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

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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

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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].

Considering the importance of saliva for dental procedures and prostheses it is important to document the prevalence and association 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 0.05 was considered as significant.

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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.

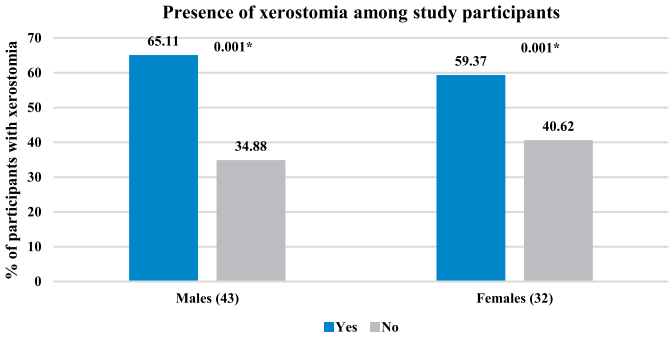

Figure 1: Percentage of Xerostomia Among the Study Population
*Significant p-Value

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 ± SD**	**Without Xerostomia Mean ± 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

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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.

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, review and editing: NUA, AKH, GMP, PR, SZA

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Ahmad R and Haque M. Oral health messiers: Diabetes mellitus relevance. Diabetes, Metabolic Syndrome and Obesity. 2021 Jul: 3001-15. doi: 10.2147/DMSO.S318972.

[2] Shahbaz M, Kazmi F, Majeed HA, Manzar S, Qureshi FA, Rashid S. Oral manifestations: a reliable indicator for undiagnosed diabetes mellitus patients. European Journal of Dentistry. 2023 Jul; 17(03): 784-9. doi: 10.1055/s-0042-1755553.

[3] Sánchez Garrido I, Ramírez L, Muñoz Corcuera M, Garrido E, Sánchez L, Martínez Acitores ML *et al.* Xerostomia and Salivary Dysfunction in Patients With Diabetes Mellitus. A Cross-Sectional Study. Journal of Oral Pathology & Medicine. 2024 Nov; 53(10): 622-36. doi: 10.1111/jop.13583.

[4] Fornari CB, Bergonci D, Stein CB, Agostini BA, Rigo L. Prevalence of xerostomia and its association with systemic diseases and medications in the elderly: a cross-sectional study. Sao Paulo Medical Journal. 2021 Jun; 139(4): 380-7. doi: 10.1590/1516-3180.2020.0616.r3.1902021.

[5] López-Pintor RM, Ramírez Martínez-Acitores L, Serrano Valle J, González-Serrano J, Casañas E, de Arriba L *et al.* Xerostomia and hyposalivation. InOral Health and Aging. 2022 Feb; 85-108. doi: 10.1007/978-3-030-85993-0_5.

[6] Erickson LE and Trump B. Oral and Dental Effects of Xerostomia. InXerostomia 2024 Jun: 51-76. doi: 10.1201/9781003526995-5.

[7] Stoopler ET, Villa A, Bindakhil M, Díaz DL, Sollecito TP. Common oral conditions: a review. Journal of the American Medical Association. 2024 Mar; 331(12): 1045-54. doi: 10.1001/jama.2024.0953.

[8] Alakkad T, Fergani O, Abulhamail L, Tajuddin A, Ashy Y, Munshi L *et al.* The impact of saliva and oral microbiome on restorative dental materials. Journal of Healthcare Sciences. 2023 Dec; 12(3): 752-7. doi: 10.52533/JOHS.2023.31228.

[9] Desai JP and Nair RU. Oral health factors related to rapid oral health deterioration among older adults: a narrative review. Journal of Clinical Medicine. 2023 Apr; 12(9): 3202. doi: 10.3390/jcm12093202.

[10] Abdelaziz AA, Doghish AS, Salah AN, Mansour RM, Moustafa YM, Mageed SS *et al.* When oral health affects overall health: biofilms, dental infections, and

DOI: https://doi.org/10.54393/pjhs.v6i7.3113

emerging antimicrobial strategies. Infection. 2025 Apr: 1-22. doi: 10.1007/s15010-025-02533-9.

