RESEARCH ARTICLE

Oral Health Vulnerability and Associated Risk Factors Among Tribal Elderly People in Bangladesh: A Primary Pilot Initiative Demanding a National Oral Health Survey

S Barua[1], S Bosu[2], M F Haque[3], L Bosak[4], R Rashid[5], S R Zaman[5], F Rahman[6], M M Rahman[7]

[1]Directorate General of Health Services (DGHS), Mohakhali, Dhaka-1212, Bangladesh

[2]Institute of Epidemiology Disease Control and Research (IEDCR), Dhaka-1212, Bangladesh

[3]Shaheed Monsur Ali Medical College Hospital, Uttara, Dhaka, Bangladesh

[4]Basic Science Division, World University of Bangladesh

[5]Director General of Health Services of Bangladesh, Dhaka-1212, Bangladesh

[6]Department of Community Medicine, National Institute of Preventive and Social Medicine, Dhaka-1212, Bangladesh

[7]Department of Biostatistics, National Institute of Preventive and Social Medicine, Dhaka-1212, Bangladesh

Abstract

Background
Tribal elderly are a vulnerable population due to their geographic location and lack of access to healthcare services, including poor oral health. As the primary initiative for a representative ethnic oral health survey for the elderly, this pilot study aims to assess the oral health status of tribal elderly in Bangladesh and identify the associated risk factors.

Methods
This cross-sectional pilot survey was conducted among 280 tribal elderlies aged 60 years and above residing in the main tribal residing region in Bangladesh. The data were collected through simple random sampling using a semi-structured questionnaire and oral examination from January to December 2019. Different statistical tools, including frequency distribution, a Chi-square association test, and a multivariable logistic regression model, were used in data analysis.

Results
Among 280 tribal elderlies, the majority (76.8%) were 60-69 years old, female (63.3%), and in the Buddhist faith (72.1%). The results showed that the Decayed, Missing due to caries, and Filled Teeth (DMFT) score was 3.39 (range: 0-31), and 25.35% of the tribal elderly had high DMFT score (DMFT≥5.0), indicating poor oral health. Respondents' age, sex, marital status, occupational status, sweet eater, tobacco, and alcohol consumption were significantly ($p<0.05$) associated with oral health. The major oral clinical signs and symptoms were dental carries (8.2%), teeth sensitivity (19.6%), loose teeth (17.5%), broken teeth (30.4%), calculus (35.7%), staining in teeth (62.1%), tongue pain (62.1%) and bad breath (17.9%). The logistic regression analysis suggested that elderly aged 80 and above had 3.33 [OR: 3.33; 95% CI: 1.18-9.39; p=0.023] times more, males were 0.46 [OR: 0.46; 95% CI: 0.21-1.01; p=0.052] time less, tobacco user (smoked/smokeless) were 2.03 [OR: 2.03; 95% CI: 1.02-4.02; p=0.043] times more and alcohol consumers were 6.83 [OR: 6.83; 95% CI: 1.82-25.62; p=0.004] times more likely to experience poor oral health condition than their counterparts.

Conclusions
Elderly aged 80 and above were found to be more likely to suffer from poor oral health conditions than 60 – 69 years old individuals, and certain lifestyle factors such as tobacco and alcohol consumption, meal frequency, and sweet consumption can further increase the risk of poor oral health conditions. The findings can be a primary initiative for further investigating the nationally representative oral health survey among tribal elderly.

Keywords

DMFT, Oral Health, Risk factors, Tribal Elderly, Bangladesh

Introduction

Oral disease is a prevalent cause of medical and emergency room visits closely linked to aging [1,2]. Poor oral health can negatively impact overall health and quality of life, leading to poor nutritional status among the elderly [3]. Consuming carbohydrates, sticky foods, and sweetened foods can contribute to poor oral health [4,5], as can the use of tobacco and alcohol [6,7]. Sweetened food and sticky food consumption lead to Dental caries, Gingival bleeding, periodontitis, calculus, and other oral health problems [8,9]. Additionally, oral health problems can cause early loss of teeth and negatively impact the ability to chew food [10]. Older individuals are particularly vulnerable to dental diseases due to lack of education and access to care [11,12] and suffer from different types of dental diseases [13,14].

In South Asia, tribal elderly individuals often face significant oral health challenges. Studies have shown that the oral health vulnerability among this population is high, with over 77.02% of individuals over the age of 45 experiencing any oral morbidity [15,16]. Additionally, periodontal disease is prevalent, with nearly 40% of tribal elderly individuals in the region affected [17,18]. These rates are significantly higher than those seen in non-tribal populations in South Asia. Factors such as limited access to dental care, poor oral hygiene practices, and a lack of education about oral health contribute to these high rates of oral health conditions among tribal elderly individuals in the region [19,20].

