

# Dry Mouth for Older Patients- Problems and Treatments - A Survey among Dental Undergraduates

Kandhal Yazhini<sup>1</sup>, Keerthi Sasanka<sup>2</sup>, Yuvaraj Babu K<sup>3</sup>, Visalakshi Ramanadha<sup>4</sup>, Dhanraj Ganapathy<sup>5</sup>

<sup>1</sup>Research Associate, Dental Research Cell, <sup>2</sup>Senior Lecturer, Department of Prosthodontics, <sup>3</sup>Assistant Professor, Department of Anatomy, <sup>4</sup>Senior Lecturer, Department of Prosthodontics, <sup>5</sup>Professor and Head, Department of Prosthodontics, Saveetha Dental College & Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

## Abstract

Dry mouth is a common complication faced by elderly people. It causes weakness and discomfort. Dry mouth is responsible for significant oropharyngeal disorder and pain which in turn leads to impaired quantity of lifestyle. Hyposalivation may cause dry mouth. The reasons for dry mouth may vary. Survey was conducted online. Questionnaire which consisted of 10 questions related to the present survey was prepared and distributed through google forms. Study population consists of 100 dental undergraduates. Data were collected and statistically analysed. This created an awareness on knowledge about dry mouth, its cause, its problems and treatments for older patients and knowledge about this topic helps the dentist to plan treatments for such patients. This study shows that there is a moderate to high level of knowledge on this topic among dental undergraduates. It is important for dental students to be aware about this topic, so that better diagnosis plans and relevant treatments can be done. Majority of the population are aware that dry mouth is a common condition among older patients and may cause weakness and discomfort.

**Keywords:** Dry mouth, problems and treatments for dry mouth, causes of dry mouth, disorders of dry mouth, elderly patients

## Introduction

Saliva is an opalescent slimy fluid containing 99% water and 1% dissolved solids. The significant organic solutes in the saliva are mucin, a glycoprotein which serves as a lubricant and the enzyme ptyalin (salivary  $\alpha$ -amylase) that initiates the digestion of starch. Saliva maintains oral homeostasis <sup>1</sup>. Hyposalivation leads to dry mouth. Dry mouth is a common complication faced by elderly people. Dry mouth is responsible for significant oropharyngeal disorders and pain which

in turn leads to impaired quantity of lifestyle. The reasons for dry mouth may vary <sup>2</sup>. Reduced saliva flow or change in biochemical composition of saliva are the common reasons for dry mouth<sup>3</sup>. The other reasons are local salivary disorder, plethora of medication and medical condition <sup>4</sup>. Treatments for dry mouth have to be designed according to the cause. Patients with dry mouth suffer from problems like difficulty in chewing, swallowing and speaking. Older people are more prone to dry mouth because they suffer from other ailments and take more medications which may lead to dry mouth <sup>5</sup>. Patients who are suffering from dry mouth and also wearing complete dentures usually have many complications like pain and discomfort, difficulties in normal functions, cracking at corners of mouth, burning sensation of tongue, alteration in taste, failure of denture retention.

Persistent dry mouth will lead to significant and permanent oral and pharyngeal disorders <sup>6</sup>. Dry mouth

---

## Corresponding Author

**Dr. Keerthi Sasanka**

Senior Lecturer, Department of Prosthodontics,  
Saveetha Dental College & Hospitals, Saveetha  
Institute of Medical and Technical Sciences, Saveetha  
University, Chennai, India

Phone:+91 83746 91106

Email:keerthis.sdc@saveetha.com

may also occur due to stroke, diabetes, thrush in mouth and autoimmune diseases. Snoring and breathing while keeping the mouth open also results in dry mouth. Smith et al., have examined the difference in decreased saliva flow rate among 3 different age groups<sup>7</sup>. Lin et al., have done an epidemiologic study and concluded that the female patients have higher prevalence for dry mouth than males<sup>8</sup>. Ship et al., in their study observed that prevalence of xerostomia increases with age and estimated that about 30% of the patients are in the 65 years or older age group<sup>9</sup>. Fox et al., in their study, pronounced that sjogren syndrome also leads to dry mouth in elderly<sup>10</sup>. Van der reijden et al., in their study, list out the treatment methodologies for oral dryness and related complaints in sjogren syndrome<sup>11</sup>. Furness et al., observe that there is no strong evidence for effectiveness of topical therapies in dry mouth<sup>12</sup>. Jacqueline et al., stipulate that initial evaluation of patients with dry mouth is essential for providing better treatment and also in preventing oral diseases<sup>13</sup>. Not drinking enough fluids, sleeping with your mouth open, dry hot weather, eating dry food etc are some of the reasons for dry mouth<sup>14</sup>. These lead to many periodontal problems like dental caries leading to discomfort difficulties in normal functions of oral cavity.

