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The Role of Physical Activity in the Prevention of Osteoporosis in Perimenopausal Women

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Abstract: ***Context and objective: Osteoporosis causes an increase in bone fragility. Its clinical significance mainly refers to (hip) fractures secondary to low or moderate trauma. Although it is well accepted that exercise is essential for the management of osteoporosis, the exact role of physical activity in the primary and secondary prevention of osteoporotic fractures is still controversial. Osteoporosis is a significant health concern for perimenopausal women, who experience hormonal changes that can accelerate bone density loss. Here's a review of the critical points found in various articles on the prevention of osteoporosis during the perimenopausal period.***

Keywords: osteoporosis, physical activity, perimenopausal women, bone density, hip fracture risk

1. Methods

The database and reference lists of selected publications were systematically searched for randomized control trial and Prospective cohort studies, respectively, published since January 2015 regarding the association of physical activity and osteoporosis in perimenopausal women.

2. Results

Two prospective cohort studies indicate the clinical relevance of this association by showing an inverse relationship between physical activity and the risk of hip fracture. There is convincing evidence that physical activity effectively slows bone loss in postmenopausal women in a dose - dependent manner. Exercise programs may increase bone mineral density.

Osteoporosis is a disease characterised by compromised bone mass and strength, resulting in an increase in bone fragility [1]. It is largely diagnosed through quantitative assessment of bone mineral density (BMD), a major determinant of bone strength [1], [2]. The level of BMD in later life is a function of the maximum bone mass attained in early adulthood and of subsequent age - related bone loss, which starts after entering the fourth decade of life and accelerates in early postmenopausal years in women [3], [4], [5]. The clinical significance and (economic) burden of osteoporosis mainly refers to hip fractures and fractures of the forearm, the proximal humerus and vertebrae secondary to low to moderate trauma in postmenopausal women [1], [6]. Worldwide, approximately 200 million women suffer from osteoporosis [6]. Approximately 6% of men and 21% of women aged 50–84 years are classified as having osteoporosis in Europe and North America [1].

Women may change their patterns of physical activity throughout their lifespan. The engagement in physical activity depends on various factors such as general health, body mass index, smoking status, and socioeconomic position. Existing low level physical activity has been shown to be associated with the risk of fractures [6]. To be beneficial to bone health, high impact exercise is more important than the focus on endurance, a critical factor in the prevention of cardiovascular diseases [5], [7]. Interventions and exercise programs targeting women in the perimenopausal period may be most effective in achieving maintenance of physical activity through the critical years of bone loss in the early postmenopausal years [8], [9].

Although it is well accepted that exercise forms an integral component in the management of osteoporosis [1], the exact role of physical activity in the primary and secondary prevention of osteoporotic fractures (i. e. the clinically significant consequence of the disease) is still controversial [6]. Long - term data on the prevention of osteoporosis is scarce. Relevant reviews of the topic did not include any studies from the last decade. In addition, the low quality of included studies was noted [10]. One important review by Bonaiuti et al. meta - analysed the results of a complex range of randomized controlled trials (RCTs) regarding the association between exercise and osteoporosis in postmenopausal women published from 1966 to 1999. The authors concluded that all prescribed exercise programs, including aerobic exercise, resistance exercises or walking are effective at 1 year or more in slowing loss of BMD. (Fast) walking is recommended as the best prevention and treatment strategy for osteoporosis in postmenopausal women as it is most similar to activities of daily living and may produce the greatest compliance. The authors could not retrieve studies to show any effect of exercise for the prevention of fractures. In addition, it is unclear whether the effects of exercise on bone last after discontinuation [10].

The present review of prior publications on the association between physical activity and osteoporosis in perimenopausal women summarizes the literature.

Seven publications were included in this literature review, three of which report on RCT (Randomized Control Trial) [12], one on a controlled though not randomized clinical trial [13], and three on prospective cohort studies [15]. Six studies exclusively evaluated postmenopausal women [13], whereas one included both men and women and only presents limited data on the subgroup of postmenopausal women [11].