Bangladesh is one of the most densely populated countries in the world, where 1.10% of the country's total population is tribal [21]. They mainly live in the flatland districts of the north and south-east of the country, while the rest reside in the Chittagong Hill Tracts [22]. Most of the tribal people live near the jungle and the hills. Smokeless tobacco has been implicated as a risk factor for numerous oral conditions, starting from gingivitis to oral cancers [23]. Many older people among the tribes have the habit of chewing betel nuts and tobacco leaves without knowing the side effects [22].

Research on the oral health of tribal elderly individuals in Bangladesh has shown that they have a higher incidence of oral health issues compared to the general population [24,25]. One study found that almost 75% of tribal elderly individuals in Bangladesh had at least one decayed or missing tooth, and over 50% had periodontal disease [26]. This contrasts with the national average, where only about 60% of older adults have at least one decayed or missing tooth, and around 25% have periodontal disease [27]. Along with the abovementioned risk factors, cultural and traditional practices, such as chewing betel nuts and tobacco, can also increase the risk of oral health issues [15,20]. Despite these challenges, there are limited programs and initiatives in place to improve oral health and access to dental care for tribal elderly individuals in Bangladesh.

The isolation from mainstream development activities, together with poverty and difficult healthcare accessibility, made the tribal communities specifically vulnerable to various problems, including oral health [22]. However, relatively few studies have focused specifically on the tribal groups in the country [23,28,29]. Therefore, this pilot study aims to assess the oral health status of tribal elderly in Bangladesh and identify the associated risk factors. Although the tribal elderlies are vulnerable due to this poor oral health, there is no nationally representative study on oral health. The findings of this pilot study could be a primary initiative for the national oral health survey in Bangladesh.

Methods

Ethical consent and permission for data collection

This study followed the guidelines of the World Medical Association's (WMA's) Declaration of Helsinki. The ethical approval was taken from the institutional review board of the National Institute of Preventive and Social Medicine, Dhaka (IRB registration number: NIPSOM/IRB/2019/111), and formal permission for data collection in the community was taken from the tribal community leaders (called '*Karbari*'). Both written and verbal consent were obtained from each participant before initiating the interview for data collection. A brief introduction to the aims and objectives of the study was given first. Then, the written consent translated into the native language was read out to illiterate tribal elderly. Participants who agreed with the consent were finally included in the study.

Study design

This study was conducted cross-sectionally as a pilot initiative involving a general health assessment through a semi-structured questionnaire.

Sample size estimation

The sample size of the study was calculated by using the formula stated below:

$$n = \frac{z^2\sigma^2}{d^2} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where,

n = assumed/ desired sample size

z = the standard normal deviation, usually set at 1.96 at 95% confidence level.

σ = standard deviation of DMFT score.

d = Margin of error= 7% (rule of thumb) = 0.07

During the literature search, Ahmed et al. (2018) conducted a study on oral health status among 26 geriatric populations and showed that the standard deviation of the DMFT score is 5.72 [29].

