

Assessment of Flexibility and Balance in Postmenopausal Women

Ms Riddhi Shingavi¹, Dr Rima musale²

¹Intern, Physiotherapy Department, TMV's Indutai Tilak College of Physiotherapy

²Professor, Physiotherapy Department, TMV's Indutai Tilak College of Physiotherapy

Abstract

Background: Menopause refers to the period after when a women's menstrual cycle stops completely. Loss of follicular activity of the ovaries results in permanent cessation of menstruation which is referred as menopause. The menopausal age ranges between 45–55 years, average being 50 years. Reduced flexibility and strength in postmenopausal women can lead to various biomechanical changes and altered postures. To maintain balance, the body has different ways to adjust its position so that center of mass stays over base of support. As performance and activities in daily living have reduced assessment of flexibility has become important. Lack of flexibility leads to problem like lower back pain and lower limb tightness. Sit and reach test is most widely used for assessment of flexibility it represents hamstring, hip, and lower back flexibility.

Objective: To assess flexibility and balance in postmenopausal women.

Methods: Permission was taken from ethical committee. In cross-sectional study, 109 postmenopausal females aged 45-60 were included. Menopause age, height, weight, BMI, balance, and flexibility was assessed. Balance was assessed using Functional reach test and Flexibility was assessed using Sit and reach test

Results: Data was descriptive statistics. Graph 1 shows No. Of population in age group. 36% of population is in 45-50 age group, 35% of population is in 51-55 age group, 29% of population is in 56-60 age group. Graph 2 shows postmenopausal mean age. In age group 45-50 the mean menopausal age is 44.9, in age group 51-55 mean menopausal age is 48.97, in age group 56-60 the mean menopausal age is 52.17. Graph 3 shows mean BMI in age groups. In age group 45-50 the mean BMI is 25.03, in age group 51-55 the mean BMI is 26.04, in age group 56-60 the mean BMI is 26.7. Graph 4 shows Sit and Reach test values with postmenopausal age group. In age group 40-45 value is 17.44, in age group 46-50 it is 17.54, in age group 51-55 it is 16.6, and in age group 56-60 it is 17.4. Graph 5 shows Functional Reach test values in postmenopausal women age groups. In age group 40-45 it is 9.4, in age group 46-50 it is 9.8, in age group 51-55 it is 9.6, in age group 56-60 it is 9.5.

Conclusion: Our study concludes that component of physical performance that is balance was affected in postmenopausal women whereas flexibility was not affected among postmenopausal women.

Keywords: Postmenopausal, Flexibility, Balance.

Introduction

Menopause refers to the period after when a women's menstrual cycle stops completely. Loss of follicular activity of the ovaries results in permanent cessation of menstruation which is referred as menopause.

Estrogen and progesterone are two most important hormones in female body when menstrual cycle stops for longer than 12 months drop in these two hormones is seen.¹ This onset in women's life not only represents end to women's reproductive function but also introduces to new phase of life. Menopause is derived from the Latin words meno (month) and pausia (halt, stop) it implies the end of a woman's period of natural fertility and cessation of monthly period. Actually it is not merely the end of menstruation but also is an inevitable part of aging. Although menopause is a universal phenomenon the age at which menopause occurs vary among women and so does the sign and symptoms.

The age at which women goes through menopause can be influenced by her genetic makeup. Factors like family history and specific genetic traits can determine when menopause occurs for her. There is no relation between the age of menopause to age of menarche or age at last pregnancy. It is also not related to number of pregnancies, lactation, use of oral pills, socioeconomic condition, race, height or weight. In thinner women menopause may seem to be early. However early menopause can occur due to factors like cigarette smoking, and severe malnutrition. The menopausal age ranges between 45–55 years, average being 50 years.² The levels of the main “reproductive” hormone estrogen, 17β -estradiol, fall from the mean values of the cyclic life (100–250 pg/mL) to less than 10 pg/mL³ at the menopausal transition. Thus it loses the ability to stimulate target cells and saturate receptors. This state leads to a functional death of estrogenic activity.^{4,5} Various menopausal symptoms are seen inside and outside the body. These symptoms can be seen because of estrogen insufficiency. They are mainly hot flashes, insomnia, vaginal dryness, and night sweats.^{6,7} There are other related symptoms and conditions like irregular menstrual bleeding, osteoporosis, arteriosclerosis, dyslipidemia, depressed mood, irritability, headache, forgetfulness, dizziness, deterioration in postural balance, palpitation, dry eyes, dry mouth, reduced skin elasticity, restless legs, and muscle and joint pain.^{7,8} but these symptoms are not necessarily linked to estrogen levels.

