Comparative evaluation of periodontal health status of pre and postmenopausal females

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Abstract:

BACKGROUND: Menopause in females is a corporeal stage that gives rise to a number of adaptive changes both at systemic and oral levels, prototypically occurring in the late fourth or fifth decade of life. Though physiological aging affects the oral tissue, the hormonal changes due to menopause also act as a major contributing factor in deteriorating the health of oral tissues. Thus, the main aim of our study was to compare the overall periodontal status and alkaline phosphatase levels in the saliva of females in their pre and postmenopausal ages.

MATERIAL AND METHODS: This study was conducted on 200 female subjects coming to the Department of Periodontology at Rajendra Institute of Medical Science for oral prophylaxis. The subjects were arbitrarily selected in the age group ranging from 15 to 70 years and were further divided based on the inclusion criteria. Group A included 100 subjects with age ranging from 15 to 45 years, and group B, 100 subjects with age 54 to 70 years. Signs of periodontitis including clinical attachment loss, furcation involvement, and probing depth and salivary alkaline levels were obtained, evaluated, compared, and analyzed.

RESULTS: In group A 65% of patients had grade 0 and 28% had grade 1 of clinical attachment level. Similarly in group B, 44% of the total had grade 0 of clinical attachment loss, 38% had grade 1, and 18% were of grade 2. On evaluating grades of furcation involvement, around 45% of the total patients in group A were grade 1 (incipient, pocket formation), while in group B, 51% of the total patients were grade 1. At least 46% in group A and only 20% in group B had no signs of furcation involvement. Salivary alkaline phosphatase levels in pre and postmenopausal patients showed a significant difference between the two groups was obtained.

CONCLUSION: The study concluded a major difference in the periodontal health of pre and postmenopausal women with many influencing factors apart from menopause itself.

Keywords:
Alkaline phosphate, furcation involvement, menopause, periodontitis

Introduction

The endocrine system is crucial to the homeostasis of the periodontium and is a complicated multifactorial relationship. Physiological changes in females during certain stages of life, such as puberty, the menstrual cycle, menopause, and postmenopause, are caused by fluctuations in hormones specifically estrogen and progesterone.[1] Estrogen deficiency is specifically responsible for intensifying any form of inflammation, including gingival inflammation during periodontitis, eventually leading to bone loss.[2] Skeletal bone loss is also a major indication due to this estrogen deficiency which in turn decreases the release of inflammatory cytokines climacteric in bone resorption. Gingival inflammations with decreased clinical attachment levels have been found

to be associated with lower estrogen levels affecting the quality of life.[3]

For ages, conventional methods have been used to assess, diagnose, and treat any form of periodontal disease with its own limitations, as a consequence of which microbiological analysis, genetic susceptibilities, and biochemical analysis have emerged as major forms of newer techniques. Enzyme estimation is used as a potential biomarker to detect the condition of tissue apart from clinical examinations.[4] Lactate dehydrogenase, alkaline phosphatase, aspartate, and creatine kinases are such enzymes involved in both intra and extracellular tissue degradation pathways and help in the early detection of periodontal disease.[5] Alkaline phosphatase is one of the intracellular enzymes responsible for degradation and possible marker for tissue destruction. Dead and damaged periodontal cells release alkaline phosphatase enzyme in the saliva, while bone formation releases this enzyme in the serum. Alkaline phosphatase is involved in the natural turnover of periodontal tissue development; hence, osteoclast, neutrophil, osteoblast, and fibroblast contain the enzyme. Estrogen deficiency causes inflammation, increased bone loss, and decreased bone density with susceptibility to resorption which in turn is responsible for elevated alkaline phosphatase levels[6]. As a result of the said phenomenon, the study was conducted to compare and evaluate the overall periodontal status and alkaline phosphatase levels in saliva of females in their pre and postmenopausal ages. A number of studies have linked menopause with some periodontal conditions, but very few studies have been conducted in India. So, there is necessity of this study to evaluate the hormonal influence on periodontal health in postmenopausal females. The current study thus emphasizes examining the periodontal status of postmenopausal women in Jharkhand, a state in the eastern part of India.

Material and Methodology

Study design and setting
This cross-sectional comparative type study was conducted in the Department of Periodontology, Dental College, Rajendra Institute of Medical Sciences, Ranchi. The study took approximately six months for attaining the study population of 200 who fulfilled the criteria entirely.

