ORIGINAL ARTICLE

Physical Therapy Journal of Indonesia (*PTJI*) 2025, Volume 6, Number 2: 237-241
E-ISSN : 2722-6034 ; P-ISSN : 2722-0125

Pelvic floor exercises to improve low back pain and activities of daily living for the elderly

Fera Gusmi Nurba[1], Muhammad Nurhadi Rahman[2], Dicky Moch Rizal[2*]

[1]Department of Physiotherapy, Universitas Esa Unggul, Indonesia;
[2]Department of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia.

*Corresponding author:
Dicky Moch Rizal;
Department of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia;
drdickyandrologi@ugm.ac.id

Received: 2025-05-28
Accepted: 2025-08-29
Published: 2025-10-18

ABSTRACT

Background: Lower back pain is a prevalent health concern on a global scale, particularly among female and elderly demographics. The objective of this study was to assess the impact of regular pelvic floor exercises on the severity of low back pain and the enhancement of daily functioning in postmenopausal women.

Methods: The present study employs a quasi-experimental design, incorporating a pre-post-test approach and a control group. Based on the extant data, 18 postmenopausal women will be distributed between the control group and the intervention group. The control group will participate in pelvic floor exercises thrice weekly for three weeks, while the intervention group will engage in pelvic floor exercises daily for three consecutive weeks. The collected data will be subjected to a paired sample t-test to make a pre-and post-intervention comparison, while an independent t-test will be employed to compare the groups at a significant level of $p<0.05$.

Results: The average numeric rating scale (NRS) and modified Oswestry low back pain disability index (MODI) values in the control group after performing pelvic floor exercises were recorded as (6.0±1.4) and (20.3±7.3), respectively, while in the intervention group, they were (2.6±1.7) and (9.44±7.9). These data show a significant difference with a p-value < 0.000 ($p < 0.05$). A comparison between the control and intervention groups after performing pelvic floor exercises with different frequencies also revealed significant differences, with p-values of 0.000 and 0.008 ($p<0.05$), respectively. However, a larger difference was observed in the intervention group performing pelvic floor exercises daily, showing a much higher delta compared to the group exercising three times a week, with NRS values of (4.4±0.5) and MODI values of (19.7±1.7).

Conclusion: In postmenopausal women, the group that performed pelvic floor exercises daily exhibited a significant reduction in NRS and MODI values compared to the group that performed exercises three times a week.

Keywords: daily living activities, lower back pain, pelvic floor exercises, postmenopausal women.
Cite This Article: Nurba, F.G., Rahman, M.N., Rizal, D.M. 2025. Pelvic floor exercises to improve low back pain and activities of daily living for the elderly. *Physical Therapy Journal of Indonesia* 6(2): 237-241. DOI: 10.51559/ptji.v6i2.248

INTRODUCTION

The aging process is an inevitable biological process for all human beings.[1] Menopause is a hallmark of the aging process in women. It is defined as the cessation of menstruation, or the final menstrual period.[2] A woman is considered to be menopausal if she has not had menstruation for 12 consecutive months, which a woman will generally experience various changes in endocrine, physical, and psychological aspects.[2]

The signs and symptoms experienced by women during the menopausal transition include sexual dysfunction, characterized by discomfort during intercourse due to vaginal tightness. This is often accompanied by menstrual irregularities and hot flashes, which can lead to fatigue, back pain, and insomnia.[3,4] This phenomenon is attributable to a decline in estrogen levels, which in turn leads to a reduction in bone density. Consequently, a significant proportion of menopausal women encounter musculoskeletal system disorders, including low back pain.[5]