Premenopause –it is a stage in woman's life before menopause during this stage body begins to show transition away from reproductive capability. It is characterized by hormonal and menstrual cycles are irregular it includes the years leading up to menopause.⁹

Perimenopause .-it is stage when body starts transitioning towards menopause. It continues first year after menopause and begins just before menopause starts and when hormonal symptoms and changes seem to appear.⁹

Post menopause –it is period of amenorrhea seen for at least more than one year from final menstrual period regardless whether the menopause was induced or spontaneous. This stage is seen after menopause.⁹ The aging process involves a decline in motor skills, flexibility, VO_2 max, strength, speed which makes it difficult to perform activities of daily living. However the extent of these changes vary individual to individual. In women, these changes are aggravated by menopause, defined as the permanent cessation of menstruation resulting from ovarian failure¹². Practicing regular physical exercises minimizes changes resulting from senescence and menopause as reflected by improved body composition, decreased joint pain and vascular resistance, increased bone mineral density, aerobic capacity, muscle strength and flexibility¹³. Reduced flexibility and strength in postmenopausal women can lead to various biomechanical changes and altered postures. This can affect balance and eventually lead to fall¹⁴. Flexibility and strength are required to perform daily activities with ease.

Balance, or postural stability, is a generic term which means keeping body steady and upright. In Equilibrium when body is at rest is known as (static equilibrium) and when in steady-state motion is known as (dynamic equilibrium). when the body's center of mass (COM) or center of gravity (COG) is maintained over its base of support (BOS) then the balance is greatest. Balance is a complex motor control

task involving the detection and integration of sensory information to assess the position and motion of the body in space and the execution of appropriate musculoskeletal responses to control body position within the context of the environment and task. Thus, the interaction of the nervous and musculoskeletal systems is necessary for balance control. Different types of balance control are required for functional task including (1) static balance control to maintain a position still when you are standing or sitting; (2) dynamic balance control to stabilize the body when the support surface is moving or when the body is moving on a stable surface such as sit-to-stand transfers or walking; and (3) automatic postural reactions this is when our body reacts quickly to unexpected movements or changes in environment like if ground suddenly shakes or you are pushed.

Motor Strategies for Balance Control -To maintain balance, the body has different ways to adjust its position so that center of mass stays over base of support. Ankle Strategy, Hip Strategy, Stepping Strategy, Weight-shift Strategy, Suspension Strategy are used to control body sway. These strategies work together to help to stay balanced and to prevent falls by adjusting your body positions in response to changes in environment.¹⁵

Flexibility is the ability to easily move a single joint or series of joints smoothly and easily through an unrestricted, pain-free range of motion (ROM). Flexibility can be determined on basis of muscle length and extensibility of periarticular soft tissues. Muscle and tendons need to be able to stretch and relax to allow for movement. The way joint surfaces roll and slide, along with the flexibility of the tissues around the joint affect joint ROM and an individual's overall flexibility. As performance and activities in daily living have reduced assessment of flexibility has become important. Lack of flexibility leads to problems like lower back pain and lower limb tightness. Sit and reach test is most widely used for assessment of flexibility it represents hamstring, hip, and lower back flexibility.

Dynamic flexibility- This form of flexibility, also referred to as active mobility or active ROM. It is how much your muscles can move your body through its full range of motion actively. It is dependent on the degree to which a joint can be moved by a muscle contraction and the amount of tissue resistance met during the active movement. **Passive flexibility**- This aspect of flexibility, also referred to as passive mobility or passive ROM, is the degree to which a joint can be passively moved through the available ROM and is dependent on the extensibility of muscles and connective tissues that cross and surround a joint. Passive flexibility is a prerequisite for but does not ensure dynamic flexibility.¹⁵

Body Mass Index (BMI) obesity is often expressed in terms of body mass index. Overweight is usually due to obesity but can arise from other causes such as abnormal muscle development or fluid retention. BMI is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by square of the height in meters (kg/m^2).¹⁶

METHODOLOGY

A cross-sectional study using simple random sampling method was conducted on 109 subjects. Postmenopausal women with age – group 45-60 years who were willing to participate, those with cessation of menstruation for 1 year, and those who were working or housewife's in and around Pune were included.

Subjects who have undergone hysterectomy, those under hormone replacement therapy, women suffering from malignancy or fractures, postmenopausal women with neurological and cognitive conditions and also with vestibular disorders were excluded from the study.

Outcome Measures

1. Functional Reach Test
2. Sit and Reach Test

Procedure

The ethical clearance was taken from the ethical committee of Tilak Maharashtra Vidyapeeth. The 109 subjects were included based on the inclusion and exclusion criteria. The aim and purpose along with procedure of study was thoroughly explained to the subjects. Informed consent was taken from subjects before the commencement of the study. To assess various test instructions were given to subjects prior to performance of tests .A demographic data was taken and then assessment of flexibility using sit and reach test and balance using functional reach test was done.

