

Periodontal Status and Potential Risk Factors in the Myanmar Population: Data from the First National Oral Health Survey in 2016–2017

Abstract

Periodontal disease is quite common in many developing countries, but no nationally representative data on periodontal disease is available in Myanmar until 2016. A nationwide cross-sectional survey with a stratified two-stage sampling method was conducted among 4668 participants aged 12–74 years. Periodontal assessments and self-administered questionnaire surveys were conducted to assess the periodontal status and risk factors in the Myanmar population using data from the first national oral health survey in 2016–2017. Descriptive statistics and logistic regression analysis were performed to assess the prevalence of periodontitis and its association with potential risk factors. The prevalence of gingivitis was 38.2%, 41.5%, 44.4%, and 43.7% in 12, 15–18, 35–44, and 60–74 year-olds, respectively. The prevalence of periodontitis in the latter three age groups was 2.3%, 16.3%, and 35.2%, respectively. After adjusting for other risk factors, younger participants aged 15–18 years (odds ratio [OR]: 0.1, 95% confidence interval [95% CI]: 0.0–0.2) and aged 35–44 years (OR: 0.4, 95% CI: 0.3–0.5) were less likely to have periodontitis. Moreover, participants educated upto junior high school level (OR: 1.6, 95% CI: 1.1–2.7), primary school and below level (OR: 1.9, 95% CI: 1.2–3.2), everyday smokers (OR: 1.6, 95% CI: 1.3–2.0), and everyday tobacco chewers (OR: 1.5, 95% CI: 1.2–1.8) were associated with increased risk of periodontitis. Periodontal complications were prevalent in Myanmar older adults. Prevention efforts should focus on tobacco control and oral hygiene.

Keywords: Myanmar, periodontal status, prevalence, risk factors

Introduction

Periodontal disease, comprising gingivitis and periodontitis, is an inflammatory condition affecting the tissues surrounding the teeth.^[1] It affects about 20%–50% of the global population, with a public health concern in older adults worldwide.^[1] Periodontitis is more prevalent in developing countries, with a prevalence of 50%–90%.^[2] The most severe form of periodontitis affects approximately 14% of the global adult population and is the 11th-most common disease worldwide.^[3,4] Acknowledging that periodontal disease is preventable and irreversible, many countries have initiated efforts to reduce the burden of periodontal diseases.^[1]

Myanmar remains a predominantly rural country, with only 30% residing in urban areas.^[5] Myanmar health system currently faces many challenges, and the burden of noncommunicable diseases is alarming.^[6] Furthermore, oral health has been neglected

in most national health plans, and its political priority remains low.^[7]

Nationwide data are needed to assess disease prevalence and burden for strategic planning, policymaking, and delivering effective oral health services.^[8] However, a nationwide oral health survey was unknown in Myanmar until 2016, and only a regional survey was conducted in the Yangon region in 1992, and high prevalence rates of different periodontal problems in adults were reported (86.2%–97.0%).^[7] Therefore, nationwide survey was conducted in 2016–2017 to establish baseline data on oral health status and for planning behaviors of the Myanmar population and effective strategic management of oral health programs integrating with other public health programs in Myanmar.

This study uses the data from the survey to assess the prevalence and distribution of periodontal problems in the Myanmar population and identify potential risk factors associated with periodontitis.

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Materials and Methods

This was a nationwide cross-sectional study on participants aged 12, 15–18, 35–44, and 60–74 years. The sampling was based on the data obtained from the 2014 population census, and 21 townships were selected using a stratified two-stage sampling technique based on the administrative set-up in Myanmar. The number of participants in each age group was planned to be 30 for each sampling unit with equal distribution of sex. A total of 5040 participants were eligible to participate in the study (1260 participants in each age group), but 372 participants were excluded due to missing data or consent forms. Therefore, the final number of participants was 4668. Clinical oral examinations and questionnaire-based surveys were performed from December 2016 to January 2017.

