Dentika Dental Journal
Journal homepage: https://talenta.usu.ac.id/dentika

Oral Findings and Gustatory Function of Postmenopausal Indonesian Women with Low Levels of Reproductive Hormones

Manuel D H Lugito [*1,2]

[1]*Faculty of Dentistry Universitas Prof Dr Moestopo (Beragama), Jakarta, 10270, Indonesia*
[2]*Siloam Hospital Lippo Village, Karawaci, Banten, 15810, Indonesia*
[*]Author: manuel_lu@dsn.moestopo.ac.id

ARTICLE INFO

Article history:
Received 15 September 2023
Revised 4 December 2023
Accepted 4 December 2023
Available online 22 December 2023

E-ISSN: 2615-854X

P-ISSN: 1693-671X

How to cite:
Lugito M. Oral findings and gustatory function of postmenopausal Indonesian women with low levels of reproductive hormones. Dentika Dental Journal. 2023; 26(2): 97-104

http://doi.org/10.32734/dentika.v26i2.13672

ABSTRACT

Menopause is always associated with various problems in the mouth. This study aims to determine oral findings and taste function in postmenopausal women in Indonesia. Descriptive cross-sectional sample of 18 postmenopausal women aged between 53 and 89 years living in nursing homes. Data were collected through demographic questionnaires, oral examination, measuring total saliva volume, assessing saliva pH, checking estradiol and progesterone levels in the blood. Taste tests were carried out the next day with liquids of three different concentrations of four different taste qualities including sweet, salty, sour and bitter. Research results: average age of participants was 75.4+8.6 years, and average DMFT 16.06+2.59. Significant reductions were seen in pH and saliva flow rate, while the most common oral complaints were xerostomia (22%) and pain in the temporomandibular joint (11.1%). Mean estradiol levels were 1.5 + 4.4 pg/mL and progesterone 0.05 + 0.06 ng/mL. Burning Mouth Syndrome and Oral Candidiasis were not found. The majority reported a higher level of taste sensitivity, especially to solutions with the highest concentration, namely bitter taste. This research shows that subjects experienced changes in oral health due to hormonal changes, side effects of medication, and the aging process. Decreased taste function, especially sensitivity to salty, sweet and sour tastes.

Keywords: Estradiol; Gustatory; Menopause; Progesteron; pH; Salivary

ABSTRAK

Menopause selalu dikaitkan dengan berbagai masalah di mulut. Penelitian ini bertujuan untuk mengetahui temuan oral dan fungsi pengecapan pada wanita pascamenopause di Indonesia. Deskriptif cross-sectional dengan sampel 18 wanita pascamenopause usia antara 53 dan 89 tahun yang tinggal di panti jompo. Pengumpulan data melalui kuesioner demografi, pemeriksaan mulut, pengukuran volume total air liur, penilaian pH air liur, pemeriksaan kadar estradiol dan progesteron dalam darah. Uji rasa dilakukan keesokan harinya dengan cairan tiga konsentrasi berbeda dari empat kualitas rasa berbeda termasuk manis, asin, asam, dan pahit. Hasil penelitian: rata-rata usia peserta 75,4+8,6 tahun, dan rata-rata DMFT 16,06+2,59. Penurunan signifikan terlihat pada pH dan laju aliran air liur, sedangkan keluhan mulut yang paling umum adalah xerostomia (22%) dan nyeri pada sendi temporomandibular (11,1%). Rata-rata kadar estradiol adalah 1,5 + 4,4 pg/mL dan progesteron 0,05 + 0,06 ng/mL. Sindrom Mulut Terbakar dan Kandidiasis Mulut tidak ditemukan. Mayoritas melaporkan tingkat kepekaan rasa yang lebih tinggi, terutama pada larutan dengan konsentrasi tertinggi, yaitu rasa pahit. Penelitian ini menunjukkan bahwa subyek mengalami perubahan pada kesehatan mulut akibat perubahan hormonal, efek samping pengobatan, dan proses penuaan. Penurunan fungsi pengecapan terutama pada kepekaan terhadap rasa asin, manis dan asam.

