



Original Article



Association of Xerostomia with Diabetes a Cross Sectional Study in Subset of Karachi

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ARTICLE INFO

Keywords:

Xerostomia, Diabetes Mellitus, Salivary Flow Rate, HbA1c

How to Cite:

Arfeen, N. U., Haider, A. K., Phull, G. M., Rathore, P., & Ahmed, S. Z. (2025). Association of Xerostomia with Diabetes a Cross Sectional Study in Subset of Karachi: Xerostomia and Diabetes. *Pakistan Journal of Health Sciences*, 6(7), 232-236. <https://doi.org/10.54393/pjhs.v6i7.3113>

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Received Date: 30th April, 2025

Revised Date: 21st July, 2025

Acceptance Date: 25th July, 2025

Published Date: 31st July, 2025

ABSTRACT

Xerostomia, is a common oral symptom of Diabetic Mellitus (DM). It has a detrimental impact on clinical procedures and outcomes due to decreased saliva. Considering its impact on oral cavity and dental procedures it is important to identify the Association of xerostomia with diabetes.

Objective: To identify the prevalence and association of xerostomia in diabetic patients subset of Karachi. **Methods:** It was a cross sectional study conducted from January 2024 to October 2024. The calculated sample size was 63 which was increased to 75. Patients reporting to OPD with history of diabetes were recruited and they were advised to get their HbA1c and random blood sugar level (RBS) checked. After getting their HbA1c and RBS reports their stimulated salivary flow rate was calculated. Stimulated salivary flow less than 0.7ml/min was considered as low. Chi square and independent t-test was applied for comparison at 95% confidence interval and p value less than 0.05 was considered as significant. **Results:** The xerostomia was found to be present in 47 (62.66%) participants. The salivary flow was identified as 0.46 ± 0.31 in diabetic patients with xerostomia, compared to female, male diabetic patients had less salivary flow at 7.01 ± 0.62 HbA1c and 220.53 ± 5.12 RBS. **Conclusions:** There was 62.66% prevalence in diabetic patients in the recruited subset of Karachi. Males had more prevalence than females. Higher HbA1c and RBS levels were associated with the presence of xerostomia.

INTRODUCTION

Dry mouth, or xerostomia, is a common oral symptom of Diabetic Mellitus (DM) [1]. Compared to the non-diabetic population, xerostomia has been documented as one of the common symptoms in people with type 1 and type 2 diabetes, which has a substantial negative influence on oral health and quality of life [2]. The prevalence of xerostomia in diabetics has been documented as 12.5% to 53.5% depending on the hyperglycemic profile of the individual with the diabetes. According to one study, xerostomia was reported by 43% in diabetes patients, with a greater

prevalence in women [3]. Age, type of diabetes, and length of illness do not seem to have a major impact on prevalence, while some data have pointed to a link between worse glycemic control and longer disease duration [4]. The Oral manifestations of xerostomia are diverse and clinically significant, and they have a considerable impact on how well dental and medical therapies work. Common symptoms of xerostomia include thick, stringy saliva, frequent thirst, a dry or sticky feeling in the mouth, and trouble speaking, chewing, swallowing, and tasting food.



