

## Tooth loss, associated factors and prosthetic treatment need among patients receiving methadone maintenance therapy in Dar es Salaam, Tanzania

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### Abstract

**Background:** Tooth loss is a common issue among the general population in Tanzania, often resulting from dental caries, periodontal diseases, or trauma. Patients with substance use disorders are at an increased risk of tooth loss due to several factors, including impaired oral hygiene practices, dry mouth, and sugar cravings. These factors contribute to dental caries and periodontal diseases, which can ultimately lead to tooth loss. Additionally, individuals with substance use disorders are frequently involved in violent incidents and may sustain injuries that result in tooth loss. This study aims to assess tooth loss, its associated factors, and the need for prosthetic treatment among patients receiving methadone maintenance therapy at clinics in Dar es Salaam, Tanzania, from December 2019 to June 2021

**Materials and Methods:** This hospital-based descriptive cross-sectional study involved 427 patients receiving methadone maintenance therapy at clinics in Dar es Salaam, Tanzania. Participants were interviewed using a structured questionnaire and intra-orally examined with a dental mirror and probe. The findings were recorded on a clinical examination sheet. Data were analyzed using Chi-square tests and logistic regression analyses in SPSS software version 23. A p-value of less than 0.05 was considered statistically significant.

**Results:** Four hundred and twenty-seven study participants were analyzed, with a mean age of 41. Of these, 80.8% were male. Approximately 61.4% of the participants had a primary education or less. About 88.8% had lost one or more teeth, with a significant difference in tooth loss observed between age groups ( $p=0.001$ ). The mean number of teeth lost among participants was 8.95, with a standard deviation 7.772. Mandibular molars were the most lost teeth, accounting for 74%, followed by maxillary molars at 64.9%. Dental caries was the predominant cause of tooth loss, responsible for 58.3% of cases. Kennedy class III was the most common classification for partial edentulism on the upper jaw (52.5%) and lower jaw (49.8%). Only 6.3% of participants had dental prostheses, with acrylic removable partial dentures being the most common type on the upper jaw (81.8%) and lower jaw (88.9%).

**Conclusions:** The prevalence of tooth loss among patients with substance use disorders is high, with the common causes being similar to those in the general population: dental caries, periodontal diseases, and traumatic injuries. Only a tiny percentage of the participants have dental prostheses, indicating a significant need for prosthetic treatment in this group.

**Keywords:** Dental caries, periodontal diseases, tooth loss, substance use disorder.

### Introduction

Patients undergoing methadone maintenance therapy (MMT) typically suffer from substance use disorder (SUD), characterized by mental, physical, and behavioural symptoms such as loss of control, interpersonal strain, hazardous use, tolerance, and withdrawal (Teoh, 2016; McLellan, 2017). SUD has a broad spectrum of health impacts, affecting almost every organ, including oral health (Rees & Levine, 2012). Poor oral hygiene and infrequent dental visits, which are common among individuals with SUD, often lead to dental caries and periodontal diseases, ultimately resulting in tooth loss (Titsas and Ferguson, 2002).

MMT aims to reduce substance misuse, improve health and social functioning, and manage relapse risks. It is an effective treatment with positive economic impacts, including increased productivity, better health outcomes, and improved overall quality of life (Ettner et al., 2006; McLellan et al., 2000). In 2011, Tanzania launched its first MMT clinic at Muhimbili National Hospital in Dar es Salaam, followed by additional clinics at Mwananyamala and Temeke hospitals, as well as facilities in Mwanza, Mbeya, and Zanzibar (PEPFAR, 2017). These clinics provide methadone alongside integrated services such as HIV and hepatitis counselling, tuberculosis testing, and mental and psychosocial support (Bruce et al., 2014). Approximately 30,000 people in Dar es Salaam are estimated to use injectable drugs, with around 5,000 benefiting from the MMT program nationwide (Mbwambo, 2013; PEPFAR, 2017).

