RESEARCH ARTICLE

Journal of Ecophysiology and Occupational Health, *Vol 24(4), DOI: 10.18311/jeoh/2024/44375, 435-439, December 2024*

ISSN (Online) : 0972-4397
ISSN (Online) : 0974-0805

Effect of Body Mass Index on Lumbosacral Angle in Post Menopausal Women Using Inclinometer

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Abstract

Background: Because of the drop in oestrogen levels, postmenopausal women typically those who have not had a menstrual period for 12 months straight experience major physiological changes. Bone density, muscle mass, and fat distribution all may be impacted by these modifications. As a result, BMI increases and changes in body composition are common in postmenopausal women, and these factors can impact the musculoskeletal system, including the spine. Weight control, core strengthening exercises, and posture training are among possible therapies for postmenopausal women to lessen the negative consequences of elevated BMI on spine health. **Aim:** This study uses an inclinometer to study the effect of body mass index on lumbosacral angle in post-menopausal women. The lumbosacral angle is associated with several issues that Postmenopausal women face. Postmenopausal women have a high prevalence of musculoskeletal issues. **Objective:** The objective is to evaluate the effect of body mass index on lumbosacral angle in post- menopausal women using an inclinometer. **Materials and Methods:** A cross-sectional study in which 96 post-menopausal women (45-55 years) were included as per inclusion criteria using the Consecutive sampling method. Data was collected by assessing BMI, and lumbosacral angle using an inclinometer and analysis was done by INSTAT software. **Result:** The study included a total of 96 participants. 48 individuals were in the 40-50 age range, while 48 participants were in the 50-55 age range. So, by calculating the average of both the groups. Overall study results point to a relationship between postmenopausal women's lumbosacral angle and body mass index. **Conclusion:** According to this study there is an effect of body mass index on lumbosacral angle in post-menopausal women using an inclinometer. We also found that the study showed alternation in the lumbosacral angle among postmenopausal women.

Keywords: BMI, Lumbosacral Angle, Inclinometer, Postmenopausal Women, Prevalence

Abbreviation

BMI - Body Mass Index

1. Introduction

The changes that a woman goes through immediately after her menstrual period ends are sometimes referred to as menopause. Thus, ovarian follicular activity is lost as a result of the end of the reproductive cycle. Menopause refers to a woman's final menstrual cycle, which is followed by a total cessation of menstrual flow. Pre-menopause and post-menopause are the two stages of menopause that are typically separated. The term "premenopausal" refers to the period before a woman's monthly cycle starts to exhibit noticeable irregularities in timing. The term "postmenopausal" describes women who have experienced the cessation of menstrual

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Article Received on: 06.06.2024 Revised on: 04.07.2024 Accepted on: 05.07.2024

flow for a minimum of 12 consecutive months[1]. Most women experience menopause as a result of changes in physiological and morphological factors brought on by aging. The population's rate of obesity is rising quickly, which is also associated with negative health effects, including Type 2 diabetes, cardiovascular disease, elevated risk of arterial hypertension, swelling of the articulation, osseous tissue, and several varieties of cancer. In postmenopausal women, low estrogen levels are a major factor in alterations to body composition and distribution of fat tissue. The body mass index, or BMI, calculates the body structure, values, and categories according to the classification (WHO)[2].

Underweight	< 18.50 kg/m^2
Normal	18.5–24.99 kg/m^2
Overweight	≥25 kg/m^2
Class 1 obese	30–34.99 kg/m^2
Class 2 obese	35–39.99 kg/m^2
Class 3 obese	≥ 40 kg/m^2

The period of irregular periods leading up to menopause is known as perimenopause, and its duration is varied. A woman's menopausal age is a biological marker for the prediction of her subsequent diseases and her death[3].

1.1 Lumbar Lordosis

It is the lumbar spine's anteriorly convex curvature in the middle sagittal plane. The development of lumbar lordosis in humans is a mechanism that occurs during the process of achieving gait and erect posture. Lumbar lordosis may change into hyper or hypo lordosis[4,5]. Low back pain risk factors include decreased abdominal muscular force and increased lumbar lordosis. Low back pain can affect 60-80 % of persons at some point in their lives[5]. According to the literature, numerous factors influence the angle of lumbar lordosis, such as age, gender, ethnicity, obesity, posture, activity, muscular strength, and flexibility of the spine and lower limbs. This complexity makes it challenging to determine the optimal range for this angle. The lumbar angle is assessed using a variety of techniques, such as goniometers, inclinometers and X-ray imaging[6]. The lumbosacral angle is a clinically significant radiographic measurement associated with changes in the curvature of this region[7]. Spinal shape can be influenced by high body weight or weight growth, especially over an extended period, as bone is a metabolically active tissue that adapts to its loading environment. The anthropometric measurements have been better because of their ease of measurement and low cost. BMI is commonly used to alternate between the diagnosis of obesity and fat distribution[8]. Obesity is nowadays a pandemic condition. Musculoskeletal disorders are commonly seen in obese subjects. Higher body mass index often corresponds to increased abdominal fat deposition, can alter the distribution of weight and affect the curvature of the spine, including the lumbosacral angle[9]. By connecting a line across the superior edge of the sacrum's plane with a horizontal line, one can calculate the lumbosacral angle[10]. The effect of obesity on the lumbosacral angle is excess body weight can increase the load placed on the spine, potentially leading to changes in spinal curvature to accommodate the increased stress[11].

