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Original Research Article

To assess the effect of increasing age on body composition parameters in young and middle-aged healthy obese females by body segment analyzer

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ABSTRACT

Introduction: Aging is often associated with changes in body composition that includes total fat mass and decreased total lean body mass. In addition to changes in total fat mass, visceral or centrally located fat stores increase in size.
Aims and Objective: To assess the effect of increasing age on body composition parameters in young and middle-aged healthy obese females by Body Segment Analyzer and framing preventive health measures that reduce the changes in body composition during middle age, thus setting the stage for a healthy old age.
Materials and Methods: The study was conducted in Department of Physiology (CRL), BPS GMC for Women, Kanpur Kalan, Sonepat. The data for this comparative study was collected from 150 females of which 75 were of group I and 75 were of group II. Group I had cover a range from 18 to 34 years and group II had cover a range from 35 to 50 years.
Results: The present study showed, the effect of age on body fat mass, fat free mass, soft lean mass and percentage body fat was found to be highly significant ($p < 0.05$) but skeletal muscle mass in both the groups was not found to be significant ($p = 0.434$).
Conclusions: From the present study it was concluded that age had severe effect on body composition parameters that is body fat, fat free mass, soft lean mass and percentage body fat in obese females.

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1. Introduction

Aging is often associated with changes in body composition that includes total fat mass and decreased total lean body mass. In addition to changes in total fat mass, visceral or centrally located fat stores increase in size.[1–3] In women, age related changes in body composition, i.e. an increase in body weight and body fat and a decrease in fat free mass, have been observed after menopause.[4–7] Numerous studies have reported age related increases in body weight and fatness and decreases in fat free mass after young adulthood.[4,8] Age-related decline in physical activity is associated with increased body weight and body fatness as reported in cross-sectional studies.[9] The assessment of body composition has reached an outstanding position in studies in the area of nutrition, physical activity and health because of the important role of body components in human health, especially regarding the influence of excess body fat and its distribution on the onset of non-communicable chronic diseases.[3,10] There are several factors that have been identified as risk factors for central fatness, including genetic effects, gender, and age. Numerous studies on changes in body composition from middle to old age and on the many factors associated with these changes were summarized well.[11] Understanding the scope of age related changes in body composition and the factors associated with them in healthy adults will help to improve our knowledge

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and understanding of these processes and assist in the prevention of functional limitation and in the management of health status into old age.[4,8]

Human body composition is one of the branches of human biology, mainly to study the change rule of the number of body composition in human body, the influence of various factors in vivo and in vitro on the quantitative relationship between components, as well as in vivo determination of human components. Body composition measurement not only indicate systemic nutritional status and health status, but also provide valuable information for the diagnosis and treatment of various disease, whose quality and distribution are closely related to health status of people at all ages.

The human body composition is an important measure of physical health standards, the proportion of body composition is normal to achieve body composition balance and to maintain the health status. At the same time, its composition to a certain extent also reflects the gender, age, growth and development, disease and other factors.[12]

So, the present study was conducted to know the effects of aging on body composition because, with the increase of age systematic assessment of changes of human body components is important for human health and nutritional status. So females who enter old age with an adequate body composition will have a better health status than those with an inadequate body composition.

2. Aims and Objective

To assess the effect of increasing age on body composition parameters in young and middle-aged healthy obese females by Body Segment analyser and framing preventive health measures that reduce the changes in body composition during middle age, thus setting the stage for a healthy old age.

3. Materials and Methods

The study was conducted in Department of Physiology (CRL), Bhagat Phool Singh Medical College, Khanpur Kalan, Sonepat.

3.1. Study design

The data for this comparative study was collected from 150 females of which 75 were of group I and 75 were of group II. Group I had cover a range from 18 to 34 years and group II had cover a range from 35 to 50 years. The revised BMI cut - off for the Asians as recommended by WHO had considered to classify the overweight and obesity.[13] The subjects were selected according to these guidelines. The study was conducted after approval of protocol by Institutional Ethical Committee.

3.2. Sample size

Using master 2.0 software by taking exposure in control 0% at 80% power of 5% alpha error the sample size were of 150 i.e. 75 each group 1 (18 to 34 years) and group 2 (35 to 50 years).

3.3. Study population

Obese MBBS students and female staff according to WHO guidelines.

3.4. Study technique

Simple random sampling (by computerized random no. table)

3.5. Inclusion criteria

1. Healthy obese female subjects.
2. Subjects who had given written consent.

3.6. Exclusion criteria

1. Subjects should not have age less than 18 years and not more than 50 years.
2. Subjects should not be on any medications like anti-hypertensive, anti-diabetics etc.
3. Subjects should not have any history of any chronic disease like diabetes, cardiovascular or renal disease.
4. Non-pregnant and menopausal female subjects.