Methadone use, like other opioids, reduces salivary flow, causing xerostomia, and MMT patients often experience increased sugar cravings (Titsas and Ferguson, 2002; Nathwani and Gallagher, 2008). Furthermore, these patients frequently have co-occurring mood, personality, and anxiety disorders, which contribute to dental anxiety and fear of needles, discouraging regular dental visits (Robinson et al., 2005). Tooth loss in these patients commonly results from dental caries, periodontal diseases, or injuries sustained during altered mental states (Osunde, 2017).

Inadequate dentition can impair mastication, affecting the digestive system and overall health (Gaewkhiew et al., 2017). Tooth loss also impacts speech and aesthetics, leading to embarrassment, reduced self-confidence, and potentially missed job opportunities. Additionally, tooth loss can result in bone resorption in the jaws, altering facial profiles (Lund, 2014). Dental professionals classify partially edentulous arches to facilitate prosthesis fabrication, with Kennedy's classification being the most widely used due to its ease of visualization and recognition of prosthesis support (Zaigham & Muneer, 2010).

Various prosthetic devices can replace missing teeth, including removable partial dentures, complete dentures, fixed bridges, resin-retained bridges, and dental implants (Morin et al., 2005; JADA, 2015). In developing countries like Tanzania, removable partial dentures are the most common due to their affordability and ease of fabrication (Khalifa et al., 2012).

Despite efforts by the Tanzanian government to improve the health of SUD patients through MMT, oral health services are not included, potentially compromising overall health (PEPFAR, 2017; Kane, 2017). Information on tooth loss and associated factors among Tanzanian SUD patients is limited. This study aims to provide baseline data on tooth loss, its causes, classifications, and prosthetic treatment needs among SUD patients receiving MMT in Dar es Salaam, Tanzania

## Methodology

This was the descriptive cross-sectional hospital based study, involving registered substance use disorder adult patients aged 22 years and above, attending Methadone maintenance clinic at Muhimbili National Hospital, Mwananyamala Regional Referral Hospital and Temeke Regional Referral Hospital, between the time period from December 2019 to June 2021.

Four hundred and twenty-seven subjects to be involved in the study were obtained by systematic sampling method from the list of all 3600 registered patients receiving methadone in Dar es Salaam. This sample size is about 12% of all 3600 registered patients. Thus, 12% of

registered SUD patients from each centre were obtained. MNH, with 1500 registered SUD patients, contributed 177 subjects; Mwananyamala, with 1200 registered SUD patients, contributed 140 subjects; and Temeke, with 900 registered SUD patients, 110 subjects were obtained from that centre. Male and female lists were created separately at each centre, and 12% of each sex was recruited. A sampling interval (k) was generated by the calculation  $k = 3600/427 = 8$ . Therefore, from the list, every eighth subject was picked for involvement in the study. If the eighth person was not present for any reason, the next person on the list was recruited.

Participants were interviewed using a structured questionnaire and intra-orally examined with a dental mirror and probe, then findings were entered on a clinical examination sheet. Chi-square test and logistic regression analyses were then conducted using SPSS software version 23. A p-value <5% was used to determine statistical significance.

## Results:

### Socio-demographic distribution of study participants

There were 427 participants adults, of whom (80.8%) were males and those who had primary education were 262 (61.4%). Most participants were 44 years or less, and the participant's mean age was 41 years.

