Original Article

Variation in The Body Composition in Pre-Menopausal & Post-Menopausal Women

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Abstact:

Menopause is an important hallmark for women because lots of changes occur in the body secondarily due to diminished ovarian function. This comparison study was carried out in the Department of Physical medicine and rehabilitation, Bangabandhu Sheikh Mujib Medical University to describe the variation of body composition and to observe the variation of body density, fat deposition among pre and post menopausal women. For this 50 patients of Pre menopausal and post menopausal women aged from 35 to 55 years were taken in this study. The average duration of which was 6 months. The patients were selected on the basis of inclusion and exclusion criteria. Main outcome measures were mean value of height, weight and age of menarch, body mass index, total fat mass amount, percentage of body fat(%), lean mass amount(kg), lumbar spine BMD, waist to hip ratio. Mean values of body mass index, total fat mass amount, percentage of body fat (%), lean mass amount (kg), lumbar spine BMD, waist measurement, hip measurement, waist to hip ratio were higher in pre menopausal group than post menopausal group. The study concluded that bone mineral density is greater in pre-menopausal women than post-menopausal women and remains high up to 35-40 years of age, and declines to older age. BMD positively correlates with weight of women. Premenopausal women have higher height than postmenopausal women though height does not have correlation with BMD in this study.

Key words: Body composition, Menopause.

Abbreviations: BMD: Bone mineral density, BMC: Bone mineral content, DEXA: Dual X-ray absorptiometry, BMI: Body mass index.

Introduction:

Perimenopause may be more important than the actual menopausal or postmenopausal period. Historically, menopause was viewed as a two-stage process, pre- and postmenopause. Treloar, Boynton, Behn, and Brown (1967) introduced the concept of perimenopause. They indicated that the critical marker of perimenopause was menstrual irregularity, defined as genital bleeding changing to either longer or shorter than its usual flow intervals.[1] Two years later, Jaszmann and colleagues introduced the notion of menopause consisting of three stages-premenopause, menopause, and postmenopause.[2] Perimenopause has been recognized as a separate entity in the menopausal process.[3] It begins a few years before actual menopause when women experience changes in menstrual pattern including menstrual cycle irregularity, change in menstrual flow, and ending with no menstruation for 12 months. These changes are secondary to diminished ovarian function. Since circulating estrogen from extraglandular aromatization is important in preventing bone loss in women with menstrual irregularity and prolonged amenorrhea,[4] fat mass may be particularly important to bone metabolism during perimenopause. These additional small evels of non-ovarian estrogen may play a significant role in retarding bone loss, given the loss of ovarian estrogen. Thus, we hypothesize that fat mass is an important determinant of BMD in perimenopausal women. The relationship between soft tissue body composition and BMD has been examined in pre- and postmenopausal women. Although it is generally agreed that body weight is an important determinant of BMD, there is considerable controversy regarding the relative contributions of its two major components: lean and fat mass to BMD. Some studies have shown that only lean mass is the major determinant of BMD and fat mass may have no significant physiological effect in either pre- or postmenopausal women.[5] These studies have suggested that increased lean mass reflect increased muscle strength, stimulating bone remodeling through localized pressure. In contrast, others suggest that fat mass is the main determinant,[6] while still others have found that both lean and fat mass exert independent effects on BMD.[7] Studies supporting the influence of fat mass on BMD have suggested that the effects may be mediated by a combination of hormonal

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factors including serum estrogen and leptin levels and the mechanical loading of fat mass. In fat mass, androgens are converted to estrogen, an important source of estrogen for midlife women. Leptin, produced mainly by adipose tissues, induces differentiation of bone marrow stromal cells toward the osteoblastic lineage, facilitating bone formation.[7]