All obese female subjects were selected according to WHO guidelines for overweight and obese,[14] for that physical indices like height and weight was to be taken prior. All the subjects were explained the whole procedure beforehand and a written consent had taken. All precautions related to the instrument had to be taken.

Body Composition Analysis had done by Body Segment Analyser InBodyS10 based on the principle of Body Impedance Analysis (BIA). Body Impedance Analysis method had been extensively used in studies of body composition, mainly because of its rapid processing of information, its non-invasiveness, and the production of information with a portable instrument of easy handling and relatively inexpensive which estimates the distribution of body fluids in the intra - and intercellular spaces.[15,16] Body Impedance Analysis is based on the principle that the various body components offer a different resistance to the passage of en electrical current, generating resistance vectors (measure of opposition to the flow of the electrical current through the body) and reactance (measure of opposition to the flow of current caused by the capacitance produced by the cell membrane). Thus, after identifying the levels of resistance and reactance of the organism to the electrical current, the analyzer evaluates total body water and, assuming constant hydration, predicts the quantity of

fat free mass. However, if an individual is hyper hydrated, the fat free mass value is overestimated.

Interpretation of these nomenclatures shows that lean tissues are high conductors of electrical current due to their large amount of water and electrolytes, i.e., they show low resistance to the passage of an electrical current. In contrast, fat, bone and skin have low conductivity and, with a smaller quantity of fluids and electrolytes, they show high electrical resistance. After resistance and reactance are determined, their values can be used to estimate body composition based on specific predictive equations for each clinical situation and for each age range and gender. The classical BIA method consists of the use of four electrodes attached to the hand, wrist, foot and ankle of the non dominant side of the body. The method is based on the conduction of a painless low- intensity electrical current at a fixed or multiple frequency which is introduced in the subjects by means of cables connected to source (electrodes on the hand and foot. In order to obtain reliable test results, care should be taken with the preparation of the patient, of the equipment and of the measuring instruments such as scale and stadiometer, as well as the place where the test will be performed, preventing errors of measurement.[16]

Following parameters were taken-

1. Body fat mass
   Body fat mass refers to the total quantity of lipids that can be extracted from fat and other cells. Body fat mass cannot be directly estimated using the BIA method, but rather it is calculated by excluding Fat Free Mass (FFM) from body weight.
   Body Fat Mass = Body weight – Fat Free Mass (FFM)
   Body Fat Mass is stored under the skin, as well as between the abdomen and muscles. When an examinee's body fat mass is outside of the standard range, he/she is diagnosed as being obese.
2. Fat free mass
   Fat free mass consists of the weight of the remaining components once body fat mass has been excluded from body weight.
3. Skeletal muscle mass
   100% skeletal muscle mass refers to the ideal quantity of skeletal muscle mass for an examinee's standard weight.
4. Soft lean mass
   Soft Lean Mass can be calculated by excluding the mineral found in the bones from body weight.
5. Percentage body fat
   Percentage body fat indicates the percentage of body fat to body weight. Percentage Body Fat (%) = Body Fat Mass (kg)/Body weight (kg)*100

Statistical analysis will be done by calculation of 'p' value and analysis of result by using't' test.

4. Observation and Result

The collected data was entered in excel spread sheet. Mean +/- Standard deviation was calculated for quantitative data, percentage. Student t- test was used for normally distribute variables to find the mean difference using SPSS software. P-value < 0.05 considered as statistically significant.

Table 1: Distribution of mean and standard deviation among group 1 (18 to 34 years) and group 2 (35 to 50 years)

Parameters	Group 1 (N =75) Mean ± SD	Group 2 (N=75) Mean ± SD
Body fat mass	26.785 ± 4.9059	30.765 ± 7.327
Fat free mass	38.348 ± 4.0076	39.892 ± 4.382
Skeletal muscle mass	21.620 ± 3.7498	21.207 ± 2.602
Soft lean mass	60.3353 ± 8.329	67.8373 ± 9.790
Percentage body fat	38.4027 ± 7.041	43.0109 ± 5.349

In Table 1, the mean and standard deviation in group 1 (18 to 34 years) of body fat mass was 26.785 ± 4.9059; fat free mass was 38.348 ± 4.0076 ; skeletal muscle mass was 21.620 ± 3.7498 ; soft lean mass was 60.3353 ±8.329 and percentage body fat was 38.4027 ± 7.041 and similarly the mean and standard deviation among group 2 (35 to 50 years) of body fat mass was 30.765 ± 7.327 ; fat free mass was 39.892 ± 4.382; skeletal muscle mass was 21.207 ± 2.602; soft lean mass was 67.837 ± 9.790; and percentage body fat was 43.0109 ± 5.349.

