Prevalence and predictors of tobacco smoking among university students in Sylhet Division, Bangladesh

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Background: Among university students, large numbers are involved with smoking and suffer from many chronic diseases. This study examined tobacco smoking prevalence and potential predictors among university students in Sylhet Division, Bangladesh.

Methods: A total of 416 students were selected for face-to-face interviews. Logistic regression analysis was used to fulfil the specific objectives of the study.

Results: It was discovered that the prevalence of smoking among university students in Sylhet Division was 37% and almost half of current male students were smokers. Mother's occupation and peer smoking status were found to be significant factors. Although data were collected using multistage sampling, the stages (type of university, universities, departments and academic levels) were insignificant with smoking status. There is a 2.1 times greater likelihood of a student becoming a smoker if a close friend is a smoker. The adjusted living expenses (>\$100) was a proactive factor, though individually it was a significant factor.

Conclusions: This study and previous studies found that smoking initiation among female students is negligible, so gender-specific health promotion and intervention is needed in Bangladesh. Tobacco control awareness programs and 'No smoking' signage should be displayed within university campuses and sanctioned by university authorities.

Keywords: peer influence on smoking, predictors of tobacco smoking, prevalence of tobacco smoking, university students

Introduction

Tobacco smoking is a major public health problem throughout the world, especially for young adults. There is evidence that prolonged smoking among the adult population causes a wide range of diseases, leading to premature morbidity and mortality.[1,2] Smoking is known to be associated with about 40 diseases.[3–5] The risk of developing cancer among smokers is 23 times that of non-smokers.[6]

There are about 1 billion smokers across the world with around 70.0% of them living in low-income countries.[1,7] Smoking is responsible for the deaths of 1 of every 10 adults, causing around 7 million deaths across the world each year,[8] with the life expectancy for smokers at least 10 y less than for non-smokers.[9] In 2012, the global incidence of cancer among young adults was 43.3 per 100 000 people and the corresponding mortality rate was 15.9 per 100 000 people.[10] Undergraduate students are at high risk of smoking due to their young age, easy access to tobacco products,[11] intimate association with smoking peers[12] and influence of friends and parental smoking.[13]

Students may start to smoke as a way of expressing their transition into adulthood[1] and, as a consequence, are more likely to smoke than the general population.[14] Some students may smoke in order to fit in, as they are more likely to become involved with different kinds of sociocultural groups while on campus. If a student initiates smoking, it becomes difficult to stop and the student is likely to develop a regular smoking pattern for life. According to Senol et al.,[15] among the original non-smokers who enter university, one-third become regular smokers by the end of their studies. Masjedi et al.[16] also showed that the prevalence of smoking is significantly higher in students in their last year of study compared with those in their first year.

The estimated cost of tobacco in low- and middle-income countries is 10% of the student's income,[17] so the money paid for tobacco is diverted from nutrition, education and medical care.[18]

According to the Global Adult Tobacco Survey (GATS), around 22 million people (23.0%) in Bangladesh are currently smoking various types of tobacco products. Approximately 12.0% and 26.0% of the overall population aged 15–24 and 25–44 y, respectively, are consuming some form of tobacco.[19] A study based on the Demographic and Health Survey reported that the prevalence of tobacco smoking among men in Bangladesh is 60%.[20] The number of tobacco smokers is increasing daily because of cheap tobacco products, the lack of strong and effective tobacco control regulations and weak enforcement of existing regulations.[21,22] In previous studies, smoking prevalence among students of universities located in the capital of Bangladesh was found to be 31.0%[23] and 41.0%.[24] Among medical students in the northwest part of Bangladesh (Rajshahi Division), smoking prevalence (20.0%) was comparatively lower among graduate-level students.[25] Previous studies also found the significant factors for tobacco smoking initiation are friend's influence,[22] perception of social appearance[21] and a family history of smoking.[22]

It was discovered in the literature review that very few studies have been conducted to identify predictors or risk factors of tobacco smoking among university students in Bangladesh. The majority of the studies that have been conducted were with medical students and mostly cover the Dhaka Division. However, undergraduate students form a large proportion of the student population compared with medical students and there are many universities outside of the Dhaka Division. Furthermore, no study has ever been conducted among university students in the Sylhet Division of Bangladesh. In Sylhet, at least one person in most households lives abroad and so their financial situation is better than the average household in Bangladesh. This division is a comparatively conservative area of the country with respect to norms and values as well as life patterns compared with the Dhaka Division. It is therefore important to investigate the causes of tobacco smoking and establish ways of successfully controlling tobacco consumption. The purpose of this study was to investigate the prevalence and identify possible predictors of tobacco smoking among university students in northeast Bangladesh.

