

# Oral health-related quality of life in the Myanmar population: The first national oral health survey 2016 – 2017

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**Objectives:** To describe the oral health-related quality of life (OHRQoL) and its potential influencing factors within the Myanmar population. **Methods:** Data were from the first national oral health survey, involving 3,513 participants aged 15–18 years, 35–44 years, and 60–74 years from 21 selected townships in Myanmar. Self-administered questionnaire-based surveys, conducted from December 2016 to January 2017, included socio-demographics, behavioral factors, self-reported oral conditions (number of teeth present, teeth and gingival conditions), and inquiries regarding OHRQoL (a set of 12 questions with 5 response options) using the recommended questions from WHO Oral Health Surveys. **Results:** The most prevalent oral health issues were difficulties in chewing (32.2%) and biting foods (30.8%). In bivariate analysis, older individuals, rural residents, and participants with higher educational levels were associated with OHRQoL. In multiple regression analysis, self-reported number of teeth, teeth and gingival conditions were strong predictors of OHRQoL in all age groups. **Conclusion:** Self-rated oral health conditions predicted quality of life due to oral problems. The development of national oral health policies and strategies is imperative to facilitate early detection of oral health problems and promote the awareness of oral health importance.

**Keywords:** quality of life, risk factors, oral health, self-assessment, Myanmar

## Introduction

Oral health is a fundamental component of overall well-being, significantly influencing individual daily life, social interactions, perception of general health and quality of life (Sabbah *et al.*, 2019). Poor oral health adversely affects the individual's oral health-related quality of life (OHRQoL) (Koistinen *et al.*, 2020). Impaired OHRQoL is linked to various negative outcomes, such as low self-esteem, depression, social isolation, and an augmented burden on the healthcare system (Thwin *et al.*, 2023a). Consequently, the assessment of OHRQoL is a valuable approach for understanding the dynamics of oral health and addressing healthcare needs of a population.

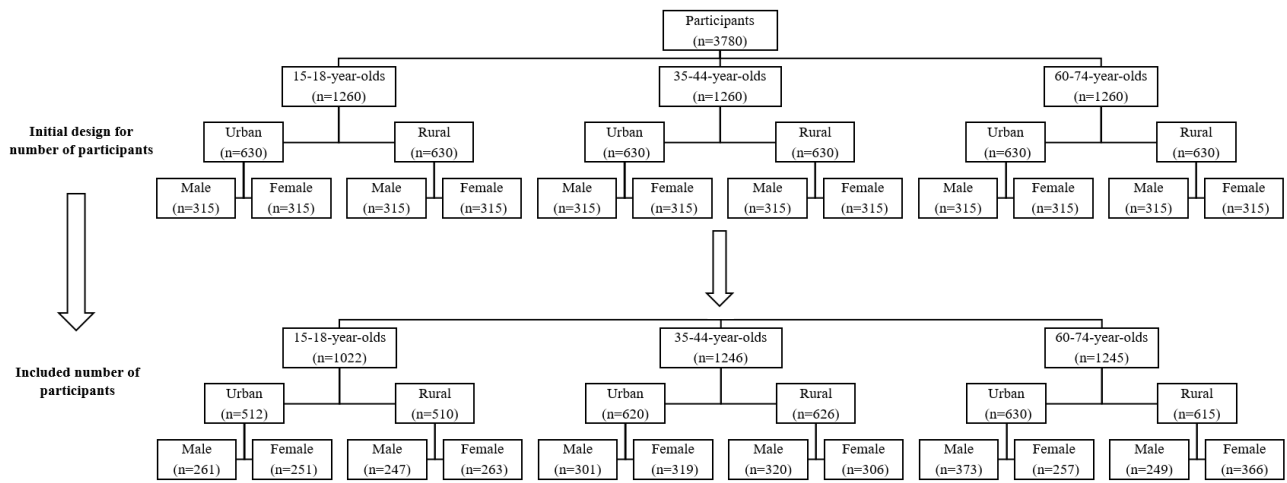
Despite the growing momentum for universal healthcare access in Myanmar, oral health is neglected in most national health agendas, lacking political attention (Oo *et al.*, 2021). Furthermore, no national oral health survey had been undertaken until 2016. To address this gap, the first nationwide survey was conducted during 2016–2017 to establish baseline data concerning the oral health status, self-assessment of oral health, and oral health behaviors in the Myanmar population, indicating the predominant oral diseases as public health concerns (Thwin *et al.*, 2023b; c).