3. Methods

A multi - step strategy was used to identify all relevant articles. We used overlapping search strategies including systematic electronic searches (MEDLINE using the MeSH terms "exercise", "physical activity", and "osteoporosis") and hand search of the reference lists of all included articles.

Clinical implications

The early perimenopause is a period in which fast bone loss in women occurs. Effective interventions should target perimenopausal women in order to maintain physical activity into the critical postmenopausal years of life. Even in later life initiation of physical activity can reduce fracture risk, but it must be maintained in order to preserve its benefits on bone health [7]. As physical activity seems to stimulate bone accretion in a dose - dependent manner.

1) Understanding Osteoporosis Risk Factors

Articles generally emphasize the importance of recognizing risk factors specific to perimenopausal women, including:

- Declining oestrogen levels: Oestrogen is crucial for maintaining bone density, and its decrease during perimenopause can lead to increased bone resorption.
- Genetics: A family history of osteoporosis can heighten risk.
- Lifestyle factors: Smoking, excessive alcohol consumption, and sedentary behaviour are associated with a higher risk of developing osteoporosis.

2) Nutritional Strategies

Many studies highlight dietary modifications that can help prevent osteoporosis:

- Calcium and Vitamin D: Adequate intake of calcium (1, 200 mg/day) and vitamin D (800 - 1, 000 IU/day) is essential to support bone health. Dairy products, green leafy vegetables, and fortified foods are rich sources.
- Protein: Sufficient protein intake is necessary for bone health, with recommendations suggesting moderate amounts from both animal and plant sources.
- Limit Sodium and Caffeine: Reducing high - sodium and excessive caffeine consumption can also be beneficial, as both can negatively affect calcium retention.

3) Physical Activity

The consensus among literature stresses the role of physical activity in bone health:

- Weight - bearing exercises: Activities like walking, jogging, dancing, and resistance training can stimulate bone formation and are particularly recommended.
- Balance and strength training: These exercises can help prevent falls, which is crucial for avoiding fractures in individuals with decreased bone density.

4) Hormonal and Non - hormonal Therapies

Several articles discuss pharmacological interventions:

- Hormone Replacement Therapy (HRT): HRT may be beneficial for maintaining bone density but should be considered based on individual risk profiles and potential side effects.
- Bisphosphonates and Other Medications: Non - hormonal options, including bisphosphonates and selective oestrogen receptor modulators (SERMs), might be recommended for women at high risk of osteoporosis.

5) Lifestyle Modifications

Articles advocate for a holistic approach to reducing osteoporosis risk:

- Cessation of Smoking: Quitting smoking has been shown to slow bone loss.
- Reducing Alcohol Consumption: Limiting alcohol intake to moderate levels can also contribute to better bone health.

6) Screening and Monitoring

Regular screening for bone density (e. g., DEXA scans) is suggested, particularly for women with additional risk factors. Early detection of low bone density can prompt timely intervention.

7) Patient Education and Compliance

Several reviews underline the importance of educating patients about osteoporosis and the importance of compliance with preventive measures, including lifestyle changes and treatments.

4. Conclusion

Based on few and not entirely comparable studies discussed in this review moderate or high intensity physical activity appears to exert site - specific beneficial effects on BMD. Individually tailored, intense, high impact exercise programs [13] may be most effective to maximize the goals of public health to prevent osteoporosis and consecutive adverse outcomes. However, high cost, low practicability, and limited applicability in routine prevention and care may limit the appropriateness of this. In order to maximize the goals of public health most effective, individually adapted, intense, high impact exercise programs are needed. However, they may be complicated to communicate and adherence on the population level may be hard to achieve. These programs must be weighed against popular and applicable existing programs (e. g. aerobic classes, Tai Chi, and walking) which appear to be easier to adhere to but appear to be less effective in the prevention of osteoporotic fractures in the individual postmenopausal women.

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