The Relationship between Tooth Loss and Gingival Status with Oral Hygiene in Postmenopausal Women

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Abstract

Poor oral hygiene can lead to further periodontal damage, especially in the postmenopausal pre-elderly who are deficient in estrogen. This study aimed to analyze the relationship between socio-demographic factors, tooth loss and gingival status on oral hygiene in postmenopausal women aged 45 until 59 years old.

This study was a cross-sectional study of postmenopausal women aged 45 until 59 years old with periodontitis in Jakarta Indonesia Information about age, education level and duration of menopause were obtained through interviews and history taking. Clinical examination was performed to check the oral hygiene index, the number of tooth loss and gingival status, namely the plaque index, papillary bleeding index. The results of this study showed that subjects who lost their teeth ≥4 (57.10%) had poor oral hygiene compared to <4 (42.90%) however, the Spearman correlation test showed that there was no significant relationship between the number of tooth losses (p = 0.907) with oral hygiene index. Pearson correlation test showed that there was a significant relationship between gingival status as measured by plaque index and papillary bleeding index (p=0.001) with the oral hygiene index.

The conclusion of this study, postmenopausal women are prone to experience problems in the oral cavity, especially periodontal tissue. Socio-demographic factors such as age, level of education and also the length of menopause were not significantly associated with oral hygiene; however, there was a significant relationship between gingival status and oral hygiene in postmenopausal women aged 45 until 59 years old.

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Introduction

Oral health and teeth are essential in speech function, appearance and overall health. Poor oral hygiene is a major problem for the community.[1] Oral disease can represent a risk of infection, lack of knowledge to properly control plaque can increase the risk of infection in the oral cavity. Periodontal disease and caries are considered to be the result of interactions between bacteria and hosts. The progress of these two factors is influenced by various factors such as socio-demographic conditions, systemic diseases, drugs, behaviour, and the environment.[2,3] Gingivitis is inflammation of the gingiva without damage to other supporting tissues, characterized by red gingiva, loosening of the stipplings, swelling and bleeding. Plaque contains microbes that can develop on the soft and hard tissues on the surface of the teeth. If gingivitis is not treated, the damage will involve not only the gingiva but also other periodontal tissues, namely cementum, periodontal ligaments and alveolar bone.[4]

The oral cavity vulnerable with a bacterial attack at any time, especially in postmenopausal, it is caused due to a decline in the postmenopausal hormone estrogen. Estrogen receptors on the gingiva, periosteal fibres, fibroblasts on the periodontal ligament and

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osteoblasts prove a direct relationship between steroid sex hormones and periodontal tissue. Estrogen is a reproductive hormone that plays a role in cell proliferation, differentiation and growth of tissues including keratinocytes and fibroblasts in the gingiva. This hormonal action can change the effectiveness of the epithelial barrier against bacterial attack and maintain and repair collagen. Estrogen deficiency causes the gingival epithelium to become thinner, atrophic so that inflammation can occur.[4–6]

Reduced levels of estrogen also cause a decrease in bone mineral density, leading to periodontal damage. Richa et al. revealed that postmenopausal women with osteoporosis had a higher plaque, gingival, and bleeding index compared to non-osteoporotic postmenopausal women.[7] Research by Puspitadewi et al. showed that there was a significant relationship between estrogen levels and alveolar bone density.[8] Decreased bone density will put osteoporosis at risk, where this condition will lead to rapid bone loss when an infection occurs, especially periodontal diseases.[9]

The hormone estrogen influences immunological factors and responses, including expression and presentation of antigens, production of cytokines such as expression of apoptotic factors and cell death. This steroid sex hormone plays a role in the microcirculation, resulting in changes such as swelling of endothelial cells, pericytes of venules, attachment of granulocytes and platelets to the walls of blood vessels and increase vascular permeability. Estrogen deficiency is associated with disruption of gingival health, thereby increasing the risk of gingivitis, periodontitis and even tooth loss.[10]

The reasons for tooth loss for an individual are many and complex, and the process usually starts at a young age. Periodontal complications are one of the reasons for tooth loss or in combination with other oral diseases such as cavities, trauma, and systemic diseases that can cause a large or small loss of teeth.[11]

