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The Role of Physiotherapy in Preventing Osteoporosis in Postmenopausal Women – A Literature Review

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ABSTRACT:

Background: This review is to reinforce the quality of living of women with osteoporosis in post menopause. This significance is done by the collection of the available evidence and recent guidelines. Thus, with the help of recent evidence to provide effective management in preventing osteoporosis in postmenopausal women and preventing from developing further complications.

Methods: Total 83 articles were collected from various research data base in that Cochrane Library (1), Google Scholar 43 PubMed (21) and research gate (18) were searched for published papers from 2015 to 2025. According to selection criteria we have chosen 4 articles. We evaluated the role of physiotherapy in preventing osteoporosis in postmenopausal women.

Results: High-intensity resistance training (HiRIT) led to significant gains in bone density, posture, and physical function among postmenopausal women, with high adherence and minimal side effects. Other structured exercise programs, especially those combining weight-bearing and resistance training, also showed strong improvements in strength, balance, and mobility. Even short-term intervention boosted functional outcomes within 12 weeks.

Conclusion: Currently, there is no universally established protocol to prevent osteoporosis in postmenopausal women. However, evidence suggests that engaging in dynamic resistance exercises at low to moderate intensity, performed 2 to 3 times per week over an 8 to 12-week period, can lead to modest improvements in bone mineral density. Although these gains may be incremental, they contribute to enhanced bone strength and a reduced risk of fractures. Incorporating regular, targeted exercise remains a practical and effective strategy for maintaining bone health in this population.

Keywords: Physiotherapy, physical therapy, physical intervention, osteoporosis, bone mineral density, fracture risk, osteoporosis management, osteoporosis strategies, postmenopausal, postmenopausal syndrome

Introduction:

Menopause is a critical stage of female reproductive ageing and health, with important implications relating to fat mass and its distribution, dyslipidemia and neurodegeneration. In this context, it is likely that some of the biological changes co-occurring with menopause, contribute to the well-documented higher risk of dementia in women, as well as the observed increase in cardiovascular disease whose pattern becomes more like that of men at older ages despite its lower prevalence at younger ages. However, the contributions of menopause to health have been historically understudied in the context of ageing.

According to the World Health Organization (WHO) “Scientific Group on Research in the Menopause”, natural menopause is defined as the permanent cessation of menstruation resulting from the loss of ovarian follicular activity. Furthermore, natural menopause is deemed to have occurred after 12 consecutive months of amenorrhea, for which no other obvious pathological or physiological causes could be determined. menopause occurs at the final menstrual period (FMP), which can only be known with certainty retrospectively, a year or more after the event. Induced menopause, however, is defined as the cessation of menstruation following either surgical removal of both ovaries (i.e. oophorectomy), or iatrogenic ablation of ovarian function (i.e. chemotherapy or irradiation) Ambikairajah et al. (2022).

Osteoporosis is a significant public health concern characterized by diminished bone mineral density (BMD), resulting in increased bone fragility and susceptibility to fractures (Howe et al. (2011; Poduval & Vishwanathan (2023). According to the World Health Organization (WHO), osteoporosis is operationally defined as a BMD that is 2.5 standard deviations or more below the mean of a young adult reference population (T-score ≤ -2.5) (Salari et al. (2021; Mäkitie & Zillikens (2022). The most used and validated diagnostic method for measuring BMD is dual-energy X-ray absorptiometry (DXA) (Salari et al. (2021). Alongside DXA, ultrasound imaging to assess the speed of sound (SOS) in bones like the tibia is also utilized in some diagnostic settings (Salari et al. (2021).

The bone is composed of compact (cortical) and spongy (trabecular) tissues, each contributing to its mechanical strength and metabolic functions. Cortical bone forms the dense outer layer and provides mechanical support, while trabecular bone, located in the inner structure, plays a vital role in metabolic activities and shock absorption due to its spongy, vascular structure (Bhatnagar & Kekatpure (2022; 6. Poduval & Vishwanathan (2023). The remodeling of bone tissue, regulated by osteoblasts and osteoclasts, maintains bone health. However, physiological changes such as aging and menopause disrupt this balance, leading to decreased bone mass, especially in trabecular bone, which is more metabolically active (Poduval & Vishwanathan (2023).

