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Research Article

ASSESSMENT OF PERIODONTAL STATUS OF POSTMENOPAUSAL WOMEN ATTENDING DENTAL CLINICS

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ABSTRACT

Background & objectives: Natural menopause is defined as a spontaneous cessation of natural menstruation for 12 consecutive months at 45-55 years of age (mean 50-52). Menopause brings oral health problems commonly because of lack of estrogen. This association needs further perusal which was addressed in the following study along with patient education regarding periodontal health.
Methods: The study was conducted in Udaipur, India on 100 postmenopausal women aged between 54-70 years with cessation of menstruation for 12 months. The participants were examined for Clinical Attachment Loss (CAL), Furcation Involvement, Probing Depth, Oral Hygiene Index - Simplified (OHI-S) and Gingival Index (GI). Number of teeth present in the oral cavity of subjects was considered and emphasis was laid on reasons of tooth loss. The oral cavity was examined for signs of Periodontitis.
Results: In the study, four completely edentulous participants were reported while others had dentate state ranging from 3 to 32 teeth with exfoliation being the dominant reason for tooth loss. Nearly half of the dentulous participants did not show CAL but maximum participants revealed Grade-I Furcation Involvement. Measurement of OHI-S and GI revealed that majority of the population falls into "fair" category of former index while according to latter index major portion of population suffers from mild gingival inflammation.
Interpretation & conclusion: The conclusion drawn out from the results indicated towards risk of postmenopausal women for periodontal diseases and negligence of major portion of study population towards their periodontal health.

INTRODUCTION

Menopause is defined as permanent cessation of menstruation owing to loss of ovarian follicular activity (Bruce and Rymer, 2009). Menopause archetypically occurs in fifth decade of life in women (Portillo, 2002). A diagnosis of natural menopause is made retrospectively following 12 months of amenorrhea with no pathologic association (Bruce and Rymer, 2009; Nelson, 2008). Menopause may however be artificially induced by radiation, surgery and chemotherapy (Nelson, 2008).

Many studies have shown that oral mucosa and salivary glands are sensitive to estrogen action. Due to expression of estrogen receptors within these tissues, decreased estrogen activity not only affects genital organs, but also heart, bone and metabolic functions. Mainly decreased estrogen level in circulating blood affects behaviour and attitude of old age group (Eliasson *et al*, 2003).

Estrogen and progesterone are responsible for physiological changes in women at specific phases of their life: *puberty*, *menstrual cycle*, *pregnancy*, *menopause and post-menopause* (Amar and Chung, 1994). Estrogen inhibits the expression of inflammatory cytokines important in bone resorption, and estrogen deficiency may contribute to more intense gingival inflammation during periodontitis and subsequent oral bone loss, and may result in bone loss at both oral and skeletal sites. A number of studies have suggested that the risk of

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postmenopausal tooth loss is reduced by estrogen replacement (Lemer, 2006). Furthermore, lower estrogen levels have been linked to gingival inflammation (Norderyd *et al*, 1993) and reduced clinical attachment levels (Reinhardt *et al*, 1999).

Menopause is also associated with significant adverse changes in orofacial complex. Women appear to experience an increase in oral symptoms that may result from endocrine disturbances (reduced estrogen), calcium and vitamin deficiency and various psychologic factors during their menopausal years (Frutos *et al*, 2002; Sewon *et al*, 2000). They may complain of dry mouth because of decreased salivary secretion as well as a burning sensation of the mouth and tongue. Taste sensation may change, causing frequent complaints of a metallic taste (Rose and Kaye, 1990). Some women develop a condition known as Menopausal Gingivostomatitis, which is characterized by gingiva that are dry and shiny, bleed easily and range in colour from abnormally pale to erythematous (Friedlander, 2002).