Kata Kunci: Estradiol; Rasa; Menopause; Progesteron; PH; air liur

1. Introduction

Modern medicine is targeted at significantly increasing human life expectancy [1,2], with the ratio of the global population over 60 years expected to double from 12 % to 22% between 2015 and 2050 [2]. Based on Statistics Indonesia, the number of elderly in Indonesia is expected to increase by approximately 10 % and 20 % in 2020 and 2024 respectively [3].

Menopause is a physiological process that typically occurs during the fourth and fifth decades in women. This phenomenon is defined retrospectively as the time of the final menstrual period, followed by 12 months of amenorrhea, while postmenopause describes the period following the final menses [4,5]. Deficiency in estrogen level can lead to several oral problems such as dry mouth, burning mouth, dysgeusia, chronic orofacial pain, and periodontal issues [6–8].

The prevalence of taste disorder increases with age [9,10] and more than 50% of those with this condition are more than 65 years old [10], while 17.97% of menopausal women experience dry mouth [11]. However, long-term care for postmenopausal women with oral problems has received limited attention in Indonesia [12,13]. It is crucial for dentists to be capable of diagnosing and treating oral symptoms among this population with extra care. This study aimed to evaluate oral findings and gustatory function of postmenopausal women in Indonesia, particularly in South Tangerang.

2. Methods and Materials

This was a cross-sectional descriptive-analytic study carried out in Melania Nursing Home, South Tangerang. Ethical approval was received from the ethics committee of the Faculty of Dentistry in the University of Prof Dr Moestopo (Beragama) with no. 062/loloskajietik/FKGUPDM(B)/IV/2018). The samples consisted of 18 postmenopausal women aged between 53 and 89 years living in a nursing home, and written informed consent was obtained.

Data were collected for each participant concerning oral hygiene practices, educational status, systemic disorders, smoking habits, menopausal information, and gustatory experience through a questionnaire. Subsequently, each participant underwent an oral examination, total whole saliva volume measurement, pH of saliva assessment, estradiol, as well as progesterone level blood examination. Dental caries were recorded using DMFT WHO criteria and whole saliva volume was obtained under a resting situation in a silent location from 8 AM to 11 AM or at least 6 hours after the last intake of meal or drink. Saliva was stored in a dry and sterilized plastic tube marked from 0 to 20 ml for about 5 minutes.

Before the gustatory function test, the participants were asked to sip a small amount of water. The test was performed the following day with solutions in three different concentrations of four taste qualities namely sweet (1g/ml, 2g/ml, and 4g/ml sucrose), salty (1g/ml, 2g/ml, and 4g/ml sodium chloride), sour (50%, 66.67%, 80% citric acid), and bitter (1g/100ml, 2g/100ml, 4 g/100ml black coffee). Subsequently, 4 drops of each taste quality stimulus solution from the smallest to the highest concentration were dripped on the anterior tip of the tongue. The participants were then ordered to close their mouths and wipe back and forth. This was followed by a rating of gustatory sensitivity for each concentration on a linear visual analog scale (VAS) from 0 to 3, where 0 = no taste sensitivity, 1 = less taste sensitivity, 2 = good taste sensitivity, and 3 = very good taste sensitivity [14].

3. Results

The average age of the participants was 75.4 $\pm$ 8.6 years, with a minimum of 53 years and a maximum of 89.17 years old. The distribution of educational background ranged from elementary, junior, and senior high school, to bachelor's degree. The body mass index also showed a diverse distribution and the mean age of menopause inception was 47.22 $\pm$ 5.662 years. The average number of years since menopause was 28.14 $\pm$ 10.55 years, while the mean level of estradiol and progesterone was 1.5 $\pm$ 4.4 pg/mL and 0.05 $\pm$ 0.06 ng/mL respectively (Table 1). The majority of participants reported several systemic diseases and the use of medications, with the most common being antidiabetic and antihypertensives.

Table 2 shows the distribution of serum estradiol and progesterone levels, whole volume, and saliva pH based on the age of postmenopausal women. The majority of the participants had lower levels of total saliva, pH, as well as serum estradiol, and progesterone in every age range.