Previous studies have differed as to the site (e.g., total, spine, or femur) in which BMD is measured, the parameters (e.g., BMD vs. BMC) used in analysis, as well as in the participants' menopausal status. It has been established that significant variation in the relationship between soft tissue body composition and bone mass will occur when different bone mass parameters are used.[8] Further, some of these studies did not separate pre- and postmenopausal women in their analyses and none have recognized perimenopausal women as a separate group with distinctive endocrinology and clinical presentation. Because the role of aromatized estrogen varies according to menopausal status, this recognition is essential to uncover the effect of fat mass on BMD, currently shrouded in mixed groups of pre, peri and postmenopausal women.[9] Additional factors that have varied widely in previous studies include ethnicity, levels of physical activity, smoking habits,[10] muscle strength, or changes in sex hormones, potentially confounding the relationship between soft tissue body composition and BMD. In this study, we investigated the relationship between soft tissue body composition and BMD in sedentary, non-smoking, and perimenopausal women. We also statistically controlled for other confounding factors such as levels of estradiol (E2), race, and muscle strength.

Methods:

This comparative study was carried out in the Department of Physical medicine and rehabilitation, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka from 1st January 2009 to 30th June 2010. The average duration of study was 6 months. A total of 60 patients of Pre menopausal and post menopausal women aged from 35 to 55 years age group were taken in this study. Finally 50 patients were remaining for the study and 10 patients were dropped out. The patients were selected on the basis of inclusion and exclusion criteria. Patients with perimenopausal age not taking HRT, experiencing changes in menstrual pattern over the past 12 months or no menstruation in the past 3-6 months, and free from cardiovascular disease, musculoskeletal problems were included in this study. Patients with hysterectomy and/or bilateral oophorectomy, ovarian tumor and women on diet or loosing or gaining weight were excluded from the study.

Data collection procedure:

Data were collected by a pre designed proforma. Patient's information was obtained through using patient's information sheet which involves questionnaire, clinical findings and biochemical findings. BMI calculated as weight (kg) divided by height squared (m2). Lumbar spine BMD (L2-L4), total fat mass amount, and the percentage of body fat will be measured by dual-enery X-ray absorptiometry (DEXA, QDR 2000:W, Hologic, Waltham, MA). Baseline characteristics, anthropometric characteristics, and lumbar spine BMD will be compared between the two groups. In each group, correlations between BMD and variables will be investigated. The waist-to-hip ratio expressed as the circumference of the waist (in centimeters) divided by the circumference of the hip (in centimeters). The circumference of the waist was measured at the point located halfway between the lower rib margin and iliac crest. The hips were measured at the level of greatest circumference that includes the buttocks. Measures were recorded to the nearest 0.1 cm using a tape measure. DEXA measurements will perform between 09:00 and 12:00 h with a total body scanner and results will be evaluated by the same examiner. This equipment uses switched pulsed stable dual-energy radiation with 70 and 140 kV. The machine performs serial transverse scans from head to toe at 1.2-cm intervals, providing a pixel size of 1.9 X 1.2 mm. The radiation dose is 0.05-0.15 mGy. The reproducibilities of total body fat mass amount and lean mass amount measurements will be determined in, each of whom will be measured twice at a 1-week interval.

Statistical analysis

All data were recorded systematically in preformed data collection form and quantitative data expressed as mean and standard deviation and qualitative data as frequency distribution and percentage. Statistical analysis was performed by using SPSS for windows version 15.0. 95% confidence limit was taken. t test, Chi-square test and Fisher's Exact test was done to measure the level of significance. Probability value <0.05 was considered as level of significance.]

Results:

50 patients of pre menopausal and post menopausal women aged from 35 to 55 years age group were taken in this study. Table 1 shows, Distribution of Height, Weight and Age at menarche. Among all participants in the pre menopausal group mean value of height, weight and age at menarche were 148.87 ± 5.57, 59.40 ± 7.74, 12.00 ± 0.50 respectively. On the other hand in the post menopausal group were 146.82 ± 5.28, 51.60 ± 9.74, 12.08 ± 0.57 respectively. Weight was statistically significant between two groups.

Table 1: Distribution of Height, Weight and Age at menarche.