While there exists evidence on OHRQoL among adults and older adults in Myanmar (Tun *et al.*, 2018; Htun and Peltzer, 2019; Thwin *et al.*, 2023a), available data have been limited to specific areas. National oral health surveys are crucial for determining oral health

needs, monitoring oral health disparities across different regions, and planning interventions at the national level. The present study represents a pioneering effort to comprehensively investigate the OHRQoL within the Myanmar population. By analysing data of Myanmar's first national oral health survey, the study aims to describe the OHRQoL and its potential influencing factors within the Myanmar population.

## Methods

A nationwide cross-sectional study was conducted from December 2016 to January 2017, encompassing individuals aged 15–18, 35–44, and 60–74 years, using the index age groups recommended by WHO. The sampling strategy was based on the 2014 population census data, and a stratified two-stage sampling approach was utilized to select 21 townships from the 15 states and regions. The included townships were as follows: Shwegu (Kachin state), Demoso (Kayah state), Hpa-An (Kayin state), Falam (Chin state), Mudon (Mon state), Pauktaw (Rakhine state), and Pindaya, Kengtung, Namhkan (Shan state), Zigon (Bago region), Monywa (Sagaing region), Yebyu (Tanintharyi region), South Dagon and Hlaingtharya (Yangon region), Amarapura and Pyigyitagon (Mandalay region), Chauk and Magway (Magway region), Bogale and Pantanaw (Ayeyarwady region), and Tatkon (Naypyitaw union territory). Initially, it was planned to include 30 participants per sampling site in each age group (Figure 1), aiming to recruit 1,260 participants in each age group, evenly



**Figure 1.** Intended and included numbers of participants in each age group.

distributed by geographic location and gender. However, 267 participants were excluded due to missing data or incomplete consent forms, leaving 3,513 participants for final analysis (participation rate, 92.9%). The study was authorized and approved by the Ethical Committee of the Department of Medical Services of Ministry of Health, Myanmar in 2016 (Reg. No. KuTha-Dental/Survey/2016/36). Additionally, requisite permissions were duly secured from local authorities.

The operation and survey manuals were prepared and developed by the WHO Collaborating Centre for Translation of Oral Health Science, Niigata University (WHOCC, Niigata University). A comprehensive training and calibration workshop was administered for all examiners, including both local dentists and non-dental personnel, under the guidance and supervision of international public health experts for a week. Ten survey teams were assembled, each led by a senior dentist and including five team members. The gold standard for assessment was established by WHOCC, Niigata University (HO referred to as a “gold standard” examiner). Various oral health factors and questionnaire survey items were evaluated for inter-examiner and intra-examiner reliability, with interclass correlation coefficient = 0.82. A detailed explanation on these methods is provided in our previous publication (Thwin *et al.*, 2023b).

The survey teams informed local authorities or administrators a month ahead, and invitations detailing the study’s purpose and procedures were dispatched to participants through local authorities. The willing participants signed the written consent forms and returned to the survey teams. Coordination with local authorities determined the dates for data collection. The team initiated the process by explaining the rationale and benefits of the study to each participant, verifying and re-confirming that the participants willingly consented to participate.

Participants completed a self-administered questionnaire based on the WHO Oral Health Surveys: Basic Methods (5<sup>th</sup> edition) (World Health Organization, 2023), which was designed in the respective local languages. These questionnaires were administered with the assistance of trained personnel at designated examination sites, including city halls and monasteries. The questionnaire

enquired about socio-demographics, behavioural factors, self-reported oral conditions, and experience of reduced quality of life due to oral problems.