Tooth loss is still one of the hundred health problems affecting the world population. This condition happened because tooth loss can cause functional, aesthetic and social disturbances. After all, it affects the quality of human life and also plays a role in causing 7.6 million DALY (disability-adjusted life years).[12,13]

Peres et al. in his research revealed that the loss of teeth at the age of 35 to 44 years nearly four times higher than in adolescents are at the age of 15 to 19 years and a half of the average tooth loss in an elderly (aged 65 to 74 years).[14] Data from several studies indicate that individuals aged less than 65 years; the average has 24 teeth left, where the subject is living in rural areas are at greater risk little teeth left. Females have fewer retained teeth than males [15]

Research by Sinavarat et al. showed that 80% of subjects believed that natural teeth could last a lifetime, but 51% of subjects considered that tooth loss was a natural part of ageing and 20% of subjects thought that brushing well could not save their teeth in their lifetime.[2] Tooth loss generally occurs in older individuals, but tooth loss is still a consequence of the severity of periodontitis, and tooth extraction due to cavities. Periodontal examinations to determine factors that contribute to periodontal destruction such as tooth loss, age-related bone loss, systemic disease, oral hygiene, and bad habits are factors of particular value in identifying age-related progression of individual periodontitis.[11] This study aimed to analyze the relationship between socio-demographic factors, tooth loss and gingival status on oral hygiene in postmenopausal women aged 45 until 59 years old.

Material and Methods

This study is a cross-sectional study with 143 subjects. This study conducted in Central Jakarta and East Jakarta Indonesia in 2018 on postmenopausal women and suffering periodontitis. The study received ethical approval from the Research Ethics Committee of Dentistry (KEPKG), Faculty of Dentistry, Universitas Indonesia. All subjects provided written informed consent to be included in this study. The demographic data and the duration of menopause were obtained from interview and history. Subjects are called menopause if the subject does not experience menstruation for one consecutive year naturally.[16] Women who underwent hormone replacement therapy, experienced surgical menopause, had systemic diseases, smoked and had periodontal treatment for at least six months from the examination, were excluded in this study. Before performing the examination, the inter-examiner test was

performed for calibration of the plaque index, papillary bleeding index, and attachment loss. The inter-examiner agreement between clinical examinations was good, with an error rate of only ± 1 mm.

Tooth loss data was carried out through a clinical examination of the patient's oral cavity. Attachment loss examination was measured from the cementoenamel junction to the bottom of the pocket using a UNC-15 probe to help confirm the diagnosis of periodontitis. The examination was carried out on the mesio-buccal, mid-buccal, disto-buccal, mesio-lingual, mid-lingual, disto-lingual surfaces of any teeth but excluding root and third molars.[17]

Plaque index examination was performed using the Silness and Loe plaque index. Papillary bleeding index examination was performed by examining the right palatal surface and the left buccal surface of the maxilla. In mandibular examination was carried out on the buccal surface to the right and lingual surface to the left. Oral hygiene index examination using The Greene and Vermillion Oral Hygiene Index was done by summing the debris index with the calculus index. [18–20]

Data analysis was performed using the Kolmogorov-Smirnov test for data normality and additionally using the Pearson correlation test and Spearman correlation test for bivariate analysis with a significance level of 5%.

Results

This study consisted of 143 subjects with the mean age of the subjects was 53.87 ± 3.26, with the mean duration of menopause was 5.20 ± 4.34. The mean level of oral hygiene was 2.06 ± 0.89 (Table 1).

Subjects (n = 143)	Mean ± SD	Median (Min-Max)
Age (Years)	53.87 ± 3.26	54 (45-59)
Length of Menopausal (Years)	5.20 ± 4.34	4 (1-19)
Tooth Loss	6.57 ± 5.52	5 (0-21)
Plaque Index	1.16 ± 0.55	1.12 (0.08-3)
Papillary Bleeding Index	1.64 ± 0.90	1.53 (0-4)
Oral Hygiene Index	2.06 ± 0.89	1.98 (0.32-6)

SD, standard deviation.
Table 1. Subjects' characteristics.