Dry mouth is a common condition among older people which leads to weakness and discomfort. It is important for dental students to be aware of this affliction so that better diagnosis and plan relevant treatment can be given<sup>15</sup>. Previous research articles predominantly focus only on medications as treatment for dry mouth<sup>16</sup> and not on the alternative therapies. But home treatment

and minor lifestyle alterations may also help to relieve symptoms of dry mouth. Some are frequent water intake, using ice chips while feeling dry in the mouth and restriction to sugar free items. Aim of this survey is to analyse the knowledge among dental undergraduates on dry mouth in older patients, its problem and treatments.

## **Materials and Methods**

### **Study design, area and study population:**

A survey was conducted among dental undergraduates. The sampling from this survey is about 100. Participants aged 17-25 are considered. Participants in this survey are volunteers and no incentives were provided to the participants. The survey was conducted in the month of april, 2020.

### **Survey instruments:**

A questionnaire was prepared after extensive review and amendments were made to improve clarity of the questions and eliminate ambiguous responses. The survey instrument was a structured questionnaire with both open and close ended questions. 10 questions were prepared related to the present survey and were circulated to the participants via google forms.

## **Data Analysis**

Only completely filled online forms were included in the study, the filled responses were verified by two reviewers and the collected data was entered on the same day. The entered data were analysed using SPSS statistics<sup>19</sup>. Descriptive analysis was performed to calculate frequencies of categorical variables.<sup>17-21</sup>

### Results and Discussions

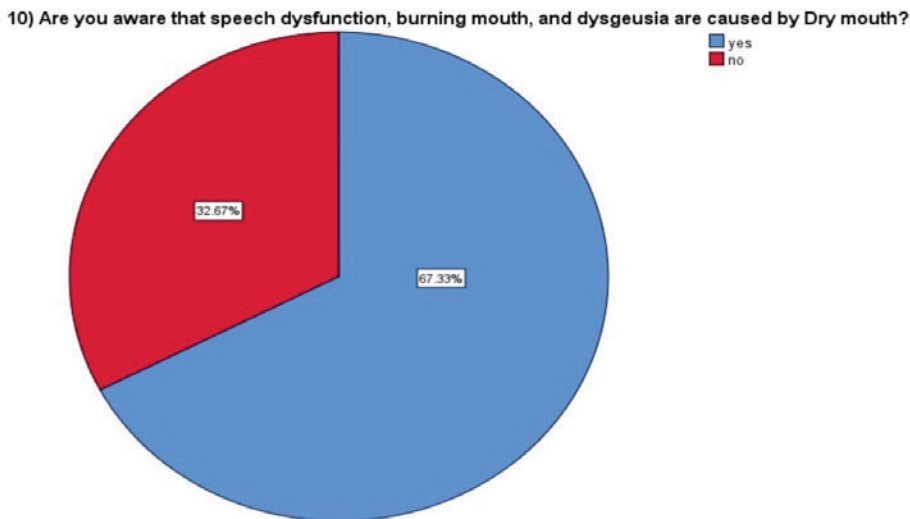


Figure 10: The pie chart depicts awareness on the symptoms of dry mouth Majority (67.33%,blue) were aware and few (32.67%,red) weren't aware

Figure 1: The pie chart depicts awareness on the symptoms of dry mouth. Majority, 67.33% (blue) were aware and around 32.67% (red) weren't aware.

