

# Evaluation of Xerostomia in Different Psychological Disorders: An Observational Study

SURESH KANDAGAL VEERABHADRAPPA<sup>1</sup>, PRAMOD REDDER CHANDRAPPA<sup>2</sup>, SNEHAL PATIL<sup>3</sup>, SEEMA YADAV ROODMAL<sup>4</sup>, AKSHAY KUMARSWAMY<sup>5</sup>, MOUNESH KUMAR CHAPPI<sup>6</sup>

## ABSTRACT

**Introduction:** Psychiatric diseases like anxiety, depression, schizophrenia and bipolar disorders are increasing at an alarming rate. These diseases can affect the quantity and quality of saliva leading to multiple oral diseases. Although many researchers have evaluated xerostomia in general population, its prevalence is not been assessed in patients suffering from different psychological disorders.

**Aim:** To investigate the prevalence of xerostomia and to assess the correlation between xerostomia and dryness of lip and mucosa in different psychological disorders.

**Materials and Methods:** A cross-sectional observational study was conducted over a period of six months in Department of Psychiatry and Department of Oral Medicine. Patients with anxiety, depression, schizophrenia and bipolar disorder, as diagnosed by an experienced psychiatrist, were given a questionnaire to evaluate the xerostomia. Patients with symptoms of xerostomia were subjected to oral examination by a skilled oral diagnostician to check for dryness of lips and mucosa. One hundred patients from each group of psychiatric diseases were included in the study using a consecutive sampling technique. An equal number of healthy individuals reporting

to oral medicine department for routine oral screening were included as control group after initial psychiatric evaluation.

**Results:** In this study statistically significant increase in the xerostomia in psychiatric patients was recorded when compared to the control group ( $p < 0.01$ ). Xerostomia was significantly higher in anxiety patients (51%) followed by depression (47%), bipolar disorder (41%), schizophrenia (39%) and control group (27%). The majority of the psychiatric patients had 'moderate' to 'severe' xerostomia whereas the control group had 'mild' xerostomia. Xerostomia was significantly higher in younger age group (18–49 years) than in older age group and females patients had higher xerostomia than male patients. Psychiatric patients had significantly more dryness of lip and mucosa than healthy controls. A moderate to strong spearman correlation ( $r = 0.72$ ) was observed between xerostomia and psychological alterations.

**Conclusion:** A positive association was established between psychological alterations and xerostomia and dryness of lip and mucosa. Emotional alterations may act as a precipitating factor that could influence the salivary secretion resulting in multiple oral diseases. Psychiatrists can screen for xerostomia and collaborate with dentists for comprehensive management of xerostomia in psychiatric patients.

**Keywords:** Anxiety, Bipolar disorder, Depression, Psychosomatic diseases, Schizophrenia, Saliva

## INTRODUCTION

In the last few decades there has been unprecedented rise in the incidence of psychiatric disorders worldwide which is a major public health problem [1,2]. Psychosomatic disorders are characterized by physical and physiological changes originating partially from emotional factors. Emotional alterations can disturb hormonal, vascular and muscular functions, which may result in physiologic changes causing decreased salivation and dryness of oral mucosa [1-3]. Studies have estimated the prevalence rate of mental disorders in India to be about 65.4/1000 population [4].

Saliva is a complex physiological and biological fluid which maintains homeostasis of the oral cavity and keeps oral mucosa healthy. Decreased salivary secretion is associated with symptoms like halitosis, dysgeusia, dysphagia, burning sensation, difficulty in mastication and speech [5-7]. Failure to recognize these symptoms may affect the oral health and quality of life of psychiatric patients [8,9].

It is difficult to assess xerostomia in contrast to that of hyposalivation, which can be objectively evaluated by using sialometry. Xerostomia is a set of symptoms and a single measurement method cannot reflect every aspect of the patient's situation. Direct questioning is a relatively accurate method which can be used to assess xerostomia; therefore, this study included multiple questionnaires that were concerned with the dry mouth situation [5].

Although various investigators reported the association between xerostomia with certain psychosocial disorders, the exact prevalence was not studied in different group of psychiatric patients [10,11]. The principal aim of the present study was to gather the basic data regarding xerostomia in patients suffering from different psychological disorders in Indian population with different ages and sex.