Socio-demographic data included age (15–18 years, 35–44 years, or 60–74 years), gender (male or female), geographic location (urban or rural), and educational attainment (university and above, high school level, junior high school level, or primary school and below). Each location was categorized as urban or rural, as defined by the administrative bureau of census in Myanmar. Subsequently, the participants’ residency was determined based on their current address. Behavioral factors included frequency of tooth brushing (twice or more a day, once a day, or less than once a day), last dental visit (<12 months, 1–2 years, >2 years, or never), smoking cigarette currently (no or yes), and chewing tobacco currently (no or yes). Participants were asked to self-rate oral conditions in terms of number of teeth present (20 teeth or more, 10–19 teeth, 1–9 teeth, or no natural teeth), self-rated tooth condition (good, average, or poor), and self-rated gingival condition (good, average, or poor).

Participants were asked about their experiences of reduced quality of life due to oral problems as recommended by WHO Oral Health Surveys: Basic Methods (5<sup>th</sup> edition) (Table 1). The Myanmar version of these questions was developed through standard forward-backward translation. Initially, a Myanmar bilingual expert translated the questions, and then back-translated. A panel of professionals reviewed them for clarity and cultural relevance. Pilot-testing on a small sample refined the questions, with minor corrections based on feedback. This inquiry involved a set of 12 questions with response options on a scale ranging from “0: never” to “4: very often”. The scores for each question were summed, and so the total scores ranged from 0 to 48. A higher score indicates a greater degree of diminished OHRQoL.

Daily data verification, entry, and cleaning were performed. IBM SPSS Statistics for Windows, version 22.0 (SPSS; Chicago, IL, USA) was employed for statistical analyses. Descriptive statistics summarized demographics and general data. Given non-normal data distribution, associations between mean OHRQoL scores and potential risk factors were assessed using the Mann-Whitney U

**Table 1.** Experience of reduced quality of life due to oral problems among 3513 Myanmar adults.

	<i>Never (%)</i>	<i>Sometimes (%)</i>	<i>Fairly often (%)</i>	<i>Very often (%)</i>
Difficulty in biting foods	69.2	17.9	3.6	9.3
Difficulty in chewing foods	67.8	19.0	3.8	9.5
Difficulty with speech/trouble pronouncing words	90.7	5.3	1.3	2.6
Dry mouth	82.8	14.4	1.0	1.8
Felt embarrassed due to appearance of teeth	85.2	10.6	1.4	2.8
Felt tense because of problems with teeth or mouth	84.7	10.6	2.7	2.0
Have avoided smiling because of teeth	91.9	5.3	1.1	1.7
Had sleep that is often interrupted	90.3	7.5	0.9	1.4
Have taken days off work	93.0	4.9	0.9	1.2
Difficulty doing usual activities	94.1	4.4	0.6	0.9
Felt less tolerant of spouse or people who are close to you	95.3	3.6	0.5	0.7
Have reduced participation in social activities	95.7	3.2	0.5	0.5

test or Kruskal Wallis test. Univariable and multivariable linear regression models, after checking for normality and multicollinearity, were computed to interpret potential risk factors influencing OHRQoL by different age groups. Statistical significance was set at  $p < 0.05$  for all tests.

### Results

Of the 3,513 participants, 49.8% were men and 50.2% were urban residents. Only 12.3% had attained a university-level education or higher. Further data regarding descriptive characteristics of the study population are available at [https://www5.dent.niigata-u.ac.jp/~prevent/pdf/pr171110\\_suppl\\_table.pdf](https://www5.dent.niigata-u.ac.jp/~prevent/pdf/pr171110_suppl_table.pdf). The mean OHRQoL score was  $2.46 \pm 4.35$ . Table 1 shows the participant responses to the 12 questions, with approximately three-fourths reporting never experiencing difficulty in biting (69.2%) or chewing foods (67.8%).

Table 2 summarises the relationships between OHRQoL score and various potential risk factors. Associations were detected between OHRQoL and several socio-demographic variables, specifically age, geographic location, and educational attainment. All behavioral variables, except for last dental visit, were associated with OHRQoL, as were all variables related to self-reported oral conditions.

