Correlation between oral health and periodontal status in post-menopausal women

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Abstract: In the menopause phase, a fluctuating hormone level is observed which causes an estrogen deficiency. During this phase, increased severity of periodontal disease and decreased bone mineral density has been observed. Periodontitis is a progressive condition leading to irreversible loss of bone and periodontal ligament attachment. Post-menopausal women have a higher rate, net loss of alveolar bone density. Few treatments have come to be known due to its severity of periodontal disease. Hormonal therapy is a Bisphosphonates drug therapy used to control the hormonal fluctuations. This retrospective study was conducted under a hospital based university setting. Ethical approval for this study was granted by the institute's ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). Consent to use treatment records for research purposes were obtained from patients at the time of patient entry into the university for dental needs. The retrospective data were collected by obtaining and analysing the 89000 dental case records of the university from June 2019 to March 2020. The primary cause of periodontitis is a bacterial plaque, in which estrogen hormone deficiency is one of the factors that contribute to periodontal damage. In the present study, no difference was found in periodontal severity between perimenopausal and postmenopausal women; however, the present study obtained valuable information regarding periodontal severity in perimenopausal and postmenopausal women. The sample size that was taken are 63 women patients with a history of non systemic disease, who came to the private dental institute for consultation. The inclusion criteria for the current study were patients with a pre and post menopause women, complete photographic and written records regarding the complete intra-oral examination of the patient. The exclusion criteria were incomplete data, censored dental records and absence of photographic evidence.

INTRODUCTION

Various research have been done to observe the correlation between oral health and women in pregnancy. As oral health can be affected by the hormonal changes happening in a women's body during these phases. However, menopause is another important stage in every women's life as they undergo one of the final hormonal change of womanhood. Menopause can be defined as permanent cessation of ovarian function. Periodontal disease can be explained as a microbial infection which is multi factorial.

In the menopause phase, a fluctuating hormone level is observed which causes an estrogen deficiency. During this phase, increased severity of periodontal disease and decreased bone mineral density has been observed. Periodontitis is a progressive condition leading to irreversible loss of bone and periodontal ligament attachment. Post menopausal women have a higher rate, net loss of alveolar bone density. Few treatments have come to be known due to its severity of periodontal disease. Hormonal therapy is a Bisphosphonates drug therapy used to control the hormonal fluctuations.

A similar longitudinal study observing the correlation of periodontal disease and edentualism with rates of bone loss in older women by P Famili at al 2005. Another study done by E Shin Chen et al in 2004 showed evidence that periodontal Status was affected along with post-menopausal osteoporosis affecting the oral health. According to Mine Tezal et al 2005, periodontal Disease severity in post menopausal women can be explained as incidence of tooth loss. Based on study done by Taguchi et al 1996, proved that early menopause phase & late menopause phase had different severity in its destruction. In early menopause, density in lumbar spine correlated with density of the mandibular cortex. The late menopause condition correlates to density of the cortex and cancellous bone. Leena Palomo et al in 2009 brought to light the use of estrogen therapy and bisphosphonate drugs. Yunhee Lee et al in 2019 proved a positive association between hormonal replacement therapy (HRT) & periodontal status in post menopausal women.

For the past few researches collecting these information was challenging due to the willingness because the sample consists of females. Furthermore, lack of advanced technology such as advanced radiography known as shei bone score measurements to record better information.

A research on this topic is very necessary to bring out a spontaneous approach to the issue by providing early diagnosis to treat oestrogen deficiency and post menopausal patients. To be a able to prevent disorders such as fractures, tooth loss or severe demineralisation of bone. At the least it should help create an awareness amongst patients to practise good oral hygiene.

MATERIAL AND METHODS

This retrospective study was conducted under a hospital based university setting. Ethical approval for this study was granted by the institute's ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). Consent to use treatment records for research purposes were obtained from patients at the time of patient entry into the university for dental needs. The retrospective data were collected by obtaining and analysing the 89000 dental case records of the university from June 2019 to March 2020.

The sample size that was taken are 63 women patients with a history of non systemic disease, who came to the private dental institute for consultation. The inclusion criteria for the current study were patients with a pre and post menopause women, complete photographic and written records regarding the complete intra-oral examination of the patient. The exclusion criteria were incomplete data, censored dental records and absence of photographic evidence.