Menopausal women also exhibit symptoms of periodontal diseases which refer to both gingivitis and periodontitis. Gingivitis is inflammatory condition of soft tissues gums. Gingivitis can often be controlled by removing the hard and soft deposits from the tooth surface (Kochman *et al*, 2004). If unchecked, gingivitis progresses to periodontitis, an inflammation of supporting tissues of teeth, including the gingiva, alveolar bone and periodontal ligament (Buencamino *et al*, 2009). Periodontitis is a chronic inflammatory process that occurs in response to a predominantly Gram-negative bacterial infection originating in dental plaque. Specific bacterial species, such as *Porphyromons gingivalis, Tannerella forsythensis* - have been shown to be important in etiology of periodontitis (Brennan *et al*, 2007). Periodontitis leads to progressive and irreversible loss of bone and periodontal ligament attachment, as inflammation extends from gingiva into adjacent bone and ligament. Signs and symptoms of progressing periodontitis include red, swollen gums that may appear to have pulled away from the teeth, persistent bad breath, pus between the teeth and gums and loose or separating teeth (Buencamino *et al*, 2009).

To alleviate uncomfortable symptoms associated with estrogen deficiency and to prevent some of the chronic illnesses common to the postmenopausal women, Hormone Replacement Therapy (HRT- estrogen or estrogen and progestin) - is often prescribed on a short-term and long-term basis (Friedlander, 2002). HRT includes *oral administration, estrogen containing dermal patches and Tibolone* (Ederveen and Kloosterboer, 1999). Marcos reported that response to HRT in periodontal diseases is probably due to existence of estrogen receptors localized in gingiva and periodontal ligament (Lopez *et al*, 2005).

The current study emphasizes on examining periodontal status of post-menopausal women and educating them about importance of maintaining oral hygiene.

MATERIALS AND METHODS

The current study is cross-sectional, descriptive-analytic type, which had been conducted in Darshan Dental College and Hospital for a span of two months. Primarily, ethical clearance was obtained from Institutional Ethical Committee, in order to undertake the study and carry out procedures to examine periodontium in post menopausal women. The examiner conducting the study was calibrated under a Gynaecologist and Professor & Head of respective dental college.

Study Population - A total of 100 subjects were selected on the basis of inclusion criteria for the study, aging between 54-70 years, with informed consent.

Selection of Subjects - All the subjects taking part in the study were required to fulfil following inclusion criteria

Inclusion Criteria for subjects taking part in the study

1. Female
2. Aged between 54-70 years
3. Cessation of menstruation for 12 months

Exclusion Criteria for subjects taking part in the study

1. Local inflammation
2. Focal infection and fibrosis of major salivary gland
3. Sjogren syndrome
4. Mikulicz syndrome
5. Dehydration
6. Autoimmune diseases
7. Post- radiotherapy changes
8. Chemotherapy

Data Collection - Upon enrolment of subjects, data regarding age of attainment of menopause and any problems or surgical intervention associated with it was recorded. The subjects were also enquired upon any history of medical problems like Diabetes Mellitus, Hypertension, Thyroid disorders or any other chronic illnesses. Information regarding their dental visits in a year, brushing habits and other adverse habits like tobacco smoking or chewing were recorded.

Clinical Examination-The subjects were examined using mouth mirror and other instruments of respective indices and periodontal parameters.

In the hard tissue examination; number of teeth present and missing teeth were examined and reasons for loss of teeth elicited. In soft tissue examination, gingiva was thoroughly assessed. The following indices and periodontal parameters were recorded using variety of instruments

a. The Debris and Calculus component of Oral Hygiene Index-Simplified (Green and Vermillion) using explorer,
b. Gingival index (Loe and Silness) and Probing Pocket Depth using William's periodontal probe,
c. Clinical Attachment Loss using CPITN-C (Community Periodontal Index and Treatment Needs-Clinical) probe,
d. Furcation Involvement using Naber's Probe.

The subjects responded to questionnaire assessing perception of periodontal health, awareness of risks for progressing periodontitis, and impacts of periodontitis on systemic health. Perception of periodontal health status was compared to actual diagnosis from clinical exam outcome.

Following the clinical examination, each subject received an "awareness and education session" in which each was made aware that poor oral hygiene is related to gingival inflammation and is noted to be not only a risk factor for progressing periodontitis, but also reportedly related to risk for infective endocarditis-related bacteremia (Lockhart *et al*, 2009), poorer

glycemic control (Grossi and Genco, 1998) and is associated with stroke, and adverse cardiovascular outcomes (Kinane and Bouchard, 2008). Each participant was told that supragingival bacterial plaque deposits are visible within few hours of a professional dental cleaning, and progresses to subgingival bacterial plaque infection. Bacterial plaque calcifies within a week if proper and effective oral hygiene is not maintained. Hence, removal of these deposits during more frequent maintenance visits is a preventive measure. Furcation Involvement was explained to those subjects who presented with that condition. They were educated about the fact that when furcation is repeatedly involved, up to one-third of tooth's attachment apparatus is already lost and that the presence of furcation involvement is a risk factor for adjacent site of neighbouring tooth.

