



# Prevalence of Dry Mouth and Associated Demographic, Behavioural and Clinical Factors: A Hospital-Based Study Among Elderly in Dar Es Salaam

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**Abstract**

**Aim:** This study aimed at determining the prevalence of self-reported and clinically determined dry mouth among elderly patients attending a referral hospital in Dar es Salaam; and to assess factors associated with the condition.

**Methodology:** This cross-sectional study included elderly patients aged 60 years and above who were attending Mwananyamala referral hospital in Dar es Salaam between January and February 2017. Data was collected using structured interview questionnaire, followed by clinical oral examination. Chi-square test was used to check for bivariate associations between variables; and multiple logistic regressions to determine relative contribution of demographic, behavioral and clinical variables on dry mouth.

**Results:** Information was obtained from a total number of 334 elderly patients aged 60-90 years, response rate 86%. The prevalence of self-reported dry mouth (xerostomia) was 65.3% and clinically determined dry mouth 64.1%. Multiple logistic regression analyses revealed that elderly participants who were 70+ years old (OR= 2.0, CI= 1.1-3.6 and OR= 2.5, CI= 1.5-4.4); those who used tobacco (OR= 2.1; C.I= 1.2-3.5 and OR= 2.9; CI= 1.5-5.6.); those having at least one tooth with cervical caries (OR= 1.7, CI= 1.0-2.9 and OR= 2.9; C.I= 1.7-5.1) and poor oral hygiene (OR= 2.7; C.I= 1.6-4.5 and OR= 4.3; C.I= 2.5-7.3) were significantly at higher odds for xerostomia and clinically determined dry mouth, respectively. Level of education, systemic disease, and use of systemic medication showed no statistically significantly association with dry mouth i.e xerostomia and clinically determined dry mouth.

**Conclusions:** The results of this study revealed that, the prevalence of complaints of xerostomia and clinically deter-

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**Keywords:** Dry mouth; Elderly; Hyposalivation; Older adults; Tanzania; Xerostomia.

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mined dry mouth were high among elderly patients attending Mwananyamala referral hospital. The condition was significantly associated with socio demographic, clinical and behavioral factors showing the need for multi-disciplinary oral health care for this group of population.

## Introduction

With the gradual change in global demographic pattern, an increase in the proportion of elderly is expected, especially in low- and middle-income countries like Tanzania [1]. Elderly people are at risk of non-communicable diseases, this poses increased burden when it comes to their need for health and oral health care in countries where communicable diseases are still prevalent [2]. Whereas hyposalivation indicates an objectively determined reduced salivary flow rate, xerostomia is a subjective feeling of dry mouth reported by patient through answering a set of structured questions [3]. Dry mouth may either be caused by diseases which directly affect the salivary glands, e.g. Sjögren syndrome, or indirect effects, such as presence of systemic diseases and their treatment and behavioral factors e.g. tobacco use. Presence of dry mouth may bring about complications that include; high rates of plaque, periodontal problems and caries, due to lack of wash out effect [4]. Presence of such complications may interfere with normal oral function and hence affect their quality of life [5,6].

The most recent review and meta-analysis on prevalence of dry mouth revealed rates ranging from 0.01% to 45% for xerostomia and 0.02% to 40% for hyposalivation i.e. clinically examined [7]. These studies have mostly been conducted in high income countries. This variation depends on the population being studied i.e. community based versus hospital based; and the instruments or tools utilized. Studies in the African setting are meagre, among these few studies, xerostomia has been reported to affect patients with diabetes and populations living with Human Immunodeficiency virus [8,9].

Elderly population and female have been reported to be the most commonly affected by xerostomia [10]. Similarly, the prevalence of dry mouth whether reported or clinically examined, was observed to be higher among the elderly [11]. The most probable reason cited was due to the fact that majority of the elderly patients either develop systemic diseases or use medications thereof, which increases the odds of complaints of dry mouth as well as dry oral tissues on clinical examination. Tobacco use in different forms for instance cigarette smoking behavior has been seen as one of the factors that pre-dispose to dry mouth [12] as well as change in saliva quality [13].

