

Comparison of Upper Extremity Endurance and Hand Grip Strength Among Premenopausal and Postmenopausal Women

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DOI: <https://doi.org/10.52403/ijhsr.20250805>

ABSTRACT

BACKGROUND: Women's reproductive years come to an end with menopause because of ovarian follicular function decline. The postmenopausal period is associated with an increased prevalence of shoulder injuries; shoulder stiffness was shown to be the most prevalent symptom during this time, occurring at a rate of 75.4%. Grip strength is a key sign of physical ability, especially for women who have gone through menopause and are losing muscle and bone mass because their estrogen levels are dropping.

OBJECTIVE: To compare upper extremity endurance and hand grip strength among premenopausal and postmenopausal women.

METHOD: A cross-sectional study was conducted among 60 female participants in the age group of 40-60 years, were divided into 30 premenopausal and 30 postmenopausal group based upon the inclusion and exclusion criteria. The upper extremity endurance (modified push up test) and hand grip strength (handheld dynamometer) were measured respectively.

RESULT: Intergroup comparison was done using Mann-Whitney U test and the level of significance was kept ($p < 0.05$). The result revealed that there was a significant difference in upper extremity endurance (premenopausal: 16.96 ± 2.17 postmenopausal: 9.76 ± 1.56) and hand grip strength (premenopausal: 19.47 ± 2.32 postmenopausal: 16.67 ± 1.62) among postmenopausal women.

CONCLUSION: There is a reduction of upper extremity endurance and hand grip strength among postmenopausal women.

Keywords: upper extremity endurance, hand grip strength, premenopausal women, postmenopausal women

INTRODUCTION

The menopause is the time in a woman's life when she moves from the reproductive to the nonreproductive stages. It is a natural occurrence that is comparable to menarche, pregnancy, and the postpartum phase. It is the period of time starting with the last menstrual cycle, whether or not menopause

was caused. Every stage of the reproductive process involves a shift in the hormonal environment, which causes a variety of problems and changes in the physical and mental health of the woman. Although none of the events in a woman's reproductive life are regarded as diseases, they are likely natural indicators that indicate when she

needs extra care to be healthy, avoid complications, and improve her quality of life.^[1,2]

In India, menopause typically occurs at age 46. However, between 69 and 85 percent of Indian women believed that menopause had a negative impact on their physical health. Menopausal symptoms include urogenital symptoms like vaginal dryness and bladder and sexual dysfunctions, musculoskeletal dysfunctions, vasomotor symptoms like hot flashes and night sweats, and physical and mental exhaustion and sleep issues.^[3]

Postmenopausal women are more likely to sustain shoulder injuries.^[4,5] According to a prevalence study looking into postmenopausal symptoms, shoulder stiffness was the most prevalent complaint during this time, occurring at a rate of 75.4%.^[4] Furthermore, it was discovered that postmenopausal women had a much higher prevalence of full-thickness rotator muscle tears (8.9%) than premenopausal women (3.1%). The majority of the literature's studies on postmenopausal women focused on their fall and fracture risks. Most of the research focused on lower extremity functioning, balance and bone mineral density.^[6,7] However, the evaluation and treatment of the upper extremities of postmenopausal women are equally important as those of the lower extremities. Protective training methods that improve the strength, endurance, and stability of the muscles surrounding the shoulder can help prevent shoulder diseases, which are more prevalent in the postmenopausal age group.^[7,8]

An important metric for measuring a person's health and physical performance, particularly for postmenopausal women, is grip strength since it is a crucial predictor of muscular strength and general physical functionality.^[9] This physiological shift is linked to a number of detrimental health outcomes for women, such as decreased muscle strength and bone mineral density, both of which have a major influence on grip strength. According to numerous studies, postmenopausal women typically

perform worse physically and have weaker grips than their premenopausal counterparts. This is mainly because of the drop in estrogen, which makes the natural loss of muscle mass, which starts as early as the third decade of life.^[10] Furthermore, grip strength—a measure of muscle strength—tends to steadily deteriorate with age, making it a particularly pertinent indicator of physical deterioration in postmenopausal women.^[11]

After menopause, many women endure physical function limits. Women are a prime target for research and preventative health care initiatives due to their increased vulnerability to the effects of aging and the fact that they make up the majority of the older population.^[12] The difference in the physical performance can be analyzed clinically by hand grip strength and endurance. Handgrip strength is an excellent outcome predictor of functionality, nutritional status, and mortality.^[13] It is positively related to lower and upper muscular strength so that it is considered a surrogate measure of overall muscular strength.^[14]

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).^[15] There is a role of hormonal component in the regulation of force production which has been indicated for hand muscles.^[16] So the purpose of the study is to find out the relationship between physical performance amongst healthy premenopausal with regular periods and postmenopausal females with natural history of menopause.

