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A Comparative study of periodontal status among pre-menopausal and post menopausal women

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Introduction

Periodontal disease is a disease which comprises of both gingivitis and periodontitis. Gingivitis is an inflammatory condition of the soft tissues surrounding the teeth. Periodontitis is a chronic inflammatory process that occurs in response to a predominantly gram-negative bacterial infection originating in dental plaque. [1]Periodontal disease results in progressive and irreversible loss of bone and periodontal ligament attachment, as inflammation extends from the gingiva into adjacent bone and periodontal ligament.[2]Menopause is a physiological state in women that gives rise to adaptive changes at both the systemic and oral level. Menopause literally means "without oestrogen" and by definition, it is the time at which cyclic ovarian function stops as oestradiol ceases to be the major circulating oestrogen. Menopause occurs mostly in the fifth decade of life of a women.[3,4] Hormonal changes have been implicated as factors responsible for physiologic as well as Psychologic changes in women at specific phases of their life. Salivary flow rate and composition may be altered and contribute to the development of several oral conditions such as oral discomfort (burning sensation) and xerostomia.[5,6]After menopause, women become more prone to oral changes, especially periodontal disease. These oral alterations seen after menopause are frequently related to hormonal changes although physiological aging of the oral tissues may also play a contributing role. [7, 8]Gingival epithelium becomes thinner and more prone to recession as well as inflammatory changes during menopause. [9]Progesterone level is associated with vascular permeability which results changes in gingival swelling and inflammation. It also alters the rate and pattern of collagen production, and also alters the immune responses. Changes in oestrogen hormone level can cause alteration in immune function and changes in flora ecology of the mouth. [10,11]Postmenopausal osteoporosis is closely associated with oestrogen deficiency that results in reduction in bone mass caused by imbalance between bone resorption and formation.[12]It has been suggested that this reduction in bone mineral density could contribute to periodontal disease progression

which includes periodontitis, clinical attachment loss and gingival recession.[13]

Subjects and Methods

A sample of 100 women of age group 40-55years visiting the Department of Periodontics were randomly selected for this study and were categorized into two groups, namely:

Group A: Pre-menopausal group

Group B: Post-menopausal group

The group A consisted of 50 premenopausal women (before the onset of menopause) within the age group 40-55years and group B consisted 50 postmenopausal women (completed within 5years) within the age group 40-55years.Medical history was taken thoroughly.

Inclusion Criteria: (for both groups)

1. Women aged 40-55 years.
2. Not undergone any type of periodontal therapy 6 months prior to the initial examination.
3. Minimum no. of teeth presents -28

Exclusion Criteria: (for both groups)

1. Presence of systemic diseases affecting periodontium.
2. Patient having poor oral hygiene [Oral hygiene index-Simplified 1.2].
3. Patient on Hormone replacement therapy

The clinical measurements were made by a single examiner. A calibrated periodontal probe (UNC-15) was used to measure the following clinical parameters:

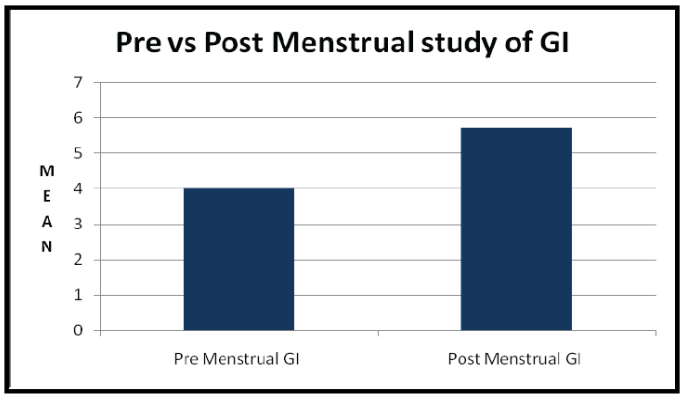
1. Gingival index (GI) (Loe and Silness, 1963): For index teethi.e 16 ,12, 24, 36, 32,44
2. Probing pocket depth (PPD): PPD was measured at six sites (mesio-facial, mid facial, distofacial, disto-lingual, mid-lingual, mesio-lingual) per tooth;
3. Clinical attachment level (CAL): CAL was measured in the site of tooth which has maximum attachment loss.

Statistical analysis: Statistical analysis was done with SPSS v.20 software. Intergroup comparison between premenopausal and post- menopausal women was done by using independent t-test. All p-values of less than 0.05 were considered to indicate statistical significance.