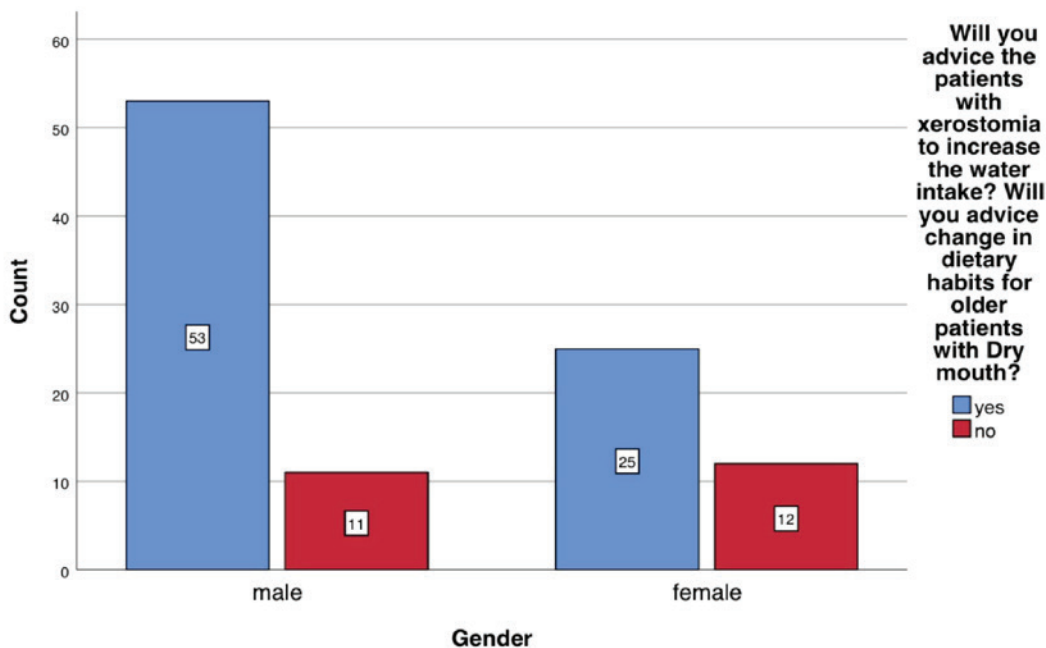
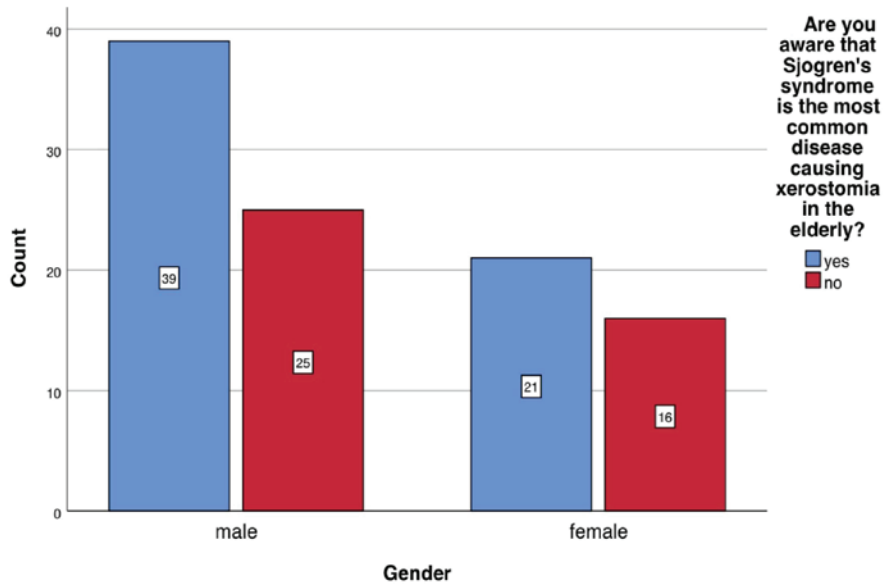
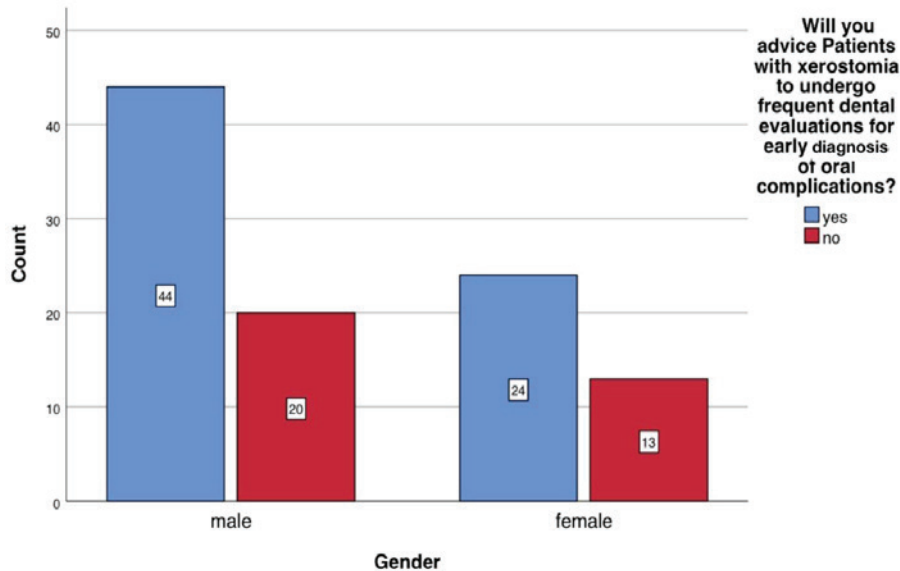