Before the survey, ten survey teams, each consisting of a senior dentist and two junior dentists (examiner and recorder), were calibrated by international experts for a week. Kappa values for inter- and intra-examiner reliability were 0.8. Trained dentists conducted periodontal examinations using a plain mirror and a WHO CPI periodontal probe, with examination criteria of WHO Oral Health Surveys: Basic Methods (5th edition).^[9]

Two indicators (gingival bleeding and periodontal pockets) were used for periodontal assessment in all age groups, but only one was applied for 12-year-olds. All present teeth, except the third molars, were examined. The missing teeth were recorded; however, the reason for tooth loss was not asked. The coding system was (a) bleeding on probing (BOP) (0, absence; 1, presence; 9, excluded; X, not present) and (b) the periodontal probing depth (PPD) (0, absence of pocket: 0–3 mm; 1, shallow pocket: 4–5 mm; 2, deep pocket: ≥ 6 mm; 9, excluded; X, not present). The condition with $\geq 10\%$ BOP of examined teeth and PPD of ≤ 3 mm was defined as gingivitis, and those with PPD ≥ 4 mm, regardless of BOP were defined as periodontitis. The severity and extent of periodontitis were assessed in participants with periodontitis. The periodontitis severity was identified as mild/moderate periodontitis when they scored 1 on the PPD examination and severe periodontitis when they scored 2. The extent of periodontitis was evaluated as localized ($<30\%$ of teeth involved) or generalized ($\geq 30\%$ of teeth involved).

Parents of 12-year-olds and participants aged ≥ 15 years answered a structured questionnaire designed in respective local languages at the examination sites. The variables included in this study were educational level (university and above, high school, junior high school, or primary school and below), frequency of toothbrushing (never, less than once a day, once a day, or twice or more a day), type of toothbrushing (toothbrush with toothpaste or others), last dental visits (never, <6 months, 6–12 months, 1–2 years, or >2 years), reasons for dental visits (routine dental checkup or treatment), and smoking and tobacco chewing

habits (never, $<$ once a week, \geq once a week but not every day, or every day).

Data were analyzed using IBM SPSS 22.0 (SPSS, Chicago, IL, USA). Descriptive statistics were computed. The association between periodontal diseases and potential risk factors was analyzed using the Chi-squared test. The odds ratio (OR) and 95% confidence interval (CI) were calculated using logistic regression to interpret the effects of potential risk factors of periodontitis. The goodness-of-model fit statistics was also evaluated using Hosmer–Lemeshow Test ($\chi^2 = 5.14$, $df = 8$, $P = 0.741$). The statistical significance level for all tests was set at $P < 0.05$.

This study was authorized by the Ethical Committee of the Department of Medical Services, Ministry of Health, Myanmar, in 2016 (Reg. No. KuTha-Dental/Survey/2016/36). The study was also permitted by the Ministry of Education, Myanmar, for school-aged children and local authorities for participants from other age groups.

Results

Among 4668 participants, 49.4% ($n = 2308$) were men and 50.3% ($n = 2347$) resided in urban areas. Gingival bleeding and shallow periodontal pockets were more common in men and urban residents but deep periodontal were more common pockets in women and rural residents. No significant differences were observed in periodontal outcomes by gender and location. Overall, 42.0% of participants had gingivitis and 14.3% had periodontitis [Table 1]. More missing teeth were found in 60–74-year-olds, and 33.5% of them had <20 functional teeth.