Table 1. The Sociodemographic Characteristics of Postmenopausal Women in Melania Nursing Home

	N	**%**
Age (years)		
Mean	75,4	
Standard Deviation (SD)	8.6	
Range of age (years)		
51-55	1	5.5%
56-60	0	0
61-65	0	0
66-70	3	16.7%
71-75	6	33.3%
76-80	3	16.7%
81-85	2	11.1%
86-90	3	16.7%
Educational Background		
Elementary School	2	11.11%
Junior High School	7	38.89%
Senior High School	7	38.89%
Bachelor	2	11.11%
Body Mass Index		
Underweight	1	5.56%
Healthy	10	55.55%
Overweight	5	27.78%
Obese	2	11.11%
Systemic Diseases		
Diabetes Mellitus	3	16.67%
Hypertension	5	27.78%
Hyperlipidemia	1	5.55%
Diabetes Mellitus, Hypertension	3	16.67%
Diabetes Mellitus, Hypertension, Hyperlipidemia	1	5.55%
Menopausal age		
Mean $\pm$ SD (years)	47.72 $\pm$ 5.66	
Length of menopause		
Mean + SD (years)	28.14 $\pm$ 10.55	
Level of Estradiol serum (pg/mL)	1.5 $\pm$ 4.4	
<10	16	88.89%
11	1	5.56%
16	1	5.56%
Level of Progesterone hormone (ng/mL)	0.05 $\pm$ 0.06	
< 0,1	10	55,56%
0,1	7	38,89%
0,2	1	5,55%
Whole Saliva (mL/minute)		
Mean	0.32 $\pm$ 0.36	
Hyposalivation	13	72.2%
Normal	0	0
Hypersalivation	5	27.8%
pH Saliva Total		
<7	14	77.78%

Normal	0	0
>7	4	22.22%
Xerostomia		
Yes	4	22.22%
No	14	77.78%
TMJ Pain	2	11.11%
BMS	0	0
Oral Candidiasis	0	0

The dental behavior and oral hygiene habits were recorded, with a total of 11.1% of women admitting to brushing their teeth once a day, 83.4% brushing twice or more a day, and 5.5% not brushing due to full edentulous conditions. Regarding additional care practices, only a total of 11.1% used dental floss, 27.8% brushed their tongue, and none used mouth rinse. In terms of dental visits, 16.6% visited the dentist regularly once a year, and 44.4% used prostheses. Intra-oral examination showed that 38.9% did not have fixed occlusion, and the mean DMFT was 16.06 $\pm$ 2.59. The most common oral complaint was xerostomia (22%) and pain of temporomandibular joint (11.1%). However, none of the participants experienced Burning Mouth Syndrome and Oral Candidiasis.

Table 2. Distribution of Volume of Whole Salva, pH of saliva, Level of Serum Estradiol, and Progesterone According to Age

Age (years)	**Volume of Whole Saliva (mL)**	**pH of Whole Saliva**	**Level of Progesterone (ng/mL)**	**Level of Estradiol (pg/mL)**
50 – 55	0.1	6.6	0	0
56 – 60	-	-	-	-
61 – 65	-	-	-	-
66 – 70	0.1	6.6	0.1	0
	0.2	6.6	0	0
	0.2	7.2	0	0
71 – 75	0.1	6.4	0	16
	0.1	6.6	0	0
	0.1	6.6	0.1	0
	0.1	7.4	0.1	0
	1	7.8	0.1	0
	0.5	7.6	0	0
76 – 80	0.1	6.4	0	0
	1	6.6	0,1	0
	0.3	6.6	0,2	11
81 – 85	0.1	6.6	0	0
	0.2	6.4	0	0
86 – 90	0.2	6.6	0.1	0
	0.1	6.6	0.1	0
	1.3	6.6	0	0

Table 3 shows the characteristics related to the taste sensitivity test for the solutions studied. The majority of the participants reported higher levels of gustatory sensitivity for solutions with the highest concentration.

