ORIGINAL ARTICLE

Differences in Periodontal Severity Between Perimenopausal and Postmenopausal Women with Chronic Periodontitis

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Abstract

Objective: To analyze the differences in periodontal severity between perimenopausal and postmenopausal women with chronic periodontitis. **Material and Methods:** A cross-sectional study with 63 subjects, comprising 27 perimenopausal and 36 postmenopausal women, aged 45–59 years, was conducted in East Jakarta. The women were interviewed regarding their perimenopausal and postmenopausal status; they underwent a periodontal examination for periodontal pockets, attachment loss, gingival recession, plaque index, debris index, calculus index, oral hygiene index, papilla bleeding index, and tooth mobility. Independent T-test and Mann-Whitney U test were used for bivariate analysis. **Results:** There were significant differences (p<0.05) in age between perimenopausal and postmenopausal women (p=0.01); however, no significant differences (p>0.05) in gingival recession (p=0.33) or tooth mobility (p=0.84) were observed. Independent t-test revealed no significant differences in pocket depth (p=0.95), attachment loss (p=0.71), plaque index (p=0.89), debris index (p=0.52), calculus index (p=0.46), oral hygiene index (p=0.48), or papilla bleeding index (p=0.63) between perimenopausal and postmenopausal women. **Conclusion:** There was no difference in periodontal severity between perimenopausal and postmenopausal women; however, the current study obtained valuable information regarding periodontal severity in perimenopausal and postmenopausal women.

Keywords: Periodontal Diseases; Oral Hygiene; Perimenopause; Postmenopause.

Introduction

The prevalence and severity of gingivitis increase at the peak age of 21–30 years, whereas those of periodontitis increases significantly in individuals aged >40 years. The severity of periodontitis may increase with age [1]. Various studies have shown that the prevalence of periodontitis is generally lower in women than in men; however, this is not observed in the older population [2].

The proportion of elderly women with periodontitis continues to increase; a more prolonged life indicates that more disability increases are associated with chronic infections, including periodontitis. Puberty, menstruation, pregnancy, and menopause are the stages that occur in the life of women; these stages affect their physical condition, particularly the condition of the oral cavity. This is inseparable from the biological and endocrinological changes that occur in the body, such as hormonal changes that affect our health [2,3].

Steroid sex hormones play an important role in the development of periodontal disease. Estrogen is a steroid sex hormone associated with periodontal health. Estrogen receptors are expressed in the periodontium and mucosa of the oral cavity; thus, the levels of this hormone are directly related to the condition of the oral cavity [4]. Previous authors showed a complex interaction among steroid hormones, periodontal tissues, and microorganisms in perimenopausal and postmenopausal women [5].

The perimenopausal phase is the menopausal transition period that spans the last few years prior to the last menstrual period and ends 12 months after; this phase can last from 4–10 years. Perimenopause, commonly referred to as climacteric, is a period of crucial physical, emotional, and psychological changes in a woman's life [6]. The postmenopausal phase begins approximately 12 months after menopause. The transitional period before menopause can be psychologically traumatic and confusing because there is sadness regarding the loss of reproductive ability; however, a simultaneous feeling of being free from the monthly routine and finding a new status toward maturity is experienced [7]. Postmenopausal estrogen deficiency affects the immune system because it plays a role in improving the body's immune system. Changes in the immune system make individuals susceptible to the development of periodontitis [8,9].

Postmenopausal women have a higher risk of periodontitis than premenopausal women [10]. This is consistent with the findings that postmenopausal women have a significantly higher plaque index than premenopausal and perimenopausal women. This indicates that postmenopausal women can have more severe periodontal destruction than premenopause and perimenopause [11].

This menopausal symptom is a consequence of aging and is sometimes painless. Generally, women who enter the stage of menopause experience discomfort in the oral cavity [4,7]. The present study aimed to analyze the differences in periodontal severity between perimenopausal and postmenopausal patients with chronic periodontitis.

Material and Methods

Study Design

This cross-sectional study was conducted in East Jakarta with perimenopausal and postmenopausal women aged 45–59 years having chronic periodontitis. Demographic data were obtained via interview. Women with a history of oophorectomy, hormone replacement therapy, diabetes mellitus, smoking, or periodontal treatment in the six months prior to examination were excluded.