Clinically, osteoporosis is often identified after a fracture has occurred. Fragility fractures, defined as fractures resulting from minimal trauma such as a fall from standing height, are the primary clinical manifestation and the most serious consequence of osteoporosis (Gregson et al. (2022; Zutshi et al. (2023). These fractures commonly affect the vertebrae, hip, and wrist, leading to pain, disability, reduced quality of life, and increased morbidity and mortality (Howe et al. (2011; Zutshi et al. (2023). Vertebral fractures are strongly associated with postmenopausal osteoporosis and are linked to low back pain and functional limitations (Zutshi et al. (2023).

Osteoporosis is more prevalent among older populations, especially postmenopausal women due to hormonal changes affecting bone turnover. Research shows that the lifetime risk of fractures for women aged 50 and above in developed countries exceeds 40%, with hip fractures accounting for more than 20% (Howe et al. (2011). Men, although at lower risk due to higher peak bone mass and absence of menopause, are not immune; the condition is more prevalent in older men compared to younger ones due to age-related bone loss (Salari et al. (2021).

Several risk factors for osteoporosis have been identified and are classified into modifiable and non-modifiable categories. Modifiable factors include low body weight, sedentary lifestyle, smoking, excessive alcohol consumption, poor calcium intake, and long-term glucocorticoid use. Non-modifiable factors comprise age, gender, race, genetic predisposition, and early menopause (Salari et al. (2021). Secondary osteoporosis can result from chronic diseases (e.g., endocrine disorders, inflammatory bowel disease, and rheumatoid arthritis), poor nutrition, delayed puberty, and the use of medications such as steroids (Salari et al. (2021; Mäkitie & Zillikens (2022).

Globally, the prevalence of osteoporosis is expected to rise due to the aging population (Howe et al. (2011). Studies in Indian populations have shown a prevalence rate of 24.7% in adults aged 30 to 90 years, with postmenopausal women being the most affected (Salari et al. (2021). The disease also presents differently across the lifespan. In children, the diagnosis is more complex and requires consideration of growth patterns and pubertal development, with low BMD and recurrent fractures serving as key indicators (Mäkitie & Zillikens (2022).

Effective prevention strategies focus on early identification of at-risk individuals, particularly postmenopausal women and older men. Screening and early intervention are crucial in reducing the burden of osteoporotic fractures, which are a major cause of disability and death among the elderly (Salari et al. (2021; Gregson et al. (2022).

Materials and Methods:

Search Strategy: An electronic web search for studies from 2015 to 2025 was conducted in the databases PubMed, Cochrane library, Google Scholar and research gate. Keywords used in research are Physiotherapy, physical therapy, physical intervention, osteoporosis, bone mineral density, fracture risk, osteoporosis management, osteoporosis strategies, postmenopausal, and postmenopausal syndrome

Inclusion and exclusion criteria

Studies published in English between 2015 and 2025 were included, with only full-text articles selected to ensure comprehensive assessment. Research focusing exclusively on postmenopausal women was considered, while excluding reviews, case reports, and meta-analyses. Only original studies such as clinical trials and randomized controlled trials were included. Articles were screened based on study design, title, and abstract relevance to the review topic. Further selection was refined by applying inclusion and exclusion criteria specific to the target population. Studies not meeting the inclusion criteria, unrelated to postmenopausal women, lacking relevance to the research objective, published in other languages, or available only as abstracts without full text were excluded. Finally, only freely accessible and eligible full reports were reviewed in detail.

Data extraction

Table 1- demographic characteristics of population

Authors	**Population**	**Intervention**	**Control Groups**
Watson et al., 2018	101 postmenopausal women aged 65 ± 5 years with T-scores < –1.0 (osteopenia/osteoporosis)	Exercises: deadlifts, squats, overhead press, and impact-based chin-up landings for twice weekly 30 minutes (5 sets of 5 reps)	Low-intensity balance and mobility exercises, stretches and low-resistance movements
Tamara et al., 2021	103 Serbian women aged 59–70 with DXA-confirmed primary osteoporosis.	Duration: 12 weeks Frequency: 3 sessions per week, 70 minutes Warm-up (10 mins) Resistance exercises (30 mins) Balance exercises (15 mins) Cool-down (10 mins) Aerobic exercise: Fast walking (3–5 km/h), 5 times/week, 50–60 mins	TUG, STS, FES-I, and OKAT-S. for 12 weeks.
Chusairil et al., 2024	42 menopausal women (aged 50–65 years), divided into: Walking group (n=14) Bone joint exercise group (n=14) Control group (n=14)	Walking group: 1.6 km walk, 3×/week Bone Joint Exercise group: Arm and leg joint exercises, 3×/week	No Intervention
Laura et al., 2023	52 postmenopausal women with osteoporosis IT Group: Home-based exercises with remote coaching GT Group: Supervised group exercises (initially in gyms, later online due to COVID-19)	Exercise twice weekly, one hour per session Joint mobility, muscle strength, balance, coordination, and endurance training for twice a week 1 hr /session	home-based exercises along with patient education 1-3 sessions.