Table two shows that subjects aged 50 years and over (92.90 %) had more poor oral hygiene than subjects under 50 years old (7.10 %). However, subjects with low education

(7.10 %) were slightly oral hygiene poor compared to subjects with higher education (92.90 %). Subjects with menopause duration of ≤5 years (71.40%) over many have poor oral hygiene compared with menopause > 5 years (28.60%). Poor oral hygiene was also more common in subjects who lost teeth ≥4 (57.10%) and had papillary bleeding index > 1 (92.90%).

Subject (n = 143)	Oral Hygiene Index		
	Good n (%)	Fair n (%)	Poor n (%)
Socio-demographic			
Age			
<50 Years	3 (9.70)	8 (8.20)	1 (7.10)
≥50 Years	28 (90.30)	90 (91.80)	13 (92.90)
Education Level			
Low	11 (35.50)	38 (38.80)	1 (7.10)
High	20 (64.50%)	60 (61.20)	13 (92.90)
Occupation			
Unemployed	3 (9.70)	11 (11.20)	4 (28.60)
Employed	28 (90.30)	87 (88.80)	10 (71.40)
Length of Menopausal			
≤5 Years	20 (64.50)	63 (64.30)	10 (71.40)
> 5 Years	11 (35.50)	35 (35.70)	4 (28.60)
Oral Status			
Tooth Loss			
<4 Teeth	12 (38.70)	32 (32.70)	6 (42.90)
≥4 Teeth	19 (61.30)	66 (67.30)	8 (57.10)
Plaque Index			
≤1	27 (87.10)	35 (35.70)	0 (0)
> 1	4 (12.90)	63 (64.30)	14 (100%)
Papillary Bleeding Index			
≤1	18 (58.10)	19 (19.40)	1 (7.10)
> 1	13 (41.90)	79 (80.60)	13 (92.90)

Table 2. Characteristics subject based on the oral hygiene index.

Subjects (n = 143)	Oral Hygiene Index	
Socio-demographic	**Correlation Coefficient**	**p-value**
Age	0.052	0.541[a]
Education Level	-0.160	0.057[a]
Occupation	0.065	0.443[a]
Length of Menopausal	0.069	0.415[a]
Oral Status		
Tooth Loss	0.010	0.907[a]
Plaque Index	0.773	0.001[b] *
Papillary Bleeding Index	0.574	0.001[b] *

[a] Spearman correlation test; [b] Pearson correlation test (* significant p <0.0 5)
Table 3. Correlation between socio-demographic factors and oral status in subjects with oral hygiene index.

Spearman correlation test showed no there is a significant relationship between age (p = 0.541), educational level (p = 0.057), occupation (p = 0.443), length of menopause (p =

0.415) and total tooth loss (p = 0.907) with the level of oral hygiene. Pearson's correlation test showed that there was a significant relationship between the plaque index (p = 0.001) and the papillary bleeding index (p = 0.001), with a strong positive correlation level for the plaque index (0.773) and a moderate positive correlation level for the papillary bleeding index (0.574) (Table 3).

Discussion

Good oral health in old age is essential in maintaining the adequate oral function, preventing pain and discomfort, controlling local and systemic inflammation, maintaining sustainable social interactions, and improving quality of life.[21]

This study was conducted on postmenopausal subjects with periodontitis aged 45 to under 60 years. This is in accordance with the research of Ojeda et al. who conducted a study on postmenopausal women aged 45 years and the study of Ahuja et al. which showed that the mean age of menopause was 44.69 ± 3.79 .[22,23]

Women who were menopausal due to surgery and hormone replacement therapy were excluded in this study because they could affect the examination of the subject's periodontal condition. This is in line with Baziad's study, which showed that giving hormone therapy to menopausal women can increase collagen synthesis [24]. Subjects with systemic disease, smoking and undergoing periodontal treatment for at least six months were also excluded because this would affect the severity of the subject's periodontitis. This is in line with the research of Prasanna et al. and Akram et al. [25,26]

