

Original Article

Gustatory Functional Level and Oral Dryness: Impact of Menopause on Women Health

Kulwinder Kaur¹, Prabhnoor Kaur², Balwinder Singh³, Kavipal Singh⁴, Kirandeep Kaur⁵, Ramandeep S. Narang⁶

¹Assistant Professor, Dept of Obstetrics & Gynaecology, Govt. Medical College, Amritsar, Punjab, India, ²Intern, Govt. Medical College, Amritsar, Punjab, India, ³Associate Professor, Department of Oral Medicine and Radiology, SGRD Institute of Dental Sciences & Research, Amritsar, Punjab, India, ⁴Professor & Head, Dept of Prosthodontics, SGRD Institute of Dental Sciences & Research, Amritsar, Punjab, India, ⁵Consultant Oral & Maxillofacial Surgeon, Ex-Student, SGRD Institute of Dental Sciences & Research, Amritsar, Punjab, India, ⁶Professor and Head, Department of Oral Pathology, SGRD Institute of Dental Sciences & Research, Amritsar, Punjab, India

ABSTRACT:

Introduction: In post menopausal women, the main concern to the dental professional is mainly oral dryness and altered taste. The sense of taste can have drastic impact on the quality of life. So, the purpose of this study was to compare the gustatory functional level and xerostomia score levels in post menopausal women as compared to pre menopausal and age matched men group. **Material and Methods:** The present clinical study consisted of Group 1 which included 25 postmenopausal women aged between 45 – 75 years, Group 2 which included 25 postmenopausal age matched men aged between 45 – 75 years and Control group which included 25 premenopausal women aged between 25 – 45 years. The xerostomia scores were assessed on basis of questionnaire on severity of xerostomia and the gustatory function was assessed using taste strips of different tastes at different concentrations. **Results:** There was significant difference in mean values of both xerostomia score, gustatory functional levels between group 1 & 2 and control group. Also there was significant difference between group 1 and group 2 in comparison of gustatory levels. The results also showed negative correlation between XI score and Gustatory levels in postmenopausal women group. **Conclusion:** Gustatory levels are more reduced in postmenopausal women when compared to age matched men group. This is of more concern for the patients as these changes can result in altered life styles not because of age only. As the dentists and gynaecologist are generally the first healthcare professionals for patients with these disorders, so there is an increase role of physicians and gynaecologist to work in coordination for better assessment of the overall health status of individuals.

Keywords: Postmenopause, Oral dryness, gustatory functional level.

Received: 18 January 2018

Revised: 16 February 2018

Accepted: 27 February 2018

Corresponding Author: Dr. Balwinder Singh, Associate Professor, Department of Oral Medicine and Radiology, SGRD Institute of Dental Sciences & Research, Amritsar, Punjab, India.

This article may be cited as: Kaur K, Kaur P, Singh B, Singh K, Kaur K, Narang RS Gustatory Functional Level and Oral Dryness: Impact of Menopause on Women Health. J Adv Med Dent Scie Res 2018;6(5):25-29.

INTRODUCTION

For centuries, people used to believe that the end of menstruation, an event known as menopause, was influenced by the moon. So, the term menopause was coined from the Greek and Latin words for “moon” and “stop.” This is a naturally occurring event of life that all healthy women ultimately experience. It occurs when the ovaries tends to stop producing hormones called estrogens. Thus the drop in the levels of estrogen leads to the end of menstruation cycle. Estrogen is one of those hormones which is known to affect nearly about 300 different tissues of body.¹

This physiological change found to be associated with menopause make women to suffer few but very uncomfortable symptoms which include hot flashes, night sweats and vaginal dryness. Along with the reduced estrogen levels arising from menopause also in concordance with age-related changes considerably increases the risk of developing cardiovascular diseases, bone disorder like osteoporosis, Alzheimer’s disease and certain oral diseases.^{2,3}