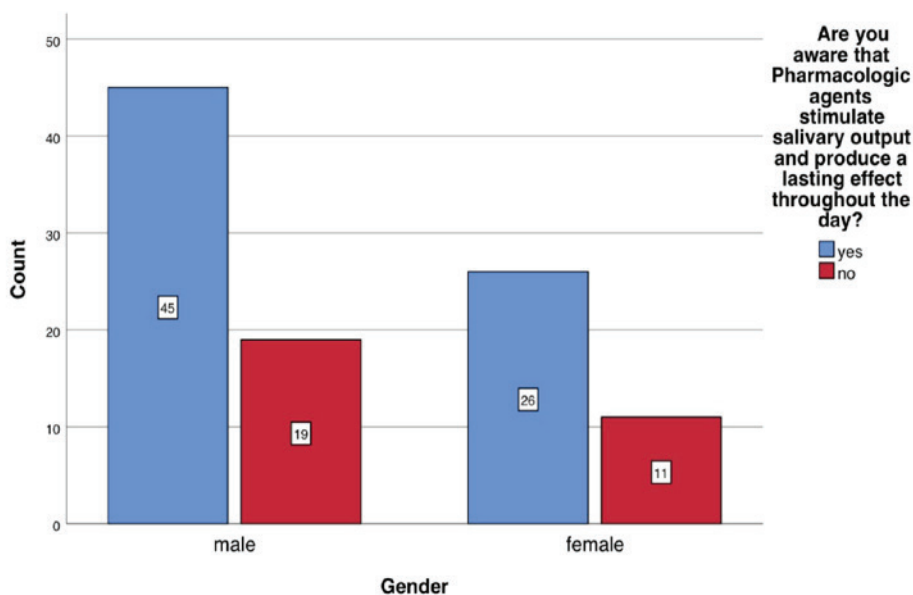
Figure 2: Bar graph representing association between gender and opinion of dental students on advising to change dietary habits in xerostomia patients. X axis represents gender and Y axis represents the number of participants' opinion on advising to change dietary habits in xerostomia patients. 78 participants felt that it is necessary to change dietary habits for xerostomia patients. Out of 78 participants, 53 participants were male and 25 participants were female. There is no significant difference in opinion between male and females. Chi square value- 3.098, df- 1, p value= 0.078 (>0.05). Hence statistically not significant.