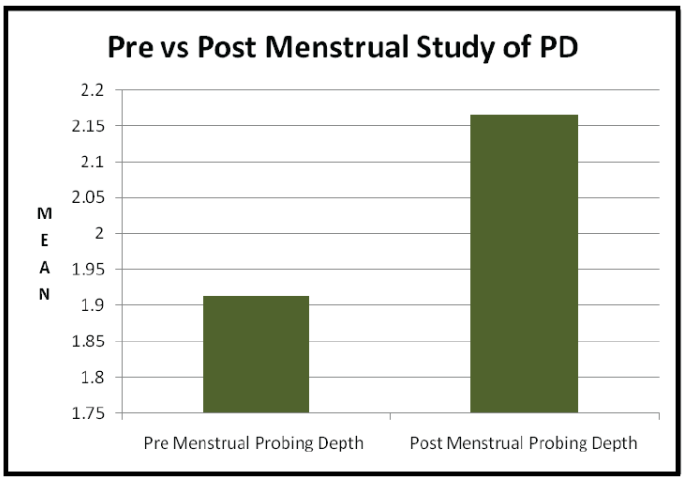
Results

The data so collected was statistically analysed. In this study, calculation of mean, standard deviation from the means, p-value, t-test was carried out between two samples of premenopausal and postmenopausal women, each of which contained 50 observations, for three different indices PD,GI, CAL. We found that a highly significant p-value (< 0.05) between the two groups as shown in the tables and figures hence were able to conclude that that periodontitis is much more prevalent in post- menstrual women than in pre- menstrual women.

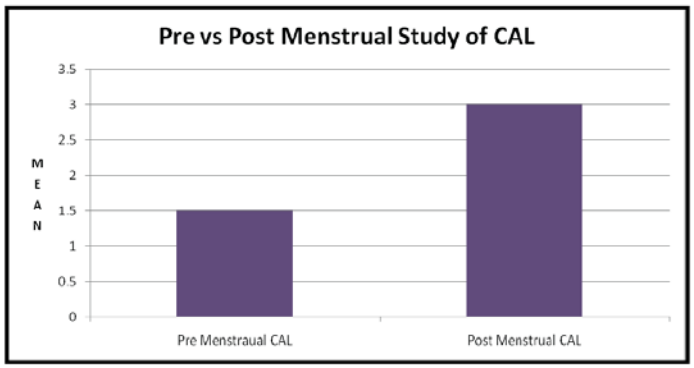
1. Gingival index : Table 1



2. Probing depth : Table 2



3. Clinical attachment level : Table 3



Discussion

Natural menopause is defined as a spontaneous cessation of natural menstruation for 12 consecutive months at 45-55 years of age (mean 50-52).[14] There are many hormonal changes that take place during menopause, as a result of which the gingivamight become more susceptible to plaque leading to a much higher risk for gingivitis and advanced periodontitis.[15] Menopause brings oral health problems commonly because of lack of oestrogen. It favours the loss of the alveolar bone of jaws, resulting in periodontal disease, mobile teeth, and tooth exfoliation.[16] Menopause affect bones throughout the body, and one of its effect is reducing relative anchorage that the jaw has on one'steeth.[17] Pre- menopausal and post- menopausal phase is a physiological process associated with many functional and compositional alterations in almost all systems of the body to varying extents. It is a state of physiological stress which is accompanied by profound hormonal, biochemical and metabolic changes.[18,19,20,21]The variety of physiological changes occurring during premenopausal and postmenopausal periods influence salivary secretion and composition and oral health. Hence, the oral cavity and its contained structures are important parts that serve as indicators for the general health status of the body.[22,23]The bad oral health status according to clinical parameters in postmenopausal women can be explained on the basis of the hormonal changes and decreased immunity and immunoglobulins especially IgA. Thus the less immunity lead to higher dental caries, missing teeth, gingival inflammation, calculus, plaque deposition, and also increase pocket depth.[18,19, 24,25] Steroid hormones have been shown to directly and indirectly exert influence on cellular proliferation, differentiation and growth in target tissues, including keratinocytes and fibroblasts in the gingiva.[26] Two theories which explained about the actions of hormones on the cells are : 1) change of the effectiveness of the epithelial barrier to bacterial insult; and 2) effect on collagen maintenance and repair.[27] Also, hormones have also been shown to increase the rate of folate metabolism in oral mucosa, since folate isin need of tissue maintenance. Hence, marked up metabolism can deplete folate stockpiles and hold down tissue repair.[28] Oestrogen is responsible for alterations in blood vessels of target tissues in females.[29]In contrast, progesterone has been shown to have little effect on the vasculature of systemic target tissues.[30] However, in gingiva and other non-periodontal intraoral tissues, more evidence has been collected for progesterone affecting the local vasculature than for oestrogen. Progesterone has also been shown to reduce corpuscular flow rate, allowing for accumulation of inflammatory cells, increased vascular permeability and proliferation.[31]Together both of them affect the micro circulatory system by producing the following changes: swelling of endothelial cells and periocytes of the venules, adherence of granulocytes and platelets to vessel walls, formation of micro thrombi, disruption of the perivascular mast cells, increased vascular permeability and vascular proliferation.[3] The physiological changes due to concentrations of sex hormones influences the periodontal status from anatomical, histological and metabolic functions which lead to marked increase in dental caries