Methods and materials

Study design

A quantitative cross-sectional study was conducted among university students in the Sylhet Division. Over the last few decades, the Sylhet Division has developed as a centre for higher education that has included the setting up of some government and privately owned universities in the area. All universities in the Sylhet Division are located in the Sylhet District. This study was carried out with two public universities (Shahjalal University of Science and Technology [SUST] and the Sylhet Agriculture University [SAU]) and four private universities (Leading University [LU], Sylhet Metropolitan University [SMU], Sylhet International University [SIU] and North-East University [NEU]).

Study sample

This study covered university students at the undergraduate and postgraduate levels. Approximately 24 000 students are currently studying at these two levels in the Sylhet Division. The inclusion criteria for the study sample was full-time students and ≥18 y of age. A sample of 418 students was calculated based on the estimated prevalence of current tobacco smokers that were >18 y of age in Bangladesh[19] (23.0%, confidence interval 95.0%, margin of error 5.0% and non-response rate 10.0%). According to the sample size, the power of the test achieved 0.9.

A multistage stratified sampling technique was used, where each university was considered as a stratum. From each stratum, five departments were selected and from each department, two batches were selected using a 'lottery method'. Students were chosen from the selected, batches by systematic random sampling, with student registration numbers used as the instrument for sampling. Probability proportional to size (PPS) sampling was used to determine the number of students in each university. The sampling design is shown in Figure 1.

Instrument of the study

A standardized questionnaire was developed based on the GATS questionnaire. The questionnaire covered socio-economic
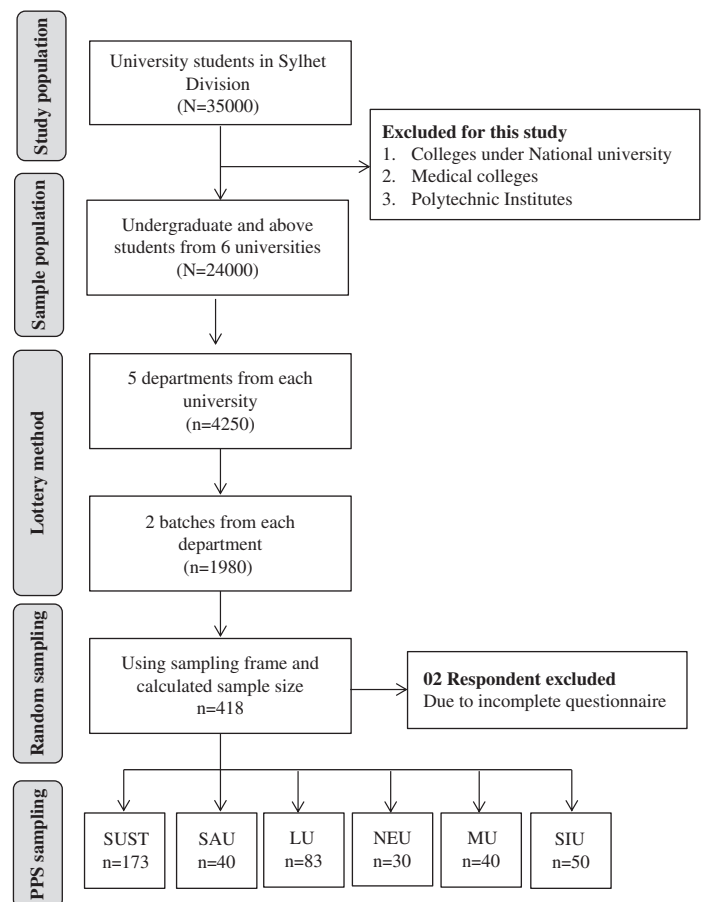
Figure 1. Sampling design for the study.

information (age, gender, marital status, religion, family member, parents' education, profession, family income, personal expenditures etc.), tobacco smoking, health issues, knowledge of and attitude towards adverse health effects of tobacco smoking and tobacco control policy-related questions. For this study, the relevant domains for analysing the prevalence and predictors of tobacco smoking were adopted. The questionnaire was reviewed and approved by the tobacco control research team from the funding organization.