Table 2: Comparison of mean values among group 1 (18 to 34 years) and group 2 (35 to 50 years)

Parameters	t-value	p-value
Body fat mass	3.909	0.001
Fat free mass	2.252	0.026
Skeletal muscle mass	0.784	0.434
Soft lean mass	5.054	0.001
Percentage body fat	4.513	0.001

In Table 2, effect of age on different parameters of body composition was studied in group 1 (18 to 34 years) and group 2 (35 to 50 years). The effect of age on body fat mass, fat free mass, soft lean mass and percentage body fat was found to be highly significant ($p < 0.05$) but skeletal muscle mass in both the groups was not found to be significant ($p = 0.434$).

5. Discussion

In the present study the effect of age on different parameters of body compositions among group 1 (18 to 34 years) and group 2 (35 to 50 years) were studied. In obese females according to WHO guidelines, the cut– off point for all Asians for overweight or obesity varies from 22 kg/m^2 to 25 kg /m^2 as risk and for high risk it varies from 26 kg/m^2

to 31 kg/m^2 and subjects were chosen by keeping the range in mind for appropriate and effective results.[14] Our results were highly significant in both groups related to different body composition parameters i.e. Body fat mass, Fat free mass, Soft lean mass and percentage body fat showing that there was correlation of these parameters with age. But in our study the effect of age on skeletal muscle mass was not found to be significant. Valdes et al[17] pointed that obesity is not only related to shortened life expectancy, but also related to accelerated aging. So, focusing on obesity related lifestyle and prevent weight gain is very important. Study by Yusuf et al[18] showed that after middle age, body fat accumulation began to increase with age and tends to accumulate in certain areas of body. The amount of body fat goes up steadily after age 30. Elderly women have almost 1/3 more fat compared to younger ones. Fat tissues build up towards centre of body. The amount of visceral fat is also related with total body fat that suggests effect of age as well as genetic correlation in different studies.[10] The importance of increasing age and changes in body composition are associated with increased risk of developing osteoporosis, cardiovascular disease and other clinical conditions.[11,16] The decline in fat free mass was significantly more in group 2 as compared to group 1 suggesting effect of age. Fat free mass to body weight makes an essential risk indicator of major issues in public health services at large. Age dependent deficit fat free mass associated with obesity is one of major risk factor for cardio metabolic disorder.[17]

The soft lean mass decreases significantly with aging, even among relatively young adults. This decrease was more noticeable among obese women who displayed greater risk of rapid decrease in lean mass as compared to normal weight.[14]

The hormonal factors seem to affect body composition on manner that is decrease in skeletal muscle mass and increase in fat mass or vice – versa. Hormones are responsible both for the regulation of body composition and also for tissue metabolism.[5] Improved lifestyle, socioeconomic status and education about nutritional status, good dietary habit tends to have less effect on skeletal muscle mass with age advancement. As in our study we found that skeletal muscle mass result was not significant because better lifestyle of medical students and employees not impact their skeletal muscle mass to higher extent with aging. Hence, it shows that regular exercise and physiological functioning of skeletal muscle mass can be improved in older females.[17]

6. Conclusion

From this study it was concluded that age had severe effect on body composition parameters that is body fat, fat free mass, soft lean mass and percentage body fat in obese females. Since body composition measurements not only indicate systemic nutritional status and health status, but also provide valuable information for the diagnosis and treatment of various diseases like cardio vascular diseases, osteoarthritis, metabolic syndrome and diabetes mellitus. So the present study was done for setting the stage for healthy old age because females who enter old age with an adequate body composition will have a better health status than those with an inadequate body composition and thus framing better living measures and awareness about nutritional status, good eating habit tends to have improvement and less burden on parameters with advancement of age and have a better health status among obese females

7. Summary

The present study was aimed to know the effect of age on different parameters of body composition in obese females. This study was conducted on 150 females out of which 75 were group 1 (18 to 34 years) and 75 were of group 2 (35 to 50 years). The healthy obese females were selected for both groups according to WHO criteria for obesity. We found in our results that there was significant effect of age on body composition parameters i.e. body fat mass, fat free mass, soft lean mass and percentage body fat. Since body composition anomalies is closely related to lipid metabolic disorder diseases such as obesity, diabetes, hypertension and cardiovascular disease, so by body composition analysis we can found changes in body composition and adipose accumulation as early as possible, in order to change lifestyle of each overweight and obese females and also to understand the scope of age related changes in body composition. The factors associated with them in healthy females will help to improve our knowledge and understanding of these processes and assist in the prevention of functional limitation and in the management of health status into old age.

8. Source of Funding

None.

9. Conflict of Interest

None.

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