Due to a dramatic increase in this group of population in Tanzania (URT, household census 2002 and 2012), a deterioration of oral health status and conditions like dry mouth and their complications is anticipated. Before the conduction of this study [14] there was no retrieval data on prevalence of dry mouth in Tanzania. This study, therefore, set out to examine the prevalence of xerostomia and clinically determined dry mouth and their associated factors. This baseline information will assist in formulation of studies that will address oral health of the elderly among representative sample of the elderly in Tanzania.

## Materials and methods

This cross-sectional study was conducted in Mwananyamala referral hospital, in Dar-es salaam city from January to February 2017. The study included all patients aged 60 years and

above attending the elderly general clinics for treatment during the study period. Mentally challenged individual, those who received radiotherapy in head and neck region and those with health condition that could interfere with interview and clinical examination were excluded from the study. All consenting patients were interviewed using structured questions, followed by clinical examination.

Interview schedule was constructed in English, and translated to Kiswahili which is a national and official language, spoken proficiently by most (95%) of Tanzanians. Face-to-face interview was conducted by one trained and calibrated dentist (AJL) in an allocated room in a private setting. The structured interview schedule included questions on elderly patients' social-demographic details (age, sex and level of education), behavioral factors (smoking and tooth brushing habits), reported history of systemic disease and use of systemic medications. To assess xerostomia, a set of questions developed by Fox et al., [15] was used, see appendix 1. A total score of the 10 xerostomia items, ranging from 0 to 10, was obtained and later on the score was dichotomized into two 0 = 'no report of symptom' and 1 = 'report of at least one symptom' [14].

After the interview, one trained and calibrated dentist (AJL) conducted all clinical oral examinations using day light as a source of illumination at the dental clinic, with an assistant recording the observations. Mouth mirrors and sickle probe (No. 23 explorer) were used to conduct oral clinical examination. Dry mouth was assessed clinically by recording whether or not a mouth mirror 'sticks to the buccal mucosa'. Participants were said to have 'dry mouth' if the mirror sticks to the buccal mucosa. Oral hygiene of elderly patients was assessed using the Mucosal – Plaque Score (MPS) [16]. The index consists of four-point mucosal score and four-point plaque score which are added to get MPS. Further to this, the participants were examined for presence of prosthesis of any type as well as cervical caries on any tooth. Participants who were identified with problems that needed treatment were referred for treatment from the dental clinic in the hospital. Furthermore, all participants were provided with oral health education.

Statistical Package for Social Sciences (SPSS) for PC, version 23.0, (IBM corporation, Armonk, NY, USA) was used to analyze data. Cross tabulations were done to assess bivariate relationship between the measures of dry mouth (perceived and clinically determined dry mouth) with socio-demographics, clinical factors and reported oral health behaviors, using Pearson's chi-square statistical tests. Significant level was set at  $p < 0.05$ . Factors associated with xerostomia and clinically determined dry mouth were assessed by Multiple logistic regression analysis, using the logit model with 95% confidence interval and odds ratios, indicating statistically significant relationship if both values were above or below 1.

The study was granted ethical approval by the Research Ethics Committee of the Muhimbili University of Health and Allied Sciences (MUHAS) and permission to conduct the study was obtained from Mwananyamala Referral Hospital Administration. Informed consents were obtained from the participants before interview and clinical examination.

## Results

A total of 334 elderly patients were interviewed and clinically examined. The mean mean age of participants was 67.7 years SD 6.6 ranging from 60 to 90 years. Majority of the elderly

participants belonged to the age group 60-69 (74.9%; n= 250), female (55.4%; n= 185) and have completed primary education (65.3%; n= 218). Almost all patients reported to brush their teeth, while less than half of them (40.1%; n= 134) reported to use tobacco of different forms (Table1). Clinical examination findings revealed that more than a half of the elderly had cervical caries (56.6%; n= 189) and poor oral hygiene (52.1%; n= 74), while only 14% (n=47) of them had prosthesis of different forms. Almost all the participants reported to have been diagnosed with systemic disease (94.6%: n= 316) with about 76.6% (n= 256) of them reporting to use systemic medications (Table 1).