2. Materials and Methods

It was cross cross-sectional study the survey was completed offline over a month using a data collection sheet. Women of the age group 45 to 55 diagnosed with body mass index on lumbosacral angle in postmenopausal women residing in Karad participated in this study. Prior written permission was acquired. The study has received ethical approval. 96 were taken as sample size for this study using Consecutive sampling.

2.1 Inclusion and Exclusion Criteria

Postmenopausal women [45-55 years] with body mass index more than - Obesity Grades 1, 2 and 3 and willing to participate were incorporated into the study. In premenopausal women, previous surgery - hysterectomy, mastectomy, partial colectomy and spinal deformities were excluded.

3. Result

A cross-sectional study was carried out in Karad aimed to study the the effect of body mass index on lumbosacral angle in post-menopausal women using an inclinometer. The participants were postmenopausal women between 45-55 years. A lumbosacral angle was seen in postmenopausal women. In this study, 96 postmenopausal women were involved and the effect of body mass index on lumbosacral angle in post-menopausal women was

checked. The survey study helped to understand the current existing effect of physiotherapy for lumbosacral angle in postmenopausal women. 48 individuals were in the 40-50 age range, while 48 participants were in the 50-55 age range. So, by calculating the average of both groups, statistical analysis was done, and that app calculated the mean, SD, and p values according to the inclinometer.

Table 1. In the 40-50-year group

Parameters	Mean	SD	P value
Age	46.83	1.548	<0.0001
Height (cm)	147.58	3.913	
Weight (kg)	68.60	7.022	
BMI (kg/m^2)	31.58	1.743	
Lumbar flexion	50.29	5.082	
Lumbar extension	16.14	2.010	

From Table 1, it was observed that in the mean BMI, lumbar flexion and lumbar extension, there is an alternation of the lumbosacral angle in postmenopausal women.

So, by calculating the average statistical analysis was done, and that app calculated the mean, SD, and p values according to the inclinometer.

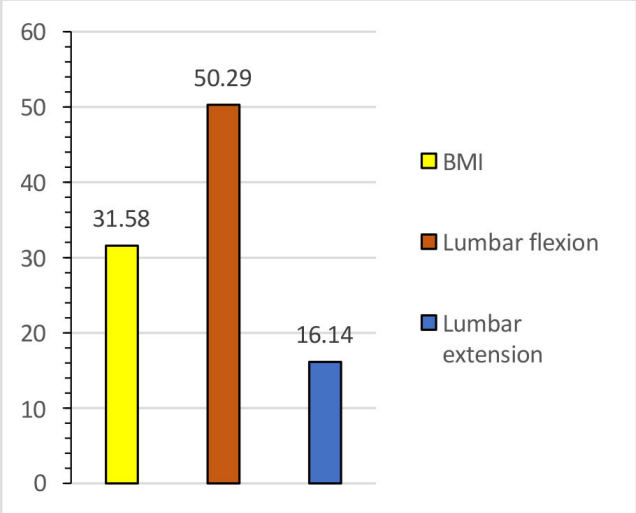

Figure 1. Body mass index on lumbosacral angle in postmenopausal women.

Table 2. In the 50–55-year group

Parameters	Mean	SD	P value
Age	53.27	1.410	<0.0001
Height (cm)	148.31	3.888	
Weight (kg)	69	4.672	
BMI (kg/ m2)	31.43	1.387	
Lumbar flexion	51.54	5.690	
Lumbar extension	15.81	2.275	

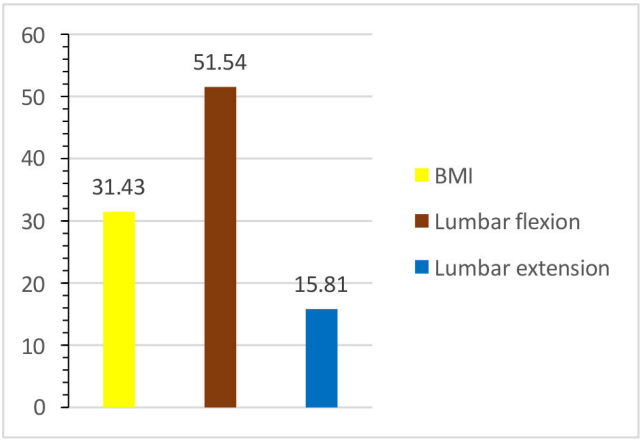

Figure 2. Body mass index on lumbosacral angle in postmenopausal women.