Statistical Analysis - The recorded information was put in excel sheet and analyzed using SPSS (Statistical Package for the Social Sciences) program version 18.0. Frequency distribution of subjects under different periodontal parameters was evaluated. Mean and standard deviation of the periodontal parameters and indices was also evaluated.

OBSERVATION AND RESULTS

A total of 100 postmenopausal women were recruited for the study on the basis of Inclusion Criteria for different examinations. The data obtained after conducting epidemiological survey and performing detailed examination of the subjects has been summarised in form of tables which are as follows.

Table 1 Number of years since menopause

No. of years since menopause	No. of subjects
1-5	29
6-10	31
11-15	21
16-20	19

Table -1: Tabular representation showing distribution of post menopausal women on the basis of number of years elapsed after menopause.

Table 2 Number of teeth present

No. of teeth present	No. of subjects
< or = 16	19
>16	77
Edentulous	4

Table-2: Tabular representation showing distribution of participating subjects on the basis of number of teeth present within the oral cavity.

After assessment of collected data with the help of SPSS software, following results were obtained which are tabulated as follows.

Table 3 Clinical Attachment Loss (CAL)

Codes	Frequency	Valid Percentage
0	43	44.8
1	36	37.5
2	17	17.7

Table - 3: Represents Clinical Attachment Loss among the subjects after menopause.

In 44.8% participants no attachment loss was found, 37.5% participants clinical attachment loss had begun while 17.7% participants revealed significant loss of attachment.

Table 4 Furcation Involvement

Grades	Frequency	Valid Percentage
1	42	43.8
2	11	11.5
3	1	1
4	25	26
Not involved	17	17.7

Table-4: Represents Furcation Involvement among postmenopausal women depicting advanced stage of periodontal disease.

17.7% participants revealed no evidence of furcation involvement while maximum participants, that is, in 43.8% subjects a slight catch was appreciated in furcation area during probing. On the other hand, in 11.5% participants the probe penetrated up to halfway in the furcation area, in 1% subjects the probing was observed through and through in the furcation area and in 26% subjects, gingival recession along with through and through probing in furcation area was observed.

Table 5 Probing Depth

Probing Depth (mm)	Frequency	Valid Percentage
0	10	10.4
1	1	1
2	23	24
3	9	9.4
4	18	18.8
5	18	18.8
6	12	12.5
7	2	2.1
8	3	3.1

Table - 5: Represents the measure of probing depth that has been obtained in different subjects after detailed clinical examination.

44.8% participants showed clinically normal probing depth, that is, between 0-3 mm whereas in 55.2% participants pathological probing depth between 4-8 mm was reported which gives an idea of attachment loss and beginning of periodontitis in these participants.

Oral Hygiene Index-Simplified (OHI-S)

The Mean Oral Hygiene Index-Simplified score calculated for the participants was 2.66 ± 1.07.

Gingival Index (GI)

The Mean Gingival Index score calculated for the participants was 1.00 ± 0.34.

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) (McKinlay *et al*, 1992). There are several hormonal changes taking place during menopause, as a result the gums become more susceptible to plaque and thus leading to a much higher risk for gingivitis and advanced periodontitis (Suresh and Radfar, 2004). Menopause brings oral health

problems commonly because of lack of estrogen. It favours the loss of the alveolar bone of jaws, resulting in periodontal disease, loose teeth, and tooth loss (Sasireka *et al*, 2013). Menopause can also affect bones throughout the body, reducing relative anchorage that the jaw has on one's teeth (Turner and Aziz, 2002).