## MATERIALS AND METHODS

**Patient selection and questionnaire:** The present observational study was conducted over a period of six months from March 2015 to August 2015 in Department of Psychiatry and Department of Oral Medicine, Yenepoya University, Managlore, Karnataka, India. Consecutive patients reporting to the psychiatry department and diagnosed with anxiety, depression, bipolar disorders and schizophrenia by an experienced psychiatrist were administered a valid and reliable questionnaire for assessment of xerostomia [5]. This questionnaire was developed by Dyananoor S et al., to assess the severity of xerostomia and consisted of six questions with dichotomous response as yes or no [5]. Based on the answers to the questions the study population was classified as mild, moderate or severe xerostomia. The criteria for assessing the severity of the xerostomia are presented in [Table/Fig-1] [5].

Ethical clearance was obtained from the Institutional Ethics Committee prior to the initiation of the study. Written informed

1.	Do you feel your mouth is dry?	Mild Xerostomia
2.	Do you sip liquids to aid in swallowing dry food?	
3.	Do you feel thirsty very frequently?	Moderate Xerostomia
4.	Do you have difficulties swallowing any food?	
5.	Does your mouth feel dry throughout the day?	Severe Xerostomia

**[Table/Fig-1]:** Modified questionnaire for assessment of xerostomia [5].

consent was taken from all the enrolled patients. A detailed case history was taken; the associated oral symptoms and clinical signs were recorded.

Pilot study was conducted on 50 randomly selected participants, to assess the validity (face, content) and reliability of the questionnaire. The reliability was assessed by measuring Cronbach's alpha. Test-retest reliability was calculated using Intra-class Correlation Coefficient (ICC). The validity was assessed by correlating all questions with each other.

Subjects who answered affirmatively to at least one of the questions were recorded as having oral dryness. These patients were subjected to complete oral examination by a skilled oral diagnostician to check for dryness of lip and mucosa. Depending on the severity of the symptoms, xerostomia subjects were classified into mild, moderate and severe. One hundred patients of each groups suffering from anxiety, depression, bipolar disorders and schizophrenia- respectively were included as study groups. These subjects were selected using a consecutive sampling technique. Similarly, 100 healthy individuals reporting to Department of Oral Medicine for routine oral screening with no known psychiatric disease were consecutively recruited as a control group. Each group was further divided into two subgroups according to the age as young-middle group (18 - 49 years) and an older adult group (50 - 77 years).

**Exclusion criteria:** The exclusion criteria included patients using tobacco and alcohol. Patients with known causes of xerostomia on radiotherapy, salivary gland diseases, medication and subjects with any other systemic disorders were excluded.

**Dryness of lip and oral mucosa:** Diagnosis was made when there was absence of a saliva coating over the dorsum of the tongue, buccal mucosa, labial mucosa and the absence of pooled saliva over the floor of the mouth. Lip dryness was recorded when upper or lower lip showed the characteristic shiny appearance and/or in presence of chapped lip [12].

## STATISTICAL ANALYSIS

Chi square test was used for comparison of xerostomia in all groups. A spearman correlation was done to assess the association between xerostomia to dryness of lips and mucosa. ANOVA was applied to find association between multiple groups. All the statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. (Chicago, USA) and  $\alpha$ -value was set at < 0.05.

## RESULTS

**Pilot Study:** The internal consistency reliability coefficient (Cronbach's alpha) for the questionnaire was 0.72. The coefficient of test-retest reliability measured by ICC was 0.73. Correlations

Psychiatric diseases	Prevalence of xerostomia in %			Total	p-value
	Mild	Moderate	Severe		
Anxiety (100 patients)	22	15	14	51%	0.01*
Depression (100)	19	17	11	47%	
Schizophrenia (100)	14	8	17	39%	
Bipolar disorders(100)	12	14	15	41%	
Controls (100)	13	8	6	27%	

**[Table/Fig-2]:** Prevalence of xerostomia among different psychiatric diseases. ANOVA Test p<0.05 is significant

Psychiatric diseases	Male	Female	0.034*	18 - 49 years	50 - 77 years	0.025*
Anxiety (51%)	18	33		28	23	
Depression (47%)	18	29		26	21	
Schizophrenia (39%)	17	22		23	16	
Bipolar disorders (41%)	18	23		20	21	
Controls (27%)	13	14		15	12	

**[Table/Fig-3]:** Gender wise and age wise distribution of xerostomia among different psychiatric diseases. ANOVA Test test p<0.05 is significant\*

Psychiatric diseases	Xerostomia		Total	Spearman's Correlation	p-value
	Dry lips	Dry mucosa			
Anxiety	18	21	51%	0.72	<0.05 (S) *
Depression	20	19	47%	0.68	<0.05 (S) *
Schizophrenia	15	14	39%	0.76	<0.05 (S) *
Bipolar disorders	17	14	41%	0.72	<0.05 (S) *
Controls	9	8	27%	-	

**[Table/Fig-4]:** Association of xerostomia with psychological diseases. p<0.05 is significant\* Chi square test

between the items i.e., questions ranged between 0.32-0.45 (<0.50).