Using the equation (1), the required sample size when σ =5.72 is

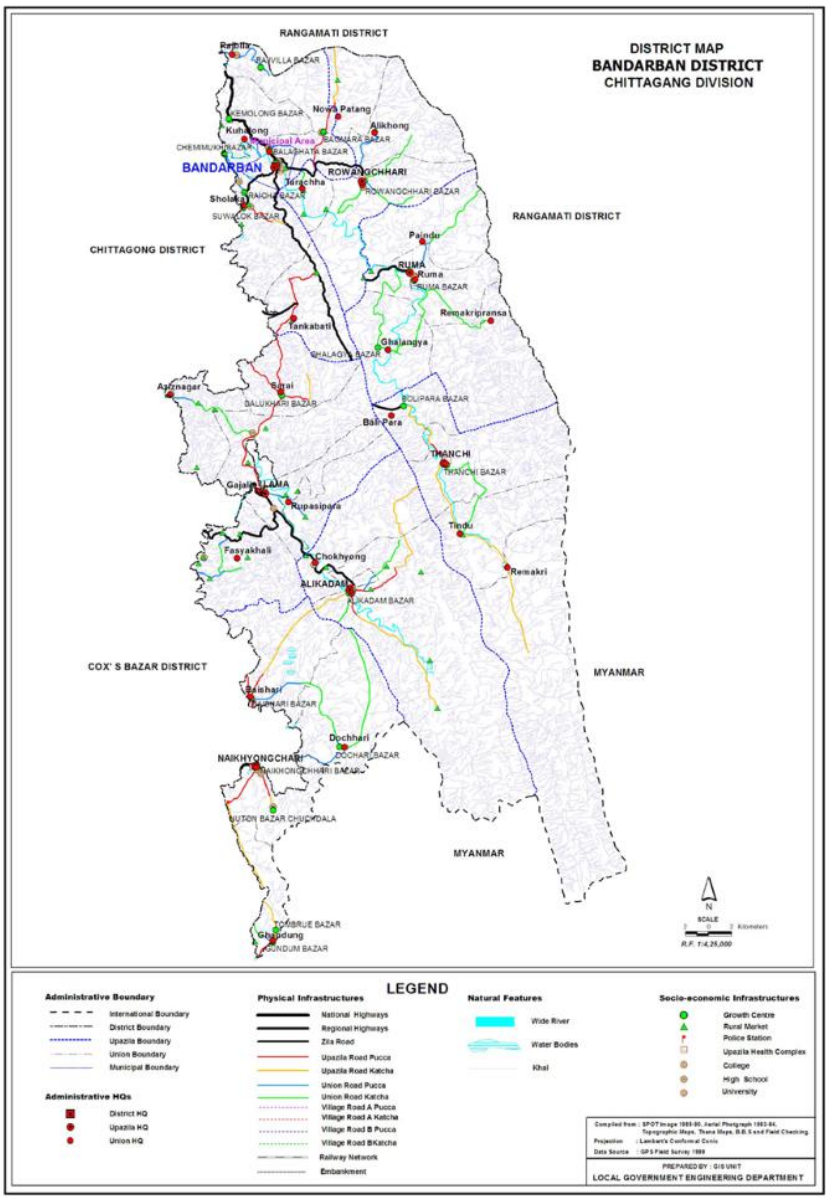
$$n = \frac{1.96^2 \times 5.72^2}{0.07^2} = 260$$

Initially, the study chose 260 as the required sample size. As no study with a sufficient sample size was found, we additionally considered a usable 5% non-response rate. Finally, the sample size became 273, and information was collected from 280 older tribal adults as the round-up sample size.

Study participants and data collection

The study was conducted among tribal elderlies aged 60 years and above in South-Eastern Bangladesh from January to December 2019. A simple random sampling (SRS) technique was used to collect the data. The residence of the tribal elderlies was divided into 20 *paras* (Para, social-geographical zone, or village in Bangladesh). Eight *paras* were randomly selected by a random number generator obtained by R programming language, and then the eligible 35 elderlies from each *para* were included for further interview. The face-to-face interview was used to collect socio-demographic data and instruments for anthropometric and oral health-related information. A group of trained data enumerators (dental students) was enrolled to collect data using the necessary data collection tools- Caries probe (a tool for observing caries), Periodontal Probe (a tool for observing periodontitis) and Dental Mirror. The map of the study area is presented in Figure 1.

Figure 1. Study place- map of Bandarban district.



The figure was retrieved from the website of the Local Government Engineering Department (LGED), Bangladesh.

Study selection criteria

The inclusion criteria for data collection were: (i) aged 60 and above; (ii) living in the tribal community of South-Eastern Bangladesh; (iii) agreed to participate in a general dental health assessment and an interview. On the other hand, the exclusion criteria were: (i) elderly who were physically ill, and (ii) non-resident but currently residing in Bandarban district for work purposes.

Variable measurements

Socio-demographic variables of the tribal elderly were age (in complete year), sex, religion, marital status, monthly family income, educational status, occupation, and family type. Personal habit-related variables were tobacco consumption and alcohol consumption. Diet-related variables were meal time, variety of food taking, daily frequency of meals (dinner, lunch, breakfast), snacks eating, oil, drinking of tea, soft drinks, sweets and vegetable consumption. The dietary habits were measured by 24-hour recall methods, a 7-day food frequency method and other food-related questions.

The patients were asked about their oral health conditions. A modified scoring system of WHO was used to detect gingival and periodontal status among the patients [31]. This score system was used to determine the periodontal health and gingival condition. They were asked to open their mouth, and after checking oral conditions based on clinical signs and symptoms, the answers were noted on the Bengali-translated questionnaire. The dependent variable of the study was oral health status assessed by observing oral health-related indicators and the Decayed, Missing due to caries, and Filled Teeth (DMFT). The DMFT score was computed for each elderly person following the guidelines of the World Health Organization (WHO) oral health survey [32].