Table 3 summarises the univariable linear regression analysis for predictors of OHRQoL among different age groups. In the 35–44 years age group, gender and education significantly predicted OHRQoL, while these factors were unrelated in the 15–18 year and 60–74 year age groups. Conversely, current tobacco chewing predicted OHRQoL in the 15–18 years and 60–74 years age groups, but not in the 35–44 years age group. All three self-reported oral conditions; number of teeth present, tooth condition, and gingival condition predicted OHRQoL across all age groups. After adjusting for confounding factors, these three variables remained significant predictors of OHRQoL for all age groups, while the significance of tobacco chewing disappeared (Table 4).

### Discussion

The present study represents the first large-scale epidemiological survey at a national-level, employing the WHO Oral Health Surveys' recommended questions to better understand OHRQoL and its associated factors in Myanmar. The findings highlight the prevalence of oral health problems, with the most common issues being difficulty in chewing and biting foods, followed by experiencing dry mouth. Difficulty in chewing and biting foods, were also major oral health problems in neighbouring countries like Thailand (Yiengprugsawan *et al.*, 2011); and ranked second highest in Indonesia (Husain and Tatengkeng, 2017) and fourth highest in Malaysia (Abdullah *et al.*, 2013). These differences may partly derived from variations in examination criteria, study population and the perception of impaired oral health across different cultures (Htun and Peltzer, 2019).

During the data collection period (2016–2017), most participants reported favorable OHRQoL. There are several possible reasons why few participants reported poor OHRQoL. First, only a quarter of participants described their teeth or gingival condition as “poor”. This suggests that, despite oral health being recognized as a public health concern in the Myanmar population (Thwin *et al.*, 2023b; c), the study participants may consider minor or even severe oral health conditions as less disruptive to their lives than other general health problems. Secondly, approximately 85% of participants reported having 20–32 remaining teeth. Having few remaining teeth is associated with unfavorable OHRQoL (Kato *et al.*, 2018). Another explanation could be that over three-quarters of participants did not smoke or chew tobacco, whereas these substances are known to be detrimental to oral tissues (Gajendra *et al.*, 2023).

The bivariate analyses associated socio-demographic factors and OHRQoL. Older adults reported poor OHRQoL, consistent with prior research (Haag *et al.*, 2017), likely due to a higher prevalence of oral health issues among the elderly. Urban residents reported better OHRQoL compared to rural counterparts, possibly due to disparities in oral healthcare access and oral health

**Table 2.** OHRQoL and potential associated factors among 3513 Myanmar adults.

Variables	%	OHRQoL score Mean $\pm$ SD	<i>p</i> -value (MWU or Kruskal Wallis)
Age (years)			
15 – 18	29.1	1.57 $\pm$ 3.09	
35 – 44	35.5	2.79 $\pm$ 4.65	<b>&lt;0.001</b>
60 – 74	35.4	2.86 $\pm$ 4.79	
Gender			
Male	49.8	2.33 $\pm$ 4.08	
Female	50.2	2.59 $\pm$ 4.60	0.395
Geographic location			
Urban	50.2	2.38 $\pm$ 4.39	
Rural	49.8	2.54 $\pm$ 4.30	<b>0.011</b>
Educational level			
University and above	12.3	2.07 $\pm$ 3.54	
High school level	28.3	1.76 $\pm$ 3.34	
Junior high school level	27.7	2.98 $\pm$ 4.85	<b>&lt;0.001</b>
Primary school and below	31.7	2.78 $\pm$ 4.84	
Tooth brushing			
Twice or more a day	62.7	2.38 $\pm$ 4.20	
Once a day	33.2	2.67 $\pm$ 4.42	
Less than once a day	4.1	2.96 $\pm$ 4.69	<b>0.049</b>
Last dental visit			
<12 months	8.6	2.40 $\pm$ 3.66	
1 – 2 years	4.9	2.66 $\pm$ 5.00	
> 2 years	18.8	2.72 $\pm$ 4.71	0.061
Never	67.7	2.38 $\pm$ 4.27	
Smoking cigarette currently			
No	83.1	2.39 $\pm$ 4.24	
Yes	16.9	2.90 $\pm$ 4.21	<b>0.042</b>
Chewing tobacco or snuff currently			
No	76.5	2.39 $\pm$ 4.32	
Yes	23.5	2.68 $\pm$ 4.41	<b>0.047</b>
Self-reported number of teeth present			
20 teeth or more	84.7	1.80 $\pm$ 3.42	
10 – 19 teeth	10.1	5.45 $\pm$ 6.07	
1 – 9 teeth	4.4	7.06 $\pm$ 6.84	<b>&lt;0.001</b>
No natural teeth	0.8	8.41 $\pm$ 9.33	
Self-rated teeth condition			
Good	28.9	1.15 $\pm$ 3.18	
Average	43.2	1.63 $\pm$ 2.94	
Poor	27.9	5.10 $\pm$ 5.83	<b>&lt;0.001</b>
Self-rated gingival condition			
Good	34.4	1.42 $\pm$ 3.40	
Average	43.7	1.77 $\pm$ 3.11	
Poor	21.9	5.47 $\pm$ 6.10	<b>&lt;0.001</b>