**Prevalence of Xerostomia:** Xerostomia was reported in 51% of anxiety, 47% of depression, 39% of schizophrenia, 41% of bipolar disorders, and 27% of controls. The majority of psychiatric patients had moderate to severe xerostomia, whereas in control group, mild xerostomia was noted in 13%, moderate xerostomia in 8% and severe xerostomia in 6%. More number of patients with anxiety reported xerostomia than patients with depression, bipolar disorder, schizophrenia and the control group [Table/Fig-2]. Comparison of xerostomia in all groups using chi square test (p<0.01) revealed statistically significant differences (p<0.05). Higher numbers of psychiatric subjects were found to have xerostomia as compared to those in the healthy group.

Xerostomia was higher in young adults (18-49) than old adults (50-77) and more in female patients than male patients. The difference between the two age groups was statistically significant (p<0.025). The gender difference was statistically significant in all groups (p<0.034) [Table/Fig-3].

**Xerostomia and dryness of lip and mucosa:** On clinical examination, the prevalence of dry lip was 18% in anxiety, 20% in depression, 15% in schizophrenia, 17% in bipolar disorders and 9% in controls. Dry mucosa was observed in 21%, 19%, 14%, 14%, and 8% of anxiety, depression, schizophrenia, bipolar disorders and controls respectively. Dry lip and mucosa was higher among the study groups than control group [Table/Fig-4].

A moderate to strong spearman correlation (r=0.72) was observed between xerostomia and dryness of lips and mucosa.

The questionnaires used in present study were shown to be closely associated with a resting salivary flow rate below 1ml/minute. Question No. 1 was related to the resting saliva production as it focused on the patient's general feeling of oral dryness. The rest of the questions were mainly oriented at the stimulated saliva production during chewing and swallowing [5].

## DISCUSSION

Studies proposed that psychological disturbances, emotional instability and personality modulation have a possible role in xerostomia [1,2]. Psychological alterations establish its impact on body by the multi-directional and close inter-relations among the nervous, immune and endocrine system [13,14]. The incidence of xerostomia in emotionally altered patients may be explained on the basis of various neurophysiologic, neurochemical and neurobiological changes associated with the psychosocial disorders. Since salivary glands are neurobiologically regulated

by autonomic nervous system, processes influencing the levels of transmitter substances in this system affect the salivary gland function [12,15].

The alterations in cerebral blood flow and metabolism in psychosocial disorders leads to stimulation of lateral and paraventricular nuclei by amygdala. This in turn results in autonomic arousal and increase in plasma cortisol levels leading to altered salivary secretion and flow. Also endocrinal changes like hyperactivity of hypophysis pituitary adrenal axis results in increased cortisol levels which in turn have xerogenic effects [16].

Prevalence of xerostomia in general populations have shown great variability, due to different definitions and instruments used to measure it. The prevalence of xerostomia in general population ranges from 10% to 46%, with a lower prevalence for men (9.7%–25.8%) than women (10.3%–33.3%) [8]. These results were consistent with present study results.

Aditya et al., evaluated the prevalence of xerostomia and burning sensation in patients with psychosocial disorder [11]. Schizophrenia was the commonest psychosocial disorder; followed by depression and alcohol withdrawal syndrome with psychosis. Prevalence of xerostomia and burning sensation was 43.5% and 9.5% respectively. These results were similar to present study but in our study however anxiety patient had higher xerostomia when compared to other psychiatric conditions.

Few researchers stated that ageing has no significant clinical impact on salivary secretion and flow rate. However, few authors reported that the prevalence of xerostomia was higher in middle-aged and elderly populations [8]. This may be explained by the fact that older people suffer more commonly with systemic diseases and are on multiple medications as compared to younger age group which may directly or indirectly cause xerostomia [17–19]. Hopcraft MS et al., in their review found that xerostomia was a prevalent condition found in approximately 1 of 5 people and further increases in older individuals [8].

In the present study, xerostomia was more prevalent in younger age group. The reason could be because of changing life style pattern and competitiveness especially in the urban youth, rising levels of stress associated with personal and professional life and lack of life skills to cope with them. This pattern of age distribution has also been observed by Kumar M et al., [20].

In present study female psychiatric patients had higher xerostomia when compared to the males. This could be because of major life changes in females due to exposure to xerogenic medications or menopause. Similar results were reported by previous studies [8,21,22].