The number of oral symptoms in otherwise healthy women was found to be significantly greater in menopausal women at 43% than in premenopausal females at 6%.¹ The major concern to the dental

professional is that this decrease of estrogen levels causes a few oral conditions such as oral dryness, burning mouth syndrome and menopause induced osteoporosis which may lead to loss of alveolar bone height.⁴

. Other less common menopause-associated symptoms includes bad or altered taste, viscous saliva and mucosal disorders.⁴ However there is very little information available concerning taste changes among the postmenopausal women. The taste sensation may not seem that much important but it can lead to harmful impact on the quality of life, nutritional intake, and general state of health for the patient. Taste disorder among adults is very prevalent in many communities and it is considered as the most common oral sensory disorder following the pain. The main concern of taste decline and disturbance in the old is food-anhedonia (inability to experience pleasure) which can cause loss of body weight via decreased calorie and nutrient intake. The prevalence of taste disorder increases with age, and about 40% of those with this disorder are more than 65 years of age.^{5,6}

The influence of menopause on severity of oral dryness and taste disturbances will be studied in this study along with effect of age. So, the purpose of this study will be to compare the gustatory functional level and xerostomia score in between premenopausal women, post menopausal women and in age matched men group.

MATERIALS AND METHODOLOGY

The study was undertaken to compare the gustatory functional level and severity of oral dryness (xerostomia score-XI) in between premenopausal women, post menopausal women and in age matched men group. It was conducted in the department of Oral Medicine and Radiology of SGRD Institute of Dental Sciences n Research in unison with the Department of Gynaecology, Civil Hospital Sri Amritsar. Approval was taken from the Institutional Ethical Committee and also a written informed consent was obtained. The present clinical study consisted of Group 1 which included 25 postmenopausal women aged between 45 – 75 years, Group 2 which included 25 postmenopausal age matched men and Group 3- Control group which included 25 premenopausal women aged between 25 – 45 years. Written informed consent was obtained and the participants were subjected to a detailed case history. Inclusion criterion consisted of those postmenopausal women in whom a menstrual cycle had not occurred for at least 24 months. They were not on any kind of medication, no drug allergy and free of any systemic disease. Patients with systemic diseases such as Sjogren's syndrome, oral candidiasis, etc and patients with poor oral hygiene and periodontitis were excluded from this study.

A questionnaire comprising of 10 questions was prepared with list of symptoms related to xerostomia (Table1).⁷ Participants who affirmatively answered to at least three of these questions were included in the Group 1 and Group 2. Participants who did not answer to any of these questions formed the control group of 25 premenopausal women. Each participant was then given another questionnaire so that the severity of xerostomia could be

assessed (Table 2).⁸ The Xerostomia Inventory (XI) score was determined as the severity of dry mouth feeling. The scores of responses were added to provide a XI score for each individual. The minimum possible score was 11 and the maximum possible score was 55 for each individual.

Whole stimulated saliva was collected under resting condition in a quiet room between 10 am and 12 pm at least 3 hours after last intake of food or drink. The patients were asked to chew a standard 1 gm piece of paraffin wax. After 1 minute of chewing, saliva was collected for the next 5 minutes. The patients were asked to expectorate whole saliva into a labelled sterile plastic container. The Salivary flow rate was measured and the pH of the saliva was analysed with pH meter.

The gustatory function was assessed using taste strips. The subject was given filter-paper impregnated with four of the basic taste qualities sweet, sour, bitter, or salty flavouring. The strips contained the four tastes in four different concentration levels. The taste strips were presented with increasing concentration in a randomized order. The participant tasted the strip and they identified the type of taste the strip elicited, thus giving a measure of recognition threshold for bitter sweet, sour, and salty taste. One point was awarded for every right judgement of taste and hence giving a final taste score maximum 16 points.⁹

STATISTICAL ANALYSIS

The data collected was first visualized to confirm their normal distribution. The resulting data was analyzed using SPSS version 16 and Epi-Info 6.04 d software. Following this, descriptive statistics including the mean values and standard deviations were calculated for each variable. One way ANOVA with post-hoc Scheffe test were used to determine whether a significant difference exists between means of observations. The Pearson correlation was used to check whether correlation existed between XI score and the gustatory score. $p < 0.05$ was considered statistically significant

RESULTS

The mean ages of both the group 1 and group 2 were non significant with p value more than .05 as shown. But there was significant difference present when the ages of group 3 -premenopausal group and the premenopausal group 1 & group 2 were compared.