No other factors, except educational level ($\chi^2 = 9.69$, $df = 3$, $P = 0.021$) in 15–18-year-olds and chewing tobacco or snuff ($\chi^2 = 11.93$, $df = 3$, $P = 0.008$) in 60–74-year-olds, were associated with periodontitis. In 35–44-year-olds, educational level, reason for a dental visit, and smoking and chewing habits were significant factors for periodontitis [Table 2]. In both unadjusted and adjusted models, older age and lower educational attainment were risk factors for periodontitis [Table 3]. Lesser frequency of toothbrushing (OR: 1.3, 95% CI: 1.1–1.5 in once a day; OR: 2.1, 95% CI: 1.4–3.0 in $<$ once a day) and other types of toothbrushing (OR: 4.1, 95% CI: 2.8–6.1) showed a significant predictor of periodontitis in the unadjusted model; however, after adjusting the other factors, these variables were not associated with periodontitis. Everyday smokers (OR: 1.6, 95% CI: 1.3–2.0) or everyday tobacco chewers (OR: 1.5, 95% CI: 1.2–1.8) exhibited a higher risk of periodontitis than those without smoking or chewing habits in the adjusted model.

Discussion

This is the first study to report nationwide data on the prevalence of, and potential risk factors associated with, periodontal status in the Myanmar population. Overall,

Table 1: Distribution of periodontal outcomes, periodontal status, and severity and extent of periodontitis by different age groups											
Age (years)	n	Periodontal outcomes, % (teeth, mean±SD)			Periodontal status, n (%)			Severity of periodontitis, n (%)			
		BOP	PPD 4–5 mm	PPD ≥6 mm	Healthy	Gingivitis	Periodontitis	Mild/moderate	Severe	Localized	Generalized
12	1155	56.6 (2.9±4.1)	-	-	714 (61.8)	441 (38.2)	-	-	-	-	-
15–18	1022	60.9 (3.3±4.1)	2.3 (0.1±0.7)	0.0 (0.0±0.0)	575 (56.2)	424 (41.5)	23 (2.3)	23 (100.0)	0 (0.0)	20 (87.0)	3 (13.0)
35–44	1246	72.8 (5.9±6.5)	16.0 (0.6±1.9)	1.1 (0.0±0.1)	490 (39.3)	553 (44.4)	203 (16.3)	190 (93.6)	13 (6.4)	182 (89.7)	21 (10.3)
60–74	1245	76.8 (6.3±6.7)	34.1 (1.2±2.5)	4.3 (0.1±0.5)	263 (21.1)	544 (43.7)	438 (35.2)	385 (87.9)	53 (12.1)	356 (81.3)	82 (18.7)
Total	4668	67.2 (4.7±5.8)	18.4 (0.7±2.0)	1.9 (0.0±3.0)	2042 (43.7)	1962 (42.0)	664 (14.3)	598 (90.1)	66 (9.9)	558 (84.0)	106 (16.0)
PPD 4–5 mm: Shallow periodontal pocket, PPD ≥6 mm: Deep periodontal pocket. BOP: Bleeding on probing, PPD: Periodontal probing depth, SD: Standard deviation											

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less than half of the Myanmar population (43.7%) had healthy gingiva. In this study, approximately 57% of 12-year-olds had gingival bleeding in at least one area of the examined teeth. The gingival condition was considered better than that of a previous study;^[10] however, it might be due to different examination criteria. Conversely, gingival bleeding was considerably high in 15–18-year-olds and very high in 35–44- and 60–74-year-olds. A possible reason may be inadequate oral hygiene due to the lack of oral health awareness and low oral health literacy.^[11] Gingival bleeding is not an indicator of periodontitis but a reliable sign of gingivitis and a warning predictor of the possible development of periodontal problems later if not controlled.^[2] Therefore, effective oral health education is important to improve their oral health knowledge and behaviors with appropriate strategies for better oral health in the Myanmar population.