Operational definition

DMFT: According to WHO, DMFT is the total number of decayed, missing teeth due to caries and filled teeth in the permanent teeth [32]. The mean number of DMFT is the sum of individual DMFT values divided by the sum of the population.

Gingival bleeding: Gingival bleeding is a common bleeding disorder which indicates the presence of periodontal disease [33].

Dental caries: A prevalent chronic infectious disease that develops when bacteria in the mouth metabolize sugars to produce acid that demineralizes the hard tissues of the teeth [34]

Tooth sensitivity: A pathologically deepened gingival sulcus around a tooth at the gingival margin [35].

Quality control of Data

To ensure the quality of data, we took multiphase initiative- (i) revised and validated the translated questionnaire by conducting a pre-test; (ii) collected the data by a trained data collection team (e.g., Dental Students); (iii) checked the data and fixed errors by observing descriptive statistics; (v) employed updated version of statistical software in data analysis, and (vi) finally, randomly re-observed a portion of elderly regarding their oral health and verified the collected data for improving overall data quality.

Statistical analysis

The collected data were processed, edited, and coded first, and observed consistency by frequency distribution. In data analysis, descriptive statistics, including frequency distribution table, graphs and diagrams, were performed first. Elderly oral health status was assessed by DMFT levels. For analytical purposes, the DMFT index score was statistically classified into high DMFT (poor oral health status; DMFT score≥5.0) and low DMFT (good oral health status; DMFT score less than 5.0) considering 75% percentiles (75% percentiles of DMFT was 5.0) which also supports WHO guideline on oral health survey [32]. The Pearson Chi-square test was performed to observe the significantly associated factors of DMFT. The degree of associated factors of DMFT and oral health status was assessed by adjusted odds ratio in a multivariable logistic regression model [11,36]. To perform the multivariable logistic regression model, we converted our dependent variable DMFT as dichotomous [poor oral health status (high DMFT) coded as 1 and good oral health status (low DMFT) coded as 0]. Dataset management and all the statistical analysis were carried out through IBM SPSS Statistics 26.0. The confidence interval was 95%, and the level of confidence was set at 0.05.

Results

Background characteristics of the tribal elderly

The second column of Table 1 represents the socio-demographic characteristics of the tribal elderly. Among 280 respondents, most (76.8%) of the tribal elderly were 60-69 years old, 14.3% were 70-79, and 8.9% were in the age group 80 and above. The proportion of female elderly was higher (63.3% vs. 36.8%) than male, and the majority (72.1%) were Buddhist in religion. The majority of the tribal elderly were poor and lived in lower socio-economic conditions where agriculture, day labourer and housewife were the main occupational status. Illiteracy rate was high among the tribal community. One-fifth of the tribal elderly live in joint and extended families and almost 50% of the family's monthly income was only 10001-20000 Taka ($100-$200) (Table 1).

The study found that smoking is a common personal habit among tribal elderly, and 5% of them were alcohol consumers. Nine out of 10 tribal older people receive three meals in a day. However, meat and fish consumption and tea drinking were also found to be frequent in the community elderly (Table1)

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Table 1. Socio-demographic characteristics and the associated factors of DMFT