Values highlighted in bold are significant ( $p < 0.05$ ).

knowledge (Choi and Jung, 2021). The association between educational attainment and OHRQoL may simply indicate the well-established link between socio-economic status and oral health factors, including OHRQoL. No gender differences were observed in this study, aligning with previous studies in Myanmar (Tun *et al.*, 2018; Htun and Peltzer, 2019), although it is worth noting that some studies have reported worse OHRQoL in women (Haag *et al.*, 2017; Pattanaik *et al.*, 2021).

Behavioral factors, such as tooth brushing, smoking, and tobacco chewing habits, were associated with OHRQoL, which is consistent with earlier research (An *et al.*, 2022). These findings highlight the importance of regular oral hygiene to improve OHRQoL. In univariate regression, chewing tobacco or snuff predicted unfavorable OHRQoL in 15–18-year-olds and 60–74-year-olds. However, after statistical adjustment, this relationship was longer observed in either age group, indicating that it may be mediated by other factors.

Self-reported oral status strongly predicted OHRQoL across all age groups in both univariable and multivariable regression analyses. For example, fewer natural teeth predicted poor OHRQoL, in alignment with the well-established relationship between tooth loss and reduced OHRQoL (Haag *et al.*, 2017). Self-rated oral condition was also linked to OHRQoL, in other research (Nascimento *et al.*, 2021). These findings emphasize the importance of oral health assessment when studying OHRQoL and the potential value of improving quality of life through prevention and treatment of oral health conditions.

This study has certain limitations. First, there may be data variability within states and regions, potentially introducing bias into population estimates. Second, the study could not perform weighted analysis due to the unavailability of detailed population size information for the selected locations. Therefore, the study findings are constrained to the sample population, requiring caution in generalizing to the entire population of Myanmar. Third, potential cohort effects could be considered, as variations in the characteristics of study locations over time might impact the results. Additionally, we did not conduct missing data and non-response bias analyses. Furthermore, all assessments relied on personal perception and self-report, which may introduce information bias. Self-reports could also have led to random misclassification errors, potentially obscuring certain relationships. Finally, we used the WHO-recommended questions to assess the experience of reduced quality of life due to oral problems, rather than other widely recognized instrument tools for measuring OHRQoL. Nonetheless, the study adhered to a standardized protocol employing a stratified sampling method to provide a comprehensive assessment of OHRQoL for the Myanmar population. Samples were drawn from all states and regions, including both urban and rural areas. Consequently, the findings can provide basic information of OHRQoL and associated factors, representing Myanmar's first national-level oral health survey, and serving as a benchmark for future oral health-related research in the country.

Our findings are valuable for key stakeholders, including health policymakers and dental professionals in Myanmar, highlighting the need for targeted oral health promotion and education programs to promote oral hygiene practices and the importance of regular dental check-ups. Comprehensive data collection can help identify oral health disparities and inform healthcare policies to improve OHRQoL across diverse states and regions.

In conclusion, self-perceived oral health significantly predicted OHRQoL in Myanmar adults, indicating the importance of early detection of oral health issues and evidence-based oral health policies in the country. Further research is needed to monitor changes in OHRQoL over time and propose the evidence-based effective interventions aimed at enhancing oral health in the population.