Operational definition

In this study, a student is considered a regular smoker if he/she smoked any kind of tobacco products at least once a day over a period of at least 6 mo. In addition, if a student had smoked previously but had stopped at least 1 y before, he/she was classified as a non-smoker. The smoking behaviour of students consisted of the number of smokes per day, time taken up by smoking, expenditure for smoking, preferred place for smoking and so on. Tobacco products in this study included cigarettes, bidis, hukkahs, pipes and e-cigarettes. A peer group was considered to be a group of students in the same age range, batch and/or department. Peer pressure was the direct influence on students by their peers affecting their behavior, beliefs and actions.

Data collection

Face-to-face interviews using a semi-structured questionnaire were conducted in order to collect field data. Trained and skilled data collectors conducted the interviews with respondents whose participation was voluntary. Each interview usually took 30–45 min and the field coordinator checked and reviewed all the questionnaires on a daily basis.

Ethical approval

Written ethical approval was obtained from the ethical review board at Sylhet M A G Osmani Medical College, Sylhet with institutional consent obtained from university authorities. The data collectors described all ethical issues prior to each interview session, including the right of respondents to withdraw from the study at any time and an outline of the benefits of the study. The interviews only took place with the written agreement of each respondent.

Data analysis

After completion of data entry, consistency was checked by frequency analysis. If any inconsistencies were found, data were verified with the completed questionnaire. Descriptive statistics were performed to calculate the frequencies and percentages of different socio-economic variables. A χ^2 test was used for testing the association between socio-economic variables and outcome variables (smoking status), and the significance level of p-values was set at <0.05. Logistic regression analysis was performed to identify potential predictors of tobacco smoking among university students. For this study, the dependent variable is a binary variable representing the presence or absence of tobacco smoking. The predictors of tobacco smoking can be expressed as

$$p=1/(1+e^{-z}) \text{ or } p=e^{z}/(1+e^{z}), \quad (1)$$

where p is the probability of an event occurring. In the present situation, p is the estimated probabilities of predictors of tobacco smoking. The probability varies from 0 to 1 on an S-shaped curve and z is the linear combination. The linear combination z can be defined as

$$z=b_0+b_1x_1+b_2x_2+\ldots+b_nx_n, \quad (2)$$

where b_0 is the intercept of the model. The b_i (i=0, 1, 2,..., n) are the slope coefficients of the multiple logistics regression and the x_i (i=0, 1, 2,..., n) are the independent variables.[26] ORs, adjusted ORs (aORs) and their 95% CIs were calculated and statistical analysis performed using SPSS for Windows version 21 (IBM, Armonk, NY, USA).

Results

Participants

Respondents included 416 students from six universities in the Sylhet Division. Of this number, 73.3% were male and 26.7% were female, which is similar to the overall male:female student ratio in this division.[27] Ages were between 18 and 29 y, and the mean age of respondents was 22.4±1.4 y.

Prevalence of smoking

The overall prevalence of tobacco smoking was 37.0% among the study participants. According to the association between smoking status and socio-economic characteristics of the participants (Table 1), almost half of the male students were smokers (49.8%). Smoking status was also found to be higher among the older age group, indicating a steady increase of smoking prevalence among students from 18–21 y old (29.9%) to 26–29 y old (41.7%). Smoking prevalence was also higher among master's degree students (46.0%) than second-year students (33.3%).

Associations of smoking

According to Table 1, more students reported being smokers when their parents were involved in business compared with those in other professions. More than half of the students that spent more money on living (>$100) were found to be smokers. It was also discovered that smoking prevalence was higher among students living away from home (47.4%) compared with those living at home (31.0%). Analysis of the data also showed that smoking status is significantly associated with gender, parent occupations, living expenditures and residence type. However, the association is not significant when related to age, religion, university, level of academic study (in year), enrolled academic faculty or monthly family income.

