

Dental health status and oral health behavior among university students from five ASEAN countries

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ABSTRACT

The aim of this study was to investigate dental health status and oral health behavior and associated factors among university students in five ASEAN countries (Indonesia, Malaysia, Myanmar, Thailand and Vietnam). Using anonymous questionnaires, data were collected from 3,344 undergraduate university students (mean age 20.5, SD=1.6; 58.3% female) from five ASEAN countries. Results indicate that 27.7% of students reported to have sometimes, most of the time or always having tooth ache in the past 12 months, 39.4% reported to have one or more cavities, 20.3% did not brush their teeth twice or more times a day, and 30.9% had never been to a dentist (or did not know it). In multivariate logistic regression analysis, older age, living in a lower middle income country, consumption of chocolate or candy, having made a dental care visit, and poor mental health was associated with tooth ache in the past 12 months. Being male, being 20 to 21 years old, coming from a wealthier family background, living in a lower middle income country, frequent consumption of soft drinks, not having consulted with a dentist in the past 12 months and weak beliefs in the benefits of tooth brushing were associated with inadequate tooth brushing frequency (<twice a day). Further, being male, being 20 to 21 years old, inadequate tooth brushing frequency, infrequent consumption of chocolate or candy, frequent consumption of soft drinks and low physical activity was associated with inadequate or never dental care visit. Poor dental health status and oral health behaviors were found and various risk factors identified that can be utilized to guide interventions to improve oral health programs among university students.

Key Words: dental health status, oral health behavior, health risk behavior, university students, ASEAN

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INTRODUCTION

Apart from utilizing physical examination to assess dental health status, there is increasing interest to assess psychosocial dimensions such as self-reported dental health status.¹⁾ Perceived dental health status is important, as it can influence dental care utilization and the understanding of its components can be utilized to improve dental care.²⁾ Further, poor dental health behavior,

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diet and tobacco use are risk factors for periodontal disease.^{3,4} University students who are in a period of transition may be more vulnerable to take on personal responsibility for oral health behaviors and they will be future role models and leaders in their societies. Little information exists about factors associated with dental health status perception and oral health behavior among emerging adulthood, including university students, in Southeast Asian countries.^{2,5} Since such dental health status perceptions and oral health behavior are influenced by its sociocultural context, these may differ in ASEAN countries compared to other parts of the world.^{1,2}

In an adult population survey in Brazil the toothache prevalence was 17.7% in the past 6 months,⁶ and in another population survey the prevalence of toothache was 18.0%.⁷ In a study among university students in Saudi Arabia dental caries was self-reported at 57% prevalence among males and 44% among females.⁸ Factors associated with toothache and poor perceived oral health include sociodemographic variables such as being a woman,^{6,7} and low socioeconomic status,^{6,7} substance use such as current smoking and problem drinking,^{6,7} sleep disturbance,⁹ and the use of dental services in the last year was protective from toothache.⁷ Moreover, higher perceived stress was associated with higher caries experience,¹⁰ and the consumption of sugar-containing snack intakes was associated with dental caries.¹¹

It is recommended to brush the teeth twice daily with fluoride toothpaste, flossing daily, limiting between meal snacking, avoid high sugar consumption and consume drinks without added sugar, and regular dental preventive care.¹²⁻¹⁵ In a recent survey among university students in 26 countries, 32.8% reported not brushing their teeth twice or more daily, and 33.9% rarely and 24.3% never went for a dental check-up.¹⁶ In a previous review, Peltzer and Pengpid¹⁶ identified the following factors with suboptimal tooth brushing among emerging adults: being male, lower socioeconomic status, poor oral health attitudes, substance use such as smoking and alcohol use, lack of exercises, inadequate fruit and/or vegetables consumption, frequent servings of chocolate, candy or chips per day, and poor mental health or psychological distress. Moreover, less than annual or no dental visits has been found to be associated with being male, lower socioeconomic status, younger age, poor oral health attitudes, infrequent tooth brushing, smoking and anticipation of painful treatment.¹⁶

The aim of this study was to investigate dental health status and oral health behavior and associated factors among university students in five ASEAN countries (Indonesia, Malaysia, Myanmar, Thailand and Vietnam).

