ORIGINAL RESEARCH

Tooth Loss among Adult Patients Attending Public Dental Clinics in Zanzibar, Tanzania

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Abstract

Background: Tooth loss, a result of one or more oral diseases, causes partial or complete edentulism.

Aim: To determine tooth loss among patients attending selected public dental clinics in Zanzibar, Tanzania.

Materials and methods: This cross-sectional study involved patients aged 18 years and above attending selected public dental clinics in Zanzibar, Tanzania. Multistage and proportionate sampling methods were used. Chi-square tests were performed, and the level of statistical significance was set at $p \leq 0.05$.

Results: Of the 422 subjects aged 18–72 years, the majority were young adults (70.4%), females (65.2%) and with upper secondary education and above (70.1%). Tooth decay ($n = 221$; 74.4%) was the main reported cause for tooth loss among young adults ($p < 0.05$).

Conclusion: It can be concluded that tooth loss is age-related and caused mainly by tooth decay. It is more common in one jaw for younger adults, unlike older adults who had fewer missing teeth affecting mostly one jaw and location. Sex and level of education did not influence tooth loss. Tooth loss should be prevented and rehabilitative protocols in place.

Clinical significance: Clinicians are encouraged to provide oral health education to the community in an attempt to prevent diseases that cause tooth loss and make known treatment options for tooth loss.

Keywords: Adults, Patients, Public dental clinics, Tanzania, Tooth loss, Zanzibar.

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Introduction

Partial or complete tooth loss is an indicator of dental health and is an outcome of common diseases, namely dental caries, periodontal diseases, or other oral diseases.[1–6] Tooth loss has been reported to be dependent on age, sex, level of education, income and residence.[7–14] Other contributory factors include availability of dental treatment services and delayed seeking of dental services.[9,15]

European countries have reported a decline in tooth loss, while it is known to be a burden-growing disease in countries with low and middle income.[10] In 2007, it was declared by the World Health Organization (WHO) that efforts should be made to prevent tooth loss so that an individual at 80 years should have a minimum of 20 teeth.[16] However, the latest survey in Tanzania reported that the M-component contributed 52.2% of the DMF-T indicating a dominance of extraction of decayed teeth.[17] Previous studies in Mtwara reported tooth loss of some teeth to be as high as 93.2% and tooth loss of all teeth of about 2.4%, while in Pwani region tooth loss of 83.5% among older adults was reported.[18,19] The majority (52.2%) of the studied population in Dar es Salaam had a missing tooth.[20]

In Zanzibar, Tanzania the commonest cause for tooth loss was reportedly dental caries.[21,22] Another study reported that there was compromised oral function among adolescents with tooth loss.[23] The lack of retrievable studies on tooth loss among adult dental patients in Zanzibar, Tanzania led to this study. The obtained baseline data on tooth loss in Zanzibar, Tanzania by age, sex, and level of education can be used to assist in the planning of oral health services, including needs for tooth replacement among patients with tooth loss. Furthermore, findings from this study will assist the governments in implementing the WHO strategy of 2021 and ensure services reach those in need.[24] The obtained baseline data allows for comparison and follow-up studies both within and outside the country.

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Materials and Methods

In Zanzibar, Tanzania patients attending selected public dental clinics were involved in this cross-sectional hospital-based study. Tanzania Zanzibar is formed by two islands, Unguja and Pemba. Unguja, also referred to as Zanzibar, has three regions and the Urban West region has three districts with a population of 5,93,678 people.[25]

Public hospitals having high number of attending dental patients at each of the three different districts of Urban West

region of Zanzibar were purposefully selected. The Cochran's formula was used to estimate the study sample size. The required number of participants from each hospital was determined by the proportionate sampling method. The desired sample size at each hospital was obtained by enrolling the daily registered patients. As there was unavailable data on tooth loss in Zanzibar, Tanzania a prevalence of 50% was used. An additional ten percent of the estimated population size was added to compensate for unforeseen participating.