**Table 3.** Univariable linear regression for predictors of OHRQoL among different age groups.

<i>Variables</i>	<i>15 – 18 years, B (95% CI)</i>	<i>P</i>	<i>35 – 44 years, B (95% CI)</i>	<i>P</i>	<i>60 – 74 years, B (95% CI)</i>	<i>P</i>
Female (Ref: Male)	0.18 (-0.19, 0.56)	0.349	0.70 (0.19, 1.22)	<b>0.008</b>	-0.11 (-0.64, 0.43)	0.697
Rural residents (Ref: Urban)	0.13 (-0.25, 0.51)	0.497	0.31 (-0.21, 0.82)	0.244	0.03 (-0.51, 0.56)	0.925
Education, Ref: University and above						
High school level	-0.40 (-0.81, 0.01)	0.051	-0.55 (-1.22, 0.12)	0.106	0.23 (-0.93, 1.38)	0.698
Junior high school level	0.44 (-0.93, 1.81)	0.529	0.86 (0.32, 1.40)	<b>0.002</b>	-0.28 (-0.82, 0.26)	0.312
Primary school and below	0.69 (-1.47, 2.84)	0.532	-0.45 (-0.99, 0.08)	0.096	0.27 (-0.26, 0.81)	0.313
Tooth brushing, Ref: $\geq$ twice a day						
Once a day	-0.12 (-0.56, 0.32)	0.586	0.45 (-0.13, 1.02)	0.127	-0.23 (-0.77, 0.30)	0.396
Less than once a day	-0.91 (-3.39, 1.57)	0.473	-0.19 (-1.89, 1.49)	0.817	0.07 (-0.88, 1.01)	0.889
Last dental visit, Ref: < 12 months						
1 – 2 years	-0.70 (-1.91, 0.50)	0.252	-0.49 (-1.69, 0.71)	0.422	0.64 (-0.42, 1.70)	0.237
> 2 years	-0.16 (-0.78, 0.46)	0.622	0.35 (-0.31, 1.01)	0.297	0.05 (-0.57, 0.66)	0.878
Never	0.11 (-0.39, 0.60)	0.667	-0.12 (-0.67, 0.42)	0.655	0.04 (-0.50, 0.59)	0.875
Having smoking habit (Ref: No habit)	-0.29 (-1.25, 0.66)	0.543	0.33 (-0.30, 0.97)	0.302	-0.09 (-0.73, 0.54)	0.766
Having chewing tobacco or snuff habit (Ref: No habit)	1.38 (0.39, 1.37)	<b>0.036</b>	0.09 (-0.45, 0.63)	0.745	-0.60 (-1.19, -0.01)	<b>0.048</b>
Self-reported teeth, Ref: $\geq$ 20 teeth						
10 – 19 teeth	2.10 (1.12, 3.08)	<b>&lt;0.001</b>	3.42 (2.57, 4.25)	<b>&lt;0.001</b>	3.19 (2.48, 3.91)	<b>&lt;0.001</b>
1 – 9 teeth	4.57 (2.89, 6.24)	<b>&lt;0.001</b>	6.22 (4.94, 7.49)	<b>&lt;0.001</b>	3.71 (2.72, 4.70)	<b>&lt;0.001</b>
No natural teeth	7.95 (3.68, 12.21)	<b>&lt;0.001</b>	2.38 (-1.35, 6.12)	<b>&lt;0.001</b>	6.49 (4.46, 8.53)	<b>&lt;0.001</b>
Self-rated teeth condition, Ref: Good						
Average	0.55 (0.17, 0.92)	<b>0.005</b>	1.44 (0.93, 1.96)	<b>&lt;0.001</b>	2.02 (1.49, 2.56)	<b>&lt;0.001</b>
Poor	2.70 (2.25, 3.16)	<b>&lt;0.001</b>	3.41 (2.89, 3.93)	<b>&lt;0.001</b>	4.24 (3.71, 4.77)	<b>&lt;0.001</b>
Self-rated gingival condition, Ref: Good						
Average	0.29 (0.09, 0.67)	<b>0.039</b>	1.40 (0.89, 1.92)	<b>&lt;0.001</b>	1.61 (1.07, 2.14)	<b>&lt;0.001</b>
Poor	2.71 (2.18, 3.24)	<b>&lt;0.001</b>	3.94 (3.39, 4.48)	<b>&lt;0.001</b>	4.08 (3.51, 4.66)	<b>&lt;0.001</b>

Values highlighted in bold are significant ( $p < 0.05$ ).