METHODS

Sample and procedure

This cross-sectional study is part of a larger investigation of a range of health behaviors in university students in ASEAN countries. The questionnaire utilized for data collection was developed in English, then translated and back-translated into the languages (Bahasa, Myanmar, Thai, and Vietnamese) of the participating countries. In each study country, undergraduate students were surveyed in classrooms selected through as stratified random sample procedure (one university department randomly selected from each faculty as a primary sampling unit, and for each selected department randomly ordered undergraduate courses). Informed consent was obtained from participating students, and the study was conducted in 2015. Participation rates were more than 90%, except for Indonesia 69% and Myanmar 73%. Ethics approvals were obtained from all participating institutions, Research Ethics Committee, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta; the University of Malaya Medical Ethics committee (MECID 201412-905), Malaysia; Research and Ethical Committee of University of Medicine 1,

Yangon, Myanmar; Office of the Committee for Research Ethics (Social Sciences), the Faculty of Social Sciences and Humanities, Mahidol University, Thailand (MU-SSIRB 2015/116(B2)); and Committee of Research Ethics of Hanoi School of Public Health, Vietnam.

Measures

Dental health status was assessed with two questions, 1) “During the past 12 months, how often did you have a tooth ache or feel discomfort because of your teeth?” (Response options ranged from 1=never to 5=always), and 2) “How many cavities have you had in your permanent teeth?” (Response options ranged from 1= “0 cavities” to 5= “6 or more cavities” and 6=“I do not know”).¹⁷⁾

Oral health behavior. 1) “Do you brush your teeth?” 2) Do you use tooth picks?” Response options ranged from 1=twice or more a day to 4=seldom or never^{18,19)} and 3) “How frequently do you go for dental checkups?...Twice a year, once a year, rarely and never.”¹⁸⁾

Oral health beliefs in the importance of brushing teeth regularly were assessed with one question. The response option ranged from 1=of very low importance to 10=of very high importance.¹⁹⁾

Dietary behaviour. Consumption of chocolate or candy and sugared coffee or tea were assessed on a 6-point scale, ranging from 1=more than once a day to 6=never,¹⁸⁾ times per day usually drink carbonated soft drinks in the past 30 days (1= None to 7= 5 or more times per day),¹⁷⁾ and frequency of between-meal snacks.¹⁹⁾

Fruit and vegetable (FV) consumption was assessed with two questions, “How many servings of fruit do you eat on a typical day?” and “How many servings of vegetables do you eat on a typical day?” (One standard serving = 80 g).²⁰⁾ Insufficient fruit and vegetable consumption was defined as less than five servings of fruits and/or vegetables a day.²⁰⁾

Mental health

Centres for Epidemiologic Studies Depression Scale (CES-D). We assessed depressive symptoms using the 10-item version of the CES-D.²¹⁾ Scoring is classified with 15 representing severe depressive symptoms.²¹⁾ The Cronbach alpha reliability coefficient of this 10-item scale was 0.74 in this study.

Post traumatic stress disorder (PTSD). Breslau’s 7-item screener was used to identify PTSD symptoms in the past month.²²⁾ Participants who answered affirmatively to at least four of the questions were considered to have a positive screen for PTSD.²²⁾ The Cronbach alpha of this scale was 0.75 in this study.

Sleeping problems. The prevalence of nocturnal sleeping problems was estimated based on the question: “Overall in the last 30 days, how much of a problem did you have with sleeping, such as falling asleep, waking up frequently during the night, or waking up too early in the morning?” Response options ranged from 1 (none) to 5 (extreme/cannot do). Sleeping problems were defined by the response to this question with ‘severe’ or ‘extreme/cannot do’.²³⁾

Tobacco use was assessed with the question: “Do you currently use one or more of the following tobacco products (cigarettes, snuff, chewing tobacco, cigars, etc.)?” Response options were “yes” or “no”.²⁴⁾

Past month binge drinking was assessed with one item of the “Alcohol Use Disorder Identification Test”.²⁵⁾

Physical activity was assessed using the self-administered International Physical Activity Questionnaire (IPAQ) short version, for the last 7 days (IPAQ-S7S).²⁶⁾ We used the instructions given in the IPAQ manual for reliability and validity, which is detailed elsewhere.²⁶⁾ We categorized physical activity (short form) according to the official IPAQ scoring protocol²⁷⁾ as low, moderate and high.

