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THE CORRELATION BETWEEN YOGA AND POSTMENOPAUSAL OSTEOPOROSIS – AN EXPERIMENTAL OBSERVATIONAL STUDY IN A MEDICAL COLLEGE OF CENTRAL INDIA

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Abstract

Background: The bone health indices, such as bone mineral density (BMD) and bone mineral content (BMC), deteriorate in postmenopausal women, raising the risk of fractures linked to osteoporosis. This study looked at how integrated yoga affected osteoporosis in postmenopausal women between the ages of 45 to 60. The non-pharmacological methods, such as exercise or physical activity have been suggested, as therapeutic and preventive measures in this regard. Elevating intensities of physical activity has been accompanied by the maintenance of bone mineral density and bodily functions, which in turn has led to a decrease in fracture risk. **Material And Method:** The research was an experimental observational study. Fifty individuals in the 45–60 age range who are regularly engaged in ordinary employment and had postmenopausal osteoporosis with a dual-energy X-ray absorptiometry (DEXA) score of ≤−2.5 were included in the research. **Observations and Conclusion:** Practising yoga asanas regularly implies both good improvements in overall health and osteoporosis in postmenopausal women. The study also demonstrated that BMD losses brought on by menopause or aging can be improved or reversed by intervention at any age.

Keywords: Postmenopausal women, osteoporosis, YOGA, bone mineral density

Introduction

As the proportion of older persons rises, so does the occurrence of age-related bone health issues such as osteoporosis or osteopenia. Bone health indices, such as bone mineral density (BMD) and bone mineral content (BMC), deteriorate with these illnesses, raising the risk of fractures linked to osteoporosis. Additionally, these fractures are linked to greater rates of morbidity and death in both men and women, however, females are more vulnerable, particularly postmenopausal women who are more susceptible to enhanced loss of bone mineral density due to decreased estrogen production.(1) Regarding potential methods to fortify bone tissue, pharmacological methods have the potential to increase bone mass, but they also

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come with drawbacks, including detrimental effects on bone quality and architecture that exacerbate fragility. Non-pharmacological methods, such as exercise or physical activity, have been suggested as therapeutic and preventive measures in this regard. Elevating intensities of physical activity have been accompanied by the maintenance of bone mineral density and bodily functions, which in turn has led to a decrease in fracture risk.[2,3] Similarly, specific attention should be given to bone remodelling in exercise therapies, considering various patterns of mechanical stress.[4–7] As defined by the World Health Organisation, natural menopause is defined as at least 12 months of amenorrhea and isn't brought on by irrational or biological factors. According to statistics, the average age of natural menopause in developed countries is 51 years, whereas in developing and underdeveloped nations state is 48 years. The majority of women will live longer than one-third of their lives after menopause since the average lifespan has increased significantly up to seventy years in the country. In addition, the percentage of women going through menopause is increasing due to the constantly ageing population. The menopausal women's health is increasingly becoming a global priority. The natural physiological phenomenon known as menopause is brought on by primary ovaria n failure as a result of apoptosis, or programmed cell death. Within the time leading up to menopause, the women will encounter and have several annoying symptoms including vaginal bleeding, nocturnal sweats, hot flashes, dryness and atrophy, dyspareunia, disturbed sleep, increased fluctuations in mood, ageing, and ovarian function decreases. The degeneration of bone tissue's microarchitecture and decreased bone mineral density (BMD) are the main characteristics of osteoporosis, a complex systemic skeletal disease.

The gold standard for diagnosing osteoporosis using BMD is dual X-ray absorptiometry. The WHO defines osteopenia as having a T-score between -1.0 and -2.5, and osteoporosis as having a T-score of less than or equal to -2.5. The lumbar spine and femoral neck have been proposed as the anatomic regions of interest. During menopause, a lack of estrogen disrupts the regular cycle of bone turnover. Because there is less accessible oestrogen to limit osteoclastogenesis and osteoclast activity, there is an overall increase in bone resorption. Although the exact mechanism by which estrogen stimulates bone development is unknown, it is thought that cytokines play a crucial role in establishing the link between bone resorption and bone formation, or by estrogen-responsive elements on promoters of genes involved in the biosynthesis of bone matrix, such as type I collagen.[8–10]

