

Correlation of Body Fat Percentage and Body Mass Index with Depression Among Postmenopausal Women

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Received: 05-06-2026 / Revised: 02-07-2026 / Accepted: 04-08-2026

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Conflict of interest: Nil

Abstract:

Background: Various changes in body composition significantly notable during menopause transition. These changes may contribute to mood disturbances and depressive symptoms. Exploring this association can aid in early detection and preventive care.

Objectives: The aim was to correlate the body fat percentage and body mass index with depression in postmenopausal women.

Materials and Methods: Fifty postmenopausal women of age 45 to 60 years and fifty premenopausal women of age 35 to 45 years were selected for the study. Body composition parameters recorded by using bioelectrical impedance analysis. Depression is assessed by Hamilton Rating Scale (HAM-D).

Results: In postmenopausal women, body fat percentage and HAMD score was found to be positively correlated to the significant extent. ($p=0.013$). Correlation between body mass index and HAM –D score was not positively correlated in postmenopausal women. ($p=0.275$).

Conclusion: The findings of our study suggest that change in body composition is associated with psychological problems in women. Early screening of body composition and mental health status may help in timely intervention and improve quality of life in this population.

Keywords: Premenopausal, Postmenopausal, Body Composition, Depression.

DOI: 10.25258/ijcpr.18.8.46

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Introduction

The term menopause is defined as cessation of menstruation for 12 months which results in ovarian senescence and permanent amenorrhoea. It is a progressive endocrinological phase wherein women transit from regular cyclic menses to a final menstrual period followed by amenorrhoea, denoting inactive ovarian function. [1]

According to the Indian Menopause Society the average age of women is 47.5 years which is much less than western counter parts. [2] As the world's population is always on a rise with improved medical care, there will be increasing number of women entering menopause and a majority of them spend about one third of life in the post-menopausal stage.

During menopause, some women experience numerous and severe symptoms, while others experience minor or no symptoms [3]. The nature and prevalence of menopausal symptoms are common in most women. The symptoms experienced by the postmenopausal women depends

on the level of estrogen hormone. The symptoms associated with estrogen deficiency include hot flushes, night sweats, insomnia and vaginal dryness. During menopause transition, the level of reproductive estrogen is reduced from 250-100pg/ml to less than 10 pg/ml [4]. Therefore, the ability to saturate the receptors and stimulate the targeted tissue cells disappears, leading to estrogenic dysfunction. There are others symptoms and conditions that are not necessarily related to estrogen deficiency may be abnormal bleeding, osteoporosis, arteriosclerosis, depression, irritability, headache, amnesia, dry mouth, eyes, reduced skin elasticity, muscle and joint pain.

The body composition parameters determined by bioelectrical impedance analysis (BIA). It is noninvasive, easily applicable, safe, inexpensive and practical method to assess body composition [5]. Bioelectrical impedance analysis more popularly known as bioimpedance analysis. This method has been extensively used in studies of body

composition mainly because of its rapid processing of information and portable instrument with easy handling [6]. Bioelectrical impedance analysis (BIA) is a commonly used method for estimating body composition parameter particularly body fat [7]. Bioelectrical impedance analysis actually determines the electrical impedance or opposition to the flow of an electric current through body tissues which can then be used to calculate an estimate of total body water (TBW) [6]. In recent years technological improvement have made Bioelectric Impedance Analysis a more reliable and more acceptable way of measuring body composition.

The assessment of body composition has reached an outstanding position in studies in the area of nutrition, physical activity and health, especially regarding the influence of excess body fat and its distribution on the onset of non-communicable chronic diseases [8]. In women's life, menopausal transition is significantly associated with deleterious changes in body composition [9]. Menopause is an important subject to study as due to increase in life expectancy and improved health care delivery, number of postmenopausal women is significantly increasing [10].