Socio-demographic questions included age, gender, and subjective socioeconomic background).¹⁹⁾

Data analysis

Data were analyzed using the SPSS software package (PASW Statistics 24, IBM Company, Armonk, NY, USA, 2013). Descriptive statistics were used to describe the data.

Multivariate logistic regression was used to obtain adjusted odds ratios (AOR) and associated 95% confidence intervals to assess the association of sociodemographic variables, oral behavior and attitudes, poor mental health, substance use and low physical activity with the outcome variables (dental health status=sometimes/most of the time/always having toothache in the past 12 months and having one or more cavities and oral health behavior=<twice daily tooth brushing and less than annual dental attendance). All variables which were found significant in the bivariate analyses were included in the multivariate model. $p < 0.05$ was considered significant. Variance inflation factor (VIF) and tolerance values for each model indicate multicollinearity was not a concern in any of the multivariate analyses.

RESULTS

Sample characteristics

The total sample included 3,344 undergraduate university students (mean age 20.5, SD=1.6; 58.3% female) from five ASEAN countries. The sample size ranged from 231 in Indonesia to 1,023 in Malaysia. Overall, 27.7% of students reported to have sometimes, most of the time or always having tooth ache in the past 12 months, 39.4% reported to have one or more cavities, 20.3% did not brush their teeth twice or more times a day, 89.5% did not use tooth picks twice or more times a day, 30.9% had never been to a dentist (or did not know it), and 31.3% low health benefits beliefs of tooth brushing. There were country differences in terms of dental health status, behavior and attitudes. The prevalence of toothache was the highest in Vietnam (43.0%) and Indonesia (39.8%) and the lowest in Thailand (10.7%). Regarding the prevalence of having cavities, this was the highest in Indonesia (64.5%) and the lowest in Malaysia (25.0%); although in Malaysia many students reported not knowing about their cavities. Inadequate tooth brushing (<twice a day) was the highest in Myanmar (51.8%) and the lowest in Indonesia (3.8%) and Thailand (6.8%), and the use of tooth picks (once or more times a day) was the highest in Thailand (32.1%) and the lowest in Myanmar (11.7%). Less than two percent of students from Myanmar had attended dental care in the previous 12 months, while more than 45% of students from Indonesia, Thailand and Vietnam had made a dental visit in the past 12 months. The beliefs in high benefits in tooth brushing was the highest among students from Thailand (82.4%) and the lowest in Myanmar (34.6%) (Table 1).

Associations with oral health status

In multivariate logistic regression analysis, older age, living in a lower middle income country, frequent consumption of chocolate or candy, having made a dental care visit, and poor mental health (PTSD symptoms) was associated with tooth ache in the past 12 months. In terms of having cavities, being female, living in a lower middle income country, having snacks frequently, having had a dental care visit and having PTSD symptoms increased the odds of having one or more cavities (Table 2).

Associations with oral health behavior

Based on multivariate analysis with dental health behavior, being male, being 20 to 21 years

old, coming from a wealthier family background, living in a lower middle income country, frequent consumption of soft drinks, not having consulted with a dentist in the past 12 months and weak beliefs in the benefits of tooth brushing were associated with inadequate tooth brushing frequency (<twice a day). Further, based on multivariate analysis, being male, being 20 to 21 years old, inadequate tooth brushing frequency, infrequent consumption of chocolate or candy, frequent consumption of soft drinks and low physical activity was associated with inadequate or never dental care visit (Table 3).