The Fast bone loss, which is seen in about 25% of postmenopausal women, can be identified by measuring markers associated with bone resorption and loss.[9,11,12] As long as the body gets adequate calcium, yoga can encourage the bones to hold calcium. It achieves this by using weight-bearing yoga positions that stimulate a whole range of motion and have an impact on the spine, arms, shoulders, elbows, and legs. Weight-bearing yoga has been demonstrated to have a beneficial impact on bone health by lowering bone resorption, which lowers the incidence of osteoporosis in postmenopausal women. The research indicates that yoga brings flexibility as well as bring the needed muscle strength to the human body. It is one of the few workout regimens that use the arms and upper body to support weight, str engthening and thickening the bones. Yoga has been shown in recent studies to somewhat mitigate the height reduction brought on by osteoporosis. It can be a substitute for physical treatment.[1,12,13]

This study looked at how integrated yoga affected osteoporosis in postmenopausal women be tween the ages of 45 and 60.

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Materials And Methods

The research was an experimental observational study for which approval was taken from the institutional ethics committee. The study was conducted at a tertiary care teaching hospital in central India.

Inclusion Criteria:

Fifty individuals in the 45–60 age range who are regularly engaged in ordinary employment and had postmenopausal osteoporosis with a dual-energy X-ray absorptiometry (DEXA) score of ≤−2.5 were included in the research.

Exclusion Criteria

The women who were unable to execute yoga asanas and who had fractures linked to osteoporosis as well as any significantly related illness of the neurological, cardiovascular, or respiratory systems [Table 1]. The information about their normal activities, family history of osteoporosis, and demographics were documented. This work was completed in several Karnataka medical facilities.[2] For 24 weeks, the study's female participants practised yoga for one hour, at least four days a week. The hour-long yoga session comprised standing, sitting, supine, and prone asanas, as well as warm-ups and Surya namaskars. Every position had three distinct asanas, one designed to help the participants unwind and prepare them stress-free for the following one. They were followed by Omkar and Pranayama. Every pose was done five times, with 15–30-second breaks in between. The T-score of the lumbar DEXA scan was computed following six months of yoga practice by the research design. Patients were questioned regarding their overall health, mental wellness, and any discomfort they felt throughout. The patients were questioned regarding their perception of their overall physical and mental health and any pain they noticed throughout the six months of yoga after finishing the research, and the data was analysed and noted in case the record form.[1]

Observations And Results

The goal of this study was to determine how yoga poses affected postmenopausal women's osteoporosis before and after they stopped practising. The findings revealed an improvement in bone mineral density (BMD) as shown by a rise in the T-score of the DEXA scan at the lumbar spine. Table 2 shows that the before T-score was -2.55±58 and the post-T-score was -2.44±.60, with a P-value <0.05 indicating substantial significance. This suggests that practising yoga asanas regularly implies both good improvements in overall health and osteoporosis in postmenopausal women. The study also demonstrated that BMD losses brought on by menopause or ageing can be improved or reversed by intervention at any age.

Table 1: Lists of yoga poses that were taught to participants for one hour, at least four days a week, during study sessions.

Warm up:10 min	The exercises include circling the waist, circling the knees and ankles, side lifts for ten minutes, stretching, forward bending, side lunges, arm swings, upper back twisting, and opening the chest, back, and centre.
Suryana maskar: 5 min	Suryanamaskar including Yogasanas and Pranayama. Every stage of Suryanamaskar is accompanied by breath regulation.
Standing Asanas	Prarthanasana: 2 min Tadasana: 30 s to 1 min Trikonasana (extended triangle pose): 30 s to 1 min
Sitting Asanas	Ardh-Matsyendrasana: 3 min Paschimottasana: 3 min

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Asanas in supine	Padmasana: 3 min Setu Bandha Sarvangasana (bridge pose): 30 s – 1min Supta Vajrasana: 30 s to 1 min Shava-asana (the corpse posture): 3-5 min or longe
Asanas in prone	Marjariasana (cat pose): 2 min Naukasana: 3 min Makrasana: 3-5 min or longer
Pranayama and types	Sheetali Pranayama Sadant Pranayama Bhastrika Type I Type II Ujjayi Pranayama
Omkar	AUM is the root of all the mantras. AUM is composed of 3 elements, "a", "u" and "m." The fusion of these 3 elements is AUM or OM. The alphabets are pronounced in series.