In Table 2, the effect of BMI on lumbosacral angle in postmenopausal women is shown. The data indicated that in the mean BMI, lumbar flexion and lumbar extension, there is alternation of the lumbosacral angle in postmenopausal women. And the p-value is extremely significant.

The graphs indicate that the BMI on the lumbosacral angle is alternation in postmenopausal women. Overall study results point to a relationship between postmenopausal women's lumbosacral angle and body mass index.

4. Discussion

The effect of body mass index on lumbosacral angle in postmenopausal women was studied using an inclinometer. Postmenopausal women often experience changes in body composition and distribution of adipose tissue, which can impact spinal alignment and

lumbosacral angle. Correlation between higher body mass index and alteration in lumbosacral angle, indicating that increased body weight may contribute to changes in spinal curvature.

Nonetheless, research from January to June 2019 was included in a study by Roopneet Kaur titled "A Comparative Study of Body Mass Index and Waist Hip Ratio between Pre and Post Menopausal Women." conducted on pre-menopausal and post-menopausal women in Punjabi cities. It was determined that throughout the postmenopausal era, alterations in BMI and WHR may be associated with a decrease in physical activity and psychological stress. Women who are of reproductive age may experience higher levels of stress, which causes the release of hormones such as norepinephrine and adrenaline. Therefore, a study found that hormonal changes, a reduction in physical activity, and mental stress all contributed to the increases in total body fat and central fat distribution during the menopausal era. It takes more physical activity, education, and appropriate counselling to help menopausal women overcome lifestyle diseases[1].

The 2007 paper "Assessment of the BMI, WHR, and W/Ht in pre-and postmenopausal women" was written by Skrzypczak[2]. Concluded that a sharp rise in the prevalence of obesity in the population also raises the risk of arterial hypertension, Type 2 diabetes, cardiovascular disease, swelling of the articulation, osseous tissue, and several varieties of cancer[2].

Lumbo-sacral angle evaluation among the Lebanese population is a study conducted by Hassane. For the Lebanese population, the mean value of this angle, 38.980 + 9.90, may serve as a reference. The results of the study showed that gender and ethnicity have an impact on lumbar lordosis, with women having a higher LSA than men concluded that, in contrast, age did not affect the latter degenerative illness. However, other studies that looked at how age affected the LSA stated that disc degeneration- which we did not include in our study- was the cause of these changes. As a result, there was no association between age and LSA[6].

Song *et al.*'s[5] study states as much. "Correlation between Obesity and Lumbar Lordosis in Obese Pre-Menopausal Korean Females." Lumbar lordosis in obese premenopausal Korean females aged 21–45 was the subject of a cross-sectional investigation. Research indicates a connection between mechanical structures such as lumbar lordosis and fat. Both lumbar spinal illness and stress on the spine can be attributed to obesity. One of the most helpful factors that influence lumbar curvature is body mass index[5].

Lumbar scoliosis in postmenopausal women: Prevalence and Association with Bone Density, Age, and Body Mass Index, according to a study by Berven *et al.* The purpose of this research was to find out how often lumbar scoliosis is in postmenopausal women 50 years of age and older, as well as how age, osteoporosis, and BMI relate to adult lumbar scoliosis. The frequency of adult scoliosis is unclear. Furthermore, little information is known about the relationship between adult scoliosis and BMI, age, and bone mineral density. Among postmenopausal women 50 years of age and above, a 12.9% frequency of lumbar scoliosis was discovered, the majority of whom had minor curvature. Lumbar scoliosis can be independently predicted by age and BMI. The magnitude of the curve cannot be independently predicted by Bone Mineral Density (BMD)[12].

5. Conclusion

These results suggest a relationship between mechanical structures such as lumbosacral angle and obesity. Being obese puts stress on the lumbar spine and increases the risk of lumbar spinal illnesses. Body mass index is one extremely useful factor that could influence the effect of lumbar curvature. Body mass index has an impact on postmenopausal women's lumbosacral angle.

6. Acknowledgement

The authors acknowledge the guidance and support from KVV Karad. Also express their most humble and profound gratitude to Respected Dean Dr. G. Varadharajulu, Krishna College of Physiotherapy, KVV Karad for his inspiration, motivation, valuable guidance, and suggestions throughout this project.

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