Table 3. Level of Gustatory Sensitivity to Different Concentrations (Sucrose, Sodium Chloride, Citric Acid, and Black Coffee Solutions) in Postmenopausal Women

Solutions	Concentration	No Sensitivity	Low Sensitivity	Moderate Sensitivity	High Sensitivity
Sodium	1g/ml	9 (50%)	7 (38.9%)	2 (11.1%)	0
Chloride	2g/ml	4 (22.2%)	7 (38.9%)	5 (27.8%)	2 (11.1%)
	4g/ml	0	5 (27.8%)	7 (38.9%)	6 (33.3%)
Sucrose	1g/ml	9 (50%)	7 (38.9%)	2 (11.1%)	0
	2g/ml	4 (22.2%)	7 (38.9%)	5 (27.8%)	2 (11.1%)
	4g/ml	0	5 (27.8%)	7 (38.9%)	6 (33.3%)
Citric Acid	50%	8 (44.4%)	9 (50%)	1 (5.5%)	0
	66.67%	2 (11.1%)	6 (33.3%)	10 (55.5%)	0
	80%	0	4 (22.2%)	8 (444%)	6 (33.3%)
Black coffee	1g/100ml	8 (44.4%)	8 (44.4%)	1 (5.5%)	1 (5.5%)
	2g/100ml	2 (11.1%)	4 (22.2%)	5 (27.8%)	7 (38.9%)
	4g/100ml	0	1 (5.5%)	7 (38.9%)	10 (55.6%)

A significance value of 0.321 was obtained, showing that the correlation between estradiol level and DMFT value was not significant. The Spearman correlation value of -0.248 implied that the direction of the correlation was negative with very weak strength. Furthermore, a significance value of 0.957 was obtained, signifying the correlation between Progesterone level and DMFT value was not significant. Based on the Spearman correlation value of 0.014, the direction of the correlation was positive with very weak strength.

4. Discussions

The aging process in postmenopausal women causes clinical and functional changes including oral problems [4,7,14]. Estrogen, which regulates the function and growth of cells through receptors (Erα and Erβ), plays an important role in the maintenance of the oral cavity and salivary glands. Oral epithelial atrophy is caused by a reduction in cell maturation leading to increased susceptibility to inflammation [7,15]. Burning mouth syndrome in late postmenopausal conditions may also escalate in response to heat excitation [16], leading to frequent complaints. However, the symptom was not found in this study.

In this study, no oral lesions were found because all the participants were independent geriatric with no special care programs, showing optimal ability to maintain oral health with good dental behavior and oral hygiene habits [7]. However, further comparative study between dependent and independent geriatric with special care programs is needed.

Xerostomia, a subjective symptom associated with dryness in the mouth [6,14] can result from qualitative changes in the composition of saliva, disproportion among the salivary glands, or alterations in the mucosal sensory receptors [6]. Medications for systemic diseases also influence the salivary flow rate [17]. Low levels of estradiol in postmenopausal women with oral dryness may affect systemic calcium and salivary concentration, reducing plasma calcium levels [6]. The mean saliva flow rate obtained in this study (0.32 ± 0.36 mL/min) was in consonance with that of Agha-Hosseini et al., (0.30 ± 0.02 mL/min) and Foglio-Bonda et al., (0.29 ± 0.17 mL/min) [18]. Another study carried out by Ship et al., in the US on 43 healthy postmenopausal women reported that there were no changes in the quantity of saliva. This study obtained similar results with Rukmini et al., which found a significant reduction in the salivary pH [18].

Gustatory changes also occur in reaction to secondary impacts including undesirable effects of medications, oral infections, endocrine and nervous disorders, as well as nutritional deterioration [19]. Endocrine disorders including diabetes mellitus and obesity can cause a loss of sensitivity to sweet taste [6]. The acini of the salivary glands gradually become atrophic and diminish, eventually replaced by fibrous and adipose connective tissue [19].

The spatial taste-testing system is one of the methods to evaluate gustatory function, but it has limitations. On the other hand, the use of whole-mouth taste is expected to yield more accurate results [20].

The density of taste buds diminishes and this can interfere with the distribution of papillae in the tongue. Oral lesions and noxious bacterial products of the dental–alveolar infections may also alter gustatory senses (19).