The production of estradiol and progesterone decreases from the age of 45 to 52 years or when entering the menopause phase, which results in a decrease in muscle strength in women of that age.[6] A loss of muscle mass and strength is experienced by elderly women when estrogen levels decrease. Estrogen plays a role in protecting skeletal muscle from apoptosis and maintaining the integrity of the musculoskeletal system. Estrogen has been shown to enhance the efficiency of the mitochondrial electron transport chain, thereby preventing mitochondrial dysfunction, including ATP depletion and decreased membrane potential.[7] Mitochondrial dysfunction can lead to a permanent cessation of cell growth.[8]

In postmenopausal women experiencing a decline in estrogen, there is an increase in apoptosis and a decrease in muscle mass,[9] leading to musculoskeletal pain disorders such as low back pain.[10] The prevalence and disability-adjusted life years (DALYs) of this condition remained consistent across age groups after the age of 80 years.[11] This observation substantiates the assertion that low back pain constitutes a substantial public health concern worldwide, particularly among female demographics and the elderly. Non-specific low back pain is associated with numerous factors, including overweight status, sedentary work, repetitive bending and twisting positions, traumatic injuries, heavy lifting, and the aging process,

which can result in age-related muscle weakness.[12]

A promising exercise program for reducing low back pain in perimenopausal women is the pelvic floor muscle exercise (PFME), a behavioral and physical therapy approach initially introduced by Arnold Kegel, a gynecologist from the United States. PFME is a form of conservative treatment that has been utilized in various clinical settings to alleviate symptoms and improve quality of life.[21] The present study aims to examine the impact of PFME on low back pain and the ability to do daily activities in postmenopausal women. Previous studies have demonstrated significant improvements in pain intensity and functional disability scores, as well as significant improvements in static and dynamic endurance of trunk flexor and extensor muscles after treatment.[13]

Another study also demonstrated that, with the exception of pain severity, all other variables exhibited significant improvement directly in the intervention group after treatment.[14] A subsequent study employed a meta-regression analysis, which revealed that the efficacy of pelvic floor muscle strengthening exercises increased with increasing years of publication, article quality assessment scores, and the number of weeks of intervention.[15] The present study, however, is distinguished by its focus on research subjects comprising a diverse demographic of women, including postpartum women, pregnant women, patients diagnosed with cystocele, women afflicted with low back pain, and women engaged in sedentary work.[16]

The present study is distinct from previous investigations in two significant ways. Firstly, it employs an analytical approach that utilizes the numeric rating scale (NRS) to measure parameters, in conjunction with the modified Oswestry low back pain disability index (MODI).[17] Secondly, it focuses on postmenopausal women aged between 49 and 75 years who have experienced low back pain.[18] The objective of this study was to assess the impact of regular pelvic floor exercises on the severity of low back pain and the enhancement of daily functioning in postmenopausal women.

METHODS

This study used a quasi-experimental design with a pre-post test approach with a control group, which collected data before and after the intervention while using a control group as a comparison. The subjects in this study were patients from a physiotherapy on practice called "*Physiocare*" in Yogyakarta. These patients were chosen because it aligns with the research focus—postmenopausal women aged 49–75 years with chronic nonspecific low back pain. The minimum required sample size was calculated using G Power 3.1.9.4, resulting in a total of nine participants, with an effect size of 0.96, with a 0.05 error probability and a statistical power of 0.8.[19]

The data collection technique in this study consists of two groups, namely the control group with a frequency of training three times a week and the treatment group with a frequency of training every day. Each group has nine samples, with a total of eighteen samples in this study. The study included post-menopausal women aged 49–75 years with non-specific chronic low back pain, while excluding those with heart disease, diabetes, or hypertension; those taking medications that could interfere with measurements, such as NSAIDs; and those with injuries, intolerable pain, or musculoskeletal, neuromuscular, or central nervous system conditions, including stroke, fracture, head injury, or paralysis.