and periodontal inflammation.[21,22,32]For physical parameters, the reduction in flow rate during postmenopausal period due to sex hormones especially human chorionic gonadotropin(HCG) which lead to reduction in a more acidic pH, it is also related to the effect of progesterone hormone which lead to decrease plasma bicarbonate level during postmenopausal period which increase the susceptibility to oral diseases.[20,21,33,34,35]The biological mechanism for the periodontal attachment loss in postmenopausal women with low bone mineral density(BMD) may be explained by factors like the reduced healing qualities of bones with low BMD, the effects of oestrogen deficiency on the periodontal condition, and the decreased collagen synthesis.[36,37,38,39] Angiogenesis, the formation of new blood vessels from existing blood vessels, is essential in nonreproductive tissue for wound healing, repair of damaged organs, restoration of blood supply to ischaemic tissue and tumour growth. Estrogenic compounds increase the proliferation of endothelial cell in vivo and in vitro near an endothelial lesion.[40] Angiogenesis in menopause is reduced because of an oestrogen related mechanism. Another aspect to consider is the impairment of the endothelium. It is compromised not only by the direct action of oestrogen on its maturation but also by the reduction in its tropism through the decrease in periodontal capillaries density.[41,42]Scardina et al. (2012) in a comparative study of twenty-seven women in post-menopause and twenty seven women in premenopausal examined the oral microcirculation using oral video capillaroscopy. They found that decrease in periodontal density may compromise the epithelium tropism, making it prone to inflammation. The tortuosity of the capillaries may indicate a greater permanence of inflammatory factors, increased in post-menopausal women. [43] Also, menopause oestrogen deficiency up regulates the production and action of cytokines and inflammatory mediators, which results in reduced rates of bone remodelling.[44,45]Studies suggest that low oestrogen production after menopause is associated with increased production of interleukin- 1, interleukin- 6, interleukin- 8, interleukin-10, tumour necrosis factor-alpha and granulocyte macro phage colony stimulating factors. These molecules have numerous actions that include the following (Fig. 1)[46,47,48,49,50]:

1. Initiation and maintenance of immune and inflammatory responses,
2. Modulation of bone cell proliferation,
3. Induction of reabsorption of both skeletal and alveolar bone

Several researchers have concluded that osteoporosis is directly related to the height of alveolar crest and to the teeth lost in postmenopausal women (Wactawski- Wende et al. 1996). Hidebolt et al (2002) concluded that there was a relationship between the alveolar crest height and the hormonal level.[51]Tezal et al. found that low bone mineral density was related to loss of interproximal alveolar bone and, to a lesser extent, ligamentous attachment loss. [52]On the other hand, Klemetti et al (1994) observed that loss of teeth was unrelated to loss of bone density, and that the development of periodontal disease did not depend on bone density. [51]

Conclusion

Oral health in pre-menopausal and post- menopausal women should be considered as a separate problem. Through the evaluation of results of the present study, we conclude that postmenopausal women are at a greater risk of occurrence of periodontal diseases. So, awareness should be created among the post-menopausal women to consider their oral health related problem seriously and go for routine dental visit.

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Legends Tables and Figure

Table 1: Gingival Index

	Mean	Standard Deviation	t-test	p-value
Pre Menstrual	4.025876	2.04333478	11.25	< 0.05 *
Post Menstrual	5.73554	1.40869129		

* p< 0.05 is statistically significant

Table 2: Probing Depth

	Mean	Standard Deviation	t-test	p-value
Pre Menstrual	1.913767626	0.360189361	6.722	< 0.05*
Post Menstrual	2.1662	0.645632833		

* p<0.05 is statistically significant

Table 3: Clinical Attachment Level

	Mean	Standard Deviation	t-test	p-value
Pre Menstrual	1.5	1.981418787	6.45	< 0.05*
Post Menstrual	3	1.837811476		

* p<0.05 is statistically significant

Figure

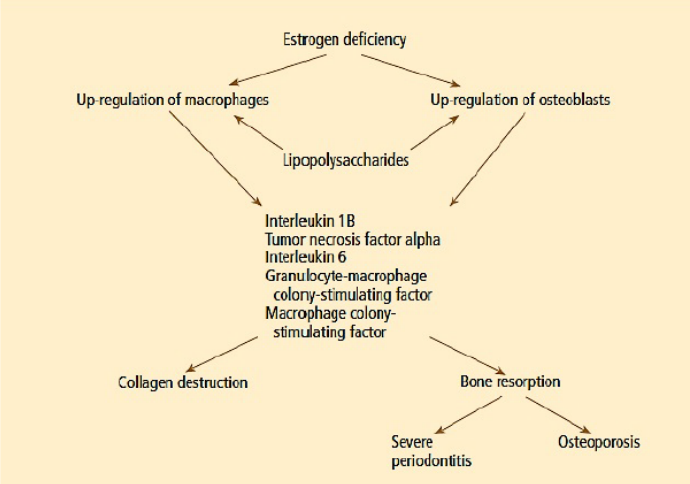

Fig: 1. Proposed model for how estrogen deficiency contributes to severe periodontal disease. Genco RJ, Grossi SG. Is estrogen deficiency a risk factor for periodontal disease? Compend Contin Educ Dent Suppl 1998;22:s23–s29. [50]