Table 1. Socio-economic characteristics, by smoking status

Characteristics	Students, n (N=416)	Smoking status, n (%)		χ²
		Smoker	Non-smoker	
Gender				80.5***
Male	305	152 (49.8)	153 (50.2)	
Female	111	02 (1.8)	109 (98.2)	
Age (y)				3.2
18–21	107	32 (29.9)	75 (70.1)	
22–25	297	117 (39.4)	180 (60.6)	
26–29	12	05 (41.7)	07 (58.3)	
Religion				3.0
Muslim	335	118 (35.2)	217 (64.8)	
Hindu	78	34 (43.6)	44 (56.4)	
Type of university				3.4
Government	213	88 (41.3)	125 (58.7)	
Private	203	66 (32.5)	137 (67.5)	
Year of study				3.5
Second	138	46 (33.3)	92 (66.7)	
Third	141	56 (39.7)	85 (60.3)	
Fourth	87	29 (33.3)	58 (66.7)	
Masters	50	23 (46.0)	27 (54.0)	
Field of study				8.6
Arts	51	10 (19.6)	41(80.4)	
Social sciences	75	27 (36.0)	48 (64.0)	
Business administration	77	32 (41.6)	45 (58.4)	
Engineering	173	67 (38.7)	106 (61.3)	
Agriculture	40	18 (45.0)	22 (55.0)	
Father's occupation				6.5
Government job	122	38 (31.1)	84 (68.3)	
Non-government job	60	21 (35.0)	39 (65.0)	
Business	189	82 (43.4)	107 (56.6)	
Farming	45	13 (28.9)	32 (71.1)	
Mother's occupation				9.9*
Government job	43	14 (31.7)	29 (68.3)	
Non-government job	18	08 (37.5)	10 (62.5)	
Business	13	10 (76.9)	03 (23.1)	
Housewife	342	122 (35.7)	220 (64.3)	
Family income (US$)[a]				1.0
<312	109	36 (33.0)	73 (67.0)	
312–624	222	85 (38.3)	137 (61.7)	
>624	85	33 (38.8)	52 (61.2)	
Living expenditure (US$)[a]				7.2*
<50	94	31 (33.0)	63 (67.0)	
50–100	256	89 (34.8)	167 (65.2)	
>100	66	34 (51.5)	32 (48.5)	
Present residence				11.6***
Home	168	52 (31.0)	116 (69.0)	
Mess	156	74 (47.4)	82 (52.6)	
Hall	92	28 (30.4)	64 (69.6)	
Peer smoking status				105.2***
No smoker friends	91	05 (3.2)	86 (32.8)	
Single smoker friend	55	10 (6.5)	45 (17.2)	
Two smoker friends	108	35 (22.7)	73 (27.9)	

Continued

Table 1. *Continued*

Characteristics	Students, n (N=416)	Smoking status, n (%)		χ^2
		Smoker	Non-smoker	
Three smoker friends	68	37 (24.0)	31 (11.8)	
Four smoker friends	46	35 (22.7)	11 (4.2)	
Five smoker friends	48	32 (20.8)	16 (6.1)	

*p<0.05, **p<0.01, ***p<0.001.
^aUS$1=80 BDT.

Table 2. Association between expenditure for smoking and monthly living expenses

	Students, n (N=154)	Expenditure for smoking (BDT), n (%)			χ^2
		<1000	1000–2000	>2000	
Living expenditure (US$)^a					15.3***
<50	31	14 (45.2)	15 (48.4)	02 (6.4)	
50–100	89	41 (46.1)	40 (44.9)	08 (9.0)	
>100	34	04 (11.8)	22 (64.7)	08 (23.5)	

***p<0.001.
^aUS$1=80 BDT.

Peer smoking status

This study discovered a very significant association between the smoking status of university students and the smoking habits of their five closest friends (Table 1). The results indicate that almost all smoker student's (96.8%) closest friends were smoke cigarette, whereas, 43.5% smoker students closest four of five friends were smoker. Only 32.8% of non-smoking students did not have any friends who smoked, while 67.2% of non-smoking students were exposed to passive smoking. Table 2 shows that there is a significant association between the student's own monthly expenditures and his/her monthly expenditures for smoking. There was also a significant association between the consumption of cigarettes per week and students monthly living expenditures (Table 3).

Predictors of smoking

A binary and multiple logistic regression analysis was conducted to determine the OR and aOR, respectively, of predictors of current tobacco smoking among university students (Table 4). Those variables not associated with tobacco smoking were eliminated from the regression model. The regression model has strong predictive power (Nagelkerke R^2=0.5). Students who were spending >$100 on their living expenditures (OR=2.2 [95% CI 1.1 to 4.1]) had higher odds of smoking than those who were not. However, when this was adjusted to include other factors such as present residence, mother's occupation and peer smoking status, then living expenditures became a protective factor (aOR=0.7 [95% CI 0.3 to 1.8]). The students who were living away from home were more likely to be smokers (aOR=1.8 [95% CI 1.3 to 1.8]) than those who were living at home. Other significant predictors were mother's occupation; if a mother was involved in business, her university-going child was more likely to be a smoker than the child of a housewife (aOR=4.1 [95% CI 1.2 to 16.4]). Peer smoking status increased the chances of smoking among a student's closest friends (aOR=2.1 [95% CI 1.7 to 2.4]).

