Evaluation of relationship between duration of lactation and tooth loss in postmenopausal women in a South Indian population - A cross-sectional survey

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Keywords
Breastfeeding, lactation, osteoporosis, periodontal pocket, postmenopause, tooth loss

Abstract
Background: Osteoporosis and periodontitis are chronic diseases characterized by bone loss. Both these conditions consist of multifactorial etiology and risk factors. Changes in bone metabolism are often reported during lactation, yet their effect on dental health is relatively unexplored. Thus, it is essential to investigate the association between breastfeeding and oral health changes.

Aim: The objective of our study is to assess the relationship between the period of breastfeeding and the total number of teeth present in postmenopausal women in a South Indian population.

Settings and Design: The current study was a cross-sectional survey of 500 postmenopausal women with a mean age of 61.7 years. They were interviewed to collect details on the duration of lactation, other reproductive factors and examined for the total number of natural teeth present.

Materials and Methods: The collected data were classified into three groups with respect to the duration of breastfeeding as Group I - 24–36 months, Group II - 37–60 months, and Group III - >60 months. Student’s t-test was done to compare the means. One-way analysis of variance was done to analyze the association followed by Tukey post hoc test.

Results: The group having the longest lactation period Group III (>60 months) had the lowest number of natural teeth (13.04 ± 6.026). The total number of the teeth was significantly greater in Group I compared to Group II (mean =7.065) and Group III (mean =8.731). Group II and Group III did not show a significant difference (mean =3.409).

Conclusions: Women with a longer duration of breastfeeding presented with significantly less number of teeth. The changes in bone metabolism brought about by longer periods of breastfeeding might increase the susceptibility of those patients to periodontal bone loss and subsequently lead to tooth loss in postmenopausal women.

Introduction
Osteoporosis a disease of low bone mass and a common finding in postmenopausal women resulting in increased risk of bone fracture. Studies suggest that approximately 50 million Indian populations are reported to be osteopenic with T-scores of <1.3 which predicts that a larger part of the population would be affected by the same in the future.¹,² The most common risk factors for developing osteoporosis are low bone mass density (BMD), the influence of estrogen, use of steroids, calcium and Vitamin D deficiency, lack of exercise, smoking habit, less than adequate body mass index, and genetic bone disorders.³

Reproductive phase in a women’s life is ruled by hormones. Estrogen the key female hormone in the endocrine system undergoes high levels of fluctuations during the stages of childbearing and menopause. Estrogen influences and regulates the calcium levels in bone. It has an antiapoptotic effect on...
osteoblasts and osteocytes and proapoptotic effect on osteoclast, leading to changes in the bone metabolism.\(^{(4)}\)

During lactation, there is physiologic hypoestrogenemia and hyperprolactinemia that lead to the following changes in calcium metabolism.
- Loss of calcium in breast milk is approximately 250–400 mg and may increase up to 1000 mg per day
- The BMD loss at 6 months was 3.7% and 10% at 12 months.
- There is a complete reversal of lost BMD within 1 year if the duration of breastfeeding is <6 months.\(^{(5)}\) However, this is unpredictable if the duration is beyond 12 months. The long-term effect of lactation during menopause needs further research.\(^{(6)}\)
- Changes were observed in the rate of dentin deposition in experimental lactation model.\(^{(7)}\)

Osteoporosis and periodontitis are chronic diseases with multifactorial etiologies and common risk factors. Pregnancy and lactation lead to changes in the bone and calcium metabolism increasing the risk of osteoporosis. The irreversible decline of BMD is often noted if lactation is continued beyond the first 6 months. Thus, based on these reports, our study aims to investigate the association between duration of lactation and the number of natural teeth present. The association could provide insight into the effect of lactation on the periodontium.

Materials and Methods

The design of the study was a cross-sectional descriptive survey. Patients visiting a Government Tertiary Health Center in Greater Chennai made the study population. The sample size was calculated using G* Power data analysis software (version 3.0.10) with a power of 0.95 and an effect size of 30 attaining a sample size of 484, this was rounded off to 500. A total of 500 participants were interviewed and 487 subjects were selected after they met the inclusion criteria and were interviewed on gynecological history, lactation, and number of teeth present.