The periodontal pockets were positively associated with increased age. Based on the highest scores of periodontal outcomes, 60–74-year-olds were the most severe periodontal condition, with a high prevalence rate of few functional teeth (<20 functional teeth) and edentulousness. Furthermore, regression models demonstrated that 60–74-year-olds are more likely to have periodontitis than other age groups. Both dental caries and periodontal disease are the main causes of tooth loss, directly affecting their nutrition and quality of life.^[12] Therefore, oral health programs, especially for the aging population, should be considered. Government and national health authorities need to play a key role to take an initiative in developing and implementing oral health strategies and should ensure that periodontal disease prevention is made an integral part of general health promotion.^[13,14]

The proportion of gingival bleeding in Myanmar was significantly higher than those in Thailand, Malaysia, Cambodia, Vietnam, and Laos in all age groups. The prevalence of shallow pockets in Myanmar was lower than that in Thailand, Malaysia, and Vietnam but higher than that in Cambodia and Laos in 35–44-year-olds. Conversely, Myanmar people had the lowest proportion of deep pockets in these age groups. In 60–74-year-olds, the proportion of shallow pockets in Myanmar was highest among neighboring countries; however, the result was opposite for deep pockets, which Myanmar was lowest.^[15] This is probably partly because of a high proportion of missing teeth in Myanmar, especially among the aging population, with an average tooth loss of 10–11 teeth in 60–74-year-olds.

Low educational attainment was associated with an increased risk of periodontitis. They may lack knowledge or neglect the importance of oral health if they have a low educational level.^[16] Some participants never brushed their teeth, and 2.5% were still using toothpicks or charcoals. This indicates that existing oral health-related information

Table 2: Association between periodontitis and potential risk factors

Variables	15–18 years (n=1022)		35–44 years (n=1246)		60–74 years (n=1245)	
	Participants, n (%)	Periodontitis, n (%)	Participants, n (%)	Periodontitis, n (%)	Participants, n (%)	Periodontitis, n (%)
Gender						
Male	508 (49.7)	9 (1.8)	621 (49.8)	115 (17.5)	622 (50.0)	223 (35.9)
Female	514 (50.3)	14 (2.7)	625 (50.2)	88 (15.1)	623 (50.0)	215 (34.5)
Location						
Urban	512 (50.1)	11 (2.1)	620 (49.8)	101 (16.3)	630 (50.6)	221 (35.1)
Rural	510 (49.9)	12 (2.4)	626 (50.2)	102 (16.3)	615 (49.4)	217 (35.3)
Educational level						
University and above	296 (29.0)	2 (0.7)*	103 (8.3)	9 (8.7)***	32 (2.6)	13 (40.6)
High school level	698 (68.3)	19 (2.7)*	227 (18.2)	18 (7.9)***	70 (5.6)	26 (37.1)
Junior high school level	20 (2.0)	2 (10.0)*	446 (35.8)	72 (16.1)***	506 (40.6)	164 (32.4)
Primary school and below	8 (0.8)	0*	470 (37.7)	104 (22.1)***	637 (51.2)	235 (36.9)
Toothbrushing						
≥ Twice a day	759 (74.3)	17 (2.2)	859 (68.9)	142 (16.5)	585 (47.0)	210 (35.9)
Once a day	257 (25.1)	6 (2.3)	357 (28.7)	56 (15.7)	552 (44.3)	188 (34.0)
< Once a day	6 (0.6)	0	22 (1.8)	4 (18.2)	58 (4.7)	22 (36.8)
Never	0	0	8 (0.8)	1 (12.5)	50 (4.0)	18 (36.0)
Type of toothbrushing			n=1238		n=1195	
Toothbrush with toothpaste	1014 (99.2)	23 (2.3)	1202 (97.0)	196 (16.3)	1039 (86.9)	360 (34.5)
Others (toothpicks, charcoal)	8 (0.8)	0	36 (3.0)	6 (16.6)	156 (13.1)	60 (38.4)
Last dental visit						
<6 months	27 (2.6)	0	64 (5.1)	6 (9.4)	65 (5.2)	19 (29.2)
6–12 months	25 (2.4)	0	71 (5.7)	7 (9.9)	49 (3.9)	17 (34.7)
1–2 years	26 (2.5)	0	61 (4.9)	10 (16.4)	84 (6.7)	32 (38.1)
>2 years	107 (10.5)	2 (1.9)	242 (19.4)	32 (13.2)	313 (25.1)	92 (29.4)
Never	837 (81.9)	21 (2.5)	808 (64.0)	148 (18.3)	734 (59.0)	278 (37.9)
Reason for last dental visit	n=185		n=438		n=511	
Routine dental checkup	10 (5.4)	0	27 (6.2)	1 (3.7)**	98 (18.2)	30 (30.6)
Treatment	175 (94.6)	2 (1.1)	411 (93.8)	54 (13.1)**	413 (81.8)	130 (31.5)
Smoking habit						
Never	980 (95.9)	22 (2.2)	982 (78.8)	134 (13.6)***	956 (76.8)	319 (33.4)
< Once a week	26 (2.5)	0	36 (2.9)	6 (16.7)***	51 (4.1)	23 (45.1)
≥ Once a week but not everyday	11 (1.1)	1 (9.1)	42 (3.4)	10 (23.8)***	24 (1.9)	8 (33.3)
Everyday	5 (0.5)	0	186 (14.9)	53 (28.5)***	214 (17.2)	88 (40.8)
Chewing tobacco or snuff						
Never	983 (96.2)	23 (2.3)	800 (64.2)	110 (13.8)*	905 (72.7)	294 (32.5)**
< Once a week	29 (2.8)	0	53 (4.3)	10 (18.9)*	63 (5.1)	23 (36.5)**
≥ Once a week but not everyday	5 (0.5)	0	44 (3.5)	11 (25.0)*	42 (3.4)	17 (40.5)**
Everyday	5 (0.5)	0	349 (28.0)	72 (20.6)*	235 (18.9)	104 (44.3)**

