



## Osteoporosis A Risk Factor for Periodontal Disease –A Review

### KEYWORDS

Osteoporosis, reduced bone mineral density, periodontal diseases.

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### ABSTRACT

*The purpose of this review article is to investigate that whether osteoporosis or low systemic bone mineral density (BMD) should be considered as a risk factor for periodontal disease progression. Method: An electronic search was performed using Google scholar, between January 1990 to December 2010. Search yielded 7404 articles out of which 109 were reviewed and 18 articles from Journal of Periodontology, Journal of Clinical Periodontology, and Journal of American Dental Association between 1990 to 2010 were selected based on inclusion and exclusion criteria.. Search was done using key words "osteoporosis", "reduced bone mineral density", "periodontal disease". Results: Among the 18 studies, 13 studies showed a positive relation and the 5 remaining studies found no significant relation between osteoporosis and periodontal disease. Conclusion: With the limitation of this review, this would indicate that osteoporosis or low systemic BMD should be considered a risk factor for periodontal disease progression.*

### INTRODUCTION:

Osteoporosis is a skeletal disease resulting in reduction of bone mineral density and micro architectural changes in the bone, leading to increased bone fragility and an increased risk of bone fracture. [9] Osteoporosis results due to imbalance between the rate of bone formation and resorption that leads to loss of bone mineral mass. This leads to a greater tendency of the bone to be broken. Osteoporosis affects mostly middle-aged and elderly people. [20] The gold standard for osteoporosis diagnosis is the measurement of bone mineral density (BMD) by dual energy x-ray absorptiometry (DXA) [9].

The World Health Organization defines osteoporosis as a bone density score > 2.5 standard deviations below the young adult mean in a female population aged 20 to 40 years. Osteopenia or low bone mass is a bone density score between 1 and 2.5 standard deviations below the mean.[9]

Osteoporosis is categorized into primary or secondary osteoporosis. Primary osteoporosis is associated with increased age and/or decreased sex hormones. Secondary osteoporosis implies an underlying cause such as of low calcium intake, systemic diseases affecting bone turnover, usage of glucocorticoids [1,2] etc.

Periodontal disease is a chronic bone destructive disease. Periodontal pathogens which are found in the dental biofilm result in inflammation of the gingiva called as gingivitis. When periodontal tissue destruction and alveolar bone loss happen, it is called periodontitis. Periodontal disease and periodontal pathogen have been linked to several systemic diseases [12]. There are many factors mentioned as periodontal risk factors such as gender, [5] body mass index [BMI], diabetes and nutrition [13], tobacco use, socioeconomic status and access to dental care. Systemic problems such as cardiovascular disease, diabetes mellitus, preterm low birth weight, osteoporosis, respiratory disease and systemic infections are also related

to the periodontal status. Recently, some studies have reported an association between osteoporosis and bone loss in periodontal diseases.

Discussions about the association between these two bone damaging diseases began in 1960. Since both osteoporosis and periodontal diseases are bone affecting entities, it has been hypothesized that osteoporosis could be a risk factor for the progression of periodontal disease.

### Risk factors for osteoporosis [26]

Non-modifiable risk factors	Modifiable risk factors
Age	Sex hormone insufficiency
Race	Calcium intake
Sex	Vitamin D intake
Family history of osteoporosis /fracture	Weight
Early menopause	Physical activity
	Cigarette smoking
	Chronic Glucocorticoid use

### METHODS AND MATERIALS:

#### Inclusion criteria:

All the articles that directly evaluated the relation between periodontal disease and osteoporosis were included.

#### Exclusion criteria:

1. Studies which did not directly evaluate the relation between periodontal disease and osteoporosis.
2. Studies that were in the form of case series and case reports.
3. Studies that examined fewer than 10 patients.

### LITERATURE REVIEW:

Kribbs et al. [11] were the first to show the association between periodontal disease and osteoporosis. They

reported that osteoporotic group had less mandibular bone mass and density and a thinner cortex at the gonion than the normal group. No differences in clinical periodontal measurements were found between osteoporotic and normal groups.

Elders et al. [3] found no statistically significant differences in gingival bleeding, probing pocket depths, gingival recession and marginal bone level of the subjects with low BMD compared to subjects with high BMD.

Von Wowern et al. [23] concluded that osteoporotic subjects did not have less bone mineral content in their jaw bones after measuring mandibular bone mineral content by dual photon absorptiometry in 52 women with mean age 68 and a history of osteoporotic fracture.

Von Wowern et al.[24] assessed 112 women with osteoporotic fractures and found greater amounts of loss of attachment in osteoporotic women with a mean age of 68.

Taguchi et al.[21] evaluated 64 women between the ages of 50 and 70 years. Osteoporotic signs consisted of thoracic spine fracture and periodontal disease signs were the number of teeth present, mandibular cortical width and alveolar bone resorption. According to the study results, they concluded that the mean alveolar bone level significantly correlated with systemic BMD.