Table 1 Dental health status, behavior and attitude

Variable	Indonesia ¹ (N=231) N (%)	Malaysia ² (N=1023) N (%)	Myanmar ¹ (N=482) N (%)	Thailand ² (N=791) N (%)	Vietnam ¹ (N=817) N (%)	All (N=3,344) N (%)
Toothache						
Never	74 (32.0)	322 (31.5)	182 (37.8)	424 (53.6)	158 (19.3)	1,160 (34.7)
Rarely	65 (28.1)	443 (43.3)	161 (33.4)	282 (35.7)	308 (37.7)	1,259 (37.6)
Sometimes/most of the time/always	92 (39.8)	258 (25.2)	139 (28.8)	85 (10.7)	351 (43.0)	925 (27.7)
Cavities						
None	75 (32.5)	302 (29.5)	267 (55.6)	187 (23.9)	312 (38.2)	1,143 (34.3)
1 or more	149 (64.5)	256 (25.0)	155 (32.3)	368 (47.0)	384 (47.0)	1,312 (39.4)
Do not know	7 (3.0)	465 (45.5)	58 (12.1)	228 (29.1)	121 (14.8)	879 (26.4)
Tooth brushing						
<once a day	7 (3.0)	4 (0.4)	8 (1.7)	6 (0.8)	12 (1.5)	37 (1.1)
Once a day	4 (1.7)	168 (16.4)	241 (50.1)	48 (6.1)	181 (22.2)	642 (19.2)
Twice or more a day	220 (95.2)	851 (83.2)	232 (48.2)	736 (93.2)	623 (76.3)	2,662 (79.7)
Use of tooth picks						
<once a day	199 (86.1)	832 (81.3)	420 (88.2)	537 (67.9)	622 (76.1)	2,610 (78.2)
Once a day	26 (11.3)	91 (8.9)	42 (8.8)	131 (16.6)	86 (10.5)	376 (11.3)
Twice or more a day	6 (2.6)	100 (9.8)	14 (2.9)	123 (15.5)	109 (13.3)	352 (10.5)
Dental visit						
Never/do not know	67 (29.0)	263 (25.7)	237 (49.8)	232 (29.4)	231 (28.3)	1,030 (30.9)
>1 year ago	46 (19.9)	395 (38.6)	231 (48.5)	191 (24.2)	198 (24.3)	1,061 (31.8)
≤1 year	118 (51.1)	365 (35.7)	8 (1.7)	367 (46.5)	386 (47.4)	1,244 (37.3)
Benefits of tooth brushing						
Low	83 (35.9)	341 (33.3)	231 (47.9)	97 (12.3)	295 (36.1)	1,047 (31.3)
Medium	30 (13.0)	187 (18.3)	84 (17.4)	42 (5.3)	186 (22.8)	529 (15.8)
High	118 (51.1)	495 (48.4)	167 (34.6)	652 (82.4)	336 (41.1)	1,768 (52.9)

¹ Lower middle income country; ² Upper middle income country.²⁸⁾

Table 2 Changes in parameters after fixed-dose combination alogliptin/pioglitazone treatment

Variables (%)	Toothache		Cavities		
	Socio-demographic variables	COR (95% CI)	AOR (95% CI)	COR (95% CI)	AOR (95% CI)
Gender					
Female (62.8%)	1 (Reference)	—	1 (Reference)	1 (Reference)	
Male (37.2%)	0.95 (0.81, 1.11)		0.62 (0.54, 0.72)***	0.65 (0.55, 0.76)***	
Age in years					
18–19 (29.5%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	
20–21 (44.6%)	1.26 (1.05, 153)*	1.15 (0.94, 1.41)	0.81 (0.69, 0.96)*	0.86 (0.72, 1.02)	
22–30 (25.8%)	2.02 (1.64, 2.47)***	1.68 (1.35, 2.09)***	0.96 (0.80, 1.16)	0.94 (0.77, 1.15)	

