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Correlation of Menopausal Status with Body Composition and Abdominal Fat Distribution

Mili Sengar[1], Kuldeep Srivastava[2], Ruchi Saxena[3]

[1]TSM Medical College, Lucknow
[2]Mayo Institute of Medical Sciences and Research, Barabanki
[3]Kalyan Singh Super speciality Cancer Institute, Lucknow

ABSTRACT

Background: Body composition parameters changes in women before and after menopause which makes ageing more complex and stressful in women.

Objective:to compare the body composition parameters among pre and post menopausal women.

Methods:A cross-sectional study, conducted in the population around Rural Health Training Centre (RHTC), Barabanki district between May to December 2016 among women in the age group 25-65 years. Body composition parameters of 348 women (total and visceral fat distribution) by bioelectric impedance method (for Model: OMRON Hbf 375) was noted for all the pre-menopausal and post-menopausal women. The variables included -weight, BMI, body fat percentage (BF %) and visceral fat percentage (VF %), Body Surface Area (BSA), Body volume index (BVI), Body volume (BV) and Lean body weight (LBM).

Result: The difference in body composition parameters in the pre and post-menopausal groups is found to be statistically significant in waist circumference, waist-hip ratio, BMI and visceral fat $p<0.05$.

Conclusion: There is increase in body composition parameters during post-menopausal period. A deeper aspect on prevention of obesity after menopause is required to be studied.

Keywords: Menopause, obesity, bio-electric, impedance

INTRODUCTION

Ageing causes changes in human body composition, but the reasons and after effects of these changes are not understood well. Various studies have shown that fat mass increases with age and lean mass (especially bone mass and muscle mass) decreases. These changes in composition with aging leads to increased morbidity and mortality which ultimately predisposes to falls and osteoporotic fractures.[1] The concept that body size, shape and composition influence susceptibility and resistance to disease is truly ancient.[2] Hormonal changes occurring during menopausal transition in women causes a more complex and stressful effects of ageing in women in comparison to men.[3] The start of this menopausal transition not only marks the end of female reproductive function but also makes them more vulnerable to a new set of health problems like cardiovascular diseases, osteoporosis and so on.[4] Aging is associated with gait and balance problems, which increase risk for falls and subsequent osteoporotic fractures. Body weight, physical activity, and muscle strength are factors that determine the voluntary loads placed upon the skeleton.[5]

OBJECTIVE

This study was conducted to compare the body composition parameters among pre and post menopausal women.

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Correspondence: Dr. Mili Sengar (Email: drmili85@gmail.com)
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MATERIAL AND METHODS

A cross-sectional study, conducted in the population around Rural Health Training Centre (RHTC), Barabanki district between May to December 2016 among women in the age group 25-65 years. The sample size was calculated to be 254(~348) considering an expected prevalence rate of 19.7% (high BMI among women),[6] with absolute precision of 5%. Multistage sampling was done to select participants. The women were categorized into two groups: pre- and post menopausal women. Menopause is defined as complete cessation of menstrual period for 12 months.[7]

Methodology: Body composition parameters (total and visceral fat distribution) by bioelectric impedance method (for Model: OMRON Hbf 375)[8] was noted for all the women. The variables included -weight, BMI, body fat percentage (BF %) and visceral fat percentage (VF %). VF was classified as normal (≤9.5), high (>9.5- 14.5) and very high (>14.5-30.0). BF% was classified as low (<20), normal (20-25) and high/obese and overweight (≥30).. BMI was classified as low (<18.5) normal (18.5-24.99) and high/overweight and obese (≥25) very high (>14.5-30.0).[9] Height, weight and waist circumference were measured.Height was measured to the nearest millimetre with a stadiometer and weight was measured with electronic scales to the nearest 0.1 kg. Waist and hip circumferences (cm) were measured with a tape while the subjects were wearing light clothing. Waist circumference was measured at the minimum circumference between the iliac crest and the rib cage whereas hip circumference at the maximum protuberance of the buttocks,[10] and then Waist Hip Ratio (WHR) was calculated.Waist-hip ratio was classified as normal (<0.85) and high (>0.85). Waist circumference was classified as normal (<88cm) and high (>88cm).[11]

The indices[8] used in this study and their derivations were:

1. BSA (Body Surface Area) was calculated using formula BSA = 0.007184 x Weight (kg)0.425 x Height (cm) 0.725
2. Body Volume Index - BVI (V/S) was calculated using formula BVI = S (51.44W/H + 15.3) where W= weight in kg, H=height in cm, S= body surface area in m^2
3. Body Volume (BV) = BVI x BSA
4. Lean Body Weight = (1.07 x Weight (kg)) - 148 x (Weight^2/(100 x Height(m))^2).

Statistical methods: All data was compiled on MS Excel with subsequent clean up and proper checks. t tests and chi square test was used to test the associations between the different variables. A p value of <0.05 was considered significant.

Ethical considerations: Ethical clearance from Institutional Human Ethical Committee of Hind Institute of Medical Sciences (Letter No. HIMS/ IHPC/ 013/ 2014) was obtained before starting the study.

RESULT

Of the total 348 women, 218 (62.6%) were premenopausal women and 130 (37.4%) were postmenopausal women. The mean age of women was 41.69 ± 11.86. More than half individuals (61.8%) lived in joint families. Most of the females were married (94%) and only 2.7% were widows. Over 40% females belonged to lower and lower middle class. 51.3% of the females in were illiterate and. Eighty nine percent of females were housewives, 5% were farmers and 2% were government employee. The mean weight (kg), height (cm), waist-circumference (cm) and waist-hip ratio was 51.83 ± 12.03, 150.78±7.34, 84.58 ± 11.16 and 0.92 ± .09 respectively. The other body composition parameters are shown in Table 1.