**Table 1:** Distribution of study participants according to socio-demographic factors (N = 427)

Socio-demographic variables	n	%
<b>Sex</b>		
Male	345	80.8
Female	82	19.2
<b>Age group (yrs)</b>		
≤ 44	288	67.4
≥ 45	139	32.6
<b>Levels of education</b>		
≤ primary	262	61.4
≥ secondary	165	38.6

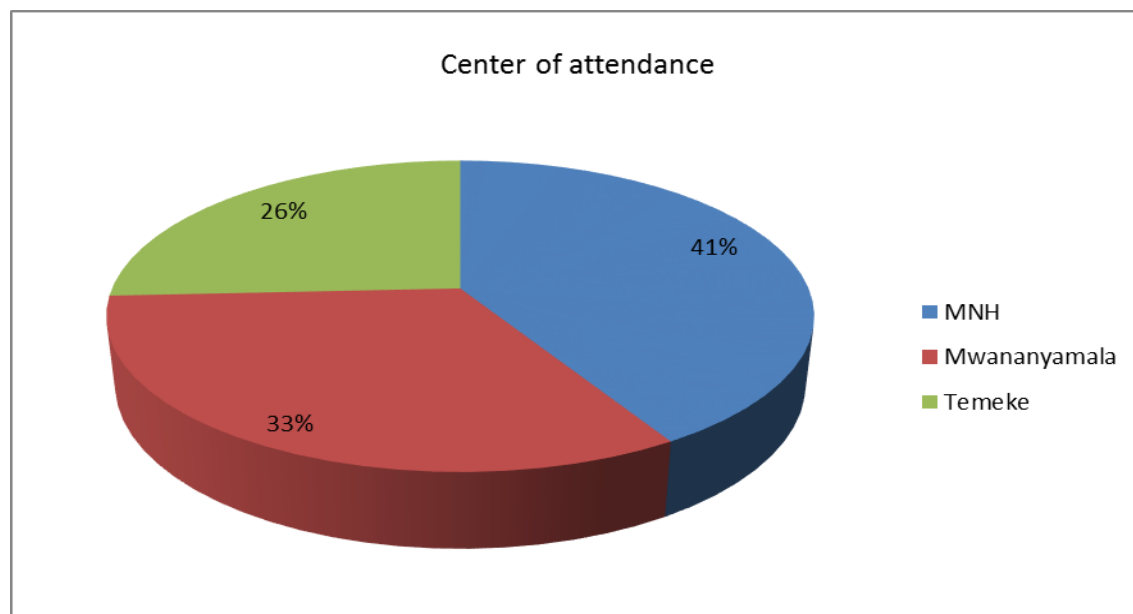


Figure 1: Distribution of study participants by centre of attendance

**Prevalence of tooth loss**

About 88.8% (n= 307) of study participants had lost one or more teeth. The majority of both males and females (n=303, 87.8% & n=76, 92.7% respectively) had lost one or more teeth, but the difference of tooth loss between them is not significant ( $p= 0.211$ ). About 84.7% (n=244) of participants aged 44 years and below had lost one or more teeth, and 97.1% (n=135) of those aged 45 years and above had lost one or more teeth. There was a statistically significant difference in tooth loss between age groups ( $p=0.001$ ). Considering the level of education, the majority of the participants had lost one or more teeth (primary education and below n=229, 87.4%, secondary education and above n=150, 90.9%), but no actual difference between these levels ( $p=0.264$ ) (table 2).

**Table 2:** Distribution of study participants according to tooth loss and socio-demographic factors (N=427)

Socio-demographic factors	Tooth loss		Statistics ( $\chi^2$ , $p$ -value)
	None n (%)	Lost $\geq 1$ n (%)	
<b>Sex</b>			
Male (n=345)	42 (12.2)	303 (87.8)	
Female (n=82)	6 (7.3)	76 (92.7)	1.566, 0.211
<b>Age groups (yrs)</b>			
$\leq 44$ (n=288)	44 (15.3)	244 (84.7)	
$\geq 45$ (n=139)	4 (2.9)	135 (97.1)	14.448, 0.001
<b>Levels of education</b>			
$\leq$ primary (n=262)	33 (12.6)	229 (87.4)	
$\geq$ secondary (n=165)	15 (9.1)	150 (90.9)	1.246, 0.264,

**Number of tooth loss**

A total of 3820 teeth were lost among all study participants, with a mean lost teeth of 8.95, SD = 7.772. About 27.0% (n=93) of males and 19.5% (n=16) of females had lost 13 to 31 teeth, while a few males (n=4, 1.2%) had lost all teeth, and none of the females had lost all teeth (Table 3). However, there was no difference in the mean of number of tooth loss between males (mean= 9) and females (mean= 8.7) ( $p=0.763$ ). The study showed a mean difference in number of tooth loss between age groups ( $p=0.001$ ). On the other hand, there is no difference in the mean number of tooth losses between levels of education ( $p= 0.260$ ).