Prevalence of reported dry mouth (xerostomia) was 65.3% (n= 218), while the number of patients who were clinically observed to have dry mouth was 64.1% (n= 214). There were 184 patients 55.1% who were found to have both xerostomia and clinically observed to have dry mouth.

As depicted in table 2, on bivariate analysis, age (p-values 0.004 and 0.000), tobacco use (p-values 0.001 and 0.000), having cervical caries (p-values 0.000 and 0.000) and oral hygiene (p-values 0.000 and 0.000) variables showed significant association with both self-reported (xerostomia) and clinically determined dry mouth, respectively. Whereas use of systemic medication was statistically significantly associated with clinically determined dry mouth (p-value 0.004), the association was not observed in xerostomia. Furthermore, sex, education, tooth brushing, presence of prosthesis and systemic disease did not significantly associate with self-reported (xerostomia) and clinically determined dry mouth.

**Table 1:** Frequency distribution of elderly participant’s socio-demographic details, behavioral and clinical characteristics (N=334).

Socio-demographic characteristics	N	%
Age: 60-69 years	250	74.9
70+ years	84	25.1
Sex: Male	149	44.6
Female	185	55.4
Level of education: No primary education	116	34.7
Completed 1° education & above	218	65.3
<b>Behavioural characteristics</b>		
Tobacco use: yes	134	40.1
Tooth brushing: yes	333	99.7
<b>Clinical indicators</b>		
Presence of cervical caries: Yes	189	56.6
Prosthetic status: at least one prosthesis: Yes	47	14.1
Poor oral hygiene status: Yes	174	52.1
Systemic disease: Yes	316	94.6
Use of systemic medication: Yes	256	76.6

**Table 2:** Reported dry mouth and clinically determined oral dryness according to socio-demographic, behavioral and clinical characteristics. Chi square analyses.

		Xerostomia		Clinically determined dry mouth	
		Yes % (n)	p-value	Yes % (n)	p-value
Age	60-69 yrs	61.2 (153)	0.007	58.4 (146)	0.000
	70+ yrs	77.4 (65)		81.0 (68)	
Sex	Male	68.5 (102)	0.272	64.4 (96)	0.903
	Female	62.7 (116)		63.8 (118)	
Education	None	62.1 (72)	0.399	57.8 (67)	0.94
	≥ 1° educ	67.0 (146)		67.4(147)	
Tobacco use	Yes	76.1 (102)	0.001	76.9 (103)	0.000
	No	58.0 (116)		55.5 (111)	
Tooth brushing	Yes	65.2 (217)	0.465	64.0 (213)	0.453
	No	100 (1)		100 (1)	
Cervical caries	Yes	74.6 (141)	0.000	78.8 (149)	0.000
	No	53.1 (77)		44.8 (65)	
Presence of prosthesis	Yes	76.6 (36)	0.790	80.9 (38)	0.100
	No	63.4 (184)		61.3 (176)	
Oral hygiene status	Poor	78.7 (137)	0.000	82.8 (144)	0.000
	Good	50.6 (81)		43.8 (70)	
Presence of systemic disease	Yes	64.9 (205)	0.524	64.6 (204)	0.439
	No	72.2 (13)		55.6 (10)	
Systemic medication	Yes	66.8 (171)	0.288	66.8 (171)	0.041
	No	60.3 (47)		55.1 (43)	