In women's life, menopausal transition is also significantly associated with deleterious changes in mental state. Psychological problems and particularly depression is one of problems menopausal women face in the modern societies [11]. Depression is one of the most common psychiatric disorders, which is not limited to specific time, place, or person and includes all groups and classes of society. Depression can be followed by some side effects and problems that leads to psychological and physical problems in the family and finally suicide, which is usually seen in untreated depression. The prevalence of this disorder in women is about two times than its prevalence in men of any age [11]. These complaints are mostly neglected by the females and ignored due to social stigmas and lack of awareness amongst the elderly population regarding the same. It often affects the quality of life and is thus essential to diagnose and treat on time [12].

The tool used in this study to assess the depression is the Hamilton rating scale. It is also called the Hamilton depression rating scale. It is abbreviated as HAM-D. It is a multiple-item questionnaire used to provide an indication of depression [13].

The termination of the menstrual cycle is correlated with a number of physiological alterations and symptoms that can negatively impact emotion and mood [8]. Due to scarcity of the studies on these topics, the present study aimed to investigate the correlation of the body composition parameters with depression in post menopausal women.

Material and Methods

The present study was carried out in Department of Physiology of government medical college. Women aged 35 to 60 years attending to the outpatient department of government medical college and hospital and the staff working in the medical college and hospital has been recruited.

Sample size: A study conducted by Batra J et al [6] inferred that the mean body mass index among premenopausal and postmenopausal women were 24.92 ± 2.65 and 26.55 ± 3.15 respectively. Using these, with 80% power and 95% confidence interval we calculated the sample size of 50 in each group namely study group – Postmenopausal women aged 45 to 60 years and comparison group – Premenopausal women aged 35 to 45 years. Both groups were subjected for anthropometric measurements like weight, height and body mass index and body composition analysis.

Body Composition Analysis: Body composition parameters like body fat percentage was assessed by body stat quad scan 4000 body composition machine, body stat limited, British isles, fluid & illness/ segmental monitoring unit. The basic principle of this method is lean tissue, which consists essentially of electrolyte containing water, conduct the electrical current, whereas the fat acts as an insulator. The impedance of the body is therefore determined largely by low- impedance lean tissues.

After selection, women from both groups were then given appointment in group of five in the department of physiology, government medical college during morning hours for measurement of anthropometric parameters and body composition analysis. All women advised to observe 4 hours fasting before investigations. Before starting the work detailed information regarding project is given to women. Body composition was done in fasting state and with set protocol by bioelectric analysis method. Informed written consent was taken from each subject before the interview. No pressure was exerted on study participants to participate in a study. Confidentiality was ensured at all stages of study.

Assessment of Depression: Depression was assessed by Hamilton rating scale (HAM-D Score). Since its development in 1960 by Dr. Max Hamilton of the University of Leeds, England, the scale has been widely used in various studies. Hamilton Depression Scale, which measures the presence and the severity of depression. Depression was assessed in subject by using Hamilton rating scale for depression with using 21 questionnaire and severity will be labelled when score is high. For every question characterizing a disease symptom, there are 4 written statements, which respectively represent the mildest to the most severe form of sick

feeling. Although the HAM-D form lists 21 items, the scoring is based on the first 17. It generally takes 15–20 min to complete the interview and score the results. The following scores are considered to determine the overall level of depression in this study.

Hamilton depression scoring

Sum the scores from the first 17 items.

- 0–7 = Normal
- 8–13 = Mild depression
- 14–18 = Moderate depression
- 19–22 = Severe depression
- ≥ 23 = Very severe depression.

Postmenopausal women who have undergone hysterectomy, diabetic, hypertensive, on hormone replacement therapy and with h/o gynecological and hormonal disorder have been excluded in this study. Ethical approval for this study was obtained from institution.

Statistical Analysis: The data was collected, compiled and analysed using EPI info (version 7.2) The qualitative variables were expressed in terms of percentages. The quantitative variables were both categorized and expressed in terms of percentages or

in terms of mean and standard deviations. Difference between two proportions was analysed using chi square or fisher exact test.

Observations and Results

The study was carried out in Department of Physiology on females of age group 35 to 60 years in postmenopausal and premenopausal women. Fifty cases each in postmenopausal and premenopausal group were selected randomly and study was carried out on body composition parameters and depression in postmenopausal and premenopausal women.