The mean salivary pH in the group 3- premenopausal group was found to be 7.19 and the mean salivary pH in group 1 and 2 was 6.41 and 6.76 respectively. There was significant difference ($p < 0.001$) present when mean salivary pH of premenopausal women was compared with the group 1 & 2. However no significant difference was observed when the group 1 and group 2 were compared among each other. (Table 3)

The mean value of XI scores in group 3- premenopausal group was 12.5. The XI score was 30.24 and 25.64 in group 1 and group 2 respectively. When the means of XI scores were analyzed, there was significant difference between group 3- premenopausal group and group 1 & 2. The XI score in group 1 was higher as

compared to group 2 but the difference was not statistically significant. (Table 3)

The Gustatory functional level value was 12.64 in group 3 - premenopausal group, 9.16 in group 1 and 10.6 in group 2. There was significant difference ($p < 0.001$) present when means of gustatory functional level value in premenopausal women was compared with the group 1 & 2. (Table 3) However, there was also significant difference present when group 1 and group 2 were compared to each other signifying that gustatory levels

were more significantly reduced in postmenopausal women group when compared to age matched men group.

Correlation tests were performed to see if any correlation existed between the variable of the study, the only significant correlation was found to be the negative correlation between XI score and gustatory levels in post menopausal women. The more the XI score, more reduced were the gustatory levels in postmenopausal women group. (Table 4)

Table 1: Questionnaire used for selection of subjects with xerostomia

| | |
|---|-----|
| 1. Does your mouth feel dry when eating a meal? | Y/N |
| 2. Do you have difficulties swallowing any foods? | Y/N |
| 3. Do you need to sip liquids to aid in swallowing dry foods? | Y/N |
| 4. Does the amount of saliva seem to be reduced in your mouth most of the time? | Y/N |
| 5. Does your mouth feel dry at night or on awakening? | Y/N |
| 6. Does your mouth feel dry during the day time? | Y/N |
| 7. Do you use gum or candy to relieve oral dryness? | Y/N |
| 8. Do you usually wake up thirsty at night? | Y/N |
| 9. Do you have problems in tasting food? | Y/N |
| 10. Does your tongue burn? | Y/N |

Table 2: The xerostomia inventory (severity of oral dryness)

1. I sip liquids to help swallow food.
2. My mouth feels dry when eating a meal.
3. I get up at night to drink.
4. My mouth feels dry.
5. I have difficulty in eating dry foods.
6. I suck sweets or cough lollies to relieve dry mouth.
7. I have difficulties swallowing certain foods.
8. The skin of my face feels dry.
9. My eyes feel dry.
10. My lips feel dry.
11. The inside of my nose feels dry.

Response options: Never (scoring 1), Hardly (2), Occasionally (3), Fairly often (4), Very often (5)

Table 3: Comparing means of salivary pH value, XI Score, Gustatory level in between the groups.

| Variables | Group A- Women Postmenopausal | Group B- Men Postmenopausal | Group C- Women premenopausal | Group A vs Group B | Group B vs Group C | Group C vs Group A |
|-----------------|-------------------------------|-----------------------------|------------------------------|--------------------|--------------------|--------------------|
| pH value | 6.42 ±0.24 | 6.76 ±0.21 | 7.19 ±0.12 | <.001** | <.001** | <.001** |
| XI score | 30.24 ± 4.06 | 26.64 ± 3.89 | 12.48 ± 1.92 | .079 | <.001** | <.001** |
| Gustatory Score | 9.16 ± 1.40 | 10.60 ± 0.96 | 12.64 ± 0.95 | <.001** | <.001** | <.001** |