Inclusion criteria were healthy patients, without major systemic diseases, age >50 years, who had attained menopause and with a history of breastfeeding.

Exclusion criteria were patients with chronic infection, Type I diabetes, coronary heart disease, chronic obstructive pulmonary disease, hormonal replacement therapy, thyroxin, anticoagulant therapy, phenytoin therapy, and bleeding disorders.

Study variables

Menopause and reproductive factors are as follows:
- Postmenopausal status was recorded if the subject did not have menarche for 12 months
- Age at puberty, the age at menopause, gravidity, and parity were recorded.

Duration of lactation
- Group I - 24–36 months
- Group II - 37–60 months
- Group III - >60 months

A number of teeth present

Trained dentists recorded the number of permanent teeth present excluding the third molars at the time of oral examination. The flowchart [Figure 1] explains the design and sequences of

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**Figure 1:** Design and sequences of the study
the study. All data are presented as a mean ± standard deviation. After achieving normality by logarithmic transformation, the Student’s t-test was done to compare the means. One-way analysis of variance (ANOVA) followed by Tukey post hoc test was done to analyze the association.

Results

Around 487 patients who satisfied the inclusion criteria were included in the study. Their mean age was 61.7 ± 8.7. Demographic means of the study sample are presented in Table 1.

Table 2 shows the observations of one-way ANOVA to compare the means of three groups of lactation. The mean number of teeth remaining was 21.7 ± 5.546 in Group I, 14.71 ± 7.159 in Group II, and 13.04 ± 6.026 in Group III. Moreover, it was statistically significant F = 26.4 and P < 0.001.

Multiple comparisons within the groups [Table 3] showed a statistically significant (P < 0.001) difference in a number of teeth present between Groups I and II (mean =7.065) and between Groups I and III (mean =8.731). However, these associations were not statistically significant between Groups II and III (mean =3.409).

The decline of the number of teeth proportional to the increased breastfeeding times is demonstrated in Figure 2. Percentage of subjects with very fewer teeth (<6) increased from 1.9% in Group I to 14.9% in Group III. There is a decrease in the percentage of subjects with a good number of teeth (>25) from 43.4% in Group I to 2.3% in Group III.

Discussion

Correlation between the period of breastfeeding and the total number of teeth present in postmenopausal women was analyzed in our study. Results indicated significant relationships between increased risk for tooth loss and duration of lactation. After dividing the study population into three groups based on the duration of lactation, it was noted that the Group III with the longest lactation period (>60 months) had the lowest number of natural teeth (13.04 ± 6.026). Correspondingly, Group I with the shortest period of lactation (24–36 months) reported a significantly higher number of teeth than Groups II and III. There was no significant difference in the number of teeth between Group II and Group III [Tables 2 and 3].

Figure 2 shows the drastic decline in the number of teeth in Group III compared to groups with shorter lactation period. The percentage of subjects with >25 teeth progressively declined with increasing lactation times. There is an increase in the percentage of subjects with very fewer teeth as the lactation duration prolonged. These differences were statistically significant (P = 0.001).

Calcium is an essential nutrient, especially in women, wherein there is a greater demand during the specific stages of their life. All these stages bring about major hormonal changes. Estrogen, a female sex hormone, has a pivotal role in the maintenance of bone health. Variation in the level of these hormones greatly influences and causes alterations in calcium metabolism. Estrogen helps in intestinal absorption of calcium. Reduced estrogen level leads to reduced absorption of calcium by bone causing decreased BMD eventually resulting in osteoporosis. In developing country like India, women lack the awareness of building adequate bone volume during the critical stages including puberty. This puts them at risk of developing osteoporosis during their reproductive phases of life. Consequently, myriad predisposing factors including increasing life spans, abysmally low calcium and vitamin D levels, menopause at an early age and decreased interpregnancy intervals – are all contributory to developing osteoporosis at an early age.[3]

Table 1: Demographic means of the study population

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teeth present</td>
<td>14.69±6.987</td>
</tr>
<tr>
<td>Age</td>
<td>61.71±8.682</td>
</tr>
<tr>
<td>Number of years since menopause</td>
<td>12.62±7.932</td>
</tr>
<tr>
<td>Pubertal age</td>
<td>12.82±1.635</td>
</tr>
</tbody>
</table>

