	0.963	0.880
Equation 1 (3 sites)	0.955	-	0.858	0.803
Equation 2 (3 sites)	0.963	0.858	-	0.854

DISCUSSION

This study was conducted to find out correlation between skinfold measurement and girth measurement methods for the assessment of body fat. % body fat was calculated for 30 participants using different equations of skinfold method (3 equations) and for girth measurement method for male and female. [4] Results showed significant positive correlation for skinfold measurement and girth measurement technique. Girth measurement techniques are easy to administer compared to skinfold measurement techniques. It requires proper practice and knowledge of measuring skinfold to get accurate measurements. For field assessments, girth measurement techniques are very helpful to measure body fat [9]. Girth measurements make the work fast & easy and can be just taking by a simple measure tape anytime and anywhere. So we can also use girth measurements, as both the methods showed significant Positive correlation for fat measurement. Limitation of the study was that only one age group of participants (Young) was taken.

CONCLUSION

Being a quick and easy administered method, Girth measurement technique can be used for assessment of body fat like Skinfolts.

FUTURE STUDY

Study can be done with more objective method of body fat measurement and compared with girth measurement. Also the study can be done with many age groups.

CONFLICT OF INTEREST: None.

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