Wealth				
Wealthy/ Quite well off (33.1%)	1 (Reference)	—	1 (Reference)	1 (Reference)
Not well off/Poor (66.9%)	0.95 (0.81, 1.11)		0.83 (0.72, 0.97)*	0.92 (0.79, 1.08)
Country income				
Upper middle income (45.8%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Lower middle income (54.2%)	2.63 (2.25, 3.08)***	2.56 (2.17, 3.02)***	1.55 (1.35, 1.78)***	2.01 (1.72, 2.35)***
Dental behavior and attitudes Tooth brushing				
Twice or more/day	1 (Reference)	1 (Reference)	1 (Reference)	
≤Twice or more/day	1.08 (0.90, 1.30)	—	0.79 (0.66, 0.94)**	0.86 (0.71, 1.04)
Use of tooth picks				
Twice or more/day	1 (Reference)		1 (Reference)	
≤Twice or more/day	0.93 (0.73, 1.18)	—	0.90 (0.72, 1.13)	—
Dental visit				
In the past 12 months	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Not in the past 12 months or never	0.77 (0.66, 0.89)***	0.75 (0.64, 0.89)***	0.52 (0.45, 0.60)***	0.53 (0.46, 0.62)***
Beliefs in importance of regular tooth brushing				
Low	1 (Reference)	1 (Reference)	1 (Reference)	—
Medium	0.92 (0.73, 1.16)	0.87 (0.69, 1.11)	1.08 (0.87, 1.33)	
High	0.70 (0.56, 0.82)***	0.83 (0.71, 1.03)	1.12 (0.96, 1.32)	
Dietary behaviour				
Between-meal snacks				
<Twice/day (50.3%)	1 (Reference)		1 (Reference)	1 (Reference)
Twice or more/day (49.7%)	0.87 (0.75, 1.02)	—	1.16 (1.01, 1.34)*	1.21 (1.04, 1.41)*
Consumption of chocolate or candy				
Rarely or never (15.1%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
1–6 times/week (42.3%)	1.11 (0.94, 1.31)	1.05 (0.88, 1.26)	1.09 (0.93, 1.26)	1.04 (0.89, 1.21)
1 or more times/day (42.6%)	1.50 (1.20, 1.86)***	1.43 (1.13, 1.81)**	1.24 (1.00, 1.52)*	1.07 (0.86, 1.33)
Consumption of sugared coffee or tea				
Rarely or never (18.3%)	1 (Reference)	1 (Reference)	1 (Reference)	
1–6 times/week (38.0%)	0.85 (0.72, 1.01)	0.92 (0.77, 1.11)	0.92 (0.79, 1.07)	—
1 or more times/day (43.7%)	0.76 (0.61, 0.94)*	0.80 (0.63, 1.01)	0.83 (0.68, 1.01)	
Consumption of soft drinks				
<Once/day (65.2%)	1 (Reference)	1 (Reference)	1 (Reference)	
Once or more/day (34.8%)	0.80 (0.68, 0.94)**	0.86 (0.72, 1.03)	1.00 (0.86, 1.15)	—
Fruit and Vegetables				
5 or more servings/day (25.1%)	1 (Reference)		1 (Reference)	
<5 servings/day (74.9%)	1.12 (0.93, 1.35)	—	1.09 (0.92, 1.30)	—
Poor mental health				
Depression symptoms				
<15 score (89.5%)	1 (Reference)		1 (Reference)	
≥15 score; severe (10.5%)	1.10 (0.86, 1.41)	—	10.98 (0.78, 1.23)	—
PTSD symptoms				
<4 (75.7%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
≥4 (24.3%)	1.72 (1.45, 2.04)***	1.63 (1.37, 1.95)***	1.21 (1.03, 1.42)*	1.20 (1.01, 1.42)*
Sleep problem				
None-moderate (95.4%)	1 (Reference)	1 (Reference)	1 (Reference)	
Severe/extreme (4.6%)	1.56 (1.11, 2.19)**	1.42 (0.99, 2.03)	0.90 (0.64, 1.25)	—
Substance use				
Tobacco use				
Not current (97.7%)	1 (Reference)		1 (Reference)	
Current (2.3%)	1.54 (0.96, 2.48)	—	1.19 (0.75, 1.88)	—

Oral health

Binge drinking				
Not in the past month (97.6%)	1 (Reference)		1 (Reference)	
In the past month (2.4%)	0.66 (0.38, 1.15)	—	1.56 (0.99, 2.14)	—
Physical activity				
Moderate or high (49.5%)	1 (Reference)		1 (Reference)	
Low (50.5%)	0.87 (0.74, 1.01)	—	0.97 (0.84, 1.11)	—

COR=Crude Odds Ratio; AOR=Adjusted Odds Ratio; CI=Confidence Interval; ***P<0.001; **P<0.01; *P<0.05