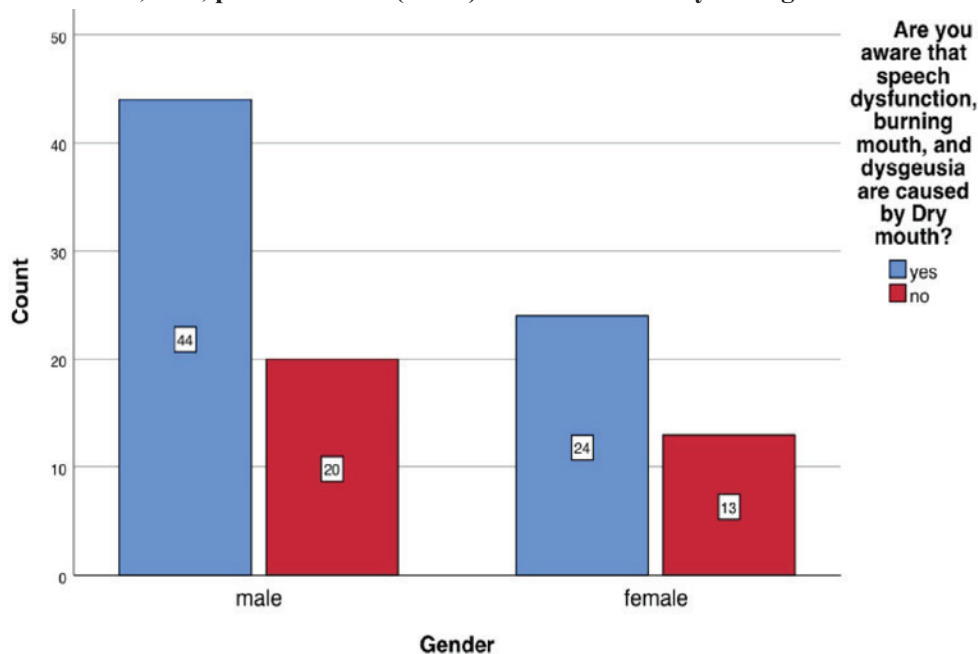
**Figure 3:** Bar graph representing association between gender and awareness of sjogren’s syndrome as a causative agent of xerostomia in elderly. The X-axis represents gender and the Y axis represents the number of participants aware of sjogren’s syndrome as a causative agent of xerostomia in elderly. Out of 60 participants who were aware that sjogren syndrome is the most common disease which causes xerostomia in elderly, 39 participants were male and 21 participants were female. There is no significant difference in awareness between male and females. Chi square value- 0.170, df-1, p value=0.680 (>0.05). Hence statistically not significant.



**Figure 4:** Bar graph representing association between gender and opinion of dental undergraduates on advising frequent dental evaluation for xerostomia patients. X axis represents gender and Y axis represents number of participants’ opinion on advising frequent dental evaluation for xerostomia patients. 64 participants felt that it is necessary to advise xerostomia patients to undergo frequent dental evaluation for early diagnosis of oral complications, in which 44 participants were male and 24 participants were female. There is no significant difference in opinion between male and female. Chi square value-0.161,df-1, p value= 0.688 (>0.05). Hence statistically not significant.



**Figure 5:** Bar graph representing association between gender and effect of pharmacologic agents in stimulating salivary output. X axis represents gender and Y axis represents the number of participants aware of the effect of pharmacologic agents in stimulating salivary output. Out of 71 participants who were aware that pharmacological agents stimulate salivary output, 45 participants were male and 26 participants were female. There is no significant difference in awareness between male and female. Chi square value- 0.903,df- 1, p value= 0.966 (>0.05). Hence statistically not significant.



**Figure 6:** Bar graph representing association between gender and awareness on the symptoms of dry mouth. X axis represents gender and Y axis represents the number of participants aware of the symptoms of dry mouth. Out of 68 participants who were aware that dry mouth causes speech dysfunction, burning mouth, and dysgeusia, 44 participants were male and 24 participants were female. There is no significant difference in awareness between male and female. Chi square value- 0.161, df- 2, p value= 0.688 (>0.05). Hence statistically not significant.

**Table 1:** Questionnaire regarding the etiology and awareness of oral effects of xerostomia

S.No	Questions	Results in percentage	
		Yes	No
1.	saliva helps maintain a neutral oral pH and provides a reservoir of calcium and phosphate ions to remineralise teeth	72.28%	27.72%
2.	medicine intake by older patients may cause dry mouth	70.30%	29.70%
3.	Candidiasis and mouth sores in older patients may be due to dry mouth	61.39%	38.61%
4.	sjogren syndrome is the common disease causing xerostomia	59.41%	40.59%
5.	awareness about discomfort caused due to dry mouth in elderly patients	86.14%	13.86%
6.	change dietary habits in xerostomia patients	77.23%	22.77
7.	xerostomia patients to undergo frequent dental evaluation for early diagnosis of oral complications	67.33%	32.67%
8.	pharmacologic agents stimulate salivary output & produce a lasting effect throughout the day	70.30%	29.70%
9.	dental instability in CD patients may be due to dry mouth	61.39%	38.61%
10.	speech dysfunction, burning mouth and dysgeusia are caused by dry mouth	67.33%	67.33%

