

Breastfeeding and Postmenopausal Osteoporosis

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ABSTRACT

Although pregnancy and breast-feeding involve adequate calcium mobilization, it is not recognized if these affect the acquisition of a healthy peak bone mass (PBM) and, hence, postmenopausal osteoporosis (PMOP). The aim of this review was to evaluate osteoporosis in postmenopausal women and its association with breastfeeding. Searches were conducted in PubMed Central and Scopus to find relevant literature and studies. Searching terms were “osteoporosis” AND “breastfeeding. There was no time restriction applied. Language was restricted to English, German and Greek. Results from different studies evaluating the association of breastfeeding and osteoporosis in women are contradictory. While some show a beneficial and protective effect of breastfeeding, others show a detrimental impact and some studies show no association at all. Postmenopausal osteoporosis (PMOP) has long been a pervasive public health concern and the prevention, assessment and management of postmenopausal osteoporosis is particularly important. Thus, more research is needed on the association of breastfeeding and osteoporosis to be able to give accurate recommendations to women.

Keywords

Osteoporosis, Breastfeeding, Bone mass density, Fracture.

List of Abbreviations

Peak Bone Mass: PBM; World Health Organization: WHO; Postmenopausal Osteoporosis: PMOP; Bone Mineral Density: BMD; Body Mass Index: BMI.

Introduction

Osteoporosis is one of the most common chronic metabolic skeletal disease defined by low bone mass and disruption of bone microarchitecture, with increased risk of bone fragility and fracture. According to the WHO, osteoporosis ‘as a disease process, causes a decrease in bone density that is a major contributing factor to the increased risk of fracture’ [1] [p3]. Since the definition of the WHO in 1994 the impact of osteoporosis has been recognized. Annually more than 8.9 million fractures are caused by osteoporosis, 4.5 million of them only in America and Europe. The risk to suffer from a wrist, hip or vertebral fracture at some point in someone's life is estimated to be 30% to 40% for developed countries. For elderly people the complications of a fracture can be life-threatening [2]. Most of the time there are no symptoms until the first fracture and therefore osteoporosis is

considered a silent disease [3]. The WHO has defined osteoporosis as a bone mineral density (BMD) 2.5 standard deviations or smaller than the average level of the young adult mean. If the BMD level is 1 standard deviation lower than the young adult mean but less than 2.5, than the diagnose is low bone mass or osteopenia.

Bone remodeling

From birth till adulthood the bone mass grows and is modeled into its final stage. At puberty bone mass is highest and from then on bone density is decreasing [4]. The skeleton undergoes continuous remodeling throughout life [5]. During this process old bone is replaced by new bone [6]. This process is called bone remodeling and it depends on the right balance of bone resorption by osteoclasts and bone deposition by osteoblasts [7]. While a healthy adult has neither an increase nor a decrease of bone mass at skeletal maturity, postmenopausal women experience an exponential decline with the greatest loss in the early postmenopausal years [1].

Risk factors

There are many known factors that affect bone mass. In general women are more affected by osteoporosis, as men have greater bone mass. The frequency of a fracture caused by osteoporosis

is six times higher for elderly women than for elderly men [1]. Moreover, genetics play an important role [8,9] and it is known that daughters of women with osteoporosis have a lower BMD [10]. Furthermore, ethnic differences have been observed, with Caucasian women having the highest risk for osteoporosis [6]. Other risk factors such as alcohol and caffeine intake, smoking, lack of exercise, low BMI and lack of calcium and vitamin D have been shown. Besides, many diseases such as celiac disease, cystic fibrosis and diabetes mellitus (type 1 and 2) are known risk factors for developing osteoporosis [4]. Reproductive factors have been mentioned as risk factors but their possible impact is controversially discussed [11-15].

Pregnancy and Breastfeeding

During pregnancy and lactation, the fetus needs calcium for the rapidly mineralizing skeleton and the growth of the skeleton. Therefore, there is an increase of needed calcium in the mother. In the phase of pregnancy this demand is met by an increased intestinal calcium absorption [16]. It has been shown that the intestinal calcium resorption is almost doubled during pregnancy [17]. During lactation the demand is fulfilled by increased calcium resorption from bone [16]. Many studies have reported a decrease of bone mass density during pregnancy and breastfeeding [18-21]. According to Åkesson et al., the BMD of a woman that has given birth and breastfed her child recovers after weaning [22].

The aim of this review was to evaluate the literature concerning osteoporosis and its association with breastfeeding.

Methods

Searches were conducted in PubMed Central and Scopus using the terms “osteoporosis” AND “breastfeeding”. There was no time restriction applied. Language was restricted to English, German and Greek. Additionally studies from the reference lists of the articles were searched, as it has been shown that the method called ‘snowballing’ increases the chance to identify all studies dealing with a certain topic [23].