The pre- and post- menopausal body composition parameters of 348 women are shown in Table 2.

Table 1: Characteristics and body composition parameters of the study women (n = 348)

Variables	Mean± S.D.	Range
Age, years	41.61 ± 11.880	25 - 65
Parity	1.80 ± 1.43	0 - 6
Weight, kg	51.83 ± 12.03	29.80 - 95.00
Height, cm	150.78±7.34	134.00 - 172.00
WC, cm	84.58 ± 11.16	60.00 - 112.00
WHR	0.92 ± .09	0.72 - 1.40
Whole body fat, %	34.18 ± 6.86	15.00 - 49.90
Skeletal mass	23.85 ± 4.52	12.10 - 41.00
VF	6.78 ± 4.85	0.30 - 30.00
BMI	22.77 ± 4.59	14.20 - 35.50
BSA	4.70 ± 1.34	1.43 - 6.61
Whole body lean mass, kg	37.29 ± 5.27	25.63 - 53.76
BV	32.94 ± 1.34	29.02 - 90.64

Table 2: Body composition parameters stratified by menopausal status (n = 348)

	Premenopausal women (n=218)	Postmenopausal women(n=130)	p value
Age, years	33.59 ± 5.43	55.07± 6.24	0.000
Parity	1.63 ± 1.405	2.09 ± 1.43	0.004
Weight, kg	51.85 ± 10.59	51.80±14.17	0.971
Height, cm	152.23±7.20	148.36± 6.94	0.000
WC, cm	83.01± 10.99	87.20 ± 10.99	0.001
WHR	0.91 ± 0.10	0.93 ± 0.07	0.159
Whole body fat, %	32.56 ± 6.51	36.90 ± 6.59	0.000
Skeletal mass	24.10 ± 4.33	23.44 ± 4.82	0.189
VF	6.00 ± 4.36	8.08 ± 5.34	0.000
BMI	22.46 ± 4.48	23.28 ± 4.76	0.107
BSA	4.47 ± 1.53	5.09 ± 0.81	0.000
Whole body lean mass, kg	37.67 ± 4.85	36.65 ± 5.88	0.079
BV	48.47 ± 9.68	48.33 ± 13.44	0.414
BVI	32.81 ± 3.44	33.15 ± 4.17	0.910

Table 3: High/Normal/Low Body composition parameters in pre- and post-menopausal women

Body composition parameters	Pre-menopausal women (218)		Post-menopausal women (130)		p value
	Low/ Normal (%)	High (%)	Low/ Normal (%)	High (%)	
Waist circumference	150 (69)	68 (31)	72 (55)	58 (45)	0.008
Waist-Hip ratio	124 (57)	94 (43)	59 (45)	71 (55)	0.03
BMI	156 (72)	62 (28)	78 (60)	52 (40)	0.03
BF%	61 (28)	157 (72)	26 (20)	104 (80)	0.1
VF%	172 (79)	46 (21)	85 (65)	45 (35)	0.004

The difference is found to be significant in height, waist-circumference, whole body fat%, visceral fat and body surface area ($p<0.05$). The difference in height may be because of the bent posture among older women.

Table 3 shows the body composition parameters in the pre and post-menopausal groups. The difference is found to be statistically significant in waist circumference, waist-hip ratio, BMI and visceral fat $p<0.05$.

DISCUSSION

Weight gain is a common among women in mid life, particularly during the menopausal transition.[12] During the menopausal transition, the visceral fat increases from being 5%–8% of total body fat during the premenopausal period to being 15%–20% of total fat during the postmenopausal period.[13] The present study has similar findings and suggests that menopausal transition influences body composition parameters with significant increase in total body fat and abdominal/visceral fat. Some studies have shown that body size and distribution measures changed over the menopause but were largely explained by age.[14] Advancing age is often considered a reason for increase in body fat in mid life of women but a careful examination of existing evidence suggests that no evidence can fully accept or reject hypothesis that menopausal transition influencing body composition.[15]

A study among 23 women who were compared for their body composition in the premenopausal and the postmenopausal (8 years apart) in a follow up study,[16] showed that there was no change in weight or waist circumference from the pre- to postmenopausal period after adjusting for age, and the increase in abdominal fat, subcutaneous adipose tissue and visceral adipose tissue was statistically significant. Another study showed a 6% increase in waist circumference, a 10% increase in fat mass and a 1% decrease in skeletal muscle mass over a 6-year period around the menopause[17] that persisted after adjustment for chronologic age. This finding is similar to the present study which shows a statistically significant difference in waist circumference in pre and post menopause. In a study by Kotani et al, [18] showed that menopause accelerates the selective deposition of visceral fat. The increase in visceral fat or waist circumference during post-menopausal period may be explained by decrease in oestrogen levels and declining energy expenditure. Many studies suggest that women have a tendency of increase in weight with aging, regardless of the menopausal transition.[19] In contrast, many reports suggest that midlife changes in body composition are likely not entirely due to age. Use of more sensitive measures such as DEXA[20] or CT or MRI[21] in studies has shown that there is an increase in abdominal tissue redistribution during the post menopause. Thus further research in this field is required to refute or accept the hypothesis of increase in body composition with menopausal transition.

CONCLUSION

There is increase in abdominal weight in post- menopause period. There exists a complexity between body composition changes and sex hormones during menopausal transition period which suggests that multiple approaches to healthy body are required. Prevention of increase in fat deposition can be achieved through behavioral and life-style changes.

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