SD: Standard deviation

Table 2: Observations of one-way ANOVA

<table>
<thead>
<tr>
<th>Period of lactation</th>
<th>Mean number of teeth remaining at present±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>21.77±5.546</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Group II</td>
<td>14.71±7.159</td>
<td></td>
</tr>
<tr>
<td>Group III</td>
<td>13.04±6.026</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Within-group multiple comparisons

<table>
<thead>
<tr>
<th>Variable</th>
<th>Period of lactation</th>
<th>P value difference</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teeth present</td>
<td>Group I</td>
<td>Group II</td>
<td>7.065</td>
</tr>
<tr>
<td></td>
<td>Group I</td>
<td>Group III</td>
<td>8.731</td>
</tr>
<tr>
<td></td>
<td>Group II</td>
<td>Group III</td>
<td>3.409</td>
</tr>
</tbody>
</table>

Figure 2: The percentage of natural teeth (≤6, 7–12, 13–24, and ≥25) according to the duration of lactation (24–36 months, 37–60 months, and >60 months)
A study conducted using the national representative health data of postmenopausal women in Korea observed that as the period of lactation increased the number of natural teeth present decreased. Moreover, the study concluded that lactation may be regarded as an independent risk factor for tooth loss. Yet, another study conducted in 1486 postmenopausal Turkish women found a similar association between the duration of breastfeeding and BMD. A similar study in the same population after adjusting for multiple variables failed to obtain the same results.

Bolzetta et al. suggested that breastfeeding for more than 1½ years is found to be the sole threat in vertebral fractures. Researches have proved that when the breastfeeding lasts <6 months, there is a complete recovery of BMD. However, if the period of lactation is beyond 6 months, BMD recovery is questionable. A study done by Sahin et al. analyzed the effect of interpregnancy interval and gynecological history of postmenopausal osteoporosis. They concluded that women who had 0–12 month’s interpregnancy interval had the highest risk for osteoporosis.

In an animal model study, when calcium deficient diet was fed to the animals, there were histomorphometric changes like cavitation of the alveolar bone. These changes were remarkably more in alveolar bone than femoral bone. Systemic bone resorption affects periodontal tissues and a familiar pathway of damage exists between systemic and periodontal bone. A cross-sectional study of 112 women predicted that as the number of years since menopause increased their BMD decreases and more periodontal tooth loss was expected.

Contributions for osteoporosis in Indian women are as follows:
1. Inadequate calcium supplementation both during childhood and postmenopause
2. Fiber-rich Indian diet which has phytates and oxalates inhibit calcium absorption
3. The lower socioeconomic class lack intake of calcium supplement
4. Early menopause
5. Vitamin D deficiency among Indians
6. Inappropriate body weight:Height ratio
7. Lack of exercise
8. General lack of awareness about osteoporosis.

Some of the limitations of our cross-sectional survey were the lack of data on Vitamin D levels. Information was obtained at one point of time causing a possibility of recall bias. As a result, it may be difficult to determine a causal relationship in cross-sectional surveys.

Therefore, prospective single-center cohort analysis with a larger sample size including the measurement of biochemical indices of bone metabolism would evaluate in detail the relationship linking tooth loss and duration of lactation.

Conclusion
This study is the first of its kind to appraise the association between duration of breastfeeding and tooth loss among postmenopausal women in India. Consequently, it is observed from the study that women with a longer breastfeeding time presented with significantly less number of teeth. Although osteoporosis is not the sole contributor to periodontitis, it may be among one of the factors, leading to increased periodontal pocket depths and tooth loss in postmenopausal women. Similarly, the duration of breastfeeding was also not the sole independent risk predictor for low bone mass. Its impact may not be definitive in women with sufficient Vitamin D levels and calcium intakes.

Thus, it would be befitting to conclude from the above scenario that though there may be interplay of many confounding factors, it behooves the periodontist to play a stellar role in mitigating these effects to the maximum by emphasizing on oral hygiene measures in tandem with adequate calcium intake during those key reproductive years in a women’s life.

References