Results

The present study aimed to evaluate flexibility and balance in postmenopausal women where 109 postmenopausal females were included .Balance was assessed using Functional reach test and Flexibility was assessed using Sit and reach test .

Statistical analysis is done manually as well as using Instat software .Descriptive statistics are stated as mean and standard deviations .Data from patients demographic data i.e. ,the age , BMI , and values of functional reach test and sit and reach test were analyzed using mean and SD .

Table 1: No.of population in age group.

SR.NO	AGE GROUP	NO. OF POPULATION
1	45-50	41
2	51-55	34
3	56-60	43

Table 1 shows No. Of population in age group.36% of population is in 45-50 age group ,35% of population is i 51-55 age group ,29% of population is in 56-60 age group

Table 2: Postmenopausal Mean age .

SR.NO	AGE GROUP	MEAN MENOPAUSAL AGE
1	45-50	44.9
2	51-55	48.97
3	56-60	52.17

Table 2 shows postmenopausal mean age. In age group 45-50 the mean menopausal age is 44.9, in age group 51-55 mean menopausal age is 48.97, in age group 56-60 the mean menopausal age is 52.17.

Table 3 : Mean BMI in postmenopausal women .

SR.NO	AGE GROUP	MEAN BMI
1	45-50	25.03
2	51-55	26.04
3	56-60	26.7

Table 3 shows mean BMI in age groups. In age group 45-50 the mean BMI is 25.03, in age group 51-55 the mean BMI is 26.04, in age group 56-60 the mean BMI is 26.7.

Table 4: Sit and reach test values in postmenopausal women

SR.NO	POSTMENOPAUSAL AGE GROUP	SIT AND REACH TEST VALUES
1	40-45	17.44
2	46-50	17.54
3	51-55	16.6
4	56-60	17.4

Table 4 shows Sit and Reach test values with postmenopausal age group. In age group 40-45 value is 17.44 i.e. Average, in age group 46-50 it is 17.54 i.e. Average, in age group 51-55 it is 16.6 i.e. Average, and in age group 56-60 it is 17.4 i.e. Above Average

Table 5 : Functional reach test values in postmenopausal women .

SR.NO	POSTMENOPAUSAL AGE GROUP	FUNCTIONAL REACH TEST VALUES
1	40-45	9.4
2	46-50	9.8
3	51-55	9.6
4	56-60	9.5

Table 5 shows Functional Reach test values in postmenopausal women age groups .In age group 40-45 it is 9.4 i.e mild fall risk ,in age group 46-50 it is 9.8 i.e mild fall risk ,in age group 51-55 it is 9.6 i.e mild fall risk , in age group 56-60 it is 9.5 i.e mild fall risk.

DISCUSSION

In the present study assessment of flexibility and balance was done in postmenopausal women and the study included 109 postmenopausal females . Flexibility was assessed using Sit and Reach test (for lower back and hamstrings) and balance was assessed using Functional reach test .The age group included in this study was 45 to 60 years .Postmenopausal women between the ages of 45 to 60 may experience changes in balance and flexibility due to hormonal fluctuations and age related factors such as decreased muscle mass and bone density. However ,incorporating regular physical activity ,including exercise specifically targeting balance and flexibility can help mitigate these change.

Muscular strength, flexibility, and balance are the key components of physical performance. Many literatures highlighted that an ability to perform a physical task at a desired level is decreased in postmenopausal women. Poor physical performance predicts frailty, disability and loss of independence among elderly. Physical Performance is lower in women compared to men and it is decreased with age in women compared to men and that suggests that gender specific factors across life may influence maximum level of physical performance achieved and performance rate declines with age. Hence, there is a growing interest in studying the effects of the deficit in estrogen in postmenopausal women’s physical health and

function. Maintaining good physical function with age is a vital component of independence in later stage of life, as poor physical functioning is associated with institutionalization, hospitalization, and mortality. Postmenopausal estrogen deficiency causes several physiologic changes in body composition such as increase in fat mass, a decrease in lean body mass, and a decrease in bone mineral density (BMD). Together, these changes increase the risk of fall and fractures in postmenopausal women. Fall incidence is three times higher in postmenopausal women than in men within the same age group. Estrogen withdrawal in menopause is suggested to affect postural stability via reducing the speed of information processing to the brain. Falls resulting in fractures to postmenopausal women may seriously hinder quality of life and lead to high morbidity and mortality, as well as an increase in direct costs for health services. Even falls without complications may lead to decrease in self confidence and quality of life. Many literatures showed that practicing regular physical exercises minimizes changes resulting from menopause as reflected by improved body composition, decreased joint pain and vascular resistance, increased bone mineral density, aerobic capacity, muscle strength and flexibility. The positive outcomes resulting from regular exercise and/or physical activity programs include increased cardiovascular fitness, decreased anxiety and depression, and enhanced feelings of well being. Additionally, exercise and/or physical activity has, in some cases, been shown to decrease feelings of fatigue and chronic muscle pain, improve quality of life.