Table 3 Logistic regression analyses predicting dental health behavior

Variables (%)	Tooth brushing <twice daily		Dental visits <yearly	
	COR (95% CI)	AOR (95% CI)	COR (95% CI)	AOR (95% CI)
Socio-demographic variables				
<i>Gender</i>				
Female (62.8%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Male (37.2%)	2.89 (2.43, 3.43)***	2.47 (2.02, 3.04)***	1.52 (1.31, 1.76)***	1.40 (1.19, 1.65)***
<i>Age in years</i>				
18 – 19 (29.5%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
20 – 21 (44.6%)	1.92 (1.55, 2.38)***	1.31 (1.02, 1.68)*	1.46 (1.24, 1.73)***	1.34 (1.12, 1.60)***
22 – 30 (25.8%)	1.55 (1.21, 1.97)***	1.20 (0.91, 1.58)	0.95 (0.79, 1.14)	0.97 (0.79, 1.18)
<i>Wealth</i>				
Wealthy/ Quite well off (33.1%)	1 (Reference)	1 (Reference)	1 (Reference)	
Not well off/Poor (66.9%)	0.68 (0.56, 0.82)***	0.77 (0.62, 0.96)*	0.96 (0.82, 1.11)	
<i>Country income</i>				
Upper middle income (45.8%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Lower middle income (54.2%)	2.96 (2.48, 3.53)***	1.92 (1.56, 2.38)***	1.34 (1.16, 1.54)***	1.08 (0.92, 1.27)
Dental behavior and attitudes				
<i>Tooth brushing</i>				
Twice or more/day	—	—	1 (Reference)	1 (Reference)
≤Twice or more/day			2.44 (2.00, 2.97)***	1.83 (1.48, 2.27)***
<i>Use of tooth picks</i>				
Twice or more/day	1 (Reference)		1 (Reference)	1 (Reference)
≤Twice or more/day	1.34 (1.00, 1.80)	—	1.30 (1.04, 1.63)*	1.26 (1.00, 1.59)
<i>Dental visit</i>				
In the past 12 months	1 (Reference)	1 (Reference)	—	—
Not in the past 12 months or never		2.44 (2.00, 2.97)***		1.80 (1.44, 2.24)***
<i>Beliefs in importance of regular tooth brushing</i>				
Low	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Medium	0.57 (0.44, 0.72)***	0.55 (0.42, 0.72)***	0.73 (0.59, 0.91)**	0.80 (0.64, 1.01)
High	0.30 (0.25, 0.36)***	0.39 (0.30, 0.47)***	0.71 (0.63, 0.83)***	0.91 (0.76, 1.09)
Dietary behaviour				
<i>Between-meal snacks</i>				
<Twice/day (50.3%)	1 (Reference)	1 (Reference)		
Twice or more/day (49.7%)	0.89 (0.75, 1.06)	—	1.12 (0.97, 1.23)	—
<i>Consumption of chocolate or candy</i>				
Rarely or never (15.1%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
1–6 times/week (42.3%)	1.21 (1.01, 1.45)*	1.01 (0.81, 1.25)	1.10 (0.95, 1.29)	0.99 (0.84, 1.16)
1 or more times/day (42.6%)	0.96 (0.74, 1.24)	1.00 (0.74, 1.37)	0.72 (0.58, 0.88)**	0.68 (0.54, 0.85)**
<i>Consumption of sugared coffee or tea</i>				
Rarely or never (18.3%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
1–6 times/week (38.0%)	1.43 (1.19, 1.73)***	1.19 (0.96, 1.50)	1.34 (1.15, 1.57)***	1.18 (0.99, 1.40)

1 or more times/day (43.7%)	1.17 (0.92, 1.49)	1.01 (0.78, 1.31)	1.15 (0.95, 1.40)	1.07 (0.87, 1.32)
Consumption of soft drinks				
<Once/day (65.2%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Once or more/day (34.8%)	2.02 (1.70, 2.40)***	1.73 (1.39, 2.15)***	2.06 (1.77, 2.41)***	1.85 (1.56, 2.19)***
Fruit and Vegetables				
5 or more servings/day (25.1%)	1 (Reference)	1 (Reference)	1 (Reference)	
<5 servings/day (74.9%)	1.24 (1.00, 1.54)*	1.23 (0.97, 1.56)	1.13 (0.96, 1.34)	—
Poor mental health				
Depression symptoms				
<15 score (89.5%)	1 (Reference)		1 (Reference)	1 (Reference)
≥15 score; severe (10.5%)	0.79 (0.59, 1.06)	—	0.79 (0.63, 0.99)*	0.79 (0.62, 1.00)
PTSD symptoms				
<4 (75.7%)	1 (Reference)		1 (Reference)	1 (Reference)
≥4 (24.3%)	1.10 (0.90, 1.34)	—	0.87 (0.74, 1.03)	—
Sleep problem				
None-moderate (95.4%)	1 (Reference)		1 (Reference)	
Severe/extreme (4.6%)	1.14 (0.77, 1.69)	—	0.73 (0.52, 1.01)	—
Substance use				
Tobacco use				
Not current (97.7%)	1 (Reference)		1 (Reference)	
Current (2.3%)	1.51 (0.90, 2.51)	—	1.22 (0.75, 1.98)	—
Binge drinking				
Not in the past month (97.6%)	1 (Reference)		1 (Reference)	
In the past month (2.4%)	1.34 (0.80, 2.24)	—	0.74 (0.47, 1.16)	—
Physical activity				
Moderate or high (49.5%)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Low (50.5%)	1.32 (1.11, 1.57)***	1.05 (0.86, 1.30)	1.44 (1.25, 1.66)***	1.32 (1.14, 1.54)***