Table 1 shows that, 72.28% of the population were aware that saliva helps maintain a neutral oral pH and provides

a reservoir of calcium and phosphate ions to remineralise teeth whereas 27.72% weren't aware. When asked about whether medicine intake by older patients may cause dry mouth, 70.30% said yes and 29.70% said no. 61.39% said yes that oral infections like candidiasis and mouth sores in older patients may be due to dry mouth but 38.61% didn't agree with this. 59.41% of the population

were aware that sjogren syndrome is the common disease causing xerostomia in the elderly whereas 40.59% aren't. On the question of awareness about discomfort caused due to dry mouth in elderly patients, the majority of the population(86.14%) said yes, they were aware & few (13.86%) said no, they weren't. When asked about the opinion of dental students on advising to change dietary

habits in xerostomia patients. Majority (77.23%) said yes and a minor population (22.77) said no. 67.33% felt that it is necessary for xerostomia patients to undergo frequent dental evaluation for early diagnosis of oral complications but 32.67% of the population didn't feel so. 70.30% were aware that pharmacologic agents stimulate salivary output & produce a lasting effect throughout the day and 29.70% weren't aware. On the question of awareness about whether dental revention and dental instability in CD patients may be due to dry mouth. 61.39% said yes and 38.61% said no. 67.33% of the population is aware that speech dysfunction, burning mouth and dysgeusia are caused by dry mouth. Whereas 32.67% of the population are not aware about this fact. Figure 1 depicts awareness on the symptoms of dry mouth. Majority, 67.33% (blue) were aware and around 32.67% (red) weren't aware. When gender was compared with the opinion of dental students on advising to change dietary habits in xerostomia patients, p value obtained was 0.078 and it was not statistically significant [Figure 2]. When gender was compared with awareness of sjogren's syndrome as a causative agent of xerostomia in elderly, p value obtained was 0.680 and it was not statistically significant [Figure 3]. When gender was compared with the opinion of dental undergraduates on advising frequent dental evaluation for xerostomia patients, p value obtained was 0.688 and it was not statistically significant [Figure 4]. When gender was compared with the effect of pharmacologic agents in stimulating salivary output, p value obtained was 0.966 and it was not statistically significant [Figure 5]. When gender was compared with awareness on the symptoms of dry mouth, p value obtained was 0.688 and it was not statistically significant [Figure 6].

The present research has origins from the team of investigators where previous studies were done based on clinical reports, interventional studies like<sup>22-24</sup>, in vitro studies like<sup>17-19,21</sup>, systematic reviews<sup>22,25-31</sup>. In one of the questions in the survey, the respondents were asked if they were aware of the fact that dry mouth causes extreme discomfort. For this 86.14% of the participants responded in affirmative, that is they are aware. The balance 13.86% were not aware of this fact. Similar query was included in a previous survey conducted by raside et al.,<sup>32</sup> in which majority responded that they were aware. On whether they were aware that in older patients, medicine intake may lead to xerostomia, 70.3%

answered that they were aware and 29.7% replied in negative. In an allied study conducted previously on the risk factors of hypo-salivation and the impacts on xerostomia by Nikeandees et al., 2017 70.5% of the population responded that they are aware of the impact of medicines in causing xerostomia in older patients<sup>33</sup>. On the awareness that dry mouth can lead to oral infections like mouth sore, candidiasis in older patients, 61.39% of the participants consented and 38.61% replied that they were not aware. Interestingly, during an analogous survey conducted by Jannan et al., 2016 it was found that only 45.2% knew this fact<sup>34</sup>. In the survey, the participants were also asked if they were aware that sjogren syndrome is the common ailment that causes xerostomia, 76% replied that they were aware. This awareness figure is considerably higher than a survey conducted by Abdelghany et al., 2011 in which only about 59.41% acknowledged this<sup>35</sup>.

A few limitations that can be seen in the research is that the sample size (100 participate) is minimum, so the results may vary with other research. The study may not be too accurate and also this research is just a sample view of reality. It is not very deep.

This study gives different information about dry mouth, its case, its problems and treatment for olders patients. Future, this survey could be extended among different types of population with large sample sizes.

## Conclusion

Dry mouth is a common condition that can be seen among older patients. It causes weakness and discomfort. It is important for dental students to be aware so that better diagnosis plans and relevant treatments can be done. Majority of the population are aware about dry mouth, its problems and treatments among older patients.