Ethical consideration
Before starting, institutional ethical clearance was obtained from the institutional ethical committee (IEC no. 091/RIMS.Ranchi/2020).

Study participants and sampling
The study was conducted on randomly selected 200 patients who fulfilled the inclusion and exclusion criteria entirely. A complete medical history of the patients was obtained only after their acceptance for participation in the study and informed consent was signed by them. The study subjects were divided into two groups on the basis of their age with 100 subjects in each group. Group A included premenopausal women of the age group 15 to 45 years, and group B were postmenopausal women with ages ranging from 54 to 70 years. Subjects with 16 permanent teeth, presenting with cessation of menstruation for 12 months, postmenopausal females with no hormonal replacement therapies, and systemically healthy subjects who have not received any periodontal therapy in the last six months, were included in the study. Medically compromised subjects or on any medication, drug or alcohol abusers, smokers, subjects with metabolic bone diseases, parathyroidism, and a history of hysterectomy were excluded from the study. A short summary of the need and outcome of the study was discussed with every patient.

Data collection tools and technique
A complete and detailed history of their dental and oral habits was obtained and recorded. Proper positioning of the patient, adequate light, mouth mirror, Naber's probe and William's graduated probe were used to evaluate the periodontal status of the patients. Probing depth, clinical attachment loss, and furcation involvement of each patient were charted. A questionnaire assessing the insight of periodontal health, awareness about the risk of progressive form periodontitis, and its impact on systemic health was provided to the patients for filling. Oral hygiene instructions and harmful consequences if left untreated were well acquainted with the patients.

Saliva collection: A plastic disposable container was used to collect unstipulated whole saliva. A clear instruction about being cleaned mouth, that is without eating anything before sample collection was given to the patient or an early morning sample was taken. The sample was then stored in a refrigerator (-2.8°C) until transported in a dry ice bag to the laboratory where the alkaline phosphatase was determined and recorded.[7]

Statistical analysis
The clinical and laboratory data obtained were recorded, tabulated, and transferred to a Microsoft Excel sheet where further statistical analysis was performed using SPSS software version 21 (Chicago USA). Descriptive analysis of the patients included frequencies, percentages, mean, and standard deviation, while the quantitative variables were assessed using Wilkoxon Mann Whitney test and Student's t-test. A significance level of $P \leq 0.05$ was set for the entire test with 95% of confidence of interval. The obtained data were represented using bar diagrams.

Results

Statistically significant results were obtained on estimating the clinical attachment levels, grades of furcation, probing depth, and salivary alkaline phosphatase level between pre and postmenopausal patients.

In Table 1 and Figure 1, clinical attachment levels of both the groups were obtained with 65% of patients with grade 0 of attachment loss, 28% with grade 1 that is, where an overgrowth is seen and around 7% of the total patients in group A had recession (grade 3). Similarly in group B, 44% of the total had grade 0, 38% had grade 1, and 18% were of grade 2 of clinical attachment loss. The mean and standard deviation were 1.420 ± 0.622 in group A and 1.740 ± 0.747 in group B. On comparison between the pre and postmenopausal patients, highly statistically significant results were obtained.

In Table 2 and Figure 2 on evaluating grades of furcation in group A, 45% of the total patients were with grade 1 (incipient, pocket formation), 7% with grade 2 (cul-de-sac), and 2% with grade 3 (through and through) type of furcation involvements. While in group B, 51% of the total patients were in grade 1, 6% in grade 2, 1% in grade 3, and 22% in grade 4 (highly exposed root surface) type of furcation involvement. In both groups, at least 46% in group A and only 20% in group B had no signs of furcation involvement. On comparing, mean and standard deviation of group A were found to be 2.950 ± 1.935, while in group B it was 2.540 ± 1.714 with statistically significant values of 0.05.

Table 3 and Figure 3 represented probing depth of the patients. In group A, 6% had 1 mm, 28% had 2 mm, followed by 14%, 4%, 14%, and 6% with 3,4, 5, and 6 mm of probing depth, respectively. In group B, around 4% had 1 mm, followed by 28%, 12%, 12%, 6%, 14%, 14%, 2%, and 4% of patients with 2, 3, 4, 5, 6, 7, and 8 mm of probing depths, respectively. On comparing the probing depths of pre and postmenopausal patients, statistically significant results were obtained with a mean value of 3.320 ± 1.938 in group A and 4.200 ± 2.256 in group B.