[11] Weerasinghe J, Weerasinghe L, Thirugnanasampanthar V, Jayasooriya P, Lombardi T. Cross-Sectional Study on Proportions of Type 2 Diabetic Patients Presenting with Oral Candidal Lesions. Applied Sciences. 2025 May; 15(10): 5539. doi: 10.3390/app15105539.

[12] Aprista S, Nelis S, Nasia AA, Prabowo YB. The effect of xerostomia on the quality of life of controlled and uncontrolled type 2 diabetes mellitus patients. Padjadjaran Journal of Dentistry. 2023 Apr; 35(1): 5-9. doi: 10.24198/pjd.vol35no1.41996.

[13] Fortuna G, Whitmire S, Sullivan K, Alajbeg I, Andabak-Rogulj A, Pedersen AM *et al.* Impact of medications on salivary flow rate in patients with xerostomia: a retrospective study by the Xeromeds Consortium. Clinical Oral Investigations. 2023 Jan;27(1):235-48. doi: 10.1007/s00784-022-04717-1.

[14] Lima DL, Carneiro SD, Barbosa FT, Saintrain MV, Moizan JA, Doucet J. Salivary flow and xerostomia in older patients with type 2 diabetes mellitus. PLOS One. 2017 Aug; 12(8): e0180891. doi: 10.1371/journal.pone.0180891.

[15] Vasconcelos AC, Soares MS, Almeida PC, Soares TC. Comparative study of the concentration of salivary and blood glucose in type 2 diabetic patients. Journal of Oral Science. 2010; 52(2): 293-8. doi: 10.2334/josnusd.52.293.

[16] Sonpanao P, Janebodin K, Namvichaisirikul N, Thongjit S, Jitprasertwong P. The Prevalence of Xerostomia in Older Thai Individuals with Type II Diabetes Mellitus and Its Association with Type of Toothpaste and Oral Functions: A Cross-Sectional Study Using Questionnaires. Geriatrics. 2023 Jul; 8(4): 76. doi: 10.3390/geriatrics8040076.

[17] Fouani M, Basset CA, Jurjus AR, Leone LG, Tomasello G, Leone A. Salivary gland proteins alterations in the diabetic milieu. Journal of Molecular Histology. 2021 Oct; 52(5): 893-904. doi: 10.1007/s10735-021-09999-5.

[18] Adolfsson A, Lenér F, Marklund B, Mossberg K, Çevik-Aras H. Prevalence of dry mouth in adult patients in primary health care. Acta Odontologica Scandinavica. 2022 Nov; 80(8): 605-10. doi: 10.1080/00016357.2022.2069282.

[19] Mascarenhas MK, Cademartori MG, Borges RD, Gonzalez MC, Bielemann RM, Thomson WM *et al.* Prevalence and Associations of Xerostomia in Older Adults in Southern Brazil. Gerodontology. 2025 Jan. doi: 10.1111/ger.12808.

[20] Ljupka A and Sanja N. The power of saliva in diagnostic oral desease. MEDIS- International Journal of Medical Sciences and Research. 2023 Mar; 2: 13-4. doi: 10.35120/medisij020113l.

[21] Hassan HA. Exploring the impact of advanced glycation end products on diabetic salivary gland dysfunctions. Glycoconjugate Journal. 2025 Mar:1-0.

[22] Hohler AD, Vaou OE, Ho DS. Diabetes and the Autonomic Nervous Systems. InDiabetes and Cardiovascular Disease. 2023 Jun: 577-600. doi: 10.1007/978-3-031-13177-6_19.

[23] Rahiotis C, Petraki V, Mitrou P. Changes in saliva characteristics and carious status related to metabolic control in patients with type 2 diabetes mellitus. Journal of Dentistry. 2021 May; 108: 103629. doi: 10.1016/j.jdent.2021.103629.