Characteristics	**Frequency**	**Low DMFT (<5)**	**High DMFT (>5)**	**P# value**
	n(%)	n(%)	n(%)	
Age				
60-69 years	215(76.8)	170(79.1)	45(20.9)	0.007***
70 to 79 years	40(14.3)	25(62.5)	15(37.5)	
>80 Years	25(8.9)	14(56.0)	11(44.0)	
Sex				
Female	177(63.2)	135(76.3)	42(23.7)	0.08*
Male	103(36.8)	74(71.8)	29(28.2)	
Marital Status				
Married	228(81.4)	176(77.2)	52(22.8)	0.04**
Unmarried/widowed/divorce	52(18.6)	33(63.5)	19(36.5)	
Religion				
Buddhism	202(72.1)	154(76.2)	48(23.8)	0.32
Christian and others	78(27.9)	55(70.5)	23(29.5)	
Educational status				
Literate	62(22.1)	43(69.4)	19(30.6)	0.27
Illiterate	218(77.9)	166(76.1)	52(23.9)	
Occupational status				
Retire and dependent	25(8.9)	14(56.0)	11(44.0)	0.014***
Housewife	98(35.0)	73(74.5)	25(25.5)	
Agriculture/Labour/Other	107(38.2)	89(83.2)	18(16.8)	
Business/Employed	50(17.9)	33(66.0)	17(34.0)	
Family Type				
Single and Nuclear Family	46(16.4)	36(78.3)	10(21.7)	0.53
Join and Extended Family	234(83.6)	173(73.9)	61(26.1)	
Monthly Family income (considering $1=100 Taka)				
< 10000 Taka ($100)	54(19.3)	38(70.4)	16(29.6)	0.701
10001-20000 Taka ($100-$200)	131(46.8)	99(75.6)	32(24.2)	
20001-30000 Taka ($200-$300)	46(16.4)	33(71.7)	13(28.3)	
> 30000 Taka (>$300)	49(17.5)	39(79.6)	10(20.4)	
Tobacco user (smoked or smokeless)				
Yes	167(59.6)	131(78.4)	36(21.6)	0.05**
No	113(40.4)	78(69.0)	35(31.0)	
Alcohol Consumption				
Yes	14(5.0)	6(42.9)	8(57.1)	0.01***
No	265(94.6)	202(76.2)	63(23.8)	
Daily meal consumption				
Less than 3 times	16(5.7)	11(68.8)	5(31.3)	0.153
Three times	254(90.7)	193(76.0)	61(24.0)	
More than three times	10(3.6)	5(50.0)	5(50.0)	
Meat consumption				
No	51(18.2)	35(68.6)	16(31.4)	0.27
Yes	229(81.8)	174(76.0)	55(24.1)	
Fish consumption				
No	15(5.4)	7(46.7)	8(53.3)	0.027**
Yes	265(94.6)	202(76.2)	63(23.80)	
Soft Drink user				
No	251(89.6)	189(75.3)	62(24.7)	0.458

Yes	29(10.4)	20(69.0)	9(31.0)	
Tea Drinker				
No	129(46.1)	103(79.8)	26(20.2)	0.05**
Yes	151(53.9)	106(70.2)	45(29.8)	
Sweet eater				
No	244(87.1)	190(77.9)	54(22.1)	0.001***
Yes	36(12.9)	19(52.8)	17(47.2)	

[#]Chi-square/Fisher's exact test. *Significant at 10% level; **Significant at 5% level; ***Significant at 1% level

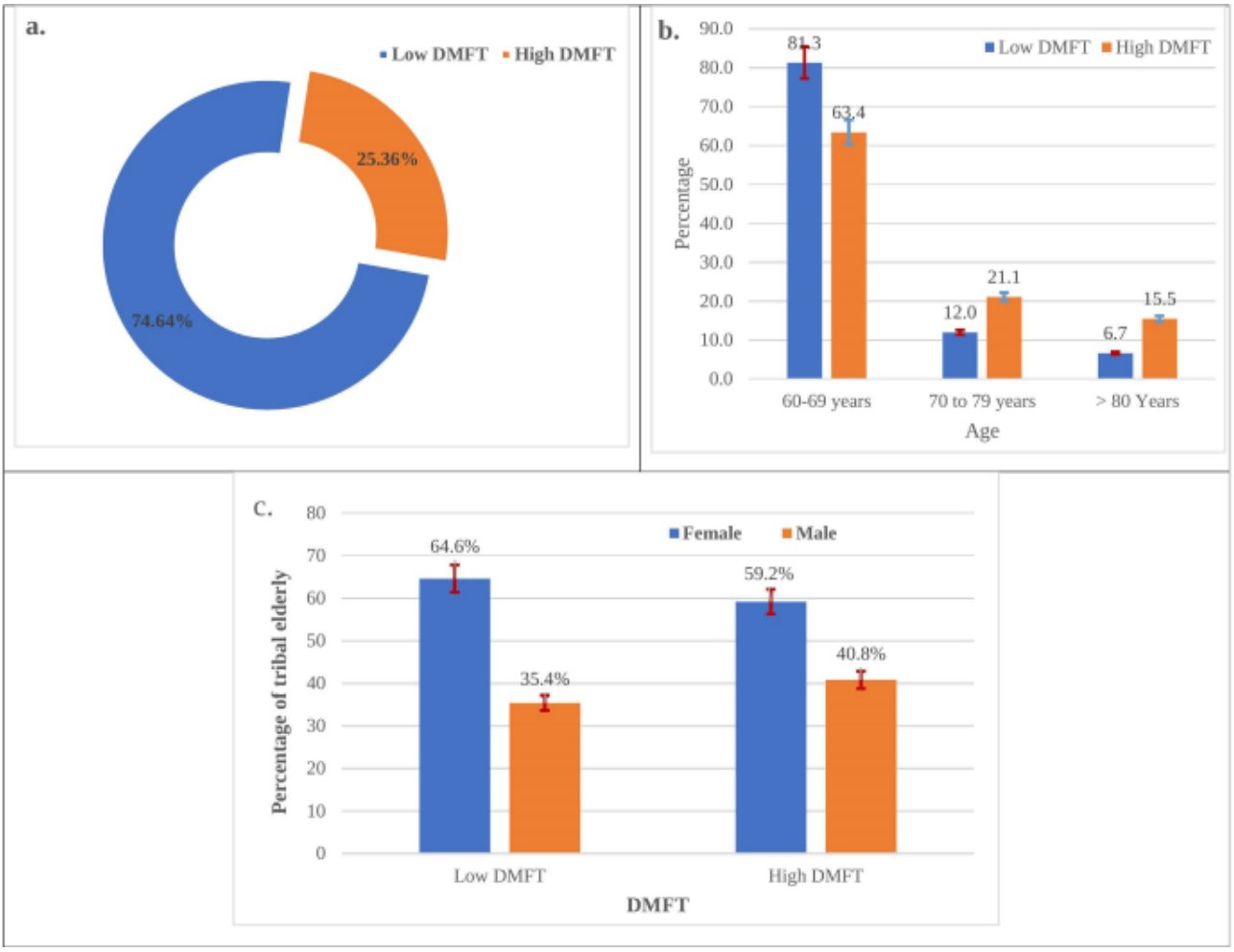
Factors associated with Poor oral health status of tribal elderly