Variables included in multivariate model were those that showed statistical significance when subjected to Chi-square statistics (Table 3). Elderly in the age group of 70 and above were more likely to have xerostomia and clinically determined dry mouth (OR=2.0, CI=1.1-3.6 and OR=2.5, CI= 1.5-4.4, respectively) than those aged 60-69 years. Similarly, elderly patients who used tobacco were at higher odds of having xerostomia and clinically determined dry mouth (OR=2.1; C.I= 1.2-3.5 and OR= 2.9; CI= 1.5-5.6, respectively) when compared to those who

did not use tobacco. Also, those who were clinically observed to have cervical caries were more likely to report xerostomia and clinically observed to have dry mouth (OR=1.7, CI= 1.0-2.9 and OR= 2.9; C.I= 1.7-5.1, respectively) than the elderly who had no cervical caries. Finally, elderly patients who were observed to have poor oral hygiene were significantly at higher odds of having xerostomia and clinically determined dry mouth (OR= 2.7; C.I= 1.6-4.5 and OR= 4.3; C.I= 2.5-7.3), respectively) than those with good oral hygiene.

**Table 3:** Factors associated with xerostomia and clinically determined oral dryness. Chi square statistics, odds ratio (OR) and 95% confidence interval (CI).

Covariates		Xerostomia		Clinical dry mouth	
		% (n)	OR (CI)	% (n)	OR (CI)
Age (years)	60-69	61.2 (153)	1	58.4 (146)	1
	70+	77.4 (65)	2.0 (1.1-3.6)*	81.0 (68)	2.5 (1.5-4.4)**
Tobacco use	No	58.0 (116)	1	55.5 (111)	1
	Yes	76.1 (102)	2.1 (1.2-3.5)*	76.8 (103)	2.9 (1.5-5.6)**
Cervical caries	No	53.1 (77)	1	44.8 (65)	1
	Yes	74.6 (141)	1.7 (1.0-2.9)*	78.8 (149)	2.9 (1.7-5.1)**
Oral hygiene	Good	50.6 (81)	1	43.8 (70)	1
	Poor	78.7 (137)	2.7 (1.6-4.5)**	82.8 (144)	4.3 (2.5-7.3)**

Key: \* p < 0.05; \*\* p < 0.01

## Discussion

In this cross-sectional hospital-based study, the prevalence of xerostomia and clinically assessed dry mouth were high. These findings are similar to what has been reported previously by Carda et al., [17] in their study among elderly patients with type-2-diabetes mellitus. This study being hospital based, could be the reason for such high prevalence, since, most of the participants reported long term use of medication for conditions like diabetes mellitus, hypertension, and chronic pains. This study did not show significant association of both xerostomia and clinically assessed dry mouth with sex, contrary to the findings reported by Johansson and colleagues among Swedish elderly [11]. Similarly, level of education of the elderly showed no association with the prevalence of xerostomia and clinical oral dryness unlike what has been reported in previous studies that showed dry mouth is associated with people who have lower education [18]. The lack of association of sex and education in the current study could be due to the type of population studied having similar characteristics socio-economic characteristics which might have masked important aspects associated with dry mouth. The association between age with xerostomia and clinically determined dry mouth is in agreement with previous studies that show an increase in dry mouth with ageing [19]. This finding might be due to senescence and increase in polypharmacy with concurrent age-related medical conditions [19].

Oral health related behaviours have been reported previously to have effect on dry mouth. Khan and co-workers reported no significant reduction in salivary secretion with smoking [22]. However, other scholars report reduced amount of saliva among participants who used tobacco in different forms, similar to findings in this study among elderly patients in Mwananyamala Hospital [11,12,21]. While short term effect of tobacco smoking has been seen to increase salivary output, long term

use of tobacco could lead to dry mouth as stated previously due to the effects of smokeless tobacco on minor salivary glands causing them to undergo degenerative changes [22]. More investigations are suggested to ascertain the effects of tobacco on dry mouth [23].