Table 2: Pre- and post-training scores' mean + standard deviation

T- Scores for in DEXA Scan	**Mean+ SD**	
Pre-training scores	-2.55+58	P < 0.05
Post-training scores'	-2.44+60	
Difference between Pre- and post-training scores'	-0.34+02	

Discussion

As our population ages, up to 200 million more people globally are expected to be affected by osteoporosis and osteopenia. Following their fractures, many persons are unlikely to have access to medical care or prescription drugs. An inexpensive, low-risk substitute is preferred. In the US, there are more than 700,000 spinal fractures and over 300,000 hip fractures annually. Twenty-five percent of Americans who suffer a hip fracture will die, and another twenty-five percent will never come out of the nursing home where they are admitted after being hospitalized.

An estimated $19 billion is presently spent in the US on the more than 2 million fragility fractures that occur each year and the resulting 500,000 hospital admissions. Yoga is the most affordable and effective substitute for pharmaceuticals and the complex medical treatment that their absence is said to cause. Better posture, increased balance, better coordination, a wider range of motion, increased strength, less anxiety levels, and an improved stride are among the "side effects" of yoga. While all of these well-established yoga benefits lower the risk of falling, which is the primary cause of all other osteoporotic fractures, improved posture directly addresses spinal fractures. Mechano transduction, which is involved in physical adaptations, therapeutic adaptations to osteogenesis, and pathologic fracture repair, may be responsible for improvements in bone mineral density (BMD). The physical remodelling of the bone occurs to satisfy the functional demands of the body in the mechanical environment. By mechanical loading that triggers the mechano transducers to do so, a dynamic equilibrium between the processes of osteogenesis and bone resorption is maintained.[2,14]

The pre-training score for the current study's DEXA scan T scores was -2.54+58. The difference between the pre-and post-training scores was -0.34 + 0.02, and the statistical significance of the difference was $P < 0.05$. The post-training score was -2.52 + 0.62. The study conducted by Fernandez-Rodriguez *et al.*[4] likewise demonstrates comparable outcomes and research methodology. Over two years, a pilot study conducted by Fishman showed a considerable improvement in the T-score at the hip and spine. When various yoga poses, including trikonasana, bhujanganasana, setu bandhasana, and paschimotasana, were studied, the results showed that the hips saw a higher rise in bone mineral density (BMD) than the spine.[15]

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In Angin and Erden's study, the T-score improved, but there was no discernible difference between the postmenopausal osteoporotic and osteopenic groups mean improvements from the exercise program. However, 43.8% of osteoporotic women and 23.5% of osteopenic women had T-scores that indicated osteopenia. women had a T-score falling within the normal range.[15]

There were no reported or photographed significant injuries associated with yoga.Yoga practi tioners appeared to have better bone quality, and the same study found that yoga appears to sa fely increase BMD in the femur and spine.[16]

There are few studies on yoga in individuals at fracture risk, and the two RCTs that were avai lable offered extremely poor certainty data, indicating that there is uncertainty about the impa ct of yoga on physical functioning. RCTs (n = 377) that examined the impact of yoga on phys ical functioning and healthrelated outcomes in older persons, such as balance and walking spe ed, were included in a systematic review.[17] In a research, the effects of an exercise program versus walking on preventing osteoporosis in younger females were compared. After three months of intervention, the T-scores of the two groups showed no difference, indicating that longer-term studies are needed to assess the effectiveness of the exercise program.[18] and also a systematic study[19] identified knowledge gaps regarding yoga's impact on health-related outcomes deemed significant by patients and medical experts. If a person is at risk of fracture and wants to practice yoga, they should consult a trained yoga instructor who knows how to modify certain poses for older persons with low bone mass.[19] The current study finds that several yoga asanas, in addition to pranayama and Surya namaskar, are beneficial in enhancing bone mineral density (BMD) and that integrated yoga activities ought to be a significant part of any fitness regimen for the treatment of osteoporosis.

Conclusion

The current study concludes that integrated yoga, which incorporates both weight-bearing and non weightbearing asanas, pranayama, and Suryanamaskar, is a safe kind of exercise that can help postmenopausal osteoporotic women enhance their bone mass and also imply good improvements in overall health.