Numerous socio-demographic, food consumption behaviour and personal habits-related factors were responsible for the oral health status of tribal elderly obtained by Pearson's Chi-square association test (Table 1). Respondents from the higher age group and economically dependent were comparatively experienced to poor oral health status (High DMFT). Variables including marital status, occupation, tobacco and alcohol consumption history, fish and sweet consumption and tea drinking were significantly ($p<0.05$) associated with the oral health status of tribal elderly.

Oral health status of the tribal elderly

The respondent's oral health status was assessed by analyzing the DMFT index (Fig 2. a, 2. b and Fig 2. c). It was seen that the mean DMFT score was 3.39 (range: 0-31), and the prevalence of high DMFT as well as poor oral health status was 25.35%. This means that one out of four tribal elderly is suffering from poor oral health conditions. Fig 1. b shows the oral health status of the elderly by their age. The analysis found that poor oral health status is age-neutral, and the majority of elderly in higher age groups are facing poor oral health conditions. In addition, poor oral health condition was found to be more vulnerable in females elderly than males (Figure 2. c).

Figure 2. DMFT levels as a predictor of oral health - a. Overall DMFT level; b. DMFT level by age groups and; c. DMFT levels by sex of the tribal elderly in Bangladesh.



Clinical signs and symptoms related to oral health of the tribal elderly

The respondents' clinical signs and symptoms related to oral health were analyzed in Table 2. It was seen that elderlies were suffering from tooth pain, where the problem was more prevalent in females than males. Almost all the clinical signs and symptoms, including gingival bleeding, dental caries, tooth sensitivity, loose and broken tooth and periodontal pockets presented in Table 2, were found higher in female than their male counterparts. In contrast, gingival bleeding was present high among male tribal elderly (Table 2).

Table 2. Distribution of clinical signs and symptoms of oral health of the tribal elderly

Oral health problems	Male	Female	Oral health problems	Male	Female
	n (%)	n (%)		n (%)	n (%)
Presence of Tooth Pain			**Presence of staining in tooth**		
Yes	8(7.9)	17(9.6)	Yes	61(35.1)	113(64.9)
No	93(92.1)	160(90.4)	No	42(39.6)	64(60.4)
Presence of Gingival bleeding			**Presence of pain in tongue**		
Yes	9(8.7)	14(7.9)	Yes	61(35.1)	113(64.9)
No	94(91.3)	163(92.1)	No	42(39.6)	64(60.4)
Presence of Dental caries			**Presence of lip pain**		
Yes	20(19.4)	41(23.2)	Yes	0(0.0)	1(100)
No	83(80.6)	136(76.8)	No	103(36.9)	176(63.1)
Presence of Sensitivity in tooth			**Presence of bad breath**		
Yes	18(32.7)	37(67.3)	Yes	20(40.0)	30(60.0)