The mean age of the subjects in this study was 53.87, which is consistent with the mean age of natural menopause in developing countries, namely 45 to 53 years[27]. However, this age is higher than the mean age of menopause in the study by Wang et al. namely, 48.94 years[28]. In this study, age was divided into <50 years and ≥50 years. This is because the age of 50 years is a normal age for women to enter menopause, but some subjects enter menopause before reaching the age of 50 years.[29]

The results of this study indicate that the subjects aged ≥50 years (92.90%), the majority have poor oral hygiene. Bacterial plaque is an indicator of decreased oral hygiene. The difference in the host response to dental plaque between young and old individuals is a compensatory mechanism induced by immune senescence. Immune senescence affects gingival inflammation, and different pathways of expression differ in young individuals.[1,30] Poor oral hygiene conditions may be due to improper oral hygiene methods or various etiologies such as irregular dental conditions, hormonal influences and stress. Irregular teeth will make plaque control is difficult, so that it increases the accumulation of plaque. Decreased levels of the hormone, particularly in women, will affect the state of periodontal directly, modify the tissue response to local factors causing more susceptible to damage periodontal [31,32] However, in this study, there was no significant relationship (p > 0.541) between age and level of oral hygiene.

Failure to perform oral hygiene procedures will lead to increased plaque accumulation. Lack of knowledge on oral health, environmental influences, methods of controlling plaque, and concern for oral health problems will affect oral hygiene. In this study, the majority of highly educated subjects (92.90%) had poor oral hygiene compared to those with low education (7.10%), but there was no significant relationship (p = 0.057) between education and oral hygiene index. Perceptions of health or disease are not only related to signs of severity and symptoms but are also a reflection of socio-demographic conditions and cultural backgrounds at both the population and individual levels. Education alone is not sufficient to motivate changes in subject attitudes. Attitudes and behaviour of the subject are needed to influence change. Behaviour is related to knowledge, the behaviour is a response to knowledge, but in reality, the environment can stimulate behaviour beyond knowledge and behaviour. In other words, individual behaviour is not always based on knowledge and behaviour. The negative influence of the environment will result in oral health care [4,33]

Research by Lkhagvasuren et al. shows that the mean value of estradiol levels in early postmenopausal (34.0 ± 1.7) was higher than in the late postmenopausal (26.3 ± 7.7). The longer of menopause duration, the less estrogen function will be.[34,35] Estrogen plays an important role in maintaining the homeostasis of the oral cavity and salivary glands. The maturity of the

oral epithelium will be impaired in postmenopause, which causes the epithelium to atrophy so it is susceptible to inflammation due to reduced estrogen.[36] Postmenopausal mean estrogen values are 10 to 20 pg / ml. Decreased gonadal hormone associated with the decreased salivary flow. This is in line with research by Parinda et al., Which suggests that estrogen deficiency during menopause leads to decreased salivary flow and hyposalivation. The reduced saliva flow will affect oral hygiene because the function of saliva is as a cleansing, has antimicrobial action and maintains the integrity of the mucosa in the oral cavity.[37–39] This research showed subjects with menopause duration of ≤5 years (71.40%) had more poor oral hygiene. This is because oral hygiene is not only influenced by hormonal factors but is also influenced by several factors such as the host and the environment.

Periodontal disease is a chronic inflammation caused by microorganisms in the dental biofilm, causing progressive destruction of the supporting tissues of the teeth. This disease is sometimes experienced at a young age and generally often occurs in old age. Periodontal treatment should be started early to prevent not only tooth loss but also that the potential effects of systemic damage can continue after the tooth has been lost, leading to more severe periodontal destruction [21]

In this study, the number of lost teeth was divided into <4 teeth and ≥4 teeth; this is in line with the study of Lorentz et al. [40] Subjects with missing teeth ≥4 teeth (57.10%) were more likely to have poor oral hygiene. However, tooth loss did not have a significant relationship with oral hygiene (p = 0.907). Adults tend to keep their teeth in order to last longer, so sometimes poor oral hygiene is caused by the accumulation of plaque in the oral cavity. This is one factor which adults lose their teeth not because of age but because of the burden of poorly controlled chronic and poor oral hygiene. Tooth loss can have implications for dietary intake, while on the other hand nutrition plays a role in the etiology of diseases in the oral cavity such as caries and periodontal disease. Due to the loss of teeth, the individual will find it difficult to chew food, thereby reducing their ability to consume healthy foods. This condition can also result in disruption of general health conditions.[21,41]