Discussion

The overall prevalence of tobacco smoking among university students in the Sylhet Division is 37.0%, while the GATS found that the overall prevalence of tobacco smoking in Bangladesh is 23.0%,[19] which indicates a higher prevalence of smoking among university students in Bangladesh than among young adults generally. This study also revealed that almost half of the male students smoke, which is consistent with the GATS.[19] However, smoking prevalence among male students was found to be higher compared with India (20.4%),[32] Pakistan (26.1%),[28] Nepal (33.6%)[33] and Malaysia (41.2%),[29] but lower than another study conducted in Bangladesh (68.0%).[30] This indicates that smoking prevalence among male students in Bangladesh is still higher than other Southeast Asian countries.

Table 3. Association between number of cigarettes per week and living expenditure among students

Living expenditure (US$)	Total	Number of cigarettes per week, n (%)				χ^2
		<10	10–25	26–50	>50	
<50	31	4 (12.9)	6 (19.4)	14 (45.2)	7 (22.6)	21.0**
50–100	88	17 (19.3)	22 (25.0)	18 (20.4)	31 (35.2)	
>$100	34	2 (5.8)	2 (5.8)	11 (32.3)	20 (57.1)	

**p<0.01.

Table 4. Predictors of smoking among university students

Predictors	OR	95% CI	aOR[a]	95% CI
Living expenditure (US$)				
<50	1.0	1.0	1.0	1.0
50–100	1.0	0.6 to 1.8	0.7	0.4 to 1.3
>100	2.2*	1.1 to 4.1	0.7	0.3 to 1.8
Present residence				
Home	1.0	1.0	1.0	1.0
Mess	2.0**	1.3 to 3.2	1.8*	1.3 to 3.3
Hall	0.9	0.6 to 1.7	0.9	0.5 to 1.8
Mother's occupation				
Housewife	1.0	1.0	1.0	1.0
Government job	0.9	0.4 to 1.7	0.7	0.3 to 1.6
Non-government job	1.4	0.5 to 3.7	0.8	0.2 to 2.6
Business	4.5**	1.4 to 14.6	4.1*	1.2 to 16.4
Peer smoking status	2.1***	1.7 to 2.4	2.1***	1.7 to 2.4

*p<0.05, **p<0.01, ***p<0.001.
[a]Each variable was adjusted with other three variables.

This study also revealed that those who spend more money are more likely to be smokers. When students have more money in their hands, they may participate in high-risk behaviors. This finding is similar to previous studies in El Salvador, where high smoking rates were associated with good economic conditions.[31] In India, pocket money provided strong predictors among young adults[32] for smoking, and in Nepal, students who received pocket money of >500 NRs per month were more likely to smoke.[33] If, however, students stayed at home with their family, they had less opportunity to take part in high-risk behaviors.

This study also found that the risk of being a smoker is 1.8 times higher for those living away from home compared with those living at home. Özecbe et al.[34] performed a study of smoking habits among university students in Turkey and found a high prevalence of smoking among students who were living with friends. This association was also observed by Ullah et al.[3]

The risk of becoming a smoker among students whose mothers were involved in business was found to be 4.1 times higher than for those whose mothers were housewives or were in service. This may be because housewives and those in service are more conscious and caring of their offspring, while women in business may have less time to take care of their children.

Peer smoking status is a strong predictor of smoking. Among five close friends, if any of them is a smoker, there was a 2.1 times greater chance that the other friends would become smokers. Those who were non-smokers but had at least one close friend who did smoke were exposed to second-hand smoking. Most of the time, those who smoked tried to influence their non-smoker friends into taking up the habit by offering them free cigarettes. Similar findings were observed in previous studies conducted in a number of other countries, including Saudi Arabia,[35] Turkey,[34] India[32] and Pakistan.[3]