**Table 3:** Distribution of study participants according to number of lost teeth and socio-demographic factors (n=3820)

Socio-demographic factors	Number of tooth loss				Statistics (t-test)
	None n (%)	Lost 1-12 n (%)	Lost 13-31 n (%)	Lost all 32 n (%)	
<b>Sex</b>					
Male	42 (2.2)	206 (59.7)	93 (27.0)	4 (1.2)	
Female	6 (7.3)	60 (73.2)	16 (19.5)	0 (0.0)	0.763
<b>Age groups (yrs)</b>					
$\leq 44$	44 (15.3)	188 (65.3)	55 (19.1)	1 (0.3)	
$\geq 45$	4 (2.9)	78 (56.1)	54 (38.8)	3 (2.2)	31.698, 0.001
<b>Levels of education</b>					
$\leq$ primary	33 (12.6)	161 (61.5)	68 (26.0)	0 (0.0)	

≥ secondary	15 (9.1)	105 (63.6)	41 (24.8)	4 (4.4)	0.260
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### Types of tooth loss

Mandibular molars are the most lost teeth (n=318, 74%) among study participants, followed by maxillary molars (n=277, 64.9%). The mandibular canines are the least lost teeth (n=36, 8.4%), followed by maxillary canines (n=90, 21.1%). Seventy-three point three per cent (n=192) and 76.4% (n=126) of participants with primary education and secondary education, respectively, had lost at least one or more mandibular molars, but no statistical difference between the levels of education ( $p=0.477$ ). Loss of maxillary molars by participants with primary education and below is 58.4% (n=153), and those with secondary education and above is 75.2% (n=124).

### Distribution of types of tooth loss according to sex, age groups and levels of education n 427

Table 4 shows that 73.6% (n=254) of males and 78.0% (n=64) of females had lost at least one or more mandibular molars; statistically, there was no difference in losing lower molars between males and females ( $p=0.409$ ). On the maxilla, 63.8% (n=220) and 69.5% (n=57) of males and females, respectively, had lost molars, but also no statistical differences between males and females ( $p=0.327$ ). There is a significant difference in losing different types of teeth between age groups ( $p < 0.05$ ).