Type I osteoporosis occurs in postmenopausal women. Type I osteoporosis related to estrogen deficiency associated with menopause, leads to cascade of accelerated bone loss by decreased secretion of parathyroid hormone, increased secretion of calcitonin and decreased calcium absorption which further aggravates bone loss. The possible mechanism by which postmenopausal osteoporosis leads to more periodontal destruction may be presence of less crestal alveolar bone per unit volume, this bone of lesser density may be more easily absorbed. Estrogen acts by blocking the production of cytokines that promote osteoclast differentiation and osteoclast apoptosis (Suresh *et al*, 2010). Studies suggest that low estrogen production after menopause is associated with increased production of interleukin-1 (IL-1), IL- 6, IL-8, IL-10, tumour necrosis factor - alpha, granulocyte colony-stimulating factor and granulocyte-macrophage colony-stimulating factor, which stimulates mature osteoclasts, modulates bone cell proliferation, and induces resorption of both skeletal and alveolar bone (Pacifici, 1996; Pacifici *et al*, 1991).

Periodontitis is an inflammatory disease characterized by loss of connective tissue and alveolar bone. Like osteoporosis, it is a silent disease, not causing symptoms until late in the disease process when mobile teeth, abscesses and tooth loss may occur (Suresh *et al*, 2010). In the present study, 57 of 100 subjects were reported with initial signs of periodontitis. The most common reason for tooth loss was evidenced to be exfoliation, when participants were enquired for. The results of the study demonstrated that 19 subjects of 100 had, up to 16 teeth or less present in the oral cavity while 77 subjects had more than 16 teeth present and 4 cases happened to be edentulous. This proves periodontitis to be the dominant cause of tooth loss. This finding in the present study has been found in confirmation with study of R. Paramashivaiah *et al* (Paramashivaiah *et al*, 2011). While the etiologic agent in periodontitis is a pathogenic bacterial plaque in a susceptible patient, periodontitis and osteoporosis have several risk factors in common. They include an increased prevalence with age, smoking and influence of disease or medication that may interfere with healing (Suresh *et al*, 2010). In the current study, out of the 57 reported cases of periodontitis, 5.3% edentulous cases gave history of medical problems – Diabetes Mellitus and Hypertension, 50.8% dentulous subjects were recorded with history of systemic diseases and were on medication, 29.8% subjects were not reported with any medical problems which suggests that advancing age must have been the risk factor whereas 14.03% subjects fell into the category of tobacco consumers. According to the study conducted by Ricardo C Alves *et al*, smoking, plaque index and age are significant predictors of missing teeth, with observed powers of 45.5%, 71.0% and 98.7% respectively (Alves *et al*, 2015). But the results of this study have not been found in confirmation with the current study. Since the previous study has been conducted on Portuguese population, the differences in oral hygiene practices and adverse habits amongst that population maybe the reason behind the differences in the results of two different studies.

The results of various periodontal parameters in the present study followed by statistical analysis demonstrate:

1. 37.5% subjects with attachment loss up to 4-5mm depth, while in the study conducted by S. Suresh *et al* (Suresh *et al*, 2010), mean clinical attachment loss of 4.2mm has been reported.
2. 43.8% subjects with Grade-1 furcation involvement, while in study conducted by M.C. Buencamino *et al* (Buencamino *et al*, 2013) 30.8% participants were reported with some degree of furcation involvement.
3. Mean probing depth and GI as 3.60 ± 2.02 mm and 1.00 ± 0.34 respectively which is similar to the study conducted by R. Paramashivaiah *et al* (Paramashivaiah *et al*, 2011) in which mean probing depth is 3.94 ± 1.06 mm and mean GI is 0.86 ± 0.34. These results show that major portion of study population reveals Mild inflammation with slight edema of gingiva with no signs of bleeding on probing which probably depicts beginning of gingivitis.
4. Mean OHI-S as 2.66 ± 1.07, while in the study conducted by R. Paramashivaiah *et al* (Paramashivaiah *et al*, 2011), mean of Debris Index and Calculus Index have been separately mentioned as 1.19 ± 0.44 and 1.21 ± 0.38 respectively. This result shows that majority of the subjects fall into "fair" category of OHI-S.

Some studies have suggested that post menopausal women using HRT have increased tooth retention (Grodstein *et al*, 1996; Taguchi *et al*, 2004) and decreased periodontal destruction (Payne *et al*, 1999; Grossi, 1998; Wactawski-Wende *et al*, 2005). TT Yildirim *et al* in his study found that postmenopausal HRT+ women did not have a greater chance of having periodontitis than premenopausal women (Yildirim and Kaya, 2011). HRT may improve mucosal wound healing in postmenopausal women (Engeland *et al*, 2009).