**Table 4.** Multivariable linear regression analysis for predictors of OHRQoL among different age groups.

<i>Variables</i>	<i>15 – 18 years, B (95% CI)</i>	<i>P</i>	<i>35 – 44 years, B (95% CI)</i>	<i>P</i>	<i>60 – 74 years, B (95% CI)</i>	<i>P</i>
Tooth brushing, Ref: $\geq$ twice a day						
Once a day	-0.14 (-0.58, 0.30)	0.540	0.42 (-0.15, 0.99)	0.152	-0.24 (-0.77, 0.30)	0.393
Less than once a day	-0.80 (-3.29, 1.69)	0.528	-0.38 (-2.07, 1.31)	0.660	0.05 (-0.90, 0.99)	0.918
Last dental visit, Ref: < 12 months						
1 – 2 years	-0.73 (-1.94, 0.48)	0.237	-0.46 (-1.66, 0.74)	0.451	0.62 (-0.44, 1.68)	0.252
> 2 years	-0.17 (-0.79, 0.45)	0.592	0.34 (-0.32, 0.99)	0.312	0.06 (-0.56, 0.67)	0.859
Never	0.14 (-0.36, 0.63)	0.588	-0.09 (-0.64, 0.46)	0.745	0.04 (-0.49, 0.59)	0.876
Having smoking habit (Ref: No habit)	-0.25 (-1.21, 0.71)	0.609	0.37 (-0.26, 1.01)	0.247	-0.12 (-0.76, 0.52)	0.717
Having chewing tobacco or snuff habit (Ref: No habit)	1.43 (-0.44, 2.42)	0.056	0.15 (-0.39, 0.69)	0.581	-0.06 (-0.02, 1.21)	0.064
Self-reported teeth, Ref: $\geq$ 20 teeth						
10 – 19 teeth	2.12 (1.14, 3.10)	<b>&lt;0.001</b>	3.38 (2.54, 4.22)	<b>&lt;0.001</b>	3.20 (2.48, 3.92)	<b>&lt;0.001</b>
1 – 9 teeth	4.58 (2.91, 6.26)	<b>&lt;0.001</b>	6.19 (4.92, 7.46)	<b>&lt;0.001</b>	3.70 (2.71, 4.69)	<b>&lt;0.001</b>
No natural teeth	8.05 (3.78, 12.32)	<b>&lt;0.001</b>	2.62 (1.11, 6.35)	<b>&lt;0.001</b>	6.49 (4.46, 8.53)	<b>&lt;0.001</b>
Self-rated teeth condition, Ref: Good						
Average	0.56 (0.18, 0.94)	<b>0.004</b>	1.46 (0.95, 1.98)	<b>&lt;0.001</b>	2.01 (1.48, 2.55)	<b>&lt;0.001</b>
Poor	2.69 (2.24, 3.15)	<b>&lt;0.001</b>	3.39 (2.88, 3.91)	<b>&lt;0.001</b>	4.24 (3.71, 4.77)	<b>&lt;0.001</b>
Self-rated gingival condition, Ref: Good						
Average	0.30 (0.08, 0.68)	<b>0.019</b>	1.41 (0.89, 1.92)	<b>&lt;0.001</b>	1.60 (1.06, 2.14)	<b>&lt;0.001</b>
Poor	2.71 (2.18, 3.24)	<b>&lt;0.001</b>	3.95 (3.40, 4.49)	<b>&lt;0.001</b>	4.08 (3.50, 4.66)	<b>&lt;0.001</b>

Values highlighted in bold are significant ( $p < 0.05$ ).

Adjusted for gender, geographic location and education.

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