**Table 4:** Distribution of types of tooth loss according to sex, age groups and levels of education n= 427

Type of teeth	Sex		Age groups (yrs)		Levels of education	
	Male n (%)	Female n (%)	≤ 44 n (%)	≥ 45 n (%)	≤ Primary n (%)	≥Secondary n (%)
Upper molars	220 (63.8)	57 (69.5)	158 (54.9)	119 (85.6)	153 (58.4)	124 (75.2)
$\chi^2, p\text{-value}$	0.959, 0.327		38.901, 0.001		12.471, 0.001	
Upper premolars	148 (42.9)	34 (41.5)	101 (35.1)	81 (58.3)	104 (39.7)	78 (47.3)
$\chi^2, p\text{-value}$	0.056, 0.813		20.641, 0.001		2.377, 0.123	
Upper canines	77 (22.3)	13 (15.9)	51 (17.7)	39 (28.1)	51 (19.5)	39 (23.6)
$\chi^2, p\text{-value}$	1.665, 0.197		6.036, 0.014		1.059, 0.304	
Upper incisors	183 (53.0)	38 (46.3)	146 (50.7)	75 (54.0)	132 (50.4)	89 (53.9)
$\chi^2, p\text{-value}$	1.192, 0.275		0.400, 0.527		0.513, 0.474	
Lower molars	254 (73.6)	64 (78.0)	202 (70.1)	116 (83.5)	192 (73.3)	126 (76.4)
$\chi^2, p\text{-value}$	0.683, 0.409		8.742, 0.003		0.506, 0.477	
Lower premolars	107 (31.0)	30 (36.6)	76 (26.4)	61 (43.9)	77 (29.4)	60 (36.4)
$\chi^2, p\text{-value}$	0.944, 0.331		13.170, 0.001		2.260, 0.133	
Lower canines	29 (8.4)	7 (8.5)	21 (7.3)	15 (10.8)	21 (8.0)	15 (9.1)
$\chi^2, p\text{-value}$	0.001, 0.969		1.487, 0.223		0.152, 0.697	
Lower incisors	100 (29.0)	16 (19.5)	64 (22.2)	52 (37.4)	79 (30.2)	37 (22.4)
$\chi^2, p\text{-value}$	3.005, 0.083		10.930, 0.001		3.056, 0.080	

### Causes of tooth loss

Dental caries was the commonest cause of tooth loss, mentioned by 58.3% (n= 192) of the participants who had lost teeth, followed by periodontal disease (n= 130, 39.6%) and traumatic injuries (n= 89, 26.9%). None of the participants mentioned any other reason for tooth loss. Most males (n=227, 65.8%) and females (n=58, 70.7%) mentioned dental caries as the leading cause of tooth loss, and there was no statistical difference between males and females ( $p=0.531$ ). Regarding age groups, most of them mentioned dental caries as a cause of tooth loss, and there is an actual difference between age groups (0.009). Among education levels, the difference is not significant ( $p=0.186$ ) (Table 5). Periodontal diseases show a significant difference between age groups ( $p= 0.001$ ). Traumatic injuries exhibit a statistically true difference between all socio-demographic factors (Table 6).

**Table 5:** Distribution of reasons for tooth loss according to socio-demographic factors (n=379)

Causes of tooth loss	Socio-demo factors					
	Sex		Age groups (yrs)		Education	
	Male n (%)	Female n (%)	≤ 44 n (%)	≥ 45 n (%)	≤ Primary n (%)	≥ Secondary n (%)
Dental caries	227(65.8)	58 (70.7)	182 (63.2)	103 (74.1)	167 (63.7)	118 (71.5)
$x^2, p\text{-value}$	1.267, 0.531		9.358, 0.009		3.365, 0.186	
Perio diseases	170 (49.3)	47(57.3)	131 (45.5)	86 (61.9)	144 (55.0)	73 (44.2)
$x^2, p\text{-value}$	2.124, 0.346		13.767, 0.001		5.533, 0.063	
Traumatic injuries	93 (27.0)	9 (11.0)	67 (23.3)	35 (25.2)	76 (29.0)	26 (15.8)
$x^2, p\text{-value}$	12.111,0.002		8.479, 0.014		10.325, 0.006	

### Kennedy's classification for partial tooth loss

On both jaws, upper and lower, Kennedy class III is dominant (n=157, 52.5% and n=152, 49.8%, respectively) followed by class IV on the upper and class I on the lower. Kennedy class III dominates all socio-demographic variables (sex, education and age). These observed data showed no significant difference between sex ( $p = 0.417$  upper jaw & 0.980 lower jaw) and education levels ( $p = 0.165$  upper jaw & 0.113 lower jaw). However, there were significant statistical differences in Kennedy classes between age groups on both jaws ( $p < 0.001$  upper jaw & lower jaw) (Table 6).