Jacobs et al.[7] designed a longitudinal study, a positive effect of oestrogen replacement therapy on the bone mass of the mandible and the lumbar spine was observed and they suggested that mandibular bone mass correlated with bone mass in the spine and the wrist.

Streckfus et al.[17] concluded that postmenopausal women on oestrogen therapy had more alveolar bone loss (ABL), more missing teeth, and reduced alveolar and second metacarpal bone density than premenopausal women.

Hildebolt et al. [4] designed a study to find whether clinical attachment loss was related to BMD. They assessed BMD of 135 postmenopausal women aged 41–70 years, with no moderate to severe periodontitis and reported that attachment loss was correlated with tooth loss, but not with BMD.

Weyant et al.[26] found no statistically significant association between periodontal disease and systemic BMD when compared the number of attachment loss sites with systemic BMD in 292 women.

Payne et al. [14] evaluated that 41 patients had normal BMD and 17 women were osteoporotic. They reported greater alveolar bone loss, crestal and subcrestal density loss in the osteoporotic and oestrogen-deficient women.

Reinhardt et al.[15] assessed bleeding on probing and clinical attachment levels in 59 women with periodontitis and 16 non-periodontitis women, all within 5 years of menopause and reported osteoporotic periodontitis patients with oestrogen deficiency had more bleeding on probing and clinical attachment levels.

Shrout et al.[18] found weak relation between the complexity of the trabecular pattern of lumbar spine and femoral BMD when 65 postmenopausal women who had no or only mild periodontal disease (no probing depths

> 5 mm) and compared the complexity of the trabecular pattern of their digital bitewings with the lumbar spine and femoral BMD.

Southard et al.[19] used quantitative intraoral radiography and systemic bone densities determined by dual-energy X-ray absorptiometry (DXA) in 61 Caucasian women. They found significant correlation between the density of maxillary and mandibular alveolar process, lumbar spine, hip and radius in healthy women.

Jeffcoat et al.[8] in a report of the study of the Women's Health Initiative, evaluated 158 postmenopausal women. The women's hipbone mineral density was confirmed by DXA and the mandibular bone density was measured by quantitative digital radiography. After data adjustment, a significant correlation was found between mandibular basal bone and hipbone mineral density.

Tezal et al.[22], in a study assessed 70 postmenopausal Caucasian women's skeletal systemic BMD by DXA and reported that the mean alveolar bone level significantly correlated with systemic BMD and a correlation between clinical attachment levels and BMD was found.

Irma Shum et al. [6] suggests that osteoporosis is associated with severe clinical attachment loss and interproximal gingival recession in 200 elderly Chinese men.

Rola Al Habashneh et al.[16] done cross-sectional study that includes 400 Jordanian postmenopausal women in which he found that osteoporosis was significantly associated with severe alveolar crestal bone loss and the prevalence of periodontitis cases in postmenopausal Jordanian women.

## RESULTS:

Among the 18 reviewed studies, 13 studies showed a positive relation between osteoporosis and periodontal disease and the 5 remaining studies found no significant relation between osteoporosis and periodontal disease.

## DISCUSSION:

Osteoporosis is a multi-factorial disease that reduces physical activity. Inadequate calcium intake, poor nutrition, smoking, consuming too much alcohol are some of its risk factors. In the post-menopausal period, bone mass is reduced due to oestrogen deficiency in women. Many of these changes ultimately lead to decrease Bone Mineral Density and osteopenia or more severe mode leads to osteoporosis.

Due to hormonal changes during this period, women are more susceptible to periodontal diseases. If not treated in this period, women show an increased risk of periodontitis.

In fact, osteoporosis cannot be a definitive factor in the understanding of periodontal disease, since periodontal diseases are multi-factorial and the main factor is microbial plaque. In fact, osteoporosis cannot be the cause of the onset of periodontal disease, but after outbreak of the disease, it may be a predisposing factor in the exacerbation, or persistence of the disease. In men osteoporosis is associated with severe clinical attachment loss and interproximal gingival recession. The underlying causes for this association are unknown, and further study is warranted to clarify these factors.

**CONCLUSION:**

The effects of osteoporosis on both systemic health and oral health need to be well understood. As a health care provider the dentist could serve as a pre-screener of patients with the potential for osteopenia or osteoporosis. Familiarity with the risk factors could help identify these individuals and aid in earlier diagnosis. Although a positive association between osteoporosis and periodontal disease was found, additional studies are needed to elucidate this topic. These data indicate a greater propensity to lose alveolar bone in subjects with osteoporosis, especially in subjects with pre-existing periodontitis. This indicates that osteoporosis or low systemic BMD should be considered a risk factor for periodontal disease progression. It is clear that larger studies with long term follow-up and large sample size are needed on this issue.

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