Various studies on xerostomia in elderly population have reported varied prevalence between 28% to 63% [23–26]. A systematic review of population based research suggested prevalence in the community of approximately 20%, although this appears to be higher in older populations and the institutionalized. Most of those studies used subjects residing in hospitals and community dwelling [27].

In this study higher association between xerostomia and dryness of lip and mucosa was noted. On clinical examination, the prevalence of dry lip was 18% in anxiety, 20% in depression, 15% in schizophrenia, 17% in bipolar disorders, and 9% in controls. Dry mucosa was observed in 21%, 19%, 14%, 14%, and 8% of anxiety, depression, schizophrenia, bipolar disorders and controls respectively. These findings were less than reported by Berti-Couto Sde A et al., and Farsi NM et al. They reported 37.5% of dry lip and 3.2% dry mucosa in xerostomic patients [28,29].

## LIMITATION

In this study, the prevalence of xerostomia was higher than the previous studies. However, study did not include subjects having

systemic diseases, under medication and radiotherapy. The actual prevalence rate of xerostomia was found to be greater than the reported rates and cross-sectional clinical surveys might probably underestimate the true prevalence rate because symptoms of xerostomia may not be present at the time of examination. The present observational study was conducted in a small sample. Further comparative studies with larger sample size would be required to make a clear distinction.

## CONCLUSION

In this study xerostomia was detected more often in psychiatric patients than the healthy individuals with a sound mind. Xerostomia is now being recognized as an important risk factor for dental diseases and its impact on the quality of life of sufferers. Hence, provision of better oral health care of this often neglected group of patients should be the priority. It is the responsibility of the psychiatrist and dentist to effectively provide adequate dental treatment for people with psychiatric disabilities through interdisciplinary approach. Early recognition and treatment of xerostomia in this group of population can improve the quality of life and prevent various other dental diseases associated with it.

## REFERENCES

- [1] Suresh KV, Ganiger CC, Ahammed YA, Kumar MC, Pramod RC, Nayak AG, et al. Psychosocial characteristics of oromucosal diseases in psychiatric patients: Observational study from Indian dental college. *North Am J Med Sci.* 2014; 6:570-74.
- [2] Suresh KV, Shenai P, Chatra L, Ronad YAA, Bilahari N, Pramod RC, et al. Oral mucosal diseases in anxiety and depression patients: Hospital based observational study from south India. *J Clin Exp Dent.* 2015;7:95-99.
- [3] Kandagal VS, Shenai P, Chatra L, Ronad YAR, Kumar M. Effect of stress on oral mucosa. *Biol Biomed Rep.* 2012;1:13-16.
- [4] Math SB, Chandrashekar CR, Bhugra D. Psychiatric epidemiology in India. *Indian J Med Res.* 2007;126:183-92.
- [5] Dyasanoor S, Saddu SC. Association of xerostomia and assessment of salivary flow using modified schirmer test among smokers and healthy individuals: A Preliminutary Study. *J Clin Diagn Res.* 2014;8:211–13.
- [6] Kaplan I, Zuk-Paz L, Wolff A. Association between salivary flow rates, oral symptoms, and oral mucosal status. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2008;106:235–41.
- [7] Chen A, Wai Y, Lee L, Lake S, Woo SB. Using the modified Schirmer test to measure mouth dryness: A preliminary study. *J Am Dent Assoc.* 2005;136(2):164-70.
- [8] Hopcraft MS, Tan C. Xerostomia: an update for clinicians. *Aust Dent J.* 2010; 55:238-44.
- [9] Fenoll-Palomares C, Muñoz Montagud JV, Sanchiz V, Herreros B, Hernández V, Mínguez M, et al. Unstimulated salivary flow rate, pH and buffer capacity of saliva in healthy volunteers. *Rev Esp Enferm Dig.* 2004;96:773–83.
- [10] So JS, Chung SC, Kho HS, Kim YK, Chung JW. Dry mouth among the elderly in Korea: a survey of prevalence, severity, and associated factors. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2010;110:475–83.
- [11] Aditya A, Lele S. Prevalence of xerostomia and burning sensation in patients with psychosocial disorders. *J Int Dent Med Res.* 2011;4:111-16.
- [12] Longman LP, McCracken CFM, Higham SM, Field EA. The clinical assessment of oral dryness is a significant predictor of salivary gland hypofunction. *Oral Dis.* 2000;6:366-70.
- [13] Fox PC, Busch KA, Baum BJ. Subjective reports of xerostomia and objective measure of salivary gland performance. *J Dent Association.* 1987; 115:581–84.
- [14] Pai S, Ghezzi EM, Ship JA. Development of a visual analogue scale questionnaire for subjective assessment of salivary dysfunction. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2001;91:311–16.
- [15] Gelder M, Harrison P, Cowen P. Symptoms and signs of psychiatric disorders. In: Shorter textbook of psychiatry, 5<sup>th</sup> edition. New York: Oxford, 2008, 1-20.
- [16] Friedlander AH, Mahler ME. Major depressive disorder. *J Am Dent Assoc.* 2001;132: 629-38.
- [17] Navazesh M, Brightman VJ. Relationship of medical status, medications and salivary flow rates in adults of different ages. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1996; 81:172-76.
- [18] Sreebny LM, Valdin A, Yu A. Xerostomia part II: Relationship to non-oral symptoms, drugs and diseases. *Oral Surg Oral Med Oral Pathol.* 1989;68(4):419-27.
- [19] Pajukoski H, Meurman JH, Snellman-Gröhn S, Keinänen S, Sulkava R. Salivary flow and composition in elderly patients referred to an acute care geriatric ward. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997;84(3):265-71.
- [20] Kumar M, Chandu GN, Shafiulla MD. Oral health status and treatment needs in institutionalized psychiatric patients: one year descriptive cross-sectional study. *Indian J Dent Res.* 2006;17:171-77.
- [21] Thomson WM, Poulton R, Broadbent JM, Al-Kubaisy S. Xerostomia and medications among 32-year-olds. *Acta Odontol Scand.* 2006;64:249–54.