**Acknowledgement:** The author would like to thank the study participants for their participation and kind cooperation.

**Conflict of Interest :** The author declares that there was no conflict of interest in the present study.

**Source of Funding:**Self.

**Ethical Clearance:** Not required

## Reference

1. Sreebny LM. Saliva in health and disease: an appraisal and update. *Int Dent J.* 2000 Jun 6;50(3):140–61.
2. Turner MD, Ship JA. Dry Mouth and Its Effects on the Oral Health of Elderly People. *The Journal of the American Dental Association.* 2007 Sep 1;138:S15–20.
3. Han P, Suarez-Durall P, Mulligan R. Dry mouth: a critical topic for older adult patients. *J Prosthodont Res.* 2015;59(1):6–19.
4. Gupta A, Epstein JB, Sroussi H. Hyposalivation in elderly patients. *J Can Dent Assoc [Internet].* 2006;72(9). Available from: <http://www.cda-adc.ca/JCDA/vol-72/issue-9/841.pdf>
5. Aktaş A, Ozbek M, Tumer C, Tasar F. Xerostomia in elderly population. 2010; Available from: <https://avesis.hacettepe.edu.tr/yayin/6d9c671f-1c6b-4265-b64a-394b7d895f2a/xerostomia-in-elderly-population>
6. Yoshikawa M, Yoshida M, Nagasaki T, Tanimoto K, Tsuga K, Akagawa Y, et al. Aspects of Swallowing in Healthy Dentate Elderly Persons Older Than 80 Years [Internet]. Vol. 60, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences.* 2005. p. 506–9. Available from: <http://dx.doi.org/10.1093/gerona/60.4.506>
7. Smith CH, Boland B, Daureeawoo Y, Donaldson E, Small K, Tuomainen J. Effect of Aging on Stimulated Salivary Flow in Adults. *J Am Geriatr Soc.* 2013 May 25;61(5):805–8.
8. Liu B, Dion MR, Jurasic MM, Gibson G, Jones JA. Xerostomia and salivary hypofunction in vulnerable elders: prevalence and etiology. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2012 Jul 1;114(1):52–60.
9. Ship JA, Fox PC, Baum BJ. How Much Saliva is Enough? *The Journal of the American Dental Association.* 1991 Mar 1;122(3):63–9.
10. Fox PC, Busch KA, Baum BJ. Subjective reports of xerostomia and objective measures of salivary gland performance. *The Journal of the American Dental Association.* 1987 Oct 1;115(4):581–4.
11. van der Putten G-J, de Baat C, De Visschere L, Schols J. Poor oral health, a potential new geriatric syndrome. *Gerodontology.* 2014 Feb 21;31:17–24.
12. Bryan G, Furness S, Birchenough S, McMillan R, Worthington HV. Interventions for the management of dry mouth: non-pharmacological interventions [Internet]. *Cochrane Database of Systematic Reviews.* 2012. Available from: <http://dx.doi.org/10.1002/14651858.cd009603>
13. Plemons JM, Al-Hashimi I, Marek CL. Managing xerostomia and salivary gland hypofunction [Internet]. Vol. 145, *The Journal of the American Dental Association.* 2014. p. 867–73. Available from: <http://dx.doi.org/10.14219/jada.2014.44>
14. Madinier I, Starita-Geribaldi M, Berthier F, Pesci-Bardon C, Brocker P. Detection of Mild Hyposalivation in Elderly People Based on the Chewing Time of Specifically Designed Disc Tests: Diagnostic Accuracy [Internet]. Vol. 57, *Journal of the American Geriatrics Society.* 2009. p. 691–6. Available from: <http://dx.doi.org/10.1111/j.1532-5415.2009.02179.x>
15. Schein OD, Hochberg MC, Muñoz B, Tielsch JM, Bandeen-Roche K, Provost T, et al. Dry Eye and Dry Mouth in the Elderly: A Population-Based Assessment. *Arch Intern Med.* 1999 Jun 28;159(12):1359–63.
16. Murray Thomson W. Epidemiology of oral health conditions in older people. *Gerodontology.* 2014 Feb 21;31:9–16.
17. Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprakasam A. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant–Abutment Interface, With Original and Nonoriginal Abutments. *Implant Dent.* 2019 Jun;28(3):289.
18. Ganapathy D, Sathyamoorthy A, Ranganathan H, Murthykumar K. Effect of resin bonded luting agents influencing marginal discrepancy in all ceramic complete veneer crowns. *J Clin Diagn Res.* 2016;10(12):ZC67.
19. Jain A, Ranganathan H, Ganapathy D. Cervical and incisal marginal discrepancy in ceramic laminate veneering materials: A SEM analysis [Internet]. Vol. 8, *Contemporary Clinical Dentistry.* 2017. p. 272. Available from: [http://dx.doi.org/10.4103/ccd.ccd\\_156\\_17](http://dx.doi.org/10.4103/ccd.ccd_156_17)