Table 4: Correlation levels among the variables between the groups.

| Group | Variable | Saliva pH | XI Score | Gustatory Score |
|------------------------------------|-----------|-----------|-----------|--------------------|
| Group C Premenopausal women | Saliva | - | r =0.026 | r = -0.148 |
| | | | p = 0.903 | p = 0.479 |
| | XI score | | - | r = -0.107 |
| | | | | p = 0.611 |
| Group A Postmenopausal women | Saliva | - | r =0.215 | r = -0.051 |
| | | | p = 0.303 | p = 0.809 |
| | XI Score | - | | r = -0.591 |
| | | | | p = 0.002** |
| Group B Postmenopausal Men | Saliva pH | - | r =0.013 | r = 0.037 |
| | | | p=0.952 | p = 0.859 |
| | XI Score | - | | r = -0.376 |
| | | | | p = 0.064 |

DISCUSSION

Oral dryness, burning mouth, gustatory dysfunction is an increasingly common problem in the aging population. The patients with gustatory dysfunctions accounts for around 8% of patients complaining of smell and taste disorders and is the second most common disorder following pain in aging population.^{10,11} This taste disorder includes patients with both qualitative and quantitative taste disorders. The proportion of reduced gustatory patients among these accounts for very small number of taste disorder patients.

Several studies have found that smell and taste function deteriorates with age.^{12,13} So that's why in this study due to the high age of the patients, the age matched men had to be considered along with postmenopausal group, to rule out any difference due to age.

In our study, the severity of oral dryness (XI Score) was more in the postmenopausal women and age matched men group in comparison to the premenopausal women. Moreover the reduction was more significant in post menopausal women as compared to age matched men group which signifies that menopause induces more changes in addition to aging. These complaints might be due to hormonal alterations taking place at menopause causing changes in autonomic systems like vasomotor, neurological, and psychological aspect.^{14,15,16}

The oral dryness not only affects the salivary flow but also leave its impact on the composition of saliva. The salivary pH was found to be lower in postmenopausal women and age matched men group. This result is similar to the results of most studies conducted¹⁶⁻²⁰ However the results disagree with the results of Yalçın et al.²¹

These changes could be due to undetermined quantitative and qualitative changes in the salivary composition, an unbalance between the various salivary glands, or changes in the mucosal sensory receptors as estrogen receptors have been found in oral cavity. Leimola-Virtanen et al.²² concluded that the composition of saliva in menopausal women is estrogen dependent. He also stated that hormone replacement therapy reduced oral dryness resulting in improved oral well being. Wardrop et al. and Forabosco et al. also reported that menopausal women with oral discomfort were relieved of symptoms after systemic hormone replacement therapy.^{23,24}

The values obtained in the post menopausal group in our study were very near to critical pH value suggesting the probability for demineralization and increased caries. Studies have also salivary pH is a significant correlate of plasma adiponectin levels in women. Plasma adiponectin is an indicator of the pro-inflammatory cardiometabolic risk profile associated with obesity and type 2 diabetes.²⁵

In this study, there were no significant differences in age between in patients with postmenopausal women and age matched men groups. So if any differences found in taste would therefore presumably be due to the patients' condition which in this study was menopause or fall in estrogen level. The

gustatory levels were more significantly reduced in postmenopausal women in this study as compared to age matched men group. So it seems that fall in estrogen also plays role in reduced taste levels in postmenopausal women.

The studies are in concordance with the studies of Saluja et al²⁶ and Delilbasi et al²⁷ who have reported in their studies that there was significantly reduced intensity of taste perception for sweet and reduced mean total intensity rating in post menopausal women.

Several studies have observed that patients suffering from smell or taste disorder have a reduced quality of life, and may report depression due to their problem.¹² The reduction of taste perceptions often results in willingness to intake more salt and sugar in diet which may lead to dangerous health status in elderly' life.^{27,28} So it becomes enigma for patients which cause food to be tasteless and results in disorder in eating, nutrition and quality of life.