Despite a high BMI being associated with a decrease in gustatory function [1] and smell, this study showed that postmenopausal women achieved greater scores on the sensitivity scale for solutions with greater concentrations. Higher taste perception in more concentrated solutions has been reported in the elderly, for example, a twofold to threefold increase was found in salt concentration of tomato soup. However, excessive intake of salt and sugar can aggravate health hazardous conditions [20].

According to previous reports, there is an inverse relationship between nutrient consumption and progressively impaired oral health. Calcium and phosphate have beneficial effects on dental plaque and saliva. A high intake of calcium can improve enamel mineralization, decrease demineralization, and prevent loss of alveolar bone concomitant with vitamin D. Furthermore, Vitamin D is beneficial for bone health, maintaining phospho-calcium homeostasis, and has anti-inflammatory as well as antimicrobial effects [21,22].

This study serves as a preliminary investigation in Indonesia, recognizing that dental caries is a long-term process [23]. All postmenopausal women shared similar dietary habits and lived together in nursing homes. However, further longitudinal studies are needed to identify various factors causing dental caries in this population. The limitation of funds is a significant consideration in this context. In this study, although several main factors related to these oral findings were not fully explored, possible factors were discussed. The frequency of sugar consumption is directly related to the prevalence of dental caries. Vitamin D, essential for Ca absorption and maturation, also plays an important role in achieving optimal peak bone mass. The deficiency of vitamin D and calcium potentially leads to increased bone resorption, affecting tooth retention in the long term [6,21]. Furthermore, DMFT represents the total number of decayed, missing due to caries, and filled teeth. Higher DMFT is associated with a paucity of saliva, an important defensive agent against microbial pathogens [7]. Reduced saliva flow and inflammation may be linked to the modification of oral and periodontal microcirculation [21]. The salivary IgA concentration and total protein in menopausal women were higher compared to healthy young ones [4].

High DMFT score specifically missing teeth could be related to xerostomia, low salivary flow, higher consumption of sucrose, and the loss of bone mass, potentially influencing the severity of pre-existing periodontitis. As stated in previous studies, greater bone loss is associated with an elevated risk of tooth loss [17] and the prevalence of caries is higher in nursing homes [19,24]. The low provision of oral care for older adults in long-term care facilities may be due to high staff workload, rising amounts of exceptionally dependent residents, as well as lack of time and funding [25]. A study by Niklander et.al found no significant relationship between the existence of menopause and xerostomia. However, a higher prevalence of xerostomia was found among menopausal women (17.97%) compared to this present study (22.22%). It was reported that menopause in older women may represent a possible risk factor for dry mouth. Older age is related to increased chronic diseases, which is often indirectly linked with more medication intake as the most frequent etiology of dry mouth [11].

The limitation of this study was that, since the DMFT index represented a lifetime experience, the experience of dental caries in childhood cannot be excluded. Therefore, further longitudinal studies are needed to address this aspect comprehensively.

5. Conclusions

In conclusion, postmenopausal women were found to experience changes in oral health caused by hormonal fluctuations, as well as side effects of medication and the aging process. Decreased taste function occurred, specifically in the sensitivity to sweet and sour tastes. This could be attributed to hormonal factors, hyposalivation, and medication use. In the future, more studies should be conducted to determine the appropriate and exact treatment plan to prevent oral changes among postmenopausal women.

6. Acknowledgments

The author is grateful to all subjects for participating in this study.

7. Conflicts Of Interest

The author declares that there is no conflict of interest, financial or otherwise.

8. Funding Sources

None.