Periodontitis is a silent disease where pathological changes take a long time and cause discomfort. Most subjects often underestimate the presence and severity of periodontal disease and go to the dentist after the onset of severe conditions.[33] Gingival status in this study was seen from the index. This is in line with the research of Marsin et al.[4] Papillary bleeding index examination was performed because it is a sensitive indicator of the severity of gingival inflammation. Gingival bleeding is an early sign of periodontal disease and the main risk marker of inflammation periodontal. This examination is also more efficient because it does not require a lot of time examining the patient.[42,43]

Subject with plaque index >1 has poor oral hygiene in this study. If plaque is neglected, it will cause further damage and eventually lead to tooth loss. This plaque accumulation can occur in all individuals, microorganisms in the oral cavity, saliva and the enabling environment will make demineralized plaque become calculus.[44] The rough surface of the calculus that sticks to the teeth is a place for plaque accumulation that affects oral hygiene. This study also showed that there was a significant correlation between plaque index and oral hygiene (p = 0.001) with a strong positive correlation coefficient (0.773).[45] This shows that the higher of plaque index, the greater of oral hygiene index score or, the poor oral hygiene, so the risk of further periodontal damage is increased. This is in line with research Lertpimonchai et al., which revealed that the oral conditions that are fair to poor, at risk of periodontitis increase two to fivefold. This risk can be reduced by regular brushing and regular visits to the dentist.[46] Periodontal therapy focuses on reducing gingival inflammation and pocket depth through clinician care and plaque control procedures performed by patients at home. Inflammation can come back if oral hygiene conditions are not maintained.[11]

Patients who realize that their oral condition requires dental care will more adhere to care for their teeth. Patient behaviour is not only influenced by the need for treatment but also by perceptions related to oral health. Women are 1.7 times more likely to feel their gums correctly than men; women tend to be more objective in assessing the condition of their oral cavity and the complaints based on their experience. Women are more interested in their appearance and oral health conditions.[33] However, this is not in line with the research of Santos et al., which indicates that the frequency of oral hygiene is not

related to the quality of oral hygiene.[47]

Gingival health can be seen through the colour, texture, and bleeding of the gingiva. This is in line with the study by Alasqah et al. which also examined the relationship between gingival bleeding, perceived dental and gingival health. Gingival bleeding is one of the clinical signs of periodontitis. Gingival bleeding occurs as a result of incomplete removal of plaque causing thinning, ulceration of the gingival epithelium accompanied by swelling of the blood vessels. Persistent gingival bleeding may be a serious medical problem.[48] The results of this study revealed that there was a significant correlation between the papillary bleeding index and oral hygiene (p = 0.001) with a moderate positive correlation coefficient (0.574), namely the higher the papillary bleeding index, the worse the oral hygiene.[45] Gingival bleeding is one of the most common complaints in patients with periodontal disease. This condition is also related to the quality of life. This happens because of the fear and anxiety that arises when bleeding occurs when brushing teeth and will affect his life.[48,49]

The ageing process causes a series of changes in social status, sensory perception, and cognitive as well as motor functions. In general, the social background is closely related to the risk of diseases such as caries and periodontal disease. Social context has a strong influence on individual behaviour with oral hygiene.[41] Actions teeth checked regularly to the dentist me probably right subjects have the opportunity to receive information about the health of the oral cavity so that it makes it always vigilant and maintain the condition of the oral cavity.[33]

Conclusion

Postmenopausal women are prone to experience problems in the oral cavity, especially periodontal tissues. Socio-demographic factors such as age, education level and also long menopause are not significantly associated with oral hygiene, but there is a relationship significantly between the plaque index and papillary bleeding index on oral hygiene in postmenopausal women age 45 until 59 years old.

Limitation of the Study

This study did not take data on the number of caries, the subject's habits in controlling plaque, nutrition, the subject's socioeconomic condition, and the arrangement of the teeth in the arch of the jaw, which is also factors related to oral hygiene.

Declaration of Interest

The authors report no conflict of interest.

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