**Table 6:** Distribution of study participants according to Kennedy classes and socio-demographic factors (n= 427)

Kennedy class	Socio-demo factors					
	Sex		Age groups (yrs)		Education	
	Male n (%)	Female n (%)	≤ 44 n (%)	≥ 45 n (%)	≤ Primary n (%)	≥ Secondary n (%)
Upper jaw						
Class I	37 (10.7)	6 (7.3)	24 (8.3)	19 (13.7)	26 (9.9)	17 (10.3)
Class II	35 (10.1)	6 (7.3)	13 (4.5)	28 (20.1)	29 (11.1)	12 (7.3)
Class III	121 (35.1)	36(43.9)	105 (36.5)	52 (37.4)	85 (32.4)	72 (43.6)
Class IV	50 (14.5)	8 (9.8)	44 (15.3)	14 (10.1)	37 (14.1)	21 (12.7)
$x^2, p\text{-value}$	3.916,0.417		37.131,0.000		6.505, 0.165	
Lower jaw						

Class I	59 (17.1)	14 (17.1)	40 (13.9)	33 (23.7)	53 (20.2)	20 (12.1)
Class II	39 (11.3)	10 (12.2)	24 (8.3)	25 (18.0)	24 (9.2)	25 (15.2)
Class III	124 (35.9)	28 (34.1)	106 (36.8)	46 (33.1)	93 (35.5)	59 (35.8)
Class IV	26 (7.5)	5 (6.1)	21 (7.3)	10 (7.2)	20 (7.6)	11 (6.7)
$\chi^2, p\text{-value}$	0.425, 0.980		21.381, 0.000		7.474, 0.113	

### Prosthetic treatment need

Of 379 subjects who have lost their teeth, only 6.3% (n=24) have dental prostheses. Table 7 indicates that dental prostheses were provided in less than 10% of all participants with tooth loss across both sexes, levels of education and age groups. The same table indicates that there are no significant differences in the availability of prostheses between sex, levels of education and age group as their  $p$  –  $p$ -values are more significant than the cut-off point of  $p = 0.05$

**Table 7: Distribution of presence of prosthesis according to socio-demographic factors n= 379**

Socio-demographic factors	Presence of prosthesis		Statistics ( $\chi^2, p\text{-value}$ )
	Yes n (%)	No n (%)	
Sex			
Male	19 (6.3)	284 (93.7)	0.044, 0.835
Female	5 (6.6)	71 (93.4)	
Age groups (yrs)			
≤ 44	15 (4.0)	232 (96.0)	1.304, 0.861
≥ 45	9 (2.4)	123 (97.6)	
Levels of education			
≤ primary	16 (6.9)	215 (93.1)	0.302, 0.582
≥ secondary	8 (5.4)	140 (94.6)	

### Types of prosthesis

In Table 8, there are no significant differences in the presence of different types of prosthesis between sexes and levels of education ( $p > 0.05$ ).

**Table 8: Distribution of types of prosthesis according to sex and levels of education, n = 31**

Sex	Type of prosthesis			
	ALL	RPD n (%)	CD n (%)	FD n (%)
Male	22	18 (81.8)	2 (9.1)	2 (9.1)
Female	9	8 (88.9)	0 (0.0)	1 (11.1)
$\chi^2, p\text{-value}$		0.890, 0.345	0.478, 0.490	1.228, 0.268
Levels of Education				
≤ primary	21	17 (81.0)	1 (4.8)	3 (14.2)
≥ secondary	10	9 (90.0)	1 (10.0)	0 (0.0)
$\chi^2, p\text{-value}$		(0.000, 0.982)	(0.109, 0.741)	(1.265, 0.261)

### Discussion

This study indicates that approximately 4 out of 5 participants had lost one or more teeth, a prevalence nearly equal to that observed in the general population of Dar es Salaam and Mtwara (Kida et al., 2006; Mumghamba & Fabian, 2005). However, this prevalence is slightly different from that of the general populations in Sudan and Brazil (Khalifa et al., 2012).