MATERIALS & METHODS

A cross-sectional study was conducted among 60 healthy females. The subjects were divided into 2 groups. Group A with 30 premenopausal females having regular monthly periods and Group B with 30 postmenopausal females having history of natural menopause. The study was conducted in Ahmedabad City, including

different societies. The objectives and purpose of the study were thoroughly explained to all participants, and their written consent was obtained.

All participants fulfilled the following inclusion criteria:

- (1) Age group within (40-60 years)
- (2) Premenopausal women: having regular monthly periods
- (3) Postmenopausal women: with natural history of menopause
- (4) Subjects not taking any hormonal therapy

Subjects were excluded based on the following criteria:

- (1) Subjects with any neurological, vestibular and musculoskeletal disorders
- (2) Pregnant women
- (3) Subjects having hearing impairments and abnormal vision
- (4) Subjects should have not attended a structured physical activity or exercise program prior 6 months
- (5) Women with induced menopause, simple hysterectomy
- (6) Presence of medical conditions such as diabetes, cardiac disorders and thyroid disorder

OUTCOME MEASURES

(1) MODIFIED PUSH-UP TEST: This test is used to assess upper extremity endurance.

- The subject was asked to take the modified push-up position with knees flexed and elbows extended on a mat.
- Subjects were asked to bring their upper body closer to the ground by flexing their elbows without disturbing the flexion angle of their knees, and then to push their upper body back by extending their elbows.
- The number of successful repetitions performed in 30 seconds was recorded.
- Average of the three trials was recorded to be used in the analysis. ^[17]
- It is reliable (ICC= 0.77-0.97) method to assess upper extremity endurance. ^[18]

(2) HANDHELD DYNAMOMETER:

This is used to assess hand grip strength.

- A subject was asked to sit on a chair with arms at right angle and elbow by the side of the body with forearm supported on chair.
- Hand held dynamometer was held in the dominant hand and directions given to squeeze the dynamometer with the maximum isometric effort. ^[19]
- The test should be conducted three times, and the best score out of the three should be recorded.
- It was found to be highly reliable (ICC=0.98, $p<0.05$) and valid (ICC=0.99, $p<0.05$) tool to measure hand grip strength. ^[20]

PROCEDURE

This study utilized purposive sampling based on predefined inclusion and exclusion criteria. Ethical clearance was obtained from the institute before conducting the research. Subjects were screened for eligibility, and a total of 60 participants were selected according to the criteria. The participants were then divided into two groups: Group A (30 premenopausal women) and Group B (30 postmenopausal women). To assess upper extremity endurance and hand grip strength, the modified push-up test, handheld dynamometer was performed.

STATISTICAL ANALYSIS

SPSS version 20 software was used for all data analysis. Comparison of upper extremity endurance and hand grip strength was done between Group A and Group B using unpaired 't' test.