	Groups		
	Pre-menopausal	Post-menopausal	p value*
Height (cm)	148.87 ± 5.57	146.82 ± 5.28	0.187
Weight (kg)	59.40 ± 7.74	51.60 ± 9.74	0.003
Age at menarche (year)	12.00 ± 0.50	12.08 ± 0.57	0.601

*t test was done to measure the level of significance.
Data was shown as Mean ± SD.

Table 2 shows, In the pre menopausal group mean value of body mass index, total fat mass amount, percentage of body fat (%), lean mass amount (kg), lumber spine BMD, waist measurement, hip measurement, waist to hip ratio were 26.76 ± 4.54, 23.27 ± 6.86, 40.71 ± 7.45, 33.67 ± 3.45, 1.01 ± 0.11, 95.96 ± 6.10, 103.48 ± 6.68, 0.63 ± 0.04 respectively. On the other hand in the post menopausal group were 23.53 ± 3.90, 17.64 ± 6.42, 35.34 ± 7.10, 30.79 ± 3.99, 0.83 ± 0.11, 86.40 ± 10.36, 94.40 ± 9.63, 0.57 ± 0.07 respectively. Percentage of body fat (%), lean mass amount (kg), lumbar spine BMD, waist measurement, hip measurement, waist to hip ratio were statistically significant between two groups.

Table 2: Distribution of BMI, BMD. Percentage of body fat

	Groups		
	Pre	Post menopausal	p value*
Body mass index	26.76 ± 4.54	23.53 ± 3.90	
Total fat mass amount	23.27 ± 6.86	17.64 ± 6.42	0.004
Percentage of body fat (%)	40.71 ± 7.45	35.34 ± 7.10	0.012
Lean mass amount (kg)	33.67 ± 3.45	30.79 ± 3.99	0.009
Lumber spine BMD	1.01 ± 0.11	0.83 ± 0.11	0.001
Waist	95.96 ± 6.10	86.40 ± 10.36	0.001
Hip	103.48 ± 6.68	94.40 ± 9.63	0.001
Waist-to-Hip ratio	0.63 ± 0.04	0.57 ± 0.07	0.001

*t test was done to measure the level of significance.
Data was shown as Mean ± SD.

Discussion:

Among all participants in the pre menopausal group mean value of height, weight and age at menarche were 148.87 ± 5.57, 59.40 ± 7.74, 12.00 ± 0.50 respectively. On the other hand in the post menopausal mean value of height, weight and age at menarche were 146.82 ± 5.28, 51.60 ± 9.74, 12.08 ± 0.57 respectively. Chowdhury et al11 among two hundred and twenty (220) Bangladeshi premenopausal and post-menopausal women aged from 35 to 55 years were studied to compare the effect of age, parity, socioeconomic status and nutritional status on bone mineral density (BMD) of distal and ultra distal ends of radius and ulna. Height was significantly lower in post-menopausal women (148.6 +/- 6.9 vs. 151.8 +/- 5.7 cm, p<0.001). After adjustment of various biological factors in multiple linear regression, body mass index (BMI) showed negative relationship with age (slope -0.0068, p<0.001) and positive relationship with weight (slope 0.0011, p<0.05)

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Elders et al (1988)[14] measured in 286 women (46-55 years of age) using dual photon absorptiometry, the mean perimenopausal bone loss was 0.061 gram-equivalents hydroxyapatite (geqHA)/cm2 and 6.4%, respectively. In the first 2 postmenopausal years the mean bone loss was 0.044 geqHA/cm2 and 5.1% per year. These results suggest a substantial menopause related acceleration of lumbar bone loss in a relatively short time span with its onset in the perimenopausal period.

Conclusion:

The study concluded that bone mineral density is greater in pre-menopausal women than post-menopausal women and remains high up to 35-40 years of age, and declines to older age. BMD positively correlates with weight of women. Premenopausal women have higher height than postmenopausal women though height does not have correlation with BMD in this study.

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