References

1. Garmany A, Yamada S, Terzic A. Longevity leap : mind the healthspan gap. NPJ Regen Med. 2021; 6(57): 1–7.
2. United Nations, Department of Economic and Social Affairs, Population Division. World population ageing 2017 - Highlights (ST/ESA/SER.A/397). New York: United Nations, 2017: 1-40.
3. TNP2K. The situation of the elderly in indonesia and access to social protection programs: Secondary data analysis. Jakarta: TNP2K, 2020: 1-4.
4. Santosh P, Nidhi S, Sumita K, Farzan R, Bharati D, Ashok KP. Oral findings in postmenopausal women attending dental hospital in western part of India. J Clin Exp Dent. 2013; 5(1): 8–12.
5. Dalal PK, Agarwal M. Postmenopausal syndrome. Indian J Psychiatry. 2017; 57: 222–31.
6. Singh B, Sheikh S, Pallagatti S, Kaur K, Sohi R. Evaluation of salivary calcium and salivary parathyroid levels in postmenopausal women with and without oral dryness. Contemp Clin Dent. 2013; 4(4): 1–5.
7. Raviraj J, Sunil V, Charitha M, Harhsa R, Lavanya T, Karthik V, et al. Influence of menopause on oral health: A cross sectional study. Int J Health Sci Res. 2016; 6: 232–5.
8. Siregar MFG. Menopause and the oral cavity: an oral hygiene update in Indonesia. IJCMPH 2015; 2(3): 210–6.
9. Jeon S, Kim Y, Min S, Song M, Son S, Lee S. Taste sensitivity of elderly people is associated with quality of life and inadequate dietary intake. Nutrients. 2021; 13: 1–14.
10. Sødal ATT, Singh PB, Skudutyte-rysstad R, Diep MT, Hove LH. Smell, taste and trigeminal disorders in a 65 - year - old population. BMC Geriatrics. 2021; 21(300): 1–12.
11. Niklander S, Veas L, Barrera C, Fuentes F, Chiappini G, Marshall M. Risk factors, hyposalivation and impact of xerostomia on oral health-related quality of life. Braz Oral Res. 2017; 31: 1–9.
12. Asian Development Bank. Country diagnostic study on long-term care in indonesia. Philippines: ADB, 2021.
13. Diyu IANP, Satriani NLA. Menopausal symptoms in women aged 40-65 years in Indonesia. Int J Med Health Sci. 2022; 5(2): 169–76.
14. Neumann L, Schauren BC, Adami SF. Taste sensitivity of adults and elderly persons. Rev Bras Geriatr Gerontol. 2015; 19(5): 797–808.
15. Ciesielska A, Kusiak A, Ossowska A, Grzybowska ME. Changes in the oral cavity in menopausal women—A narrative review. Int J Environ Res Public Health 2022; 19:1–10.
16. Ozasa K, Noma N, Young A, Korczeniewska OA, Eliav E, Imamura Y. Potential differences in somatosensory function during premenopause and early and late postmenopause in patients with burning mouth syndrome: An observational case–control study. J Dent Sci. 2022; 17: 399–406.
17. Dutt P, SR C, Kumar P. Oral health and menopause : A comprehensive review on current knowledge and associated dental management. Ann Med Health Sci Res. 2013; 3(3): 320–3.
18. Foglio-Bonda P, Rocchetti V, Nardella A, Fantinato M, Sandhu K, Foglio-Bonda A. Salivary pH and flow rate in menopausal women. European Review for Medical and Pharmacological Sciences. 2019; 23: 918–22.
19. Alia S, Aquilanti L, Pugnaloni S, Paolo A Di, Rappelli G, Vignini A. The Influence of age and oral health on taste perception in older adults : A case-control study. Nutrients 2021; 13(4166): 1–9.
20. Spence C. The tongue map and the spatial modulation of taste perception. Curr Res Food Sci. 2022; 5: 598–610.
21. Botelho J, Machado V, Proença L, Delgado AS, Mendes JJ. Vitamin D deficiency and oral health : A comprehensive review. Nutrients. 2020; 12(1471).

22. Diachkova E, Trifonova D, Morozova E, Runova G, Ashurko I, Ibadulaeva M, et al. Vitamin D and its role in oral diseases development. Scoping review. Dent J. 2021; 9(11): 1–17.
23. Yadav K, Prakash S. Dental caries: A review. Asian J Biomed Pharm Sci. 2016; 6(53): 1–7.
24. Lee YH, Myong JP. Relationship between bone mineral density and dental caries in Koreans by sex and menopausal state. Int J Environ Res Public Health 2022; 19(11).
25. Wu JH, Liu MF, Ho MH, Chang CC. Oral health of older adults in long-term care facilities: Effects of an oral care program emergency departments use among community-dwelling older people view project oral health of older adults in long-term care facilities. J Oral Health Dent Care. 2017; 1(2): 1–5.