* $P<0.05$, ** $P<0.01$, *** $P<0.001$. Data were analyzed using Chi-square test. Values highlighted in bold are significant ($P<0.05$)

is not well designed, and oral health challenges remain in the Myanmar population. Deficiencies in oral health literacy may lead to unfavorable oral health behaviors and poor oral health outcomes.^[17,18] Simple oral health literacy is insufficient in Myanmar, and thus, the most important thing is to use a motivational education approach.^[11] Oral health awareness should be greatly concentrated on the emphasis on improving oral health behaviors.

More than 90% of participants who experienced dental visits went to dental clinics for emergency treatment. In this regard, cost is a possible barrier to regular treatment.

Due to the absence of universal health coverage in Myanmar,^[9] people are hesitant to have regular dental visits and be treated effectively despite their knowledge of the importance of early treatment. The installment of a health insurance scheme can be considered to reduce future incidence and prevalence of common oral diseases in Myanmar.

Tobacco use in any form has a significant adverse effect on periodontal health.^[14,19] This explanation is consistent with our study, in which periodontal status tends to be significantly worse among both smokers and tobacco

Table 3: Logistic regression analysis on periodontal diseases and potential risk factors

Variables	Total participants, n (%)	Periodontitis (%)	Crude OR (95% CI)	P	Adjusted OR ^a (95% CI)	P
Age (years)						
12	1155 (24.7)	-	-	-	-	-
15–18	1022 (21.9)	2.3	0.0 (0.0–0.1)	<0.001	0.1 (0.0–0.2)	<0.001
35–44	1246 (26.7)	16.3	0.4 (0.3–0.4)	<0.001	0.4 (0.3–0.5)	<0.001
60–74	1245 (26.7)	35.2	Reference		Reference	
Gender						
Male	2308 (49.4)	15.0	Reference		Reference	
Female	2360 (50.6)	13.4	0.9 (0.8–1.1)	0.214	0.9 (0.8–1.1)	0.531
Location						
Urban	2347 (50.3)	14.2	Reference		Reference	
Rural	2321 (49.7)	14.3	1.0 (0.9–1.2)	0.977	1.1 (0.9–1.3)	0.625
Educational level						
University and above	603 (12.9)	4.0	Reference		Reference	
High school level	1201 (25.7)	5.2	1.3 (0.8–2.1)	0.270	1.2 (0.7–2.1)	0.418
Junior high school level	1370 (29.3)	17.4	5.1 (3.3–7.8)	<0.001	1.6 (1.1–2.7)	0.041
Primary school and below	1494 (32.1)	22.7	6.9 (4.5–10.7)	<0.001	1.9 (1.2–3.2)	0.005
Toothbrushing						
≥ Twice a day	2929 (62.7)	12.9	Reference		Reference	
Once a day	1573 (33.7)	15.8	1.3 (1.1–1.5)	0.007	1.7 (0.5–1.2)	0.218
< Once a day	166 (3.6)	24.9	2.1 (1.4–3.0)	<0.001	1.9 (0.7–1.1)	0.287
Type of toothbrushing	n=4606					
Toothbrush with toothpaste	4492 (97.5)	13.4	Reference		Reference	
Others (toothpicks, charcoal)	114 (2.5)	39.5	4.1 (2.8–6.1)	<0.001	1.3 (0.6–2.9)	0.443
Last dental visit						