Data Collection

Perimenopause is a condition in which a woman has not yet entered menopause and often suffers from amenorrhea, which lasts for at least 60 days, or an extension of the menstrual cycle for >7 days, and has experienced at least three symptoms of menopause, whereas postmenopause is a condition in which a woman has stopped menstruating for >12 months in a row. Perimenopause and postmenopausal status were determined by interviewing the subject. Did the subject feel pain during menstruation before; Did the subject's menstrual cycle extend long before?; How long has the subject not been menstruating? [12-14].

Periodontal severity assessment was performed through clinical examination of the pocket depth, attachment loss, gingival recession, plaque index, debris index, calculus index, oral hygiene index, papilla bleeding index, and mobility using a dental mirror, an UNC 15 Color Probe (Hu-Friedy Mfg. Co., LLC, Chicago, IL, USA) with a black band for each millimeter up to 15 millimeters and dental explorer [15]. Chronic periodontitis was diagnosed on the basis of the results of clinical examination of pocket depth, attachment loss, and gingival recession on six sides of each tooth: the mesiobuccal, midbuccal, distobuccal, mesiolingual/palatal, midlingual/palatal, and distolingual/palatal surfaces. The pocket depth was measured from the base of the pocket to the gingival margin, and attachment loss in the tooth with recessed gingiva was measured as the depth of the pocket plus the distance from the cementoenamel junction to the gingival margin (gingival recession); when the gingival margin was at the cementoenamel junction, the attachment loss was equal to the pocket depth; however, if gingiva enlargement was observed, the attachment loss was considered as pocket depth minus the distance from the gingival margin to the cementoenamel junction [16-18].

The examination was conducted twice by the same examiner; first, all the teeth (except the third molar and radix) were checked; then, the examiner re-examined them one hour later [19-21]. A single examiner performed all clinical examinations, with the aid of one dental assistant for recording purposes. The intra-examiner agreement between clinical examinations was good, with an error rate of only ±1 mm.

Examination of the plaque index was performed on four sides of each tooth: the distofacial, facial, mesiofacial, and lingual surfaces. The Greene and Vermillion Oral Hygiene Index (OHI) was calculated by summing the debris and calculus indices of each subject. Examination of the debris and calculus indices was performed on two sides of each tooth: the buccal and palatal/lingual surfaces. The papilla bleeding index was examined at the palatal surface for the upper right maxillary area,

whereas for the upper left maxillary area, it was examined at the buccal surface. For the lower-left mandibular area, the examination was performed at the lingual surface, whereas for the lower right mandibular area, the examination was performed at the buccal surface. Examination of mobility was performed by applying pressure to each tooth using the ends of two instruments and trying to rock the tooth gently in a buccolingual direction and calculating the number of mobile teeth in each subject [22-24].

Data Analysis

Data were analyzed using IBM SPSS Statistics Software, version 20 (IBM Corp., Armonk, NY, USA). Statistical analysis was performed using the Kolmogorov-Smirnov test for data normality test, in addition to independent T-test and Mann-Whitney U test for bivariate analysis, with a significance level set at 5%.

Ethical Aspects

All subjects approved and signed informed consent prior to enrolment in the study, which was approved by the Dental Research Ethics Committee (KEPKG), Faculty of Dentistry, Universitas Indonesia.

Results

Initially, 65 women were willing to participate; however, two women refused to fast while being examined; thus, 63 women (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 ($\pm$ 4.62)
Number of Pregnancies	2.73 ($\pm$ 1.71)
Number of Menopausal Years	6.16 ($\pm$ 4.62)
Number of Menopausal Symptoms	4.14 ($\pm$ 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)

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 3).

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

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

[a]Mann-Whitney U test; [b]Independent T-test; *Statistically Significant.

Discussion

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.

Authors' Contributions: PW contributed to conception and data design, performed the experiment, analysis, and interpretation and wrote the manuscript; SLCM contributed to conception, data design, analysis, interpretation and critically revised the manuscript; LSK contributed to conception and data design, interpretation and critically revised the manuscript; FMT and SRP performed the experiments and AB contributed to critically revised the manuscript.

Conflict of Interest: The authors declare no conflicts of interest.

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