Reported toothbrushing, as one of the oral health behaviors examined in the current study, did not show significant association with the reported and clinically determined dry mouth. Contrary to the study done previously among institutionalized elderly in Brazil [24]. Almost all (except one elderly) reported to brush their teeth at once a day. However, despite the high percentage of elderly reporting to brush their teeth, the majority of them were clinically found to have poor oral hygiene (Table 1). These findings are similar to what has been reported in previous survey of older adults in Tanzania [25]. Ineffective tooth brushing, poor technique and lack of assistance to perform proper tooth brushing might have played a role in this finding.

Poor oral hygiene strongly associated with both xerostomia and clinically determined dry mouth. Saliva plays a pivotal role in maintain a healthy oral environment. Hyposalivation has been reported to be associated with high plaque retention similar to what was observed in this study [26]. Lack of sufficient amount and recommended quality of saliva has been reported to be one of the factors that contribute to plaque accumulation, due to absence of cleansing ability of saliva. This lack of cleansing effects of saliva could also explain the observed association of cervical caries with both xerostomia and clinically determined dry mouth in this study.

In this study the proportion of elderly with prosthesis was low, similar to what has been reported before among Tanzanian older adults [27]. On the same note, the relationship between



having prosthesis and reported/clinically determined dry mouth was not established, further studies would be needed in order to ascertain the stated previous phenomenon.

Having systemic conditions has been observed to contribute to xerostomia and clinically determined dry mouth, attributed to effects of disease conditions on salivary glands [8]. This association was not observed in this study. Further to this, use of systemic medication has been reported before to be associated with xerostomia and hyposalivation. dry mouth was also reported to increase with increase in the number of systemic medications [6]. In this study, being hospital based, could be the reason for the lack of association as almost all participants had systemic diseases and reported to be using systemic medications. Population based studies are recommended to ascertain this relationship among the Tanzanian population.

The finding from this study should be taken with caution as it utilized a hospital based cross sectional method to assess self-reported complaints of dry mouth, and clinical examination using mouth mirror for reduced saliva. The ideal method should have been longitudinal comparison studies utilizing representative sample from the Tanzanian population. Notwithstanding this, the current findings have provided a picture on prevalence of dry mouth that can be used to guide future studies.

### Conclusion

The results of this study revealed that, the prevalence of xerostomia and clinically determined dry mouth were high among elderly patients attending Mwananyamala referral hospital. Both xerostomia and clinically observed dry mouth were significantly associated with ageing, tobacco use in different forms as well as poor oral hygiene and presence of cervical caries. The immediate implication obtained from the study shows the need for thorough medical history, dental examination and multi-disciplinary approach to oral health care for this group of population.

### Author contribution

AJL: Principal investigator, designed the study, conducted data collection and involved in statistical analysis and manuscript writing. NMM: Supervised data collection and involved in statistical analysis and manuscript writing. IKM: Supervised designing of the study, data collection and involved in statistical analyses and manuscript writing.