AOR=Adjusted Odds Ratio; CI=Confidence Interval; ***P<0.001; **P<0.01; *P<0.05

DISCUSSION

The study found that in a large sample of ASEAN university students that more than a quarter reported to have sometimes, most of the time or always having tooth ache in the past 12 months, which is probably higher than 18% prevalence of toothache in the past 6 months in two adult population surveys in Brazil.^{6,7)} Regarding the self-reported cavities in the university students, this study found a probably lower prevalence (39.4%) than in a study among university students in Saudi Arabia, with a self-reported dental caries rate of 50.5%.⁸⁾ The study found large country variations in terms of prevalence of toothache and having cavities, with finding the highest rates of tooth ache in Vietnam (43.0%) and Indonesia (39.8%) and the highest prevalence of having cavities in Indonesia (64.5%).

This study found in agreement with previous studies,^{6,7)} that being a female and living in a lower middle income country increased the odds of having poor oral health status. Further, poor dietary behavior (frequent consumption of chocolate or candy and having snacks frequently), and poor mental health increased the risks of having had toothache and/or having cavities, as found in several previous studies.^{6,7,9,10)} Like in previous studies,⁷⁾ this study found that the use of dental service in the last year was protective from toothache and cavities.

This study found a lower prevalence of inadequate tooth brushing frequency (20.3%) than in a previous large multi-country survey among university students (32.8%).¹⁶⁾ Moreover, while in this study 62.7% had not attended dental care in the previous year, the large multi-country

study found that 58.2% rarely or never had gone for a dental check-up visit.¹⁶⁾ However, there were country differences in terms of dental health behavior, with the poorest behaviors among students in Myanmar: 51.8% inadequate tooth brushing (<twice a day), and 98.3% had not (or had never) attended dental care in the previous 12 months. This finding is partially confirmed in previous studies among adolescents and adults in Myanmar.²⁹⁻³¹⁾ Overall, these results seem to be in agreement with previous studies in reporting low rates of tooth brushing and dental attendance in middle income countries.³²⁻³⁵⁾

The study found, in concordance with other studies,^{16,18,36-38)} that men were more likely to engage in poor oral health behavior (inadequate tooth brushing and dental attendance) than women. Possible reasons for this may be that women are more concerned about body and appearance, including oral appearance, than men.³²⁾ Further, the current study findings indicate associations between poor oral health behavior (inadequate tooth brushing and/or dental care visits) and weak beliefs in the importance of regular tooth brushing and health risk behaviors (frequent consumption of soft drinks and low physical activity), which is largely consistent with previous research findings.^{16,18,32,38,39)} Based on these findings, it is recommended that oral health promotion programs should be combined with general health promotion lifestyle intervention programs for this target population.

Study limitations include the cross-sectional study design of the survey, so causal conclusions cannot be drawn, and the dental health status was only assessed by self-report, which may have biased the results. Future studies should also include a dental examination.

CONCLUSION

This study found a considerable proportion of self-reported poor dental status and poor oral behavior among university students in five ASEAN countries. Sociodemographic factors, weak beliefs in the importance of regular tooth brushing and the co-occurrence of general health risk behavior were identified as possible risk factors for poor dental health status and/or poor oral health behavior.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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