This study addressed the question that XI score and gustatory functional level were more significantly reduced in postmenopausal women as compared to age matched men group suggesting that these postmenopausal women needs more special care as they are more vulnerable to oral discomforts and should seek regular dental evaluation for prevention and early management of oral disorders. These results were also in concordance with Cowart et al.²⁹ who found that old people over 65 years reported phantogeusia and the reduction of taste significantly more than young and middle-aged patients. The negative correlation between XI score and gustatory levels in postmenopausal women further signifies that oral dryness severity can result in more reduced gustatory levels. The reduction of taste performance after menopause not only is important to enjoy eating food, but also directly influences food consumption and consequently nutritional status. This alteration in taste levels can further lead to altered eating habits and dangerous life styles. This study is the first study to best of my knowledge that correlates the xerostomia severity level with gustatory function levels.

Research on interventions, signs and symptoms of the oral cavity, treatments for diseases with differing prevalence in post menopausal women should be considered a priority in women's health research.

To the best of our knowledge, there has been no research on the taste changes among postmenopausal women and young women and its comparison with men of the same age in population of North India. However, there were some limitations in the present study as it was a cross-sectional study and not a longitudinal study which might have shown different results.

CONCLUSION

In postmenopausal women, there is increased incidence of oral dryness and more reduced gustatory function levels as compared to age matched men highlighting that these changes can result in altered life styles not because of age only. As the dentists and gynaecologist are generally the first healthcare professionals for patients

with these disorders, so there is an increase role of dentists and gynaecologist coordination in assessing the overall health status of these individuals because oral health can prove as an indicator of general health.