The case sheets were reviewed for clinical photographs, medical history, medication history, treatment done, oral status and periodontal status and the data was recorded. DMFT/DMFS, Periodontal pockets, OHIS index, Debris index and plaque index scores were evaluated for each of the patients. The selected cases were examined by three people; one reviewer, one guide and one researcher. The patients' case sheets were reviewed thoroughly. Cross checking of data including digital entry and intra oral photographs was done by an additional reviewer and as a measure to minimise sampling bias. Digital entry of clinical examinations and intra oral photographs of selected subjects were assessed and this included the assessment of tooth decay, missing tooth, filled tooth and periodontal status as mentioned before by the examiner based on intraoral photographs and clinical examination data for each tooth. The examiner was trained to add data of dental caries, missing tooth and filled teeth as present or absent for all the cases by tabulation using Microsoft Excel software.

The mentioned data were coded and transferred into SPSS PC version 2.0 (IBM 2019) software for statistical analysis. A correlation and association test, Chi-Square Test was done. The results were recorded. The difference was considered statistically significant as the p value was less than 0.05. ($p < 0.05$)

RESULTS AND DISCUSSION

About 63 women's data with all inclusion criteria was extracted and were (27 perimenopausal and 36 postmenopausal) were enrolled. Perimenopausal women had an average of 4.14 ± 1.16 symptoms of menopause, whereas, in postmenopausal women, the mean duration of menopause was 6.16 ± 4.62 years (Table 1).

Table 1. Distribution of participants according to demographic and menopausal characteristics.

Variables	Mean (SD)
Age (Years)	51.10 (± 4.62)
Number of Pregnancies	2.73 (± 1.71)
Number of Menopausal Years	6.16 (± 4.62)
Number of Menopausal Symptoms	4.14 (± 1.16)

The mean pocket depth of the teeth in the women was lower than the average value of attachment loss. Attachment loss had the highest mean value among the periodontal parameters, whereas tooth mobility had the lowest mean value (Table 2).

The minimum age of perimenopausal and postmenopausal women was the same, i.e., 45 years (Table 3). There was a significant difference (p<0.05) in age between perimenopausal and postmenopausal women; however, no significant difference (p>0.05) was observed in a gingival recession or tooth mobility. No significant difference (p>0.05) in the pocket depth, attachment loss, plaque index, debris index, calculus index, OHI, or papilla bleeding index between perimenopausal and postmenopausal women were observed.

Table 2. Distribution of participants according to periodontal parameters.

Periodontal Parameters	Mean (SD)
Pocket Depth (mm)	1.68 (± 0.41)
Attachment Loss (mm)	2.65 (± 0.74)
Gingival Recession (mm)	0.97 (± 0.47)
Plaque Index	1.11 (± 0.53)
Debris Index	1.20 (± 0.53)
Calculus Index	0.93 (± 0.48)
Oral Hygiene Index	2.13 (± 0.98)
Papilla Bleeding Index	1.96 (± 0.97)
Number of Mobile Teeth (Per Subject)	0.71 (± 1.28)

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Table 3. Difference in the periodontal severity between perimenopausal and postmenopausal women.

Variables	Perimenopausal		Postmenopausal		p-value
	Mean (SD)	Min–Max	Mean (SD)	Min–Max	
Age (Years)	47.33 (± 2.49)	45–55	53.92 (± 3.76)	45–59	0.01ᵃ*
Pocket Depth (mm)	1.67 (± 0.38)	0.83–2.53	1.68 (± 0.43)	1.07–3.35	0.95ᵇ
Attachment Loss (mm)	2.61 (± 0.83)	1.08–4.88	2.68 (± 0.67)	1.57–4.35	0.71ᵇ
Gingival Recession (mm)	0.93 (± 0.56)	0.10–2.47	0.99 (± 0.41)	0.19–1.94	0.33ᵃ
Plaque Index	1.12 (± 0.55)	0.14–2.33	1.10 (± 0.53)	0.31–2.11	0.89ᵇ
Debris Index	1.15 (± 0.57)	0.15–2.55	1.23 (± 0.49)	0.26–2.32	0.52ᵇ
Calculus Index	0.88 (± 0.51)	0.06–2.05	0.97 (± 0.46)	0.08–2.20	0.46ᵇ
Oral Hygiene Index	2.03 (± 1.06)	0.21–4.61	2.21 (± 0.92)	0.34–4.25	0.48ᵇ
Papilla Bleeding Index	1.89 (± 1.08)	0.07–3.50	2.01 (± 0.89)	0.36–3.44	0.63ᵇ
No. of Mobile Teeth (Per Subject)	0.88 (± 1.55)	0.00–6.00	0.58 (±1.05)	0.00–4.00	0.84ᵃ

ᵃMann-Whitney U test; ᵇIndependent T-test; *Statistically Significant.