A) Anthropometric parameters

Height (cm)

Weight (kg)

Body mass index (kg/m)²

B) Body composition parameter

Body fat percentage (BF%)

C) Depression

Results

Table 1: Distribution of the study subjects based on the age groups

Age group	Postmenopausal		Premenopausal		P value
	No ^r	%	No ^r	%	
30 to 40	0	0	30	60.00	<0.001
41 to 50	30	60.00	20	40.00	
51 to 60	20	40.00	0	0	
Total	50	100	50	100	
Mean	50.50		39.42		<0.001
SD	3.84		2.86		

The mean age of the subjects in postmenopausal group is 50.50 ± 3.84 years and among the

premenopausal women it was 39.42 ± 2.86 years and this difference was statistically significant.

Table 2: Distribution of the study subjects based on various anthropometric parameters

Anthropometric parameters	Postmenopausal		Premenopausal		P value
	Mean	SD	Mean	SD	
Height	151.90	7.63	150.50	14.83	0.5542
Weight	61.78	13.17	55.96	12.81	0.0274
Body mass index	26.63	4.58	24.10	5.37	0.0131

There was no statistical difference in height of postmenopausal and premenopausal women.

Weight of postmenopausal women were

significantly higher as compare to premenopausal women. Body mass index of postmenopausal women were significantly higher as compared to premenopausal women.

Table 3: Distribution of the study subjects based on body mass index (Categories)

Body mass index (Categories)	Postmenopausal		Premenopausal		P value
	No ^r	%	No ^r	%	
Underweight (less than 18.50)	0	0	7	14.00	0.0334
Normal (18.50 -24.99)	23	46.00	20	40.00	
Overweight (greater than 25.00)	16	32.00	17	34.00	
Obese (greater than 30)	11	22.00	6	12.00	
Total	50	100	50	100	

Among the postmenopausal group, the subjects none of them were underweight, 46% of them were normal range, 32% were overweight and 22% were obese.

Among premenopausal group, 14% were underweight, 40% were normal, 34% were overweight and 12% were obese. There was a statistical significant difference between the categories of body mass index among the groups.

Table 4: Distribution of the study subjects based on various body fat parameter

Body fat parameters	Postmenopausal		Premenopausal		P value
	Mean	SD	Mean	SD	
Body fat percentage	41.46	5.79	38.95	6.45	0.0437
Body fat in kgs	25.70	7.53	21.80	6.61	0.0069

Body fat percentage & body fat in kgs were significantly higher in post menopausal women as compared to premenopausal women.

Table 5: Distribution of the study subjects based on HAM-D score

HAM-D (Categories)	Postmenopausal		Premenopausal		P value
	No	%	No ^r	%	
Total	50	100	50	100	
	Mean	SD	Mean	SD	
	2.90	1.83	2.34	1.44	0.0218

HAM-D score was significantly higher in postmenopausal women as compared to premenopausal women.

Table 6: Correlation of various parameters with HAM-D score

Various parameters	Postmenopausal		Premenopausal		Total	
	R	P value	R	P value	R	P value
Fat %	0.348	0.013	0.540	<0.001	0.286	0.004
Body mass index	-0.157	0.275	0.027	0.853	0.099	0.327

In postmenopausal as well as premenopausal women, body fat percentage and HAM - D score was found to be positively correlated to the significant extent.

Correlation between body mass index and HAM –D score was not positively correlated in postmenopausal and premenopausal women.

Discussion

The present study is comparative cross sectional observational study of correlation of body fat percentage and body mass index with depression in post-menopausal women. The present study was undertaken in 100 women which includes 50 postmenopausal women as a study group & 50 premenopausal women as comparative group.

The parameters studied were anthropometric parameters like height, weight, body mass index (BMI), body composition parameter such as body fat percentage (BF%) and Depression. Similar parameters were assessed by Quadri S. Dhundsi S (2012), [3] Zuzana Danková et al.(2014) [13].

Among the post-menopausal group, the subjects none of them were underweight, 46% of them were normal range, 32% were overweight and 22% were obese. Among premenopausal women, 14% were underweight, 40% were normal, 34% were overweight and 12% were obese. There was statistically significantly higher BMI in post-menopausal women as compare to premenopausal

women (p value 0.03). There was significant difference between categories of body mass index among the groups.