Table 4 categorizes the mean and standard deviation of salivary alkaline phosphatase levels in pre and postmenopausal patients. On analyzing, significant difference between the two groups was obtained with 60.507 ± 20.658 and 56.572 ± 17.349, respectively.

Discussion

Microbial pathogens are known for initiating periodontitis by eliciting a host response followed by destruction of the periodontal structures along with the alveolar
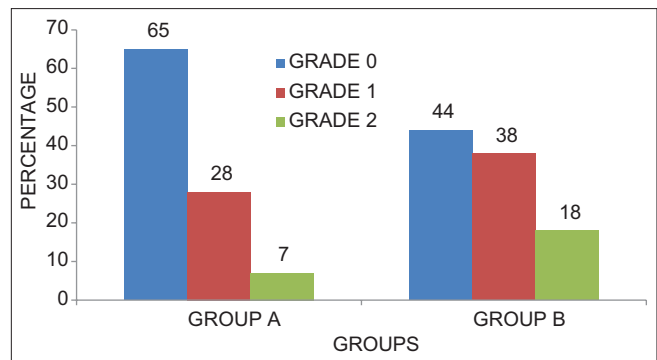

Figure 1: Representing the comparison between pre and post menopausal patients for clinical attachment loss
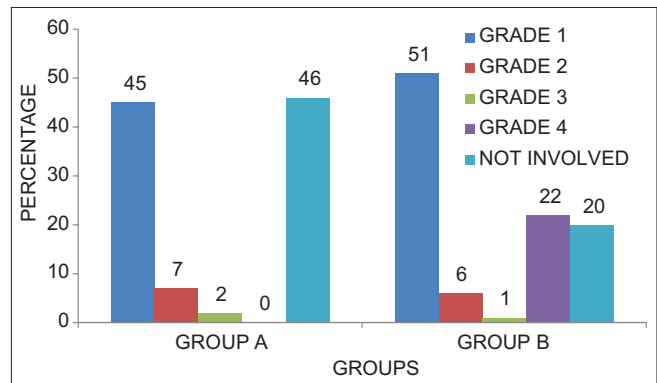

Figure 2: Representing the comparison between pre and post menopausal patients for furcation involvement
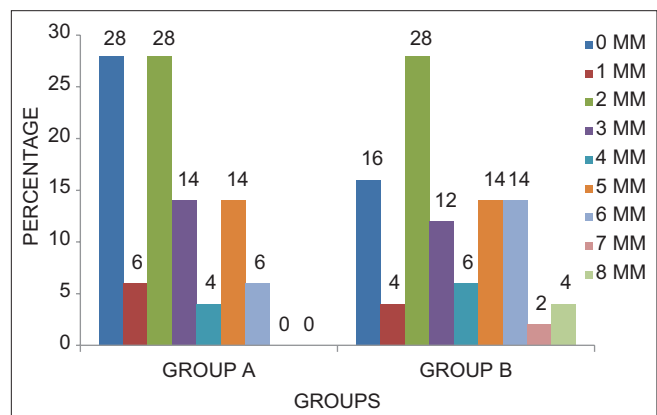

Figure 3: Representing the comparison between pre and post menopausal patients for probing depth

bone loss. Though bacterial factors are mandatory for continuation of the process, host immune-inflammatory system is responsible for aggravating the same.[8] Therefore, it makes an ample amount of sense that a patient's risk of developing periodontal disease may be altered by a number of acquired and environmental factors. Women's body undergoes an extensive range of changes during menstruation and menopause, and oral cavity is no exception.[9] An increasing immersion has been given to estrogen deficiency in relation to the

Table 1: Representing the comparison between pre and post menopausal patients for clinical attachment loss

S.No	Grade	Group A (*n*=100)		Group B (*n*=100)	
		Frequency	Percentage	Frequency	Percentage
1	0	65	65	44	44
2	1	28	28	38	38
3	2	7	7	18	18
Mean±SD		1.420±0.622		1.740±0.747	
SE		0.062		0.075	
t-test			-3.29		
df			2		
P			0.000 (HS)		