The mean age of the women was 51.10 ± 4.62 years (range, 45-59). The minimum age of 45 years corresponds to the age at which follicular cells, which are a measure of ovarian function, begin to degenerate. This is consistent with the findings of the study by Ahsan et al. that the average age of menopause is 45 years [25]. The maximum eligible age for enrolment in the present study was 59 years because individuals aged ≥60 years are considered elderly in Indonesia and were not included in the study [26].
The average number of pregnancies in the women of the present study was 2.73 ± 1.71, indicating that the average number of children per subject was 2–3. The number of pregnancies affects the aged of natural menopause, where women who have more children enter menopause longer [27].

Perimenopause is the turning point for physical, emotional, and psychological changes in a woman's life. During this phase, various symptoms occur with different degrees, ranging from low, middle, high, to very high, occurring gradually between the age of 40 and 50 years. Steroid sex hormone levels vary during perimenopause, resulting in a hormonal imbalance; during this menopausal transition, there is a decrease in estrogen production [11,28,29], triggering inflammation that manifests in an increase in the release of pro-inflammatory cytokines, resulting in decreased physical function [30]. Estrogen receptors are highly expressed in the periodontium; thus, a hormonal imbalance in perimenopausal and postmenopausal women significantly affects the periodontium [11,28]. This is consistent with previous findings that the highest prevalence of oral discomfort is observed during the perimenopausal and postmenopausal (43%) periods as compared with that in the premenopausal period (6%) [4].

The severity of periodontitis based on attachment loss is divided into three levels: mild (1–2 mm), moderate (3–4 mm), and severe (≥5 mm) [31]; thus, women in the present study had moderate severity (2.65 ± 0.74 mm) (Table 2). Oral hygiene status of the subjects is divided into three categories: good (0–1.2), moderate (1.3–3.0), and bad (3.1–6.0) [32]; hence, women in the present study had moderate oral hygiene (2.13 ± 0.98) (Table 2). This is consistent with previous findings that there is a relationship between periodontal status and oral hygiene [32].Natural menopausal age worldwide is 45–55 years. In the present study, there was a significant difference in age between perimenopausal and postmenopausal women (p<0.01). The mean age of perimenopausal

women in the present study was 47.33 ± 2.49 years, consistent with similar findings [33], whereas that of postmenopausal women was 53.92 ± 3.76 years. Understanding age-related factors at menopause is important because early menopause can increase risk factors for diseases associated with estrogen deficiency, such as osteoporosis [33].

In the present study, there were no differences in the pocket depth, attachment loss, or gingival recession between perimenopausal and postmenopausal women ($p > 0.01$). Menopause does not significantly affect the severity of periodontal disease or tooth loss. Various other factors are considered to affect the progression of periodontal disease versus menopause alone [34]. There is no difference in pocket depth or attachment loss between postmenopausal women who received hormone therapy than those who did not [35]. Estrogen deficiency causes women to experience oxidative stress as well as periodontitis; polymorphonuclear (PMN) cells actively produce reactive oxygen species, causing oxidative stress and inducing periodontal damage [11]. Women have higher attachment loss than men [36]. Hormonal fluctuations occur during the menopausal transition period. Reduced estrogen levels result in increased pro-inflammatory cytokine release because estrogen plays an important role in the inhibition of cytokines such as interleukin-1, resulting in chronic periodontitis [30,37]. Qasim et al. found significant differences in the calculus index, plaque index, pocket depth, and salivary flow between premenopausal and postmenopausal women [38].

The present study found no differences in oral hygiene between perimenopausal and postmenopausal women (Table 3); however, the mean oral hygiene level in both groups of women was moderate (Table 2), and oral hygiene is associated with oral health, which is becoming a public health concern [38]. In the present study, the plaque and papilla bleeding indices were higher in postmenopausal than in perimenopausal women, although the difference was not significant. The previous study demonstrated that there is no difference in the plaque and papilla bleeding indices between postmenopausal women with osteopenia and osteoporosis [39].

Periodontitis occurs as a result of bacterial interactions with the host, which cause initiation of the immune response and lead to the loss of collagen support from teeth and induction of alveolar bone loss, the latter of which can lead to tooth mobility [40]. In the present study, both groups had women with mobile teeth; however, this number was greater in perimenopausal women than in postmenopausal women. There was no difference in the number of subjectivity gears between perimenopausal and postmenopausal women (Table 3). This study was a cross-sectional study where the data analysis showed a descriptive and difference of periodontal status between perimenopause and postmenopause, but could not show a cause-effect relationship of this matter so that this became one of the limitations in this study in addition to the small number of subjects.

CONCLUSION

The primary cause of periodontitis is a bacterial plaque, in which estrogen hormone deficiency is one of the factors that contribute to periodontal damage. In the present study, no difference was found in periodontal severity between perimenopausal and postmenopausal women; however, the present study obtained valuable information regarding periodontal severity in perimenopausal and postmenopausal women.

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