Patients aged 18 or more years with tooth loss and presenting with other oral diseases, physical or mental disability, or having an oral prosthesis or undergoing orthodontic treatment were excluded.

On obtaining consent, a clinical form was used to record participant's sociodemographic details pertaining to age, sex and education. A visual assessment of participant's tooth loss was done while the patient was seated in a dental chair that had an overhead light, and findings were recorded in the dental chart.

Participants age was recorded in years and grouped into those of 18–34 years (score = 0) and 35–72 years (score = 1) and their sex was denoted as male (score = 0) or female (score = 1). Different levels of education recorded were no formal education, primary, junior secondary of Form II, senior secondary of above form II, and college or university education. This was regrouped into those having junior secondary education level and below (score = 0) and those having senior secondary education level and above (score = 1).

Using the patient's dental chart cause for tooth loss was reported accordingly (do not recall, pain, mobile teeth and tooth decay), teeth present were scored = 0, missing teeth were scored = 1 and teeth not erupted were scored = 2. Teeth present (score 0) and not erupted (score 2) were regrouped and scored = 0 while missing teeth maintained their score = 1. Tooth loss was then determined by jaw affected (maxillary = 1, mandibular = 2 or both jaws = 3), location of missing tooth (upper anterior = 0 or posterior = 1; lower anterior = 2 or posterior = 3) and count of missing teeth (1–3 = 0 and more than 3 = 1).

Muhimbili University of Health and Allied Sciences provided the ethical clearance with reference MUHAS-REC-09-2022-1367 for this study. Selected dental clinics were provided with an introductory letter that addressed the aim of the study. Calibration of the examiner (SSK) was against a renowned expert (LCC) in a clinical setting prior to the conduct of the study. The quality and efficiency of the main study were enhanced by a pilot study. The obtained Kappa values for intraexaminer's consistency of 1.00 for age, sex, level of education and missing tooth type were obtained by randomly recalling five subjects at each facility.

Using the SPSS version 23.0 software data from the clinical examination forms were entered, cleaned, and coded appropriately. Descriptive statistics of the study population were assessed using frequency tables and differences between age-groups, sex and education level were expressed using numbers and proportions.

Some data required transformation prior to cross-tabulations, and statistical significance at a p-value ≤ 0.05 was assessed using Pearson Chi-square test.

Results

A response rate of 100% was obtained as all the 422 enrolled subjects with ages 18–72 years, (median age of 31.1 years) participated in the study. As seen in Table 1, the majority of the participants were aged 18–34 years (n = 297;70.4%), females (n = 275;65.2%) and with an upper secondary education level and above (n = 296; 70.1%).

The main cause for tooth loss reported by study participants was tooth decay, which was statistically significantly higher in the younger (n = 221;74.4%) than older (n = 84; 67.2%) adults ($p < 0.05$). Causes of tooth loss between different sexes or levels of education showed no differences that were statistically significant (Table 2).

Table 3 shows that participants in the younger age-group had a statistically significantly higher number of missing maxillary teeth (n = 93; 31.3%) compared to mandibular teeth (n = 88;29.6%). Also, many more of the older age-group (n = 78; 62.4%) had statistically significantly more tooth loss in both jaws compared to the younger age-group (n = 116; 39.1%). There were no statistically significant differences on jaw affected with tooth loss by sex or level of education.

Study participants of age 18–34 years had a statistically significantly higher proportion of tooth loss of either back or front teeth compared to their counterparts ($p < 0.05$). The older

Table 1: Distribution of study population by sociodemographic characteristics (N = 422)

Variables		*n*	*%*
Age-group	18–34	297	70.4
	35–72	125	29.6
Sex	Male	147	34.8
	Female	275	65.2
Education level	Lower secondary level and below	126	29.9
	Upper secondary level and above	296	70.1

Table 2: Distribution of cause of tooth loss among study participants by age, sex and education level (N = 422)