These symptoms have been reported to cause dietary modifications and nutritional deficiencies [5]. Xerostomia diminishes the Saliva's cleansing and buffering properties which leads to a rise in cariogenic bacteria, a decrease in oral pH, and an increase in plaque accumulation. These factors significantly increase the risk of dental caries, particularly along the cervical margins, root surfaces, and under crown margins, as well as periodontal disease and dentinal hypersensitivity [6]. Additionally, Xerostomia can exacerbate oral pain and discomfort by predisposing individuals to recurrent oral infections, particularly oral candidiasis, which can manifest as burning mouth syndrome, angular cheilitis, geographic tongue, or white plaques. While a lack of salivary mucins hinders wound healing and defense against toxins and pathogens, the friability of the mucous membranes increases the risk of aphthous ulcers, mucositis, and traumatic lesions [7]. Xerostomia has a detrimental impact on clinical procedures and outcomes due to decreased saliva, which degrades natural oral defenses and complicates restorative and prosthetic dental treatments [8]. In dental implantology, dry mouth increases the risk of infection and implant failure due to weakened oral health and healing ability. For denture wearers, xerostomia reduces denture retention, stability, and comfort, needing unique denture design adjustments as well as the use of adhesives or lubricants to enhance fit and prevent mucosal damage. Additionally, patients with xerostomia may have discomfort, difficulty eating, swallowing, and speaking, which can impair cooperation during treatments and have a detrimental impact on long-term results [9, 10]. Assessing xerostomia in diabetic patients prior to dental procedure is critical because xerostomia, caused by hyperglycemia-induced dehydration, microvascular damage, and neuropathy, greatly impacts oral health and quality of life. Saliva is essential for lubricating oral tissues, neutralizing acids, and avoiding tooth decay, mucosal infections, and biofilm buildup. Xerostomia increases the risk of oral ulcers, periodontal disease, difficulties chewing and swallowing, and delayed wound healing, all of which can complicate dental treatments and recovery. Early detection and management of xerostomia in diabetics can help prevent these issues, resulting in safer and more effective dental care outcomes [11, 12].

Xerostomia is frequently reported among patients with diabetes mellitus; however, the reported prevalence varies widely across different populations and clinical settings. Although international studies have demonstrated an association between poor glycemic control and reduced salivary flow, region-specific data from Karachi remain limited. Furthermore, few local studies have objectively measured stimulated salivary flow alongside HbA1c and RBS levels to establish a clear clinical correlation. This gap

highlights the need to evaluate the prevalence and metabolic association of xerostomia among diabetic patients in the local population. Considering the importance of saliva for dental procedures and prostheses it is important to document the prevalence and association of xerostomia according to the disease pathogenesis of community hence the study aims to identify the prevalence and association of xerostomia in diabetic patients of Karachi so that they can be offered treatments with good outcome with least failure due to xerostomia.

METHODS

It was a cross sectional study conducted at Department of Oral and Maxillofacial Surgery of Abbasi Shaheed Hospital and Karachi Medical and Dental Colleges from January 2024 to October 2024. The study was approved by the ERB of the Karachi Medical and Dental Colleges, Abbasi Shaheed hospital (Ref no: 16/22). The sample size was estimated by using sealed envelope software keeping the prevalence of diabetes at 21% at 95% confidence interval and 5% margin of error [3]. The calculated sample size was 63 which was adjusted to 75. Patients reporting to OPD with history of dry mouth who given written consent to participate in the study were selected by convenient sampling technique and they were advised to get their HbA1c and Random Blood Sugar level (RBS) checked. Their demographic data were taken from the hospital standard OPD form. Patients with HbA1c greater than 6.5, RBS greater than 180 mg/dl without and mental disability and drug history (except diabetes) were included in the study. Patients on hormonal therapy, taking steroids, and with history of cancer or chemotherapy and those who did not consent to participate in the study were excluded. After getting their HbA1c and RBS reports their stimulated salivary flow rate was calculated. Briefly, the salivary flow measurement to be performed by having patients sitting comfortably and asking patient to chew sterile wax for 5 minutes and with the head slightly tilted forward asking the patient to spit in the measuring cup. All patients who used dental prostheses were required to remove them during measurement before testing the stimulated saliva, and to rinse their mouth for 1 minute before sampling, and then their oral cavity was evaluated to ensure no possibility of substances were in their oral cavity. The saliva produced during a period of 1 minute was collected and measured in a container. The volume of salivary flow was calculated in ml/min (millimeter per minute). The patient was instructed not to swallow any amount of saliva that is being produced. Stimulated salivary flow less than 0.7ml/min was considered as low [13]. All the observations were performed by the primary investigator of the study. Statistical analysis was done by using SPSS version 24.0. Frequency and percentages were calculated to identify the

prevalence of xerostomia. Chi square analysis was performed for finding the association between presence of xerostomia and population gender. Independent t-test was applied for comparison of mean between the groups at 95% confidence interval and p value less than 0.050 was considered as significant.