<12 months	353 (7.6)	13.9	Reference		Reference	
1–2 years	524 (11.2)	8.0	0.5 (0.4–1.8)	0.056	1.4 (0.9–2.3)	0.181
>2 years	794 (17.0)	15.9	1.2 (0.8–1.7)	0.388	1.1 (0.7–1.6)	0.749
Never	2997 (64.2)	14.9	1.1 (0.8–1.5)	0.605	1.4 (0.9–2.0)	0.053
Smoking habit						
Never	4073 (87.3)	11.7	Reference		Reference	
Yes, but not everyday	190 (4.0)	25.2	2.6 (1.8–3.6)	<0.001	1.4 (0.9–2.0)	0.085
Yes, everyday	405 (8.7)	34.8	4.1 (3.3–5.1)	<0.001	1.6 (1.3–2.1)	0.001
Chewing tobacco or snuff						
Never	3840 (82.3)	11.1	Reference		Reference	
Yes, but not everyday	239 (5.1)	26.6	2.7 (2.0–3.7)	<0.001	1.2 (0.8–1.6)	0.370
Yes, everyday	589 (12.6)	29.9	3.4 (2.8–4.2)	<0.001	1.5 (1.2–1.8)	0.001

^aAdjusted for other factors. Data were analyzed using logistic regression. Values highlighted in bold are significant ($P<0.05$). OR: Odds ratio, CI: Confidence interval

chewers. Tobacco use was found to be one of the strongest predictive factors for periodontitis in Myanmar. Therefore, their awareness of tobacco's harmful effects on health is enhanced and motivated. Tobacco control initiatives and tobacco cessation should also be provided in the practice of dental settings as per the guidance.^[20]

Our study represented the overall oral health status of the country, drawing samples from all states and regions, including urban and rural areas. Therefore, the findings could be generalized to all Myanmar population and a benchmark for future oral health-related research in Myanmar. As this study adopted the WHO basic standardized methods for oral health surveys, this

information could facilitate comparisons with other countries. This study also has some limitations. Only pocket depths were used to assess periodontitis, and clinical attachment loss, furcation involvement, degree of bone loss, and grading of tooth mobility were not evaluated. Therefore, we could not estimate the staging and grading of periodontitis in the Myanmar population. The reason for tooth loss was not also recorded, and thus, we could not assess the experiences of severe periodontal disease and tooth loss.

Conclusion

The prevalence of periodontal diseases is high in the Myanmar population. Periodontal diseases and their

ultimate consequence, tooth loss, were found to be an important public health problem in older adults. The study findings highlighted the key risk factors of periodontal diseases in Myanmar. Integrated preventive strategies based on the common risk factor approaches should be developed to reduce future burdens of periodontal diseases in Myanmar.

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Conflicts of interest

There are no conflicts of interest.

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