No	85(37.8)	140(62.2)	No	83(36.1)	147(63.9)
Presence of loose teeth			**Pocket of periodontium by scoring**		
Yes	13(26.5)	36(73.5)	Presence of Condition (Pocket 4-5 mm)	6(35.3)	11(64.7)
No	90(39.0)	141(61.0)	Absence of Condition	97(36.9)	166(63.1)
Presence of Broken tooth			**Materials used for oral hygiene practice during toothbrush**		
Yes	29(34.1)	56(65.9)			
No	74(37.9)	121(62.1)	Tooth Paste	64(36.8)	110(63.2)
Presence of calculus in tooth			No Materials used	2(100)	0(0.0)
Yes	35(35.0)	65(65)	Ash	0(0.0)	1(100)
No	68(37.8)	112(62.2)			

Degree of associated factors of oral health status

Numerous socio-demographic, food consumption behavior and personal habits related factors significantly affects the oral health status of tribal elderly found by examining adjusted odds ratio in multivariable logistic regression (Table 3). The chance of affecting to poor oral health condition was comparatively higher in older age groups. More specifically, elderly aged 70 -79 years were 2.46 [AOR: 2.46; 95% CI: 1.04-5.85; p=0.42] times more and elderly aged 80 or more were 3.33 [AOR: 3.33; 95% CI: 1.18-9.39; p=0.23] times more likely to suffer poor oral health condition than the young elderly (60 to 69 years). Male elderly was 0.46 [AOR: 0.36; 95% CI: 0.21-1.01; p=0.05] times lower chance of suffering from poor oral health condition than their female counterparts. Similarly, unmarried, and minor religious groups were more likely to suffer from poor oral health condition. Tobacco user were 2.03 [AOR: 2.03; 95% CI: 1.02-4.02; p=0.043] times and alcohol consumers were 6.83 [AOR: 6.83; 95% CI: 1.82-25.62; p=0.004] times more likely to suffer from poor oral health condition than those who did not consumed. Analysis also found that elderly who consumed sweet daily were 3.93 [AOR: 3.93; 95% CI: 1.66-9.34; p=0.002] times more likely to affect in poor oral health condition (Table 3).

Table 3. Summary of multivariable logistic regression model of DMFT to assess of oral health status

Characteristics	AOR (95% CI)	P value
Age		
60 to 69 years	Reference	
70 to 79 years	2.46 (1.04-5.85)	0.042
>80 years	3.33 (1.18-9.39)	0.023
Sex		
Female	Reference	
Male	0.46 (0.21-1.01)	0.05
Marital Status		
Married	Reference	
Unmarried/widowed/divorce	1.69 (0.76-3.73)	0.197
Religion		
Buddhism	Reference	
Christian and others	1.01 (0.51-2.03)	0.973
Educational status		
Illiterate	Reference	
Literate	1.08 (0.48-2.42)	0.860
Occupational status		
Retire and dependent	Reference	
Housewife	0.88 (0.28-2.71)	0.821
Agriculture/Labour/Other	0.24 (0.07-0.81)	0.021
Business/Employed	0.97 (0.32-2.96)	0.953
Tobacco user (smoked or smokeless)		
No	Reference	
Yes	2.03 (1.02-4.02)	0.043
Alcohol consumption		
No	Reference	
Yes	6.83 (1.82-25.62)	0.004

Daily eating habit		
Less than 3 times	Reference	
Three times	1.12 (0.31-4.05)	0.869
More than three times	3.00 (0.43-20.72)	0.266
Meat eater		
No	Reference	
Yes	1.32 (0.55-3.19)	0.532
Fish eater		
No	Reference	
Yes	0.30 (0.08-1.15)	0.079
Soft drink user		
No	Reference	
Yes	0.98 (0.34-2.79)	0.972
Sweet eater		
No	Reference	
Yes	3.93 (1.66-9.34)	0.002

Discussion

Studies on the oral health condition and hygiene practices of tribal elderly are rarely conducted in Bangladesh. Although the government has some special health policies focused on the mainland elderly, tribal elderly in Bangladesh are still vulnerable due to their geographic location [37,38]. This pilot study cross-sectionally collected and analyzed oral health-related data of 280 tribal elderly residents in Bandarban, a main tribal region in Bangladesh. The study found that the socio-demographic and economic condition of the tribal elderly was poor. The female elderly and Buddhist religion were comparatively higher than their counterparts.

According to our findings, one out of four tribal elderlies in Bangladesh were suffering from poor oral health status. The rate was very high among females and higher age groups. Generally, elderly from higher age groups and females are reluctant to maintain oral health due to their frail physical condition [39,40]. As a result, they comparatively suffer more from poor oral health conditions. This study revealed that socio-demographic traits, personal habits like alcohol and cigarette use, dietary habits like eating meat and fish for every meal, drinking soft drinks, drinking tea, and eating sweets all are linked to a poor oral health condition (High DMFT), and the findings are comparable to existing literature. According to the World Health Organization (WHO), the elderly' poor oral health is caused by modifiable risk factors, including tea and sugar consumption, tobacco use, alcohol use, poor hygiene practice, and their underlying socio-demographic and commercial determinants [41].