This study used the Numerical Rating Scale (NRS) to measure pain intensity and This study used the Modified Oswestry Disability Index (MODI) questionnaire to measure functional disability. The data normality test used the Shapiro-Wilk test. Analysis was conducted by comparing the mean NRS and MODI scores in the control and treatment groups before and after the pelvic floor exercise intervention using the paired sample T-test, while comparisons between groups were made using the independent sample T-test, as the data were normally distributed. All statistical analyses were performed using SPSS software (IBM SPSS Statistics for Windows, version 25.0, Armonk, NY, USA).

RESULTS

The results of research conducted on 18 subjects are divided into two groups, namely the control group and the treatment group, with each group totaling 9 people. The results of descriptive testing, as shown in Table 2 and Table 3 of the average NRS and MODI values in each control and treatment group before and after being given pelvic floor exercises compared with paired sample t-test statistical analysis, showed significant differences, with each group having a value of $p = 0.000$ ($p < 0.05$).

Table 1 presents the baseline characteristics of postmenopausal women in both the control and treatment groups. The mean age in both groups was over 50 years, consistent with the inclusion criteria for postmenopausal status. The mean systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were relatively similar between the groups, indicating homogeneity in these cardiovascular parameters ($p > 0.05$). In contrast, there were noticeable differences in anthropometric measures, including body weight, height, and body mass index (BMI), with the overall mean BMI classified as overweight (26.10 kg/m^2). These variables were found to be non-homogeneous between the two groups ($p < 0.05$), which may influence the outcomes and should be considered in the interpretation of the results.

Table 2 presents the NRS scores for both the control and treatment groups before and after the administration of pelvic floor exercises. In the control group (n = 9), the mean NRS score decreased from 7.33 ± 1.11 pre-intervention to 6.00 ± 1.41 post-intervention, resulting in a mean delta reduction of -1.33 ± 0.50. Meanwhile, in the treatment group (n = 9), which received daily pelvic floor exercises, the NRS score significantly decreased from 7.00 ± 1.41 to 2.56 ± 1.74, with a mean delta of -4.44 ± 0.52.

Table 3 presents the MODI scores for both the control and treatment groups before and after the implementation of pelvic floor exercises. In the control group (n = 9), the mean MODI score decreased from 30.67 ± 7.41 pre-intervention to 20.33 ± 7.31 post-intervention, with a

Table 1. Mean characteristics of subjects in the control group and treatment group

Characteristics	Control group Mean±SD	Treatment group Mean±SD	All particiapants Mean±SD
Age (year)	57.5±7.21	57.11±5.66	57.33±6.29
Weight (kg)	68.44±17.51	59.66±7.98	64.06±13.95
Height (m)	1.57±0.052	1.56±0.022	1.56±0.03
Systolic (mmHg)	119.89±7.50	120.00±6.61	119.94±6.86
Diastolic (mmHg)	80.00±5.00	77.22±7.54	78.61±6.37
HR (bpm)	85.89±3.95	84.22±3.86	85.06±3.88
RR (bpm)	18.67±1.41	19.11±0.78	18.89±1.13
BMI (kg/m^2)	27.80±7.42	24.41±3.53	26.10±5.90

Bpm, beat per minute; kg, kilogram; m, meter; mmHg, millimeter mercury; SD, standard deviation.

Table 2. Numeric rating scale (NRS) data in control and treatment groups before and after pelvic floor exercises

Group	NRS *Pre-test* (mean ±SD)	NRS *Post-test* (mean ±SD)	Difference (mean ±SD)
Control (n=9)	7.33±1.11	6.00±1.41*	-1.33±0.50
Treatment (n=9)	7.00±1.41	2.56±1.74*,#	- 4.44±0.52

N, number of participants; SD, standard deviation.
*Paired t-test showed a significant NRS reduction in both groups (p<0.05).
#Independent t-test revealed a greater reduction in the treatment group compared to the control group (p<0.05)

Table 3. Modified Oswestry low back pain disability index (MODI) data in control and treatment groups before and after pelvic floor exercise