Same finding found in Grazyna Jasienska (2005) [14], Quadri S, Dhundsi S. (2012) [3] stated that the values of BMI was more in postmenopausal women and depends on duration of menopause. Zuzana Danková et al.(2014) [10] stated higher mean values of BMI in postmenopausal group than in premenopausal women reached again no statistical significance after controlling for age.

The body fat percentage gives the relative percentage of fat in human body. Body fat percentage were significantly higher in post-menopausal women. Mean value of body fat percentage in post-menopausal women was 41.46+5.79 while that of premenopausal women was 38.95 +6.45 in our study. The greater value of BF % in post-menopausal women was found in the study of Quadri S, Dhundsi S. (2012) [3] but it is age related. SC Ho et al (2010) [15] stated that increase in BF % among post-menopausal women and those undergoing menopause transition, menopausal status remained a significant predictor of these changes in body composition.

It was observed that the postmenopausal women had significantly higher HAM –D Score (depression) as compare to premenopausal women. Afshari P et al (2015) [16] showed that a significant percentage of women experiencing depression in their menopause.

This depression can be associated with certain personal characteristics (e.g. relationship with spouse), socioeconomic status (education, income) and being exposed to cigarette smoke. Ahlawat, et al (2019) [17] study revealed prevalence of depression in significant number of postmenopausal women. To improve the quality of life of women in postmenopausal period, diagnosis of depression and relevant influencing factors is important. G. Jasienska et al (2005) [14] observed that the higher incidence of depressive symptoms in postmenopausal women.

Present study showed that in postmenopausal as well as premenopausal women, body fat percentage and depression (HAMD score) was found to be positively correlated to the significant extent. Our result are consistent with the result of Ferreira J et al (2024) [15] study stated that postmenopausal women with higher levels of fat mass tend to have a higher depression score.

Correlation between body mass index and HAM-D score was not positively correlated in postmenopausal and premenopausal women. Zhou et al [19] found similar results, suggesting no significant relationship between depression and BMI. Rasooli et al [20] showed that the severity of depression are not affected by the duration of menopause and BMI. However, Woods et al [21] reported a significant relationship between BMI and depression which is contrary to this study. Sternberg and Lee [22] also stated that high BMI is associated with the prevalence of depressive symptoms.

Barghandan N et al [8] study confirmed that postmenopausal women with higher age and lower physical activity had a greater possibility of having mild to moderate depression.

Although present study have demonstrated association between body fat and depression, relatively few studies have specifically examined the relationship between body composition parameters and depressive symptoms exclusively among postmenopausal women, particularly in the Indian population.

The present study has certain limitations. Being cross sectional, it cannot establish a casual relationship between body fat percentage and depression. The study was conducted at a single centre with limited sample size, which may affect the generalizability of the findings. Future multicentre prospective studies are needed to determine the relationship between changes in body composition and depression. Recall bias for personal information and blood estradiol level are also limitations of this study.

Overall, the findings of the present study indicate that body fat percentage is a more sensitive marker than BMI for assessing the relationship between

adiposity and depression in both premenopausal and postmenopausal women. These results highlights the importance of incorporating body composition assessment into routine women's health evaluation to facilitate early detection and management of depression.

Summary and Conclusion

The present study was undertaken to correlate body mass index, body composition parameter i.e. body fat percentage with depression in postmenopausal women. The findings demonstrated a significant positive correlation between body fat percentage and depression scores in both groups, indicating that women with higher body fat percentage were more likely to have higher levels of depressive symptoms.

In contrast, body mass index (BMI) did not show a significant positive correlation with depression in either premenopausal or postmenopausal women. These finding suggest that body fat percentage is a more sensitive and reliable indicator of the association between adiposity and depression than BMI. Therefore, assessment of body fat percentage should be considered in routine clinical evaluation, particularly in women at risk of depression. Early identification of women with increased body fat and depressive symptoms may facilitate timely preventive and therapeutic interventions along with psychological support.

Acknowledgments: The authors would like to thank the participants for the present study.

Conflicts of interest: There are no conflicts of interest.

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