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Original article

Muscle mass in Indian post-menopausal women: An observational study

Arati Mahishale [1, *], Vishagh Nair [2], Shahista Mulla [2]

[1]Department of Obstetrics and Gynecology Physiotherapy, KLE Academy of Higher Education and Research, Belagavi, India

[2]Interns (BPT), Department of Physiotherapy, KLE Academy of Higher Education and Research, Belagavi, India

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Abstract

Background: Aging is accompanied by changes in muscle strength, which is characterized by the rapid decrease of muscle mass and the increase of body fat. The aim of the present study was to evaluate the muscle mass in Indian post- menopausal women.

Methods: One hundred relatively healthy post-menopausal women within the age range of 50-55 were recruited for this study. The body mass index (BMI), girth measurement, skinfold measurement, and waist-hip ratio were the outcome measures used in this study.

Results: The BMI of women was 28.8 ± 3.4 kg/m^2. The average prevalence of changes in girth measurements in post-menopausal women was 38%, and the average prevalence of changes in skinfold measurement in post-menopausal women was 43.8%.

Conclusion: The present study concluded that the score muscle mass was below average in most post-menopausal women. It is highly recommended that the estimation of muscle mass in menopause clinics and the interventions for the prevention of muscle loss are urgently necessary for post-menopausal women.

Keywords: Menopause, Muscular mass changes, BMI

Introduction

It is generally assumed that menopause is the permanent cessation of menstruation, which is due to the loss of ovarian follicular function (1). Clinically, it is widely thought that menopause is seen following a year of amenorrhea; thus, the season of last menses is decided as menopause, and the normal age for menopause is around 51 (2). Natural Menopause is defined as, "No menses for 12 consecutive months with no obvious cause (such as pregnancy, lactation) will respectively define a woman's last menstrual period (FMP)". The definition of surgical menopause is: "The cession of menses either due to the removal of the uterus and mostly one ovary, leaving at least one ovary intact, or the removal of both ovaries, with or without the removal of uterus." (3) It is thought that changes after menopause can affect the whole body by having effect(s) on such body mechanisms as vasomotor, cardiovascular, skeletal, muscular, glandular, and central nervous systems (4).

It is generally presumed that post-menopausal women have a higher incidence rate of cardiovascular diseases than premenopausal women, which is almost statistically significant for all ages combined (5). Joint pain is one of the primary segments of menopause, which is experienced by up to half of ladies with menopausal condition (4, 6). These are just frequent normal issues. Back agony is a good illustration for that, which could be associated with musculoskeletal pain syndrome such as fibromyalgia (7). In a survey conducted in Europe, post-menopausal woman were asked about the impact of different hormonal events affecting their weight: ~50% of the women insisted that they had increased in weight, at least 4.5kg, at the time of per menopause, and just 4% mentioned a decrease in weight (8). It is believed that the insufficiency of estrogen after menopause can speed up the age-related loss of bone mass (9).

Aging is accompanied by body changes in composition, which is characterized by muscle mass reduction and an increase in body fat (10). The loss of muscle mass in postmenopausal women is a well-recognized phenomenon. The onset of menopause is characterized by changes in body composition. It is assumed that the measurement of the upper arm or

*Correspondence author: Dr. Arati Mahishale, Department of Obstetrics and Gynecology Physiotherapy, KLE Academy of Higher Education and Research, Belagavi 590010, India, Tel: + 8147252083 Email: vishaghnair@gmail.com

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thigh circumferences (11) or BMI could be used to estimate muscle mass (12). It is believed that the muscle mass is reduced, and the fat mass is increased in post-menopausal women. Both the increase in fat in postmenopausal women and the distribution of fat mass in the body (13) are regarded as increasing problems in menopausal women. There are several factors such as diet, metabolism, hormonal parameters, and lifestyle, which can influence body composition in postmenopausal women (14). Declined muscle mass (sarcopenia) is supposedly associated with physical disability and functional impairment, especially in women, and is the direct cause of muscle reduction (10, 15, 16). There is a decline in muscle mass with aging, resulting in reduced 'mechanical stress' from an increasingly sedentary lifestyle, whereas any increase in fat mass can induce a decrease in energy expenditure (17). However, the low level of anabolic hormones, especially in postmenopausal women, can limit muscle mass and muscle strength (18, 19). This post-menopausal stage is known as the stage of complaints (20). The loss of muscle mass and muscle strength can result in an increased risk of functional limitation (21). The functional limitations in tasks are relevant to daily life, tasks such as walking, climbing, and chair rising (22). It is thought that women may lose muscle strength early due to menopausal transition around the age of 50 (23). Muscle strength usually declines with age; for instance, the elderly may have only 40% of peak life-time strength (24). The loss of muscle mass is presumably an important factor to predict mobility in menopausal women (25). Therefore, the aim of the present study was to evaluate the muscle mass in Indian post-menopausal women.

Materials & Methods

One hundred relatively healthy post-menopausal women within the age range of 50-55 years were recruited for the study. Women with any abdominal surgery, hormonal therapy operation other than hysterectomy, trauma and fracture in the last 2 years were excluded based on the exclusion criteria. The outcome measures were BMI, girth measurement, skinfold measurement, and waist hip ratio.