The results of this study indicate that the oral health status of the tribal elderly population was poor, with a prevalence of 25.35% of high DMFT, indicating poor oral health. A recent healthcare study supports this finding by demonstrating the oral health issues that tribal groups faced [42]. Numerous works of literature suggest that poor oral health status (high DMFT) is negatively associated with aging and affects the quality of life of the elderly aged 75 years and older [43,44]. In addition, male elderlies were less likely to suffer from poor oral health conditions than their female counterparts, and the result is comparable to existing literature [45–47]. Unmarried and minor religious groups were also more likely to suffer from poor oral health conditions. The finding is consistent with previous research that has found that older adults are at an increased risk for poor oral health and that women tend to have poorer oral health than men [43,48].

Furthermore, tobacco users were 2.03 times more likely, and alcohol consumers were 6.83 times more likely to suffer from poor oral health conditions than those who did not consume either substance. Lastly, the elderly who consumed sweets daily were 3.93 times more likely to suffer from poor oral health conditions. In line with these findings, it is evident that sugary diets, tobacco use, and alcohol intake pose significant risks for dental illnesses, discomfort, and function impairment, as reported by the World Health Organization [49].

Most of the tribal elderly in Bangladesh live in hilly and hard-to-reach areas. Due to the challenging terrain and limited set-up, there is limited access to healthcare services, including dental care. However, improving the oral health vulnerability among tribal elderly requires a comprehensive approach-

Increasing access to dental care- Mobile dental clinics and outreach programs should be established in remote tribal areas to provide check-ups, treatments, and oral health education. Collaborations with local healthcare organizations and dental professionals can ensure affordable services in areas with limited healthcare facilities.

Raising oral health awareness- Tailored education programs should emphasize proper oral hygiene practices, like regular brushing and flossing. Training programs for community health workers can enable oral health assessments and promote preventive measures [28]. Partnerships with dental

professionals can establish referral systems for specialized care.

Collaboration among stakeholders- Government agencies, NGOs, dental associations, and tribal leaders should develop comprehensive oral health programs. International organizations and donor agencies can provide funding support.

Research and data collection- Studies should assess oral health status and needs among tribal elderly in different regions. Data on oral health indicators will facilitate monitoring and evaluation.

Policy development- Advocacy for policies that allocate resources and establish guidelines for tribal oral healthcare is necessary. Integrating oral health within existing healthcare policies will ensure holistic care.

Conclusion

In conclusion, this study has highlighted the poor oral health status of tribal elderly in Bangladesh, especially in hill track areas of the south-eastern part. The findings suggest that higher-aged elderlies are more likely to suffer from poor oral health conditions than young, elderly individuals and that certain lifestyle factors such as tobacco and alcohol consumption, as well as meal frequency and sweet consumption, can further increase the risk of poor oral health conditions in the elderly. It is important to note that these findings should be considered when developing strategies to improve oral health among the elderly population. Along with this, a nationwide oral health study among ethnic elderly is urgently needed.

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Conflicts of interest

All authors declared no conflicts of interest.

Declarations Author contribution statement

SB- Contributed to conception, data collection, analysis, writing of original draft, editing and finalizing the version to be submitted.

SB, MFH and LB- Contributed to data collection, writing of the original draft, editing, and finalizing the version to be submitted.

RR, SRZ and FR- Contributed to writing the original draft, editing, and finalizing the version to be submitted.

MMR- Contributed to the conception of the study, supervised, analyzed, wrote original draft, edited, and finalized the version to be submitted. All author has read and approved the final version of the manuscript to be submitted.

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Data accessibility statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request to the corresponding author.

Ethics:

This study followed the guidelines of the World Medical Association (WMA) Declaration of Helsinki. The ethical approval of this study was approved by the institutional review board of the National Institute of Preventive and Social Medicine (NIPSPOM), Mohakhali, Dhaka, Bangladesh, under the registration number NIPSOM/IRB/2019/111. The formal permission for data collection in the community was taken from the tribal community leaders (called 'Karbari'). Both written and verbal consent were obtained from the participants before the interview was initiated.

Both written and verbal consent were obtained from each participant before initiating the interview for data collection. A brief introduction on the aims and objectives of the study was given first, and then, the written consent translated into native language was read out for illiterate tribal elderly. Participants who agreed with the consent were finally included in the study.

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