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### References

- UN. United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Ageing 2019: Highlights (ST/ESA/SER.A/430). 2019.
- URT. Strategic Action Plan for Prevention and control of non communicable diseases in Tanzania 2016 - 2020. Minist Heal Community Dev Gender, Elder Child. 2016; 117.
- Ying Joanna N Di, Thomson WM. Dry mouth – An overview. Singapore Dent J. 2015; 36: 12–7.
- Humphrey S, Williamson R. A review of saliva: normal composition, flow, and function. J Prosthet Dent. 2001; 85: 162–169.
- 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. 2017; 31: e14.
- Johansson AK, Johansson A, Unell L, Ekbäck G, Ordell S, Carlsson GE. Self-reported dry mouth in 50- to 80-year-old Swedes: Longitudinal and cross-sectional population studies. J Oral Rehabil. 2020; 47: 246–254.
- Agostini BA, Cericato GO, Silveira ER da, Nascimento GG, Costa F dos S, Thomson WM, et al. How Common is Dry Mouth? Systematic Review and Meta-Regression Analysis of Prevalence Estimates. Braz Dent J. 2018; 29: 606–618.
- Lasisi TJ, Fasanmade AA. Salivary flow and composition in diabetic and non-diabetic subjects. Niger J Physiol Sci. 2012; 27: 79–82.
- Jeftha A. Xerostomia and salivary flow rates in HIV patients. South African Dent J. 2017; 72: 62–67.
- Benn AML, Broadbent JM, Thomson WM. Occurrence and impact of xerostomia among dentate adult New Zealanders: findings from a national survey. Aust Dent J. 2015 ; 60: 362–367.
- Johansson AK, Johansson A, Unell L, Ekbäck G, Ordell S, Carlsson GE. Self-reported dry mouth in Swedish population samples aged 50, 65 and 75 years. Gerodontology. 2012; 29.
- Rad M, Kakoie S, Niliye Brojeni F, Pourdanghan N. Effect of Long-term Smoking on Whole-mouth Salivary Flow Rate and Oral Health. J Dent Res Dent Clin Dent Prospects. 2010; 4: 110–114.
- Petrušić N, Posavac M, Sabol I, Mravak-Stipetić M. The Effect of Tobacco Smoking on Salivation. Acta Stomatol Croat. 2015; 49: 309–315.
- Minja IK, Makoye MN, Lyimo AJ. Prevalence and Assessment of Dry Mouth: A Study among Selected Group of Elderly Patients in Dar es Salaam. EC Dent Sci. 2019; 18: 392–400.
- Fox PC, Busch KA, Baum BJ. Subjective reports of xerostomia and objective measures of salivary gland performance. J Am Dent Assoc. 1987; 115: 581–584.
- Henriksen BM, Ambjørnsen E, Axéll TE. Evaluation of a mucosal-plaque index (MPS) designed to assess oral care in groups of elderly. Spec Care Dent. 1999;19: 154–157.
- Carda C, Mosquera-Lloreda N, Salom L, Gomez De Ferraris ME, Peydró A. A structural and functional salivary disorders in type 2 diabetic patients. Med Oral Patol Oral Cir Bucal. 2006;11:209–214.
- Quandt SA, Savoca MR, Leng X, Chen H, Bell RA, Gilbert GH, et al. Dry mouth and dietary quality in older adults in North Carolina. J Am Geriatr Soc. 2011 Mar;59(3):439–45.
- Ship JA, Pillemer SR, Baum BJ. Xerostomia and the geriatric patient. J Am Geriatr Soc. 2002; 50: 535–543.
- Khan GJ, Javed M, Ishaq M. Effect of smoking on salivary flow rate. Gomal J Med Sci. 2010; 8: 221–224.
- Dyasanoor S, Saddu SC. Association of xerostomia and assessment of salivary flow using modified schirmer test among smokers and healthy individuals: A preliminary study. J Clin Diagnostic Res. 2014; 8: 211–213.
- Bouquot D, Schroeder K. Oral effects of tobacco abuse. J Am Dent Inst Cont Educ. 1992; 43: 3–17.
- Thomson WM. Issues in the epidemiological investigation of dry mouth. Gerodontology. 2005; 22: 65–76.

24. Marchini L, Vieira PC, Bossan TP, Montenegro FL, Cunha VP. Self-reported oral hygiene habits among institutionalised elderly and their relationship to the condition of oral tissues in Taubaté, Brazil. *Gerodontology*. 2006; 23: 33–37.
25. Kida IA, Astrøm AN, Strand G V, Masalu JR. Clinical and socio-behavioral correlates of tooth loss: a study of older adults in Tanzania. *BMC Oral Health*. 2006; 6: 5.
26. Gupta A, Epstein J, Sroussi H. Hyposalivation in elderly patients. *J Can Dent Assoc (Tor)*. 2006; 72: 9.
27. Mosha H, Senkoro A, Masalu J, Kahabuka F, Mandari G, Mabelya L, et al. Oral health status and treatment needs among Tanzanians of different age groups. *Tanzania Dent J*. 2005; 12: 18–27.