		Cause of tooth loss					
Variables		*Do not recall (n = 49; 11.6%)*	*Pain (n = 37; 8.8%)*	*Mobile tooth (n = 31; 7.3%)*	*Tooth decay (n = 305; 72.3%)*	*Total*	*χ^2; p-value*
Age (years)	18–34	30 (10.1%)	32 (10.8%)	14 (4.7%)	221 (74.4%)	297	16.664; 0.001
	35–72	19 (15.2%)	5 (4.0%)	17 (13.6%)	84 (67.2%)	125	
Sex	Male	18 (12.2%)	10 (6.8%)	13 (8.8%)	106 (72.1%)	147	1.761; 0.623
	Female	31 (11.3%)	27 (9.8%)	18 (6.5%)	199 (72.4%)	275	
Education level	Lower secondary and below	16 (12.7%)	12 (9.5%)	10 (7.9%)	88 (69.8%)	126	0.532; 0.912
	Upper secondary and above	33 (11.1%)	25 (8.4%)	21 (7.1%)	217 (73.3%)	296	

age-group (n = 107;85.6%) had a statistically significant higher proportion of missing front and back teeth in comparison to the younger age-group (n = 159;53.5%). Location of missing tooth of participants by sex and level of education showed no statistically significant differences (Table 4).

The younger adults had a statistically significant higher proportion of 1–3 missing teeth in comparison to those missing more than three teeth. Also, the proportion of older adults (85.6%) who had lost more than 3 teeth was statistically significantly higher than those of age 18–34 years (53.5%). Number of lost teeth by sex or level of education showed no statistically significant difference (Table 5).

Discussion

This cross-sectional study was hospital-based and aimed at determining tooth loss among patients aged 18 or more years in Zanzibar, Tanzania. Sampling methods employed aimed at reducing bias; however, generalization of findings should be with caution as this study involved only participants with tooth loss attending selected dental clinics. Nevertheless, this group provides baseline data that allows for comparative and follow-up studies within and outside the country.

The younger age-group in this study with a higher number of participants is similar to a previous hospital-based - sectional study on dental patients in Tanzania.[26] Contrastingly, a higher percentage of the older adults was reported in Japan.[27] The high number of younger adults could be a reflection of the general population in Zanzibar, Tanzania.[25]

Unlike findings from another study in Misungwi, Tanzania that reported a higher number of male participants, this study had more females participants, which was in similar to findings from a study done in Dar es Salaam, Tanzania.[20,28] Oral habits and practices of females have been linked to a higher risk of developing dental caries, and probably why they tend to utilize dental services more than males.[26,29,30]

Contrary to previous studies that reported a higher proportion of participants with primary education and below, this study

Table 3: Distribution of jaw location of tooth loss among study participants by age, sex and education level (N = 422)

		Location of tooth loss by affected jaw				
Variables		*Maxillary jaw (n = 130; 30.8%)*	*Mandibular jaw (n = 98; 23.2%)*	*Both jaws (n = 194; 46%)*	*Total*	*χ^2; p-value*
Age (years)	18–34	93 (31.3%)	88 (29.6%)	116 (39.1%)	297	28.234; 0.001
	35–72	37 (29.6%)	10 (8.0%)	78 (62.4%)	125	
Sex	Male	51 (34.7%)	31 (21.1%)	65 (44.2%)	147	1.700; 0.427
	Female	79 (28.7%)	67 (24.4%)	129 (46.9%)	275	
Education level	Lower secondary and below	39 (31.0%)	21 (16.7%)	66 (52.4%)	126	4.931; 0.085
	Upper secondary and above	91 (30.7%)	77 (26.0%)	128 (43.2%)	296	

Table 4: Distribution of location of tooth loss among study participants by age, sex and education level (N = 422)