REFERENCES

1. Frutos R, Rodríguez S, Miralles-Jorda L, Machuca G. Oral manifestations and dental treatment in menopause. *Med Oral* 2002; 7:31-5.
2. S. Palacios, V. W. Henderson, N. Siseles, D. Tan, P. Villaseca. Age of menopause and impact of climacteric symptoms by geographical region. *Climacteric* 2010; 13:419-42.
3. Brunner RL, Aragaki A, Barnabei V, Cochrane BB, Gass M, Hendrix S. Menopausal symptom experience before and after stopping estrogen therapy in the Women's Health Initiative randomized, placebo-controlled trial. *Menopause* 2010; 17(5):946-54.
4. Borhan Mojabi K, Esfahani M, Jahani Hashemi H. Evaluation of Unstimulated Salivary Flow Rate and Oral symptoms in Menopausal Women. *Journal of Dentistry* 2007; 4(3).
5. Boyce JM, Shone GR. Effects of ageing on smell and taste. *Postgraduate Medical Journal*. 2006;82(966):239.
6. Glanville EV, Kaplan AR, Fischer R. Age, sex and taste sensitivity. *Journal of Gerontology*. 1964;19(4):474-8.
7. Torres SR, Peixoto CB, Caldas DM, Silva EB, Akiti T, Nucci M, et al. Relationship between salivary flow rates and Candida counts in subjects with xerostomia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;93:149-54.
8. Thomson WM, Williams SM. Further testing of the xerostomia inventory. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;89:46-50.
9. Mueller C, Kallert S, Renner B, Stiassny K, Temmel A, Hummel T, et al. Quantitative assessment of gustatory function in a clinical context using impregnated" taste strips". *Rhinology*. 2003;41(1):2-6.
10. Hummel T, Genow A, Landis BN. Clinical assessment of human gustatory function using event related potentials. *Journal of Neurology, Neurosurgery & Psychiatry*. 2010;81(4):459-64.
11. Kalantari et al. Evaluation of gustatory and olfactory function among premenopausal and postmenopausal women and men. *J Oral Health Oral Epidemiol* 2017; 6(2): 76-84.
12. Boyce JM, Shone GR. Effects of ageing on smell and taste. *Postgraduate Medical Journal*. 2006;82(966):239.
13. Pavlidis P, Gouveris H, Anogeianaki A, Koutsonikolas D, Anogianakis G, Kekes G. Age-related changes in electrogustometry thresholds, tongue tip vascularization, density, and form of the fungiform papillae in humans. *Chemical senses*. 2013;38(1):35-43.
14. Ben Aryeh H, Gottlieb I, Ish-Shalom S, David A, Szargel H, Laufer D. Oral complaints related to menopause. *Maturitas*. 1996;24(3):185-9.
15. Singh B et al Evaluation of serum calcium and serum parathyroid levels in postmenopausal women with and without oral dryness. *Gerodontology* 2017 Jun;33(2) : 240-6.
16. Singh B et al Evaluation of salivary calcium and salivary parathyroid levels in postmenopausal women with and without oral dryness. *Contemporary Clinical Dentistry | Oct-Dec 2013; 4(4):488-492.*
17. Agha-Hosseini F, Mirzaii-Dizgah, Moghaddam P, Akrad ZT. Stimulated whole salivary flow rate and composition in menopausal women with oral dryness feeling. *Oral Diseases* 2007;13:320-323.
18. Agha-Hosseini F, Mirzaii- Dizgah I, Mansourian A, Zabih- Akhtechi G. Serum and stimulated whole saliva parathyroid hormone in menopausal women with oral dry feeling. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;107:806-10.
19. Singh R, Pallagatti S, Sheikh S, Singh B, Arora G, Aggarwal A. Correlation of serum oestrogen with salivary calcium in post menopausal women with and without oral dryness feeling. *Gerodontology* 2012;29:125-9.
20. Iraj Mirzaii-Dizgah, Farzaneh Agha-Hosseini. Stimulated and unstimulated saliva progesterone in menopausal women with oral dryness feeling. *Clin Oral Investig* 2011 dec;15(6):859-62.
21. Yalcin F, Gurgan S, Gurgan T. The effect of menopause, hormone replacement therapy (HRT), alendronate (ALN), and calcium supplements on saliva. *J Contemp Dent Pract* 2005; 6: 10-17
22. Leimola- Virtanen R, Helenius H, Laine M. Hormone replacement therapy and some salivary antimicrobial factors in post and perimenopausal women. *Maturitas* 1997;27:145- 51
23. Wardrop RW, Hailes J, Burger H, Reade PC. Oral discomfort at menopause. *Oral Surg Oral Med Oral Pathol* 1989;67:535-40.
24. Forabosco A, Criscuolo M, Coukos G, Uccelli E, Weinstein R, Spinato S, et al. Efficacy of hormone replacement therapy in postmenopausal women with oral discomfort. *Oral Surg Oral Med Oral Pathol* 1992;73:570-4
25. Tremblay M, Loucif Y, Methot J, Brisson D, Gaudet D. Salivary pH as a marker of plasma adiponectin concentration in women. *Diabetol Metab Syndr*. 2012;4:4.
26. Saluja P et al. Salivary Flow Rate, Ph and Gustatory Function in Women *Journal of Clinical and Diagnostic Research*. 2014 Oct, Vol-8(10): ZC81-ZC85
27. Delilbasi C, Cehiz T, Akal UK, Yilmaz T. Evaluation of gustatory function in postmenopausal women. *Brit Dent J*. 2003;194:447-49.
28. Delibaci C, Cehiz T, Akal UK, Yilmaz T. Evaluation of some factors affecting taste perception in elderly people. *Oral health and dental management in the black countries*. 2003;4:29-35.
29. Cowart BJ, Yokomukai Y, Beauchamp GK. Bitter taste in aging: Compound-specific decline in sensitivity. *Physiol Behav* 1994; 56(6): 1237-41

Source of support: Nil

Conflict of interest: None declared

This work is licensed under CC BY: **Creative Commons Attribution 3.0 License**.