CONCLUSION

The evaluation of results of the present study brings us to this conclusion that Postmenopausal women are at a greater risk of occurrence of periodontal diseases. Although in the literature, there are very few studies that correlate only menopause or an estrogen-deficient state to susceptibility to periodontal disease (Mascarenhas *et al*, 2003; Kinane *et al*, 2006).

From the above study we also conclude that; post-menopausal women are not aware of their periodontal health, the risks for progressing disease, or the risks of progressing disease to their systemic health. A detailed sampling from this cohort strongly suggests increased usage of preventive and treatment regimens if they were more aware and better educated about periodontal status. By making education a priority when treating postmenopausal women, dental practitioners may be able to provide a greater service to this cohort.

A knowledgeable dental practitioner therefore, could advise that the conditions are possibly menopause-related and provide her with more comprehensive patient education, periodontal debridement and use of daily home rinses. Dental practitioners can play a vital role in meeting oral health needs of menopausal

patient by early diagnosis, treatment planning, and patient education (Patil *et al*, 2013).

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References

Alves RC, Felix SA, Rodriguez A-Archilla, Oliveira P, Brito J, Santos JM, (2015). Relationship between menopause and periodontal disease: a cross-sectional study in a Portuguese population. *Int J Clin Exp Med*, 8(7):11412-11419.

Amar S, Chung KM, (1994). Influence of hormonal variation on periodontium in women. Periodontol 2000, 6:79-87.

Brennan RM, Genco RJ, Wilding GE, Hovey KM, Trevisan M, Wactawski-Wende J, (2007). Bacterial species in sub-gingival plaque and oral bone loss in post menopausal women. *J Periodontol*, 78:1051-61.

Bruce D, Rymer J, (2009). Symptoms of the menopause. Best Pract Res Obstet Gynaecol, 23:25-32.

Buencamino MC, Chitguppi R, Palomo L, Santos D, Thacker H, (2013). A need to educate postmenopausal women of their periodontal health. *J Indian Soc Periodontol*, 17(2):225-227.

Buencamino MC, Palomo L, Thacker HI, (2009). How menopause affects oral health and what we can do about it. *Cleveland Clinic Journal of Medicine*, 76(8):467-75.

Ederveen AG, Kloosterboer HJ, (1999). Tibolone a steroid with a tissue-specific hormonal profile completely prevents ovariectomy-induced bone loss in sexually mature rats. *J Bone Miner Res*, 14:1963-70.

Eliasson L, Carlen A, Laine M & Birkhed D, (2003). Minor gland and Whole saliva in postmenopausal women using a low potency Estrogen (oestriol). *Arch Oral Biol*, 48:511-517.

Engeland CG, Sabzehei B, Marucha PT, (2009). Sex hormones and mucosal wound healing. *Brain Behav Immun*, 23:629-35.

Friedlander AH, (2002). The physiology, medical management and oral implications of menopause. *J Am Dent Assoc*, 133:73-81.

Frutos R, Rodriguez S, Miralles-Jorda L, Machuca G, (2002). Oral manifestations and dental treatment in menopause. *Med Oral*, 7(1):26-30, 31-5.

Grodstein F, Colditz GA, Stamper MJ, (1996). Postmenopausal hormone use and tooth loss: a prospective study. *J Am Dent Assoc*, 127:370-7.

Grossi SG, Genco RJ, (1998). Periodontal disease and diabetes mellitus: a two-way relationship. *Ann Periodontol*, 3:51-61.

Grossi SG, (1998). Effect of estrogen supplementation on periodontal disease. *Compend Contin Educ Dent Suppl*, (22):30-6.

Kinane D, Bouchard P, (2008). Group E of European workshop on periodontology. Periodontal diseases and health: consensus report of sixth European workshop on periodontology. *J Clin Periodontol*, 35:333-7.

Kinane DF, Peterson M, Stathopoulou PG (2006). Environmental and other modifying factors of periodontal diseases. *Periodontol* 2000, 40:107-19.

Kochman RH, Kochman T, Stabholz A, Celinkier DH, (2004). Bisphosphonate and estrogen replacement therapy for postmenopausal periodontitis. *Imaj*, 6:173-7.

Lerner UH, (2006). Inflammation-induced bone remodeling in periodontal disease and the influence of postmenopausal osteoporosis. *J Dent Res*, 85:596-607.