Group	MODI *Pre-test* (mean ±SD)	MODI *Post-test* (mean ±SD)	Difference (mean ±SD)
Control (n=9)	30.67±7.41	20.33±7.31*	-10.33±1.80
Treatment (n=9)	29.11±8.99	9.44±7.92*,#	-19.66±1.73

N, number of participants; SD, standard deviation.
*Paired t-test showed a significant reduction in MODI scores in both groups (p<0.05).
#Independent t-test showed that the treatment group had a significantly greater reduction than the control group (p<0.05)

mean delta reduction of -10.33 ± 1.80. In comparison, the treatment group (n = 9), which received daily pelvic floor exercises, experienced a more substantial decrease in MODI scores from 29.11 ± 8.99 to 9.44 ± 7.92, with a mean delta of -19.66 ± 1.73. These results demonstrate that daily pelvic floor exercise interventions are more effective in reducing disability levels related to low back pain compared to less frequent or no intervention.

The independent sample T-test statistical test was used to analyze the differences between the control and treatment groups after they were administered pelvic floor exercises with varying frequencies. The mean values of NRS and MODI in each group after the administration of pelvic floor exercises showed significant differences, with each group having a value of p=0.000 and p=0.008. However, the delta values for the NRS and MODI in the treatment group that performed pelvic floor exercises daily exhibited a higher delta value compared to the other groups, specifically the three-times-a-week group, with a delta value of NRS 4.44 ± 0.52 and MODI 19.66 ± 1.73.

DISCUSSION

It can be concluded that the NRS and MODI values in the treatment group with daily pelvic floor exercise frequency are significantly lower compared to the control group with pelvic floor exercise frequency three times a week in postmenopausal women. Therefore, the researcher conducted the exercise frequency every day with 2 sessions per day, in lying and sitting positions, each session consisting of 3 sets of 8 contractions held for 8 seconds. The purpose of the daily exercise is to improve muscle strength and enhance motor skills through training.

Pelvic floor exercises have an effect on subjects starting from 3 weeks of training and improve further after 12 weeks. Performing pelvic floor exercises daily, followed by long-term training, is recommended. The pelvic floor muscles consist of the levator ani muscles, including the puborectalis, pubococcygeus, iliococcygeus, and coccygeus muscles.[13] The pelvic floor plays a role in stabilizing the lower back area. When strengthening the pelvic floor muscles, it is important to have a proper understanding of pelvic floor muscle activation and a repeated exercise program.[14] Pelvic floor exercises are more effective when given specific instructions by the researcher and performed regularly by motivated subjects, as effectiveness depends on subjects' compliance during the intervention and maintenance phases.[15]

In this study, the average body weight of postmenopausal women falls into the overweight category. On average, women's body weight increases by 1 pound per year. However, the average weight gain among women varies greatly; 20% of women experience a weight gain of 10 pounds or more during this transition period.[16] Although this overall weight gain has not been proven to have a direct correlation with changes in hormonal status, it appears to be related to aging and decreased energy expenditure, resulting in increased deposition of subcutaneous and visceral abdominal adipose tissue, which leads to an increase in fat mass and a decrease in lean muscle mass.[17]

From a physiological perspective, muscle strength decreases between the ages of 50 and 60, leaving only 80% of the muscle strength in the human body.[18] Hormones during menopause change as the series of menstrual phases experienced by women ends, and the body no longer produces estrogen and progesterone hormones.[20] The decline in estrogen hormone can reduce the regulation of microRNAs (miRs), resulting in increased apoptosis and decreased muscle mass in postmenopausal women. miRs are small

non-coding RNA molecules that function in the regulation of gene expression post-transcriptionally, either by targeting mRNA for degradation or inhibiting transcription initiation.[21] miRs have been shown to alter gene expression in skeletal muscle in response to various external stimuli such as exercise and estrogen status. To date, several miRs have been identified to regulate apoptosis at multiple stages, leading to programmed cell death.[22]

Motivation to continue exercising after menopause is greatly needed to prevent disorders such as lower back pain and weakened bladder muscle tone.[12] Pelvic floor muscle strength can be assessed through bladder control.[15] In this study, the average postmenopausal woman was able to control urination for up to five seconds. Therefore, it can be concluded that the pelvic floor muscles of each subject have already shown improvement. There is no difference between pelvic floor exercises for adults and the elderly. However, initial management should be individualized and influenced by treatment goals, preferences, and estimated remaining life expectancy, as well as the most likely clinical diagnosis. Age is not a barrier to gaining benefits from pelvic floor exercises.