- [22] Daryani D, Gopakumar R. Xerostomia, its association with oral manifestation and ocular involvement: a clinical and biochemical study. *J Indian Acad Oral Med & Radiology*. 2011;23:513-517.
- [23] Loesche WJ, Bromberg J, Terpenning MS. Xerostomia, xerogenic medications and food avoidances in selected geriatric groups. *J Am Geriatr Soc*. 1995;43:401-07.
- [24] Locker D: Xerostomia in older adults. A longitudinal study. *Gerodontology*. 1995, 12:18-25.
- [25] Pajukoski H, Meurman JH, Halonen P, Sulkava R. Prevalence of subjective dry mouth and burning mouth in hospitalized elderly patients and outpatients in relation to saliva, medication, and systemic diseases. *Oral Surg Oral Med Oral Pathol Endod*. 2001;92:641-49.
- [26] Atkinson J, Grisius M, Massey W. Salivary hypofunction and xerostomia: diagnosis and treatment. *Dent Clin Am*. 2005;49:309-26.
- [27] Orellana MF, Lagavère MO, Boychuk DGJ, Major PW, Flores-Mir C. Prevalence of xerostomia in population-based samples: a systematic review. *J Public Health Dent*. 2006; 66:152-58.
- [28] Berti-Couto Sde A, Couto-Souza PH, Jacobs R, Nackaerts O, Rubira-Bullen IR, Westphalen FH, et al. Clinical diagnosis of hyposalivation in hospitalized patients. *J Appl Oral Sci*. 2012;20(2):157-61.
- [29] Farsi NM. Signs of oral dryness in relation to salivary flow rate, pH, buffering capacity and dry mouth complaints. *BMC Oral Health*. 2007;7:15.

**PARTICULARS OF CONTRIBUTORS:**

1. Lecturer, SEGi University, No. 9, Jalan Teknologi, Taman Sains, Petaling Jaya, Kota Damansara, Selangor - 47810, Malaysia.
2. Senior Lecturer, Department of Oral Pathology and Microbiology, College of Dental Sciences, Davangere, Karnataka, India.
3. Assistant Professor, Department of Public Health Dentistry, School of Dental Sciences, Krishna Institute of Medical Sciences, Deemed University, Karad, Satara, Maharashtra, India.
4. Post graduate student, Department of Periodontology, Mahatma Gandhi Mission's Dental College and Hospital, Sector 1, Kamothe, Navi Mumbai, Maharashtra, India.
5. Interim Chair Division of Periodontics, East Carolina University School of Dental Medicine, 1851 Macgregor Downs Rd, Mail Stop 701, Greenville NC 27834, USA.
6. Reader, Department of Oral and Maxillofacial Surgery, School of Dental Sciences, Krishna Institute of Medical Sciences, Deemed University, Karad, Satara, Maharashtra, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Suresh Kandagal Veerabhadrapa,  
Faculty of Dentistry, SEGi University, No. 9, Jalan Teknologi, Taman Sains, Petaling Jaya,  
Kota Damansara, Selangor - 47810, Malaysia.  
E-mail: dr.suri88@gmail.com

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