Lockhart PB, Brennan MT, Thornhill M, Michalowicz BS, Noll J, Bahrani-Mougeot FK, *et al*, (2009). Poor oral hygiene as a risk factor for infective endocarditis-related bacteremia. *J Am Dent Assoc*, 140:1238-44.

Lopez Marcos JF, Garcia Valle S, Garcia Iglesias AA, (2005). Periodontal aspects in menopausal women undergoing hormone replacement therapy. *Med Oral Patol Oral Cir Bucal*, 10:132-41.

Mascarenhas P, Gapski R, Al-Shammari K, Wang HL, (2003). Influence of sex hormones on the periodontium. *J Clin Periodontol*, 30:671-81.

McKinlay SM, Brambilla DJ, Posner JG. The normal menopause transition. *Maturitas*, 14:103-15, (1992).

Nelson HD. Menopause. Lancet, 371: 760-70, (2008).

Norderyd OM, Grossi SG, Machtei EE, Zambon JJ, Hausmann E, Dunford RG, (1993). Periodontal status of women taking postmenopausal estrogen supplementation. *J Periodontol*, 64:957-62.

Pacifici R, Brown C, Pusheck E, (1991). Effect of surgical menopause and estrogen replacement on cytokine release from human blood mononuclear cells. *Proc Natl Acad Sci* USA, 88:5134-8.

Pacifici R, (1996). Estrogen, cytokines and pathogenesis of postmenopausal osteoporosis. *J Bone Miner Res*, 11:1043-51.

Paramashivaiah R, Padmanabhan S, Dwarakanath CD, Ramesh AV, (2011). Periodontal status of postmenopausal women with osteoporosis. *World J Dent*, Oct-Dec; 2(4):297-301.

Patil S, Sinha N, Kaswan S, Rahman F, Doni B, Ashok KP, (2013). Oral findings in postmenopausal women attending dental hospital in western part of India. *J Clin Exp Dent*, 5(1):e8-12.

Payne JB, Reinhardt RA, Nummikoski PV, Patil KD, (1999). Longitudinal alveolar bone loss in postmenopausal osteoporotic/osteopenic women. *Osteoporos Int*, 10:34-40.

Portillo GM, (2002). Oral manifestations and dental treatment in menopause. *Med Oral*, 7:31-5.

Reinhardt RA, Payne JB, Maze CA, Patil KD, Gallagher SJ, Mattson JS, (1999). Influence of estrogen and osteopenia/osteoporosis on clinical periodontitis in postmenopausal women. *J Periodontol*, 70:823-8.

Rose FL, Kaye D. Internal medicine for dentistry. In: chapter 14 endocrinology. Ed. Bartuska DG. 2nd Ed. St. Lois. Mosby Company, 1075, (1990).

Sasireka K, Kurian B, Ebenezer M, (2013). Oral cavity findings among postmenopausal women attending dental

hospital in rural part of Tamil Nadu. *Int Res J Pharm. App Sci*, 3(5):260-262.

Sewon L, Laine M, Karjalainen S, Leimola-Virtanen R, Hiidenkari T, Helenius H, (2000). The effect of hormone replacement therapy on salivary calcium concentrations in menopausal women. *Arch Oral Biol*, 45(3):201-6.

Suresh L, Radfar L, (2004). Pregnancy and lactation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 97:672-82.

Suresh S, Kumar TSS, Saraswathy PK, Shankar KHP, (2010). Periodontitis and bone mineral density among pre and post menopausal women: a comparative study. *J Indian Soc Periodontol*, Jan-Mar; 14(1):30-34.

Taguchi A, Sanada M, Suei Y, (2004). Effect of estrogen use on tooth retention, oral bone height, and oral bone porosity in Japanese postmenopausal women. *Menopause*, 11:556-62.

Turner M, Aziz SR, (2002). Management of the pregnant oral and maxillofacial surgery patient. *J Oral Maxillofac Surg*, 60:1479-88.

Wactawski-Wende J, Hausmann E, Hovey K, Trevisan M, Grossi S, Genco RJ, (2005). The association between osteoporosis and alveolar crestal height in post menopausal women. *J Periodontol*, 76:2116-24.

Yildirim TT, Kaya FA, (2011). The effects of menopause on periodontal tissue. *Int Dent Res*, 3:81-86.

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