In preventing and treating lower back pain in post-menopausal women, the researcher hopes that pelvic floor exercises can become one of the home exercise programs for post-menopausal women who complain of lower back pain, in order to improve functional activities or ADL, with an appropriate exercise frequency, thereby enhancing the quality of life of postmenopausal women.

This study has several limitations. First, the relatively small sample size may limit the generalizability of the findings to the broader elderly population. Second, the short duration of the intervention may not fully capture the long-term effects and sustainability of pelvic floor exercise on low back pain and functional independence. Third, the study did not control for other factors that may influence pain perception and daily activity performance, such as psychosocial variables, comorbidities, and medication use. Future research with larger, more diverse samples and extended follow-up periods is needed to validate and expand upon these findings.

CONCLUSION

Based on the above, it can be concluded that the daily pelvic floor exercise group showed a more significant decrease in NRS scores than the three-times-per-week group. Similarly, the MODI in the group that exercised every day showed a significant decrease compared to the group that exercised only three times a week in postmenopausal women. This study suggests continuing further research related to the pelvic floor strength in premenopausal and postmenopausal women since pelvic floor exercises provide many benefits for women.

ETHICAL CLEARANCE

The Ethics Committee of Universitas Gadjah Mada reviewed and approved the research protocol with registration number KE/FK/1763/EC2023.

CONFLICT OF INTEREST

This study has no conflicts of interest.

FUNDING

This study received no funding from any institution.

AUTHOR CONTRIBUTIONS

FGN was responsible for conceptualizing and designing the studies, collecting and processing data, and drafting the manuscripts. MNR and DMR were charged with critically reviewing and editing the manuscripts to ensure their scientific rigor and clarity.