Limitations

The findings of this study are based on students self-reporting, which runs the risk of recall bias. Self-reports were cross-validated by questions on current smoking behaviors and smoking patterns rather than experimental validation, because of logistic and financial constraints. The data might be affected in some aspects due to underreporting, especially among female students, as smoking among women is socially and culturally unacceptable in Bangladesh. In this study, the authors included only public and private university students and excluded colleges and medical colleges, which includes medical, engineering and nursing college students, even though they are studying at a graduate level. In both the short and long terms, the impact on health of tobacco smoking among university students should be conducted by cohort study. To minimize risk from the community level and from the effectiveness of tobacco control initiatives then attributable risk for total population and proportional attributable risk for total population analysis could be performed in another study. The risk and predictors of smoking among university students could be measure precisely if sample will collect from all types of graduate institutions from every divisions in Bangladesh.

Conclusions

In conclusion, the findings from this study indicate that the smoking prevalence rate is 37% and that 50% of male students

are smokers. It was also discovered that peer smoking status, mother's occupation and residence type are potential predictors for tobacco smoking behaviors among university students in the Sylhet Division. These findings can be used to help develop an effective health promotion program in Bangladesh to prevent smoking among university students. Different kinds of tobacco-free messages, leaflets, posters, banners etc. may be useful to promote tobacco control programs. This study, as well as previous studies, found that smoking initiation among female students is negligible, so gender-specific health promotion and intervention is required. Potential geographical and cultural determinants and correlates of smoking should be identified and targeted by health promotion programs. According to the Tobacco Control Act 2005 (amendment 2013), all educational institutions must be free from tobacco smoke, and in order to ensure this, each university should have its own tobacco control regulation and monitoring team. University authorities should promote tobacco control awareness programs, smoking cessation training, workshops, counselling, motivational speeches, peer education and learning and smoking prevention programs among students within the university to control tobacco use among university students.

References

1 Al-Kubaisy W, Abdullah NN, Al-Nuaimy H et al. Factors associated with smoking behaviour among university students in Syria. Procedia Soc Behav Sci 2012;38:59–65.

2 American Cancer Society. Cancer facts and figures 2007. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2007/cancer-facts-and-figures-2007.pdf (accessed 12 March 2018).

3 Ullah H, Iqbal U, Azhar S et al. Prevalence and psychological characterization of smoking amongst university students in Abbottabad, Khyber Pakhtunkhwa, Pakistan. Trop J Pharm Res 2015;14(11): 2121–24.

4 Thi Thanh Huong L, Khanh Long T, Xuan Son P et al. Prevalence of smoking and associated factors: evidence from the CHILILAB Demographic Surveillance System in Vietnam. Asia Pac J Public Health 2017;29(5 Suppl):53S–61S.

5 Kebede Y, Abula T, Ayele B et al. Substance abuse. Ethiopia Public Health Training Initiative 2005. https://www.cartercenter.org/resources/pdfs/health/ephti/library/modules/Degree/Mod_Substance_Abuse_final.pdf (accessed 5 November 2018).

6 Heydari G, Yousefifard M, Hosseini M et al. Cigarette smoking, knowledge, attitude and prediction of smoking between male students, teachers and clergymen in Tehran, Iran, 2009. Int J Prev Med 2013;4 (5):557–64.

7 Jalilian F, Karami Matin B, Ahmadpanah M et al. Socio-demographic characteristics associated with cigarettes smoking, drug abuse and alcohol drinking among male medical university students in Iran. J Res Health Sci 2015;15(1):42–6.

8 World Health Organization. WHO report on the global tobacco epidemic, 2017: monitoring tobacco use and prevention policies. Geneva: World Health Organization; 2017.

9 Jha P, Ramasundarahettige C, Landsman V et al. 21st-Century hazards of smoking and benefits of cessation in the United States. N Engl J Med 2013;368(4):341–50.

10 Fidler MM, Gupta S, Soerjomataram I et al. Cancer incidence and mortality among young adults aged 20–39 years worldwide in 2012: a population-based study. Lancet Oncol 2017;18(12): 1579–89.

11 Afanador LdPC, Radi DSS, Pinto LEV et al. Sociocultural determinants of tobacco smoking initiation among university students in Bucaramanga, Colombia, 2012. Int J Prev Med 2014;5(9):1106–12.

12 El-Sharkawy GF. Cigarette smoking among university students: family-related & personal risk factors. J Am Sci 2011;7(3):260–8.

13 Morrell HE, Cohen LM, Bacchi D et al. Predictors of smoking and smokeless tobacco use in college students: a preliminary study using web-based survey methodology. J Am Coll Health 2005;54(2):108–15.