Table 2: Representing the comparison between pre and postmenopausal patients for furcation involvement

S.No	Grade	Group A (*n*=100)		Group B (*n*=100)	
		Frequency	Percentage	Frequency	Percentage
1	1	45	45	51	51
2	2	7	7	6	6
3	3	2	2	1	1
4	4	0	0	22	22
5	Not involved	46	46	20	20
Mean±SD		2.950±1.935		2.540±1.714	
SE		0.194		0.171	
t-test			1.586		
df			4		
P			0.05 (S)		

Table 3: Representing the comparison between pre and postmenopausal patients for probing depth

S.No	Depth (in mm)	Group A (*n*=100)		Group B (*n*=100)	
		Frequency	Percentage	Frequency	Percentage
1	0	28	28	16	16
2	1	6	6	4	4
3	2	28	28	28	28
4	3	14	14	12	12
5	4	4	4	6	6
6	5	14	14	14	14
7	6	6	6	14	14
8	7	0	0	2	2
9	8	0	0	4	4
Mean±SD		3.320±1.938		4.200±2.256	
SE		0.194		0.226	
t-test			-2.95		
df			8		
P			0.001 (S)		

stability of alveolar bone structure in postmenopausal females. The anti-inflammatory effect of this hormone on periodontuim is lost during estrogen deficiencies making a compromised periodontium.[10]

However, Rafiei M *et al*.,[11] in a study did not find any correlation between hormonal changes and periodontal status.

Results of the present study presented statistically significant results while evaluating clinical parameters of periodontitis and salivary alkaline phosphatase levels. This was consistence with a study conducted by

Awadhiya *et al*.,[6] where they found considerably higher salivary alkaline phosphatase levels in postmenopausal patients with periodontitis when compared to control groups. These higher levels of alkaline phosphatase in salivary sample were mainly due to higher levels of periodontal inflammation with rapid turnover. Altered bone metabolism is associated with salivary alkaline phosphatase levels in postmenopausal females which leads to a lost balance between bone formation and resorption, clinical attachment loss, and even tooth loss. Postmenopausal women showed decrease in bone mineral density (BMD) that can lead to osteoporosis of

Table 4: Representing the comparison between pre and postmenopausal patients for salivary alkaline phosphatase level

S.No	Group A		Group B	
	Frequency	Percentage	Frequency	Percentage
1	100	100	100	100
Mean±SD	56.572±17.349		60.507±20.658	
SE	10.623		12.162	
t-test	-2.895			
df	4			
P	<0.05 (S)			

bone.[12] Hemmati E *et al*.,[13] in their research found that 25% of postmenopausal women aged 50–65 years old have primary osteoporosis and 50% of women have low BMD. Bhattarai T *et al*.,[14] showed a similar comparison between alkaline phosphatase, calcium, and periodontitis in early menopausal females. Ramesh *et al*.,[15] also conducted similar studies where they showed results with higher alkaline levels in postmenopausal patients with chronic periodontitis.

Daltaban *et al*.,[16] found similar results which supported our study. In their study, they found statistically significant results with a higher mean of all clinical parameters and gingival crevicular alkaline phosphatase levels in postmenopausal patients. DI Hutomo *et al*.,[17] also noticed significantly higher levels of alkaline phosphatase in postmenopausal with chronic periodontitis. Sophia *et al*.,[18] and Khan *et al*.,[19] also presented results that supported the results obtained in our study. Because of this reason, salivary alkaline phosphatase is associated with altered metabolism of bone; it clearly represents that in postmenopausal females the balance between the two is lost leading to clinical attachment loss and tooth loss due to bone resorption. Therefore, salivary alkaline phosphatase levels can also act as an early indicator of periodontal diseases due to which prompt actions can be carried out in the form of any systemic or local periodontal therapy.[20]

Limitation

The limitation of this study is small sample size and few biochemical parameters. So, more studies with broader parameters are suggested to evaluate the concrete evidence of hormonal influence on periodontal health.

Conclusion

Within the limitations of a small sample size and few parameters of evaluation, it can be seen and concluded that postmenopausal females are more prone to periodontal destruction due to major hormonal imbalance. Though a known fact, a number of studies are still under process to evaluate the correlation and effect of this hormonal change on periodontal health.

Conflicts of interest

There are no conflicts of interest.

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