REFERENCES

1. Abdel-Aziem AA, Abdelraouf OR, El-Basatiny HM, Draz AH. The effects of stabilization exercises combined with pelvic floor exercise in women with nonspecific low back pain: A randomized clinical study. Journal of Chiropractic Medicine. 2021;20(4):229-238.
2. Agustina A, Nawati N. Hubungan kecemasan terhadap keluhan menopause pada wanita usia 45-50 tahun di kecamatan tanah sereal kota bogor. Jurnal Riset Kesehatan Poltekkes Depkes Bandung. 2021;13(2):457-465.
3. Mahdavi SB, Riahi R, Vahdatpour B, Kelishadi R. Association between sedentary behavior and low back pain; A systematic review and meta-analysis. Health promotion perspectives. 2021;11(4):393.
4. Nathania NP, Nugraha MH, Primayanti ID, Saraswati PA. Kekuatan genggaman tangan berhubungan dengan keseimbangan pada lansia wanita. Majalah Ilmiah Fisioterapi Indonesia. 2023;11(2):112-117.
5. Palacios-Ceña D, Albaladejo-Vicente R, Hernández-Barrera V, Lima-Florencio L, Fernández-de-Las-Peñas C, Jimenez-Garcia R, López-de-Andrés A, de Miguel-Diez J, Perez-Farinos N. Female gender is associated with a higher prevalence of chronic neck pain, chronic low back pain, and migraine: results of the Spanish National Health Survey, 2017. Pain Medicine. 2021;22(2):382-395.
6. Blagosklonny MV. Cellular senescence: when growth stimulation meets cell cycle arrest. Aging (Albany NY). 2023;15(4):905.
7. Roberts K, Mahajan S. Management of urgency and mixed urinary incontinence. Clinical obstetrics and gynecology. 2021;64(2):306-313.
8. Critchlow AJ, Hiam D, Williams R, Scott D, Lamon S. The role of estrogen in female skeletal muscle aging: A systematic review. Maturitas. 2023;17(8):10-17.
9. Mamipour H, Farazmehr S, Negahban H, Nazary-Moghadam S, Dehghan-Manshadi F, Nezhad MN, Jafari S, Sharifzadeh M. Effect of core stabilization exercises on pain, functional disability, and quality of life in pregnant women with lumbar and pelvic girdle pain: A randomized controlled trial. Journal of Manipulative and Physiological Therapeutics. 2023;46(1):27-36.
10. Alavi Mehr SM, Mousavi SH, Jafarnezhadgero A. The effect of a selected exercise protocol on trunk and lower limb muscle activity of older adults with both low back pain and pronated feet during walking. Sport Sciences and Health Research. 2021;14(1):129-140.
11. Bonanno M, Papa D, Cerasa A, Maggio MG, Calabrò RS. Psycho-neuroendocrinology in the rehabilitation field: focus on the complex interplay between stress and pain. Medicina. 2024;60(2):285.
12. Bofill-De Ros X, Vang Ørom UA. Recent progress in miRNA biogenesis and decay. RNA biology. 2024;21(1):36-43.
13. Juppi HK, Korhonen TM, Sievänen T, Kovanen V, Kujala UM, Aukee P, Cronin N, Sipilä S, Karvinen S, Laakkonen EK. Menopausal transition alters female skeletal muscle transcriptome. Translational Exercise Biomedicine. 2024;1(1):43-59.
14. Wijaya DN, Ramli R. Pengaruh senam kegel terhadap inkontinensia urin pada lansia. Window of Nursing Journal. 2024;4(5):32-39.
15. Pradipto T, Putra FA. Pengaruh bridging exercise terhadap inkontinensia urine pada lansia. Jurnal Riset Kesehatan Modern. 2025;7(3):35-47.
16. Sugianti R, Ngasu KE. Hubungan antara dukungan keluarga dengan keaktifan lansia mengikuti posyandu lansia dan kualitas hidup. Nusantara Hasana Journal. 2021;1(3):83-87.
17. Xiang D, Liu Y, Zhou S, Zhou E, Wang Y. Protective effects of estrogen on cardiovascular disease mediated by oxidative stress. Oxidative medicine and cellular longevity. 2021;21(1):55-62.

18. Kansakar U, Varzideh F, Mone P, Jankauskas SS, Santulli G. Functional role of microRNAs in regulating cardiomyocyte death. Cells. 2022;11(6):83-89.
19. ElDeeb AM, Abd-Ghafar KS, Ayad WA, Sabbour AA. Effect of segmental stabilizing exercises augmented by pelvic floor muscles training on women with postpartum pelvic girdle pain: A randomized controlled trial. Journal of back and musculoskeletal rehabilitation. 2019 Sep;32(5):693-700.
20. Moheboleslam Z, Mohammad Rahimi N, Aminzadeh R. A systematic review and meta-analysis of randomized controlled trials of stabilizing exercises for lumbopelvic region impact in postpartum women with low back and pelvic pain. Biological Research For Nursing. 2022;24(3):338-349.
21. Lepa AY, Wijayanti ME, Amigo TA. Hubungan lama duduk dengan keluhan nyeri punggung bawah pada mahasiswa stikes panti rapih Yogyakarta. I Care Jurnal Keperawatan STIKes Panti Rapih. 2024;5(1):72-86.
22. Seniorita D. Penyuluhan sikap wanita pre-menopause dalam menghadapi klimakterium di desa karangrejo kecamatan stabat. Pengabdian Deli Sumatera. 2022;1(2):25-34.