		Position of tooth loss					
		Upper		*Lower*			
Variables		*Anterior*	*Posterior*	*Anterior*	*Posterior*	*Total*	*χ^2; p-value*
Age (years)	18–34	30 (10.1%)	32 (10.8%)	14 (4.7%)	221 (74.4%)	297	16.664; 0.001
	35–72	19 (15.2%)	5 (4.0%)	17 (13.6%)	84 (67.2%)	125	
Sex	Male	18 (12.2%)	10 (6.8%)	13 (8.8%)	106 (72.1%)	147	1.761; 0.623
	Female	31 (11.3%)	27 (9.8%)	18 (6.5%)	199 (72.4%)	275	
Education level	Lower secondary and below	16 (12.7%)	12 (9.5%)	10 (7.9%)	88 (69.8%)	126	0.532; 0.912
	Upper secondary and above	33 (11.1%)	25 (8.4%)	21 (7.1%)	217 (73.3%)	296	

Table 5: Distribution of number of missing teeth among participants by age, sex and education level (N = 422)

		Missing teeth			
Variables		*1–3 (n = 156; 37%)*	*4 or more (n = 266; 63%)*	*Total*	*χ^2; p-value*
Age (years)	18–34	138 (46.5%)	159 (53.5%)	297	38.817; 0.001
	35–72	18 (14.4%)	107 (85.6%)	125	
Sex	Male	55 (37.4%)	92 (62.6%)	147	0.019; 0.889
	Female	101 (36.7%)	174 (63.3%)	275	
Education level	Lower secondary and below	40 (31.7%)	86 (68.3%)	126	2.101; 0.147
	Upper secondary and above	116 (39.2%)	180 (60.8%)	296	

found a dominance of participants who attained a higher level of education.[20,31] In Zanzibar, attainment of basic compulsory education requires pupils to take a terminal examination at the end of the cycle of lower secondary education, and the reported transition rate of 72.2% from ordinary secondary Form II to Form III may explain why there were many more participants with upper secondary education and more.[32,33]

In this study, tooth decay was the commonest reported cause of tooth loss and is comparative with studies conducted in other countries like Brazil and Nigeria.[34,35] Another study in Mtwara, Tanzania also reported that missing teeth due to dental caries was higher among those aged 40 years and above.[18] Contrastingly, a study conducted in Ibadan, Nigeria reported trauma as the highest causes of tooth loss, while another study in Dar es Salaam reported that the leading cause of tooth loss were related to diseases of the periodontium.[20,36] Findings from this study can be attributed to the many factors that cause tooth extraction, including dental caries that progress due of delay in seeking dental care and inevitable emergency care.[37,12]

Most of the participants had missing teeth in both upper and lower jaws, with many more having lost teeth in the mandibular jaw than the maxillary jaw. Although there were no retrievable studies in regard to tooth loss in both jaws, a study in Nigeria reported that nearly half of participants had missing teeth in the maxillary jaw, with many more having tooth loss in the mandibular jaw.[35] Teeth in the lower jaw are known to erupt much earlier than those in the upper jaw, and related oral hygiene and habits predisposes them to be at risk of tooth decay.

In accordance with other studies, this study reported a higher proportion of participants a higher proportion of participants with missing upper posterior teeth in comparison to upper anterior teeth, while in the lower jaw there was no difference between anterior or posterior missing teeth.[20] Different from the findings of this study, another study conducted in Tanzania reported that tooth loss was more in upper than lower jaw.[20] Loss of teeth in this study was not related to trauma, and this is reflected in the low proportion of missing upper anterior teeth, however, dental caries affects all teeth, including anterior teeth, although posterior teeth are the most frequently affected by dental caries.[21]

In agreement with findings of a previous study conducted in Tanzania, the majority of participant in this study had more than 3 missing teeth, and females had more tooth loss compared to males.[20] Contrary to these findings, it has been shown that tooth loss is on the decrease in the developed world.[27] The accumulative effect of disease with age could be a possible reason as to why older participants had a higher number of missing teeth.[38–40] Furthermore, in developing countries, the emergency treatment option for diseased teeth is mostly extraction.[12]

Conclusion

It can be concluded that tooth loss is age related and not influenced by sex or level of education, however, it is caused mainly by tooth decay. It is more common in one jaw for younger, unlike older adults who have both jaws affected, lost both front and back teeth, and have more missing teeth.

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