References

1. Sunitha M, S.V. Brid, Chandrashekar S. STUDY ON EFFECT OF YOGA ON OSTEOPOROSIS IN POSTMENOPAUSAL WOMEN. International Journal of Academic Medicine and Pharmacy. 2023;5(6):77–81.
2. Wade SW, Strader C, Fitzpatrick LA, Anthony MS, O'Malley CD. Estimating prevalence of osteoporosis: examples from industrialized countries. Arch Osteoporos. 2014 Dec;9(1):182.
3. Gonzalo-Encabo P, McNeil J, Boyne DJ, Courneya KS, Friedenreich CM. Dose-response effects of exercise on bone mineral density and content in post-menopausal women. Scandinavian Med Sci Sports. 2019 Aug;29(8):1121–9.
4. Fernández-Rodríguez R, Alvarez-Bueno C, Reina-Gutiérrez S, Torres-Costoso A, Nuñez De Arenas-Arroyo S, Martínez-Vizcaíno V. Effectiveness of Pilates and Yoga to improve bone density in adult women: A systematic review and meta-analysis. Moran JM, editor. PLoS ONE. 2021 May 7;16(5):e0251391.
5. Cosman F, De Beur SJ, LeBoff MS, Lewiecki EM, Tanner B, Randall S, *et al.* Clinician's Guide to Prevention and Treatment of Osteoporosis. Osteoporos Int. 2014 Oct;25(10):2359–81.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

6. Babatunde OO, Bourton AL, Hind K, Paskins Z, Forsyth JJ. Exercise Interventions for Preventing and Treating Low Bone Mass in the Forearm: A Systematic Review and Meta-analysis. Archives of Physical Medicine and Rehabilitation. 2020 Mar;101(3):487–511.
7. LaMonte MJ, Wactawski-Wende J, Larson JC, Mai X, Robbins JA, LeBoff MS, *et al.* Association of Physical Activity and Fracture Risk Among Postmenopausal Women. JAMA Netw Open. 2019 Oct 25;2(10):e1914084.
8. Sandhu SK, Hampson G. The pathogenesis, diagnosis, investigation and management of osteoporosis. J Clin Pathol. 2011 Dec;64(12):1042–50.
9. Lerner UH. Bone Remodeling in Post-menopausal Osteoporosis. J Dent Res. 2006 Jul;85(7):584–95.
10. Rogers A, Saleh G, Hannon RA, Greenfield D, Eastell R. Circulating Estradiol and Osteoprotegerin as Determinants of Bone Turnover and Bone Density in Postmenopausal Women. The Journal of Clinical Endocrinology & Metabolism. 2002 Oct;87(10):4470–5.
11. Meng Q, Zhang Z, Li F, Li J, Wang N, Guo Z, *et al.* The prescription patterns and safety profiles of oral non-steroidal anti-inflammatory drugs in China: an 8-year real-life analysis. Ann Palliat Med. 2021 Feb;10(2):2224–37.
12. Garnero P, Sornay-Rendu E, Duboeuf F, Delmas PD. Markers of Bone Turnover Predict Postmenopausal Forearm Bone Loss Over 4 Years: The OFELY Study. Journal of Bone and Mineral Research. 1999 Sep 1;14(9):1614–21.
13. Phoosuwan M, Kritpet T, Yuktanandana P. The effects of weight bearing yoga training on the bone resorption markers of the postmenopausal women. J Med Assoc Thai. 2009 Sep;92 Suppl5:S102-108.
14. Lu YH, Rosner B, Chang G, Fishman LM. Twelve-Minute Daily Yoga Regimen Reverses Osteoporotic Bone Loss. Top Geriatr Rehabil. 2016 Apr;32(2):81–7.
15. Angin E. The effect of group exercise on postmenopausal osteoporosis and osteopenia. Acta Orthop Traumatol Turc. 2009;43(4):343–50.
16. Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life. Int J Yoga. 2011 Jul;4(2):49–54.
17. Sivaramakrishnan D, Fitzsimons C, Kelly P, Ludwig K, Mutrie N, Saunders DH, *et al.* The effects of yoga compared to active and inactive controls on physical function and health related quality of life in older adults- systematic review and meta-analysis of randomised controlled trials. Int J Behav Nutr Phys Act. 2019 Dec;16(1):33.
18. Soomro RR, Ahmed SI, Khan M. Comparing the Effects of Osteoporosis Prevention Exercise Protocol (OPEP) Versus Walking in the Prevention of Osteoporosis in Younger Females. Pak J Med Sci [Internet]. 1969 Dec 31 [cited 2024 Oct 12];31(2). Available from: http://pjms.com.pk/index.php/pjms/article/view/5990
19. Kim KV, Bartley J, Ashe MC, Bardai Z, Butt DA, Chilibeck PD, *et al.* Effect of yoga on health-related outcomes in people at risk of fractures: a systematic review. Appl Physiol Nutr Metab. 2022 Mar;47(3):215–26.