The ethical approval was obtained from the Institutional Ethical Committee (IERC) of KAHER Institute of Physiotherapy, Belagavi 590010. All the participants were selected from within and around Belgavi city and were scrutinized based on the inclusion and exclusion criteria. The procedures were explained to the participants in their vernacular language. Written inform consents were obtained from study participants. Demographic characteristics were noted, too. The participants were screened using outcome measures. Anthropometric measurements of all participants were taken while they were standing with their arms lying along, and had no shoes on. The height of the participants was measured using a stadiometer. The weight of the women was measured using a weighing scale to the nearest kilogram. The BMI was calculated using the weight and the height of the women. The weight was taken in kilograms and the height in meters. The waist-hip ratio was taken above the level of the umbilicus, and the measurement for hip was taken at the highest buttock bulk. The girth measurement in upper limb, lower limb and abdomen was taken using inelastic measuring tape. The girth measurement in the right- and left-side of the arm, forearm, thigh, and calf was obtained by measuring the maximum bulk of the relaxed muscle. The skinfold measurement in the right- and the left-side of biceps, triceps, thigh, and calf was measured using a vernier caliper. The WHO scale of girth measurement of upper limb, abdomen and lower limb was done using measuring tape, and the skin fold was measured using vernier caliper. The statistical analyses were performed by Statistical package for social science (SPSS) version 20.

Results

The characteristics of the participants are presented in Table 1. The average age of the participants was 52.5 ± 3.7. The BMI of the women was 28.8 ± 3.4 kg/m^2.

Table 1. Descriptive statistics (n=100)

Variable	Mean	SD
Age (years)	52.5	3.7
Height (cm)	156.4	5.30
Weight (kg)	71.9	8.5
BMI (kg/m2)	28.8	3.4
Waist-hip ratio (cm)	85	7.0

The prevalence rate for girth measurement variables are presented in Table 2. The girth measurements in upper limb, lower limb, and abdomen were 26, 41, and 87cm, respectively. Around 65% of

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women had scored less than the mean values of girth. In lower limb, 63% of women had scored less than mean value of girth, which accounts for 41cm. The abdominal girth was 87cm on average, with 50% of women scoring below the average.

Table 2. Prevalence rate for girth measurement variables (n=100)

Variable (cm)	Mean value	Score ≤ mean value (%)	Score > mean value (%)
Right arm	28	53	47
Left arm	28	51	49
Right forearm	23	97	3
Left forearm	23	58	42
Right thigh	46	65	35
Left thigh	46	65	35
Right calf	34	60	40
Left calf	37	62	38
Abdominal girth	87	50	50

Table 3 demonstrates the prevalence rate for skinfold measurement variables. The average skinfold measurement in upper limb was 21mm for women, among whom 54% scored below normal. In lower limb, the average skin fold measurement was 28mm, with 55% of them scored below normal. In abdomen, 61% scored less than normal, with the average of 39mm.

Table 3. Prevalence rate for skinfold measurement variables (n=100)

Variable (mm)	Mean value	Score ≤ mean value (%)	Score > mean value (%)
Right Biceps	23	49	51
Left Biceps	23	48	52
Right Triceps	19	65	35
Left Triceps	19	64	36
Right thigh	32	57	43
Left thigh	32	56	44
Right calf	24	52	48
Left calf	24	53	47
Abdominal	39	61	39

Discussion

The current study was conducted to investigate muscle mass in post-menopausal women in Belgavi, India. One hundred post-menopausal women were included in the present study. The findings show that the mean BMI was 28.75, indicating that they were overweight. The average prevalence of changes in girth measurements in post-menopausal women was 38.0%, and the average prevalence of changes in skinfold measurement in post-menopausal women was 43.8%, as most post-menopause women scored below average.

Our results are inconsistent with Aloia's et al. study, which concluded that fat accumulation could increase after menopause. A study done by Voda et al., on body composition changes in menopausal women, found that there was an overall decrease in skinfold measurement in upper extremities and lower extremities, which is consistent with the findings of our study. It was also stated that the skinfold measurement in abdominal region could increase in post-menopausal women, which contradicts with the results of our study (26).

Another study done by Toth et al., on menopause-related changes in body fat distribution, found that there were not any changes in girth in extremities, but the abdominal girth tended to increase after menopause in women (27). Although most women had scored less than the mean value of girth in extremities in our study, we could not confidently find any abdominal girth difference after menopause, as equal proportions of women fell in increased and decreased categories.

In addition, Voda et al., reported that there was an overall increase in girth measurement of upper extremities and lower extremities, but the results of our study showed an overall decrease. Also, the girth measurement in abdominal region in postmenopausal women in their study was less than that of our study (26).

It is generally assumed that the onset of menopause is characterized by changes in body composition. It is also believed that the muscle mass is reduced, and the fat mass is increased in post-menopausal women. Not only is there an increase in fat in postmenopausal women but also there is a distribution of fat mass in the body (13). Moreover, it is presumed that there are several factors such as diet, metabolism, hormonal parameters, and lifestyle, which can influence body composition in postmenopausal women (14).

There is a decline in muscle mass with aging, resulting in reduced 'mechanical stress' from an increasingly sedentary lifestyle, whereas any increase in fat mass can induce a decrease in energy expenditure (17). However, the low level of anabolic hormones, especially in postmenopausal women, can limit muscle mass and muscle strength (18, 19). This post-menopausal stage is known as the stage of complaints (20). The loss of muscle mass and muscle strength can result in an increased risk of functional limitation (21).

Like many other studies, there are several limitations. First, the reliability of the skinfold measurement was not defined. Skinfold measurement necessitates experience and excellent training so as to

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avoid measurement errors. This study, however, used a good quality skinfold caliper for skinfold measurement. Second, the typical sample size for this study was small. The data base of Indian post-menopausal women and its prevalence can be made more authentic with a larger sample size and longitudinal studies.

Conclusion

Despite the fact that the study had some limitations, it was concluded that the score muscle mass was below average in most post-menopausal women. It is imperative to devise an accurate technique to estimate muscle mass in menopausal clinics so that experts can predict mobility as well as prevent chronic diseases in post-menopausal women.

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Conflicts of Interest

The authors declare no conflicts of interest.

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