In our present study Graph 1 shows finding between age group and postmenopausal mean age. In age group 45-50 the postmenopausal mean age was (44.9). In age group 51-55 the postmenopausal mean age was (48.97) and in age group 56-60 mean postmenopausal age was (52.17). As per the earlier study conducted by Magdalena, Jolanta, kuba on “High Physical Activity Level May Reduce Menopausal Symptoms” included 305 women aged 40-65 and the average age of the study group was 48.47. They also mentioned mean age of menopause in Europe is 51.3; in America 52.5; while in latin America it is 48.3. Graph 3 shows mean BMI was calculated according to age group. In age group 45-50 mean BMI was 25.03 which was overweight, in age group 51-55 mean BMI was 26.04 which was overweight and in age group 56-60 the mean BMI was 26.7 which was overweight. So as in this study the BMI in all age group found was overweight. As per the earlier study conducted on “Relationship of body mass index and body fat distribution with postural balance and risk of falls in spanish postmenopausal women” by Cantreras, Martiner Amat, Mendoza they conducted a cross sectional, observational study on 100 postmenopausal women between age 50 to 65 years with at least 12 months of amenorrhea. Participants were divided according to BMI and fat distribution and postural stability was assessed with force platform. Result showed that BMI of 25 kg/ m² or higher and android fat distribution were correlated with risk of falling. They concluded that postural instability is associated with obesity and android fat distribution in spanish postmenopausal women. Also BMI of 25 kg/m² or higher with android fat distribution can be considered as independent risk factors for falls.

Graph 4 shows mean values of Sit and Reach test in postmenopausal women was done according to age group. It was found that 40 to 55 age group had Average flexibility (i.e 17.4, 17.5, 16.6) and in age group 56-60 mean value was 17.4 which was above average. So as per present study flexibility in postmenopausal women was not much affected. As per earlier study conducted by Dr. Kajal Anadkat, Dr. Ashika Tanna (2016) on “A study to find out the relationship between physical performance and menopause amongst healthy pre and postmenopausal females-cross sectional observational study” A total number of 250 subjects of premenopausal females with regular periods (age:40- 45) and 250 subjects of post menopausal females (age: 45- 55) with natural history of menopause were selected from different areas of rajkot city for the study. The grip strength, hamstring flexibility and static balance were measured using jamar hand

held dynamometer, modified sit and reach test and One Leg Standing Test respectively. They concluded that grip strength and static balance was reduced but not the flexibility among immediate postmenopausal females due to hormonal changes compared to pre menopausal female. They also mentioned flexibility was not significantly reduced among postmenopausal females. since reduction in flexibility secondary to aging occurs rapidly after 65 years of age. This study supported our present study.

Graph 5 shows mean values of Functional Reach test in postmenopausal women. It was found that 40-60 age group had Mild fall risk .No difference in balance was found in any age group .As per our result balance is not much reduced in postmenopausal women .Dynamic balance control is required to perform all mobility tasks in our day-to-day life. Balance control consists of controlling the body's center of mass over its limits of stability, while at rest or performing movements and requires integration and complex coordination of sensory, musculoskeletal and neural systems to increase the efficiency of upright postures needed for efficient movements .As per study conducted by Khangare, Mhatre, Iyer(2022) on "Assessment of dynamic balance and bone density in premenopausal and postmenopausal middle-age women". They included females in age group of 40-60 years were divided into premenopausal and postmenopausal group based on the criteria of cessation of menstrual cycles for minimum one year. Participants were assessed barefooted for dynamic balance by physical performance mobility tests such as narrow walk test (NWT), Figure-of-8 walk test (F8WT), obstacle walk test (OWT) and normal gait speed (NGS). Bone density was evaluated by using ultrasound bone densitometer at calcaneus in community setting. Their study presented that dynamic balance is significantly reduced in postmenopausal women when compared to premenopausal women in middle-age group.

CONCLUSION

On basis of result of present study it can be concluded that component of physical performance that is balance was affected in postmenopausal women where as flexibility was not affected among postmenopausal women.

LIMITATIONS

Small sample size.

FUTURE SCOPE

Study can be conducted on correlation between lower limb flexibility and balance in postmenopausal women .

Study can also be conducted on correlation between BMI and balance and flexibility.

CLINICAL IMPLICATION

we can emphasize on flexibility and balance training during premenopausal period .

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