The data show that most males and females have lost one or more teeth, with no statistically significant difference between the sexes ( $p=0.211$ ). This contrasts with findings from the Coastal region (Sarita et al., 2004) and Dar es Salaam (Kida et al., 2006), where females were more affected. The difference may stem from this study's focus on patients with substance use

disorders (SUD), who may be equally affected by substance use regardless of gender, unlike the general populations in the other studies.

Older individuals had lost more teeth than younger ones ( $p=0.001$ ). This can be attributed to age-related stresses and diseases affecting dental tissues and periodontium, such as dental caries and periodontal diseases, leading to tooth loss. At the same time, those with higher education may have better dental care knowledge.

The mean tooth loss in this study was higher than in the general population of Dar es Salaam and Pwani regions (Kida et al., 2006), and also higher than in the general populations of Kenya and Sudan (Sanya & Ng'ang'a, 2004; Khalifa et al., 2012). This could be due to the impact of substance use, which can alter mental, physical, and behavioural characteristics, leading to reduced dental care and subsequent tooth loss (Titsas & Ferguson, 2002). Markedly, only 1.2% of the participants had lost all their teeth, all males. This finding differs from the general population of Mtwara, where 2.4% were utterly edentulous (Mumghamba & Fabian, 2005). The lower prevalence of complete edentulism in this study may be due to the younger age of the SUD patients.

A binomial logistic analysis revealed a statistically significant association between age and tooth loss, with older age groups losing more teeth. This finding aligns with observations in Sudanese, Swedish, and Indonesian populations, where tooth loss increases with age (Khalifa et al., 2012; Elisa et al., 2017). However, the study found no significant difference in the mean number of missing teeth between different education levels or sexes. This may be due to the uniform lack of oral health services, such as education and promotion, across all demographics, as well as the physiological effects of substance use, which do not discriminate based on education or sex.

Mandibular molars were the most lost teeth among the study participants, followed by maxillary molars, likely due to the anatomical features that make them more prone to dental caries. Canines, with their strong and long roots, were the least frequently lost. These patterns are consistent with findings in Kenya, where lower molars are the most commonly missing teeth (Sanya and Ng'ang'a, 2004). The study found no significant difference in molar loss between the sexes, but significant differences were noted between age groups and education levels.

Dental caries was the primary cause of tooth loss among participants, followed by periodontal disease and traumatic injuries. This aligns with findings from the general population of Mtwara (Mumghamba and Fabian, 2005), Dar es Salaam (Kida et al., 2006), and other countries like Brazil, and Japan (Montandon et al., 2012; Aida et al., 2006). The study found no significant difference between sexes, with males losing more teeth due to violence-related injuries. There were also significant differences in tooth loss causes between age groups, with older individuals more affected by caries, periodontal diseases, and injuries. This trend mirrors findings from Japan and Brazil, where extractions due to caries or fractures are common in all age groups over 15, while periodontal disease predominates in those over 45 (Montandon et al., 2012).

Among different education levels, there was no significant difference in tooth loss due to dental caries and periodontal diseases, but traumatic injuries were more prevalent among less educated individuals. This may be due to a greater propensity for violence among the less educated, leading to more traumatic tooth loss.

Kennedy class III was the most common classification among partially edentulous participants, followed by class IV in the upper jaw and class I in the lower jaw. Kennedy class III, characterized by a bound edentulous area with teeth on both sides, is more prone to dental caries and periodontal diseases due to difficulties in cleaning. These findings are consistent with data from the Indian population, where Kennedy class III is also prevalent in both sexes (Devishree et al., 2018). The study found no significant differences in the prevalence of Kennedy classes between sexes and education levels, but significant differences existed between age



groups. This may be due to additional comorbidities in older age groups, such as diabetes, which can weaken dental tissues and lead to varying patterns of tooth loss.