RESULTS

The 75 selected patients had a mean age of 52.43 ± 6.25 years. There were 43 (57.33%) male and 32 (42.67%) were female participants. The males had the mean age of 48.21 ± 5.61 and females had 52.27 ± 6.36 . The xerostomia was found to be present in 47 (62.66%) participants. Figure 1 presents the presence of xerostomia in male and female participants.

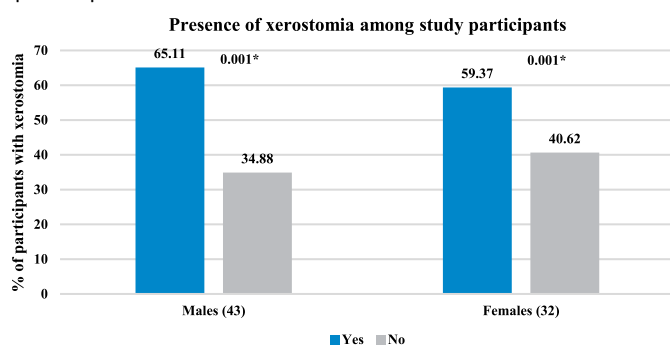


Figure 1: Percentage of Xerostomia Among the Study Population
*Significant p-Value

The salivary flow was identified as 0.46 ± 0.31 in diabetic patients with xerostomia, compared to female, male diabetic patients had less salivary flow at 7.01 ± 0.62 HbA1c and 220.53 ± 5.12 RBS. When the salivary flow, HbA1c and RBS were compared between presence and absence of xerostomia a significant difference was identified. Table 1 shows the Comparison of salivary flow, HbA1c and RBS between patients with and without xerostomia.

Table 1: Comparison of Salivary Flow, HbA1c and RBS Between Patients with and without Xerostomia (n=75)

Total Participants			
Variables	With Xerostomia Mean \pm SD	Without Xerostomia Mean \pm SD	p-Value
Salivary Flow	0.46 ± 0.31	1.21 ± 0.28	0.042
HbA1c	7.62 ± 1.21	6.8 ± 0.96	0.033*
RBS	231.18 ± 8.93	192.11 ± 10.31	0.001*
Male			
Salivary Flow	0.41 ± 0.33	0.99 ± 0.38	0.049*
HbA1c	7.01 ± 0.62	6.7 ± 0.9	0.032*
RBS	220.53 ± 5.12	190.6 ± 6.66	0.051
Female			
Salivary Flow	0.48 ± 0.19	0.67 ± 0.22	0.071
HbA1c	7.12 ± 0.80	6.9 ± 0.5	0.912
RBS	224.51 ± 6.17	199.33 ± 8.23	0.015*

*Significant p-value

The salivary flow was identified as 0.46 ± 0.31 in diabetic

patients with xerostomia, compared to female male diabetic patients had less salivary flow at 7.01 ± 0.62 HbA1c and 220.53 ± 5.12 RBS. When the salivary flow, HbA1c and RBS were compared between presence and absence of xerostomia a significant difference was identified. Table 1 shows the Comparison of salivary flow, HbA1c and RBS between patients with and without xerostomia.