Table 2-Research outcome measures and its significance

Authors	Outcome measures	Measurement tools	P value
Watson et al., 2018	Bone mineral density Cortical thickness and volume Physical function	BMD of Lumbar Spine (LS) and Femoral Neck (FN) DXA and 3D hip software Timed Up-and-Go, Sit-to-Stand, Functional Reach, Back/Leg Strength	significance
Tamara et al., 2021	Fear of fall Physical function Knowledge test	FES-I TUG (Timed Up and Go) STS (Sit-to-Stand) OLST (One Leg Stance Test) OKAT-S (Osteoporosis Knowledge Test – Serbian version)	significance
Chusairil et al., 2024	Blood samples and BMD were assessed before and after 8 weeks for:	Estrogen PTH (Parathyroid Hormone) RANKL (Receptor Activator of Nuclear Factor Kappa-B Ligand) TNF-α (Tumor Necrosis Factor-alpha) BMD (Bone Mineral Density)	significance
	HRQoL Fear of falling Physical function:	ECOS-16 Disability (WHODAS) FES-I goniometry, handgrip, 6MWT, balance tests	significance

Discussion

The LIFTMOR randomized controlled trial by Watson et al.2017 investigated the effects of high-intensity resistance and impact training on postmenopausal women with osteopenia and osteoporosis. The study found significant improvements in bone mineral density and physical function among participants, highlighting its potential non-pharmacological approach to addressing bone health in high-risk populations. However, its short-term focus may limit understanding of long-term benefits or potential risks.

Filipović et al. 2021 conducted a randomized controlled study to evaluate the impact of a 12-week exercise program on functional status in postmenopausal osteoporotic women. Their findings demonstrated significant improvements in functional outcomes, which are vital for maintaining independence and reducing fall risks in this population. However, the short duration of the intervention limits insights into its long-term sustainability beyond the study period. Implementing such structured exercise programs could prove essential in enhancing daily functionality and quality of life for osteoporotic individuals.

The study by Chusairil Pasa et al 2023 explores how walking and bone joint exercises affect bone remodeling in menopausal women. From my perspective, this research is practical and relevant, especially as it focuses on simple physical activities that many women can adopt without financial

burden. The findings clearly show that both walking and joint exercises improved estrogen levels and bone mineral density (BMD), while reducing bone resorption markers like PTH and RANKL. This highlights the effectiveness of structured exercise in managing menopausal bone health. However, there are some limitations. The study had a small sample size and lasted only eight weeks, which may not fully reflect long-term effects. Also, factors like diet, calcium intake, and other lifestyle habits weren't considered, which could have influenced the results. Overall, I believe the study offers strong evidence that regular physical activity can help prevent osteoporosis in menopausal women. Despite some limitations, it encourages a safe and low-cost approach to improving bone health.

The study by Bragonzoni et al. (2023) explored two coaching methods—remote individual training and supervised group training—for postmenopausal women with osteoporosis. Both groups followed the same structured exercise program, and the results showed similar improvements in physical function, including mobility and endurance. This indicates that remote coaching can be a practical and effective alternative when in-person sessions are not possible. A key strength of the study is its real-world application, especially during the COVID-19 pandemic, where many participants had to shift to home-based training. Despite this, adherence remained high and no major safety concerns were noted. This supports the idea that well-designed home exercise programs, combined with regular follow-up, can be safely implemented. However, the study also had some limitations. The primary outcome, quality of life, did not show significant improvement—possibly due to a ceiling effect from high baseline scores. Additionally, the sample included mostly healthy urban women, which may limit the generalizability of the findings to more frail or rural populations. Overall, the study reinforces the value of flexible, coached exercise programs in managing osteoporosis and highlights the role of professional guidance in promoting long-term physical activity.

CONCLUSION:

Early identification and detection of osteoporosis can prevent secondary complications of musculoskeletal problems. How ever performing dynamic resistance exercises of moderate to low intensity, 2-3 days a week, for 8-12 weeks, can have some effect on bone mass density.

CONFLICT OF INTEREST:

The authors declare no conflict of interest related to this study.

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