Tooth loss can be addressed by replacing missing teeth with prostheses, restoring mastication, aesthetics, and speech, and maintaining alveolar bone integrity (Morin et al., 2005). However, this study revealed a high need for dental prostheses among SUD patients, with a low proportion of them having them. This contrasts with the general populations in Sri Lanka, Iraq, Nigeria, Sudan, and Tanzania, where the need for prostheses is less than fifty percent (Thilakumara et al., 2017; Talabani et al., 2015; Ibiyemi and Lawal, 2017; Khalifa et al., 2012). The lack of prostheses may be due to inadequate oral health services and the high cost of prosthetic devices.

There were no significant differences in prosthesis availability between sexes, education levels, and age groups, which contrasts with data from Poland and Nigeria, where higher education correlates with prosthesis use, while lower education is associated with a lack of prostheses (Mehr et al., 2018; Ibiyemi and Lawal, 2017). The lack of significant differences may be due to uniform barriers to dental care among SUD patients, regardless of demographic factors. Additionally, the mental health challenges associated with substance use may impair recognition of the importance of dental prostheses.

Removable acrylic partial dentures were the most common type of prosthesis used, possibly due to their acceptance as a definitive treatment in many developing countries despite being considered intermediate dentures. This may result from resource scarcity and a lack of expertise in fabricating more complex prostheses. None of the study participants had dental implants, likely due to their high cost and the specialized expertise required. This is consistent with findings from the Nigerian general population, where most had removable partial dentures, and few had implant-supported dentures (Ogunrinde et al., 2015). Similarly, in Georgia, only 0.1% of the population had dental implants (Makhviladze et al., 2016). The low prevalence of more advanced prostheses, such as fixed dentures and complete removable dentures, is due to various factors, including the clinical condition of the remaining teeth, poor oral hygiene, and the high cost of these options. In contrast, European countries report a higher prevalence of fixed prostheses, including crowns and bridges (Zitzmann et al., 2007), likely due to better dental services and socioeconomic conditions.

The study found no significant differences in the presence of different types of prostheses between sexes and education levels, contrasting with findings from European countries, where lower education is associated with a higher frequency of removable dentures (Zitzmann et al., 2007). Similarly, in the United States, individuals with higher education levels are more likely to have dental implants (Elani et al., 2018). The differences observed may be due to the specific population studied SUD patients who may have altered mental status and less knowledge about dental prostheses and their importance

## Conclusion

The study reveals a high prevalence of tooth loss among patients receiving methadone maintenance therapy (MMT) in Dar es Salaam, Tanzania, with dental caries being the primary cause. The findings indicate that most participants have lost multiple teeth, with mandibular and maxillary molars most affected. The significant relationship between tooth loss and age underscores the need for targeted dental care interventions for older individuals within this population. The low rate of dental prosthesis use suggests a considerable unmet need for prosthetic dental treatment among these patients.

These results highlight the importance of integrating oral health services into MMT programs to address the specific dental health needs of patients with substance use disorders. Providing comprehensive dental care, including preventive measures and access to dental prosthetics, can significantly improve their overall quality of life. This study underscores the

critical need for policies and healthcare initiatives that consider the oral health challenges faced by individuals undergoing MMT, promoting better health outcomes and enhancing their social and economic well-being.

### Recommendations

Based on the results above, it is key to include comprehensive dental care in methadone maintenance therapy programs, implement educational programs to raise awareness among MMT patients about the importance of oral hygiene and the risks related to poor dental health, and increase access to affordable dental prosthetics for patients who have lost teeth, advocate for the development of policies that prioritize the oral health of individuals with substance use disorders.

### Ethical consideration

Ethical approval was sought from Muhimbili University of Health and Allied Sciences (MUHAS) and the Research Ethics Review Committee, with clearance number DA.282/298/01.C/. Permission to carry out the study was obtained from all study centres. Confidentiality and anonymity were maintained and observed at every step, from data management to analysis and presentation, and participant codes were used instead of names.

**Conflict of interest:** None

**Author contributions:** All authors contributed to the writing of this manuscript.

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