Results

In a study conducted by Kim et al. [24], 1694 postmenopausal women were asked about their lactation history. The result of this study was that women that had a history of more than 79 months of breastfeeding had a higher risk for low BMD than women with no history of breastfeeding. Moreover, the risk for low BMD rose when the duration of breastfeeding increased. Sharma et al. [11] came to similar findings in their study, however with a significantly smaller study population of 196 peri and postmenopausal women. They showed that the duration of lactation had an inverse correlation with the BMD. In a systematic review by Lee et al. [25], 3 studies were included which evaluated the association of breastfeeding and osteoporosis in Korean women. Lee et al. [25] concluded that the duration of breastfeeding increased the risk for osteoporosis in Korean postmenopausal women. According to another study by Lee et al. [26], women with a lactation history more than 24 months had a higher risk of lumbar vertebral osteoporosis than

women who breastfed for less than 12 months.

In the systematic review by Chowdhury et al. [27], breastfeeding and BMD could not be associated with each other. According to Lenora et al. [14], breastfeeding had no negative impact on the maternal BMD. In the Study of Women's Health Across the Nation (SWAN) with a sample of 3302 women from five different ethnic backgrounds in the United States it was found that lactation had a small association with bone strength in pre and perimenopausal women and no association was found with risk of fracture after the age of 42, after a follow up time of a mean of 16 years [28]. In the systematic review by Salari et al. [29] the included studies showed opposing results, as some showed a negative impact of breastfeeding, others a protective effect and some no association at all. Yan et al. [30], in their study, came to the conclusion that breastfeeding could not be associated with postmenopausal osteoporosis.

According to Crandall et al., breastfeeding had no statistically significant association with hip fracture incidence. However, women who had breastfed for at least 1 month had a decreased risk compared to women that had never breastfed [24]. According to Canal-Macias premenopausal women with a history of lactation had higher BMD than women that had never breastfed [31]. In the meta-analysis by Xiao et al. [32], the extension of the duration of breastfeeding decreased the incidence of osteoporotic hip fracture.

Discussion

Studies evaluating the impact of breastfeeding on osteoporosis in women have shown contradictory results, some showing a positive correlation, some a negative and some no association at all [11,14,24-33]. There is the possibility that the different results stem from the variation in study designs. Some studies were conducted with pre and postmenopausal women, others included only postmenopausal women and some studies evaluated the BMD during pregnancy. Another difference was the sample size of the studies. Crandall et al. [33] included the data of 93676 postmenopausal women, whereas other studies had a significantly smaller sample size, for example the study conducted by Sharma et al. with 196 women [11]. Most of the studies used a questionnaire to collect data on the lactation history of the women. The possibility of recall bias should not be underestimated. In the study by Lenora et al. the oldest women were 98 years at the time of the study [14]. Another factor could be the differences in nutrition in the different countries.

According to Lenora et al. [14], their study was one of the first with women from lower socio-economic backgrounds, which often means an inadequate diet. One factor that has been mentioned above is the ethnicity. As stated by Park et al. [34], who studied the prevalence of osteoporosis in Korea, Korean women have a higher risk of osteoporosis compared to Western women. Therefore, it is difficult to take the results from one country for other countries.

This literature review has limitations. First and most importantly, the existing literature was not evaluated systematically. Systematic

reviews need more time and financial support; therefore, it was not possible to perform a systematic review. Nevertheless, an attempt was made to show a full picture of the existing literature. Secondly, more research concerning osteoporosis and its association with breastfeeding is needed to be able to educate women about the positive and negative impact of breastfeeding. Future studies should use large sample sizes of postmenopausal women and should ideally have a long duration of follow up. In addition it is essential to consider other risk factors such as nutritional status (more precisely calcium and vitamin D intake), physical activity, ethnicity and weight change.

Conclusion

Results from different studies evaluating the association of breastfeeding and osteoporosis in women, are contradictory. Some show a beneficial and protective effect of breastfeeding, while others show a detrimental impact on the BMD. Can lactation protect the bone health of mothers, specifically in adolescence? This is a critical research question especially when study [35] suggests, that whilst adolescent mothers might be more vulnerable to bone mineral density loss than adult mothers, breastfeeding by adolescent mothers is associated with greater BMD in the proximal femur, during young adulthood.

It is of great significance to explore if lactating women lose more bone mineral content and density in the total body and lumbar spine, than non-lactating women do, during the first 6 months postpartum.

If so, after weaning, can lactating women gain more bone in the lumbar spine than non-lactating women? Lactation may result in net bone loss or not? A number of studies show no association at all.

Hence, it needs more research in order to be able to give evidence-based recommendations to women concerning breastfeeding and its impact on the BMD and osteoporosis. As the risk to suffer from a fracture is estimated to be 30% to 40% and in the most severe case it can be life-threatening, more future research for the prevention and treatment of osteoporosis is required.

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