20. Ashok V, Suvitha S. Awareness of all ceramic restoration in rural population. *Research Journal of Pharmacy and Technology*. 2016;9(10):1691–3.
21. Ajay R, Suma K, Ali S, Sivakumar JK, Rakshagan V, Devaki V, et al. Effect of surface modifications on the retention of cement-retained implant crowns under fatigue loads: An In vitro study [Internet]. Vol. 9, *Journal of Pharmacy And Bioallied Sciences*. 2017. p. 154. Available from: [http://dx.doi.org/10.4103/jpbs.jpbs\\_146\\_17](http://dx.doi.org/10.4103/jpbs.jpbs_146_17)
22. Ariga P, Nallaswamy D, Jain AR, Ganapathy DM. Determination of Correlation of Width of Maxillary Anterior Teeth using Extraoral and Intraoral Factors in Indian Population: A Systematic Review [Internet]. Vol. 9, *World Journal of Dentistry*. 2018. p. 68–75. Available from: <http://dx.doi.org/10.5005/jp-journals-10015-1509>
23. Ashok V, Nallaswamy D, Benazir Begum S, Nesappan T. Lip Bumper Prosthesis for an Acromegaly Patient: A Clinical Report. *J Indian Prosthodont Soc*. 2014 Dec 1;14(1):279–82.
24. Venugopalan S, Ariga P, Aggarwal P. Case Report: Magnetically retained silicone facial prosthesis. *journal of clinical practice* [Internet]. 2014; Available from: <https://www.ajol.info/index.php/njcp/article/view/102202>
25. Selvan SR, Ganapathy D. Efficacy of fifth generation cephalosporins against methicillin-resistant *Staphylococcus aureus*-A review. *Research Journal of Pharmacy and Technology*. 2016;9(10):1815–8.
26. Subasree S, Murthykumar K, Others. Effect of Aloe Vera in Oral Health-A Review. *Research Journal of Pharmacy and Technology*. 2016;9(5):609–12.
27. Vijayalakshmi B, Ganapathy D. Medical management of cellulitis. *Research Journal of Pharmacy and Technology*. 2016;9(11):2067–70.
28. Ganapathy DM, Kannan A, Venugopalan S. Effect of Coated Surfaces influencing Screw Loosening in Implants: A Systematic Review and Meta-analysis [Internet]. Vol. 8, *World Journal of Dentistry*. 2017. p. 496–502. Available from: <http://dx.doi.org/10.5005/jp-journals-10015-1493>
29. Kannan A, Venugopalan S. A systematic review on the effect of use of impregnated retraction cords on gingiva. *Research Journal of Pharmacy and Technology*. 2018;11(5):2121–6.
30. Jyothi S, Robin PK, Ganapathy D, Others. Periodontal health status of three different groups wearing temporary partial denture. *Research Journal of Pharmacy and Technology*. 2017;10(12):4339–42.
31. Basha FYS, Ganapathy D, Venugopalan S. Oral Hygiene Status among Pregnant Women. *Research Journal of Pharmacy and Technology*. 2018;11(7):3099–102.
32. Rasidi MQZBM, Varma MDA, Others. Knowledge, Attitude and Practice on Hyposalivation in Complete Denture Patients Among Dental Interns in Chennai, India. *Res J Pharm Biol Chem Sci*. 2017;9(2):225.
33. 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* [Internet]. 2017 [cited 2020 Jun 6];31. Available from: [http://www.scielo.br/scielo.php?pid=S1806-83242017000100211&script=sci\\_arttext&tlng=pt](http://www.scielo.br/scielo.php?pid=S1806-83242017000100211&script=sci_arttext&tlng=pt)
34. Ghapanchi J, Rezazadeh F, Fakhraee E, Zamani A. Prevalence of Xerostomia in Patients Referred to Shiraz Dental School, Shiraz, Iran during 2006--2013. *Iran J Public Health*. 2016;45(12):1665.
35. Abdelghany A, Nolan A, Freeman R. Treating patients with dry mouth: general dental practitioners' knowledge, attitudes and clinical management. *Br Dent J*. 2011 Nov 1;211(10):E21–E21.