DISCUSSION

Xerostomia is a common and serious consequence often seen in people with diabetes mellitus. In current study the prevalence of xerostomia was found to be 62.66%, which is found to be in range of previously published research, that states prevalence of xerostomia in DM patients varies greatly, ranging from 12.5% to 76.4% [14-16]. This variation in the results has been attributed to variations in the populations under study, patient ages, the types of diabetes mellitus, and the various approaches used to evaluate xerostomia [3]. Furthermore, it has been documented that diabetes-related xerostomia has a complex pathophysiology that includes dehydration from osmotic diuresis, autonomic neuropathy, microvascular abnormalities, and changes in salivary gland function brought on by chronic hyperglycemia. Research has repeatedly shown that, in comparison to healthy controls, diabetes patients have decreased resting and stimulated salivary flow rates. Additionally, it has been documented that the type of diabetes (type 1 or type 2) has no discernible effect on xerostomia; nonetheless, it has been shown that the duration of the disease matters for both types. Xerostomia is more likely to occur in patients with a prolonged history of diabetes. The symptoms like mucosal dryness, such as ocular and vaginal dryness, frequently accompany xerostomia in diabetes patients, indicating a more extensive systemic involvement of exocrine glands that may be connected to autonomic neuropathy. The dysregulation of salivary gland nitric oxide synthase enzymes and their cofactors, which are essential for preserving normal glandular function, may be one of the underlying molecular precursors of xerostomia in diabetic patients [6, 17]. In the current study we males (65.11%) were found to have greater prevalence than females (59.37%), which is contrary to documented literature. Over the past five years, several studies have consistently shown that xerostomia is more common in women. This is frequently explained by hormonal factors like menopause, which alter salivary gland function and enhance women's complaints of dry mouth. A research published in 2022 found that 61.2% of xerostomia cases were in females as opposed to men, with a similar incidence throughout age groups but a definite overall female preponderance [18]. Similarly, in 2023 research of older persons revealed that xerostomia was much more common in women than in men, with a prevalence ratio of 1.44. The study linked this to

characteristics including depression, arthritis, and polypharmacy, which are more common in women and lead to symptoms of dry mouth [19]. Numerous reasons may have contributed to the current study's reversal of this trend, which indicates a greater incidence among men. First, this discrepancy may be caused by population-specific characteristics including lifestyle, genetic background, and environmental conditions. Second, prevalence estimates and gender comparisons may be impacted by methodological variations such as sample makeup, age distribution, and data collecting methods (e.g., self-reported questionnaires vs clinical examinations). Diabetes mellitus greatly decreases salivary gland function, resulting in hyposalivation and the subjective impression of dry mouth [17]. This is supported by the reported salivary flow rate of 0.46 ± 0.31 ml/min in diabetic individuals with xerostomia. Because saliva is essential for digesting, mouth lubrication, antibacterial defense, and mucosal integrity, this decrease in salivary flow is a major cause of xerostomia [20]. Interestingly, the findings showing that male diabetes patients had reduced salivary flow and a higher HbA1c level (7.01 ± 0.62) and Random Blood Sugar (RBS) of 220.53 ± 5.12 mg/dL points to a clear correlation between poor glycemic management and decreased salivary secretion. Diabetes-related hyperglycemia causes autonomic neuropathy and microvascular damage to the salivary glands, which lowers saliva production [21, 22]. This is in line with other research that found a correlation between higher HbA1c and higher prevalence of xerostomia and lower salivary flow. Despite having higher glycemic indices, men exhibit less salivary flow. This gender difference might be due to differences in the severity of the illness, medication use, or lifestyle choices like smoking and drinking alcohol, which are known to worsen salivary gland dysfunction [23]. With the finding of the prevalence of xerostomia in the diabetic individuals the current study highlights the need of conducting more multicentric studies with larger sample size to generalize the findings as in the current research findings are limited to a single center data and smaller sample size. Furthermore, the study recommends that the salivary flow method used to assess the xerostomia should be taught to all dental graduates to prevent the complications of the procedures associated with xerostomia.

This study was limited by its single-center design and relatively small sample size, which may restrict the generalizability of the findings. The use of convenient sampling and absence of a non-diabetic control group may also limit broader comparison. Additionally, long-term follow-up and assessment of duration of diabetes were not included, which could influence salivary gland dysfunction. Future multicenter studies with larger cohorts, inclusion of control groups, and longitudinal evaluation of glycemic control and salivary parameters are recommended to

strengthen evidence and improve clinical applicability.

CONCLUSIONS

There was 62.66% prevalence in diabetic patients in the recruited subset of Karachi. Males had more prevalence than females. Higher HbA1c and RBS levels were associated with the presence of xerostomia among study population.

Authors' Contribution

Conceptualization: NUA, AKH

Methodology: NUA, AKH

Formal analysis: GMP, PR, SZA

Writing And Drafting: NUA, AKH, GMP, PR, SZA

Review and Editing: NUA, AKH, GMP, PR, SZA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

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