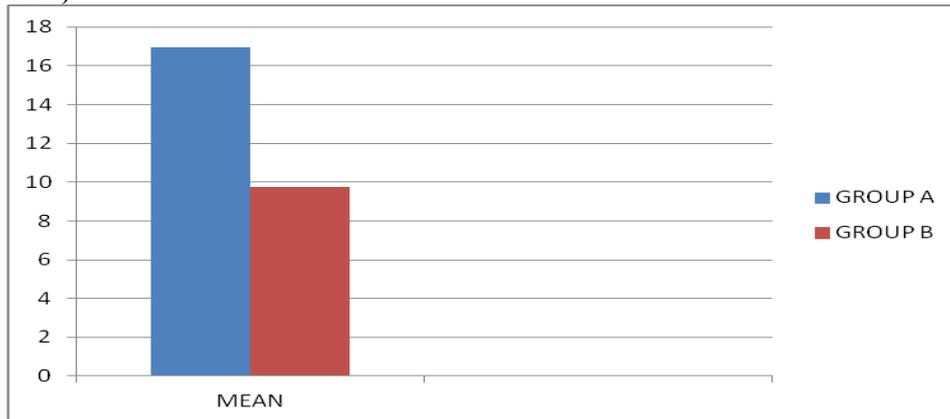
RESULT

As the data was not normally distributed, the Mann-Whitney U test was used for intergroup comparison. The results demonstrated a significant difference in upper extremity endurance and hand grip strength between premenopausal and postmenopausal women. ($p<0.05$)

Table 1: THE DIFFERENCES BETWEEN GROUPS

TEST	PREMENOPAUSAL GROUP (GROUP A) MEAN±SD	POSTMENOPAUSAL GROUP (GROUP B) MEAN±SD	p VALUE	RESULT
MODIFIED PUSH UP TEST (No. of repetitions)	16.96 ±2.17	9.76 ±1.56	<0.05	SIGNIFICANT
HANDHELD DYNAMOMETER (in kgs)	19.47 ±2.32	16.67 ±1.62	<0.05	SIGNIFICANT

GRAPH 1: MEAN OF MODIFIED PUSH-UP TEST BETWEEN THE GROUPS (NO. OF REPETITIONS)



Interpretation: A significant difference was found between Group A and Group B, indicating reduced upper extremity endurance in postmenopausal women compared to premenopausal women. ($p < 0.05$)

GRAPH 2: MEAN OF HANDHELD DYNAMOMETER BETWEEN THE GROUPS (IN KGS)



Interpretation: A significant difference was found between Group A and Group B, indicating reduced hand grip strength in postmenopausal women compared to premenopausal women. ($p < 0.05$)

DISCUSSION

The decline in muscle performance observed in postmenopausal women can be attributed to several physiological changes associated with menopause, most notably the reduction in circulating estrogen levels. Estrogen has been shown to play a crucial role in maintaining muscle mass and strength by influencing muscle protein synthesis and satellite cell activation (Phillips et al., 1993; Taaffe et al., 2005).^[21]

A decrease in estrogen levels during menopause leads to sarcopenia—a progressive loss of skeletal muscle mass and function—which adversely affects upper body strength and endurance (Maltais et al., 2009).^[22]

The significant reduction in hand grip strength found in this study aligns with previous research. For example, a study reported that hand grip strength declines significantly in postmenopausal women

compared to premenopausal women, emphasizing the impact of hormonal changes on peripheral muscle function. [23] Hand grip strength is a reliable marker of overall muscle strength and functional status, [10] and its decline can increase the risk of functional limitations, falls, and loss of independence in daily activities. [24] Regarding upper extremity endurance, the reduced performance in the modified push-up test among postmenopausal women is consistent with findings by Messier et al. (2011), [25] who demonstrated that postmenopausal women have reduced muscle endurance and strength in both the upper and lower extremities compared to younger women. The loss of muscle mass combined with increased fat infiltration in skeletal muscle, which is prevalent after menopause, may contribute to this decline (Sipilä & Suominen, 1995). [26] These findings highlight the importance of targeted interventions to maintain or improve upper extremity strength and endurance in postmenopausal women. In conclusion, our study highlights significant differences in upper extremity endurance and hand grip strength between premenopausal and postmenopausal women, emphasizing the need for targeted strategies to preserve musculoskeletal health postmenopause.

LIMITATIONS:

- Subjects' physical activity levels, socioeconomic status or dietary intake was not taken into consideration.
- BMI was not taken into consideration.

Future Research:

- Larger sample size for more accurate results.
- Future studies can be conducted using interventions aimed at improving strength and endurance in postmenopausal women.

CONCLUSION

The present study concludes that upper extremity endurance and hand grip strength

was reduced in postmenopausal women in comparison with premenopausal women.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: We sincerely thank our mentor for their guidance and all the participants for their time and effort in this study.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Meghana Garg, Gira Thakrar. Comparison of upper extremity endurance and hand grip strength among premenopausal and postmenopausal women. *Int J Health Sci Res*. 2025; 15(8):34-39. DOI: <https://doi.org/10.52403/ijhsr.20250805>