14 La Torre G, Kirch W, Bes-Rastrollo M et al. Tobacco use among medical students in Europe: results of a multicentre study using the Global Health Professions Student Survey. Public Health 2012;126(2): 159–64.

15 Senol Y, Donmez L, Turkay M et al. The incidence of smoking and risk factors for smoking initiation in medical faculty students: cohort study. BMC Public Health 2006;6:128.

16 Masjedi M, Azaripour-Masooleh H, Heydari G et al. Smoking prevalence among universities students of Tehran. J Med Counc Islam Repub Iran 2003;20(4):283–7.

17 Eriksen M, Mackay J, Ross H. The tobacco atlas 4th edn. Atlanta, GA: American Cancer Society; 2012.

18 Perera KMN, Guruge GD, Jayawardana PL. Household expenditure on tobacco consumption in a poverty-stricken rural district in Sri Lanka. Asia Pac J Public Health 2017;29(2):140–48.

19 World Health Organization. Global Adult Tobacco Survey: Bangladesh report 2009 Dhaka: World Health Organization, Country Office for Bangladesh; 2009.

20 Sreeramareddy CT, Pradhan PM, Mir IA et al. Smoking and smokeless tobacco use in nine South and Southeast Asian countries: prevalence

estimates and social determinants from Demographic and Health Surveys. Popul Health Metr 2014;12:22.

21 Hossain S, Hossain S, Ahmed F et al. Prevalence of tobacco smoking and factors associated with the initiation of smoking among university students in Dhaka, Bangladesh. Cent Asian J Glob Health 2017;6(1):244.

22 Kamimura A, Ahmmad Z, Pye M et al. Peer smoking and smoking-related beliefs among college students in Bangladesh. J Prev Med Public Health 2018;51(1):51–8.

23 Pervin K. Smoking status and effects among the students of private university. Int J Sci Res Pub 2016;6(2):304–8.

24 Hashmi R. Dynamics of smoking behavior among urban adolescents and young adults in Bangladesh: peer effect and family influences Dhaka: Bangladesh Center for Communication Programs; 2014.

25 Siddiqui M, Sultana S, Sharif T et al. Smoking habits of medical students in a private medical college of Bangladesh. Bangladesh J Med Sci 2011;10(4):280–3.

26 Dai FC, Lee CF. Landslide characteristics and slope instability modeling using GIS, Lantau Island, Hong Kong. Geomorphology 2002;42-(3–4):213–28.

27 Bangladesh Bureau of Educational Information and Statistics. Bangladesh education statistics 2016. Chapter 8: University education. Dhaka: Bangladesh Bureau of Educational Information and Statistics; 2016. http://data.banbeis.gov.bd/images/chp08.pdf (accessed 12 March 2018).

28 Asif HM, Akhtar N, Sultana S et al. Prevalence and factors related to cigarette smoking initiation and use among university students of Bahawalpur Pakistan: a cross sectional study. RADS J Pharm Pharm Sci 2017;5(3):11–6.

29 Al-Naggar RH, Bobreryshev YV, Noor NABM. Lifestyle practice among Malaysian university students. Asian Pac J Cancer Prev 2013;14(3): 1895–903.

30 Karim M, Farah S, Parash TH. Smoking prevalence, knowledge and attitudes among medical students in Dhaka, Bangladesh. Borneo J Med Sci 2016;10(1):84–91.

31 Bautista-Perez F. Prevalence of cigarette smoking and other forms of tobacco in college students. Crea Cienc 2014;9(1):58–66.

32 Lalithambigai G, Rao A, Rajesh G et al. Predictors of cigarette smoking among young adults in Mangalore, India. Asian Pac J Cancer Prev 2016;17(1):45–50.

33 Pradhan PMS, Niraula SR, Ghimire A et al. Tobacco use and associated factors among adolescent students in Dharan, Eastern Nepal: a cross-sectional questionnaire survey. BMJ Open 2013;3(2):e002123.

34 Özcebe H, Güçiz Doğan B, İnal E et al. Smoking habits and the related sociodemographic characteristics in university students. Turk Thorac J 2014;15:42–48.

35 Mahfouz MS, Alsanosy RM, Gaffar AM et al. Tobacco use among university students of Jazan Region: gender differences and associated factors. BioMed Res Int 2014;2014:279231.