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**Prevalence and Predictors of Tobacco Smoking Among University Students in Sylhet Division, Bangladesh**

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**Prevalence and Predictors of Tobacco Smoking Among University Students in Sylhet Division, Bangladesh**

**Background:** Among the university students, large numbers are involved with smoking and suffering 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 fulfill 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. Though data were collected using multistage sampling, the stages- type of university, universities, departments and academic levels were insignificant with smoking status. There was 2.1 times greater likelihood of a student becoming a smoker if one of their close friends is a smoker. The adjusted living express (more than $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 sanctioned by university authorities.

**Keywords:** Peer influence in smoking, Prevalence of tobacco smoking, Predictors of tobacco smoking, University students

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**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 mortality1, 2. Smoking has been known to be associated with about 40 diseases3-5. The risk of developing cancer among smokers is 23 times more likely than among non-smokers6.

There are about one billion smokers across the world with around 70.0% of them living in low income countries1,7. Smoking is responsible for the deaths of one out of every ten adults causing around 7 million deaths across the world each year8 with the life expectancy for smokers at least 10 years less than for non-smokers9. 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 people10. Undergraduate students are at a high risk of smokingdue to their young age, for instance, the easy access of tobacco products11, intimate association with smoking peers12, influence of friends and parental smoking13.

Students may start to smoke as a way of expressing their transition into adulthood1 and, as a consequence, are more likely to smoke than the general population14. Some of the students may smoke in order to fit in because they are more likely to get involved in different kinds of socio-cultural groups during campus life. If a student themselves initiates smoking, it becomes difficult for them to stop and they are likely to go on and develop a regular smoking pattern for life. According to Senol et al., among the original non-smokers who enter university, one-third had become regular smokers at the end of their studies15. Masjedi et al. also showed that prevalence of smoking was significantly higher in students in their last year of study compared with those in their first year16. The estimated cost of tobacco in low and middle-income countries is 10% of income17 and so the money paid for tobacco is diverted from nutrition, education, and medical care18.

According to the Global Adult Tobacco Survey (GATS) study, 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 years and 25-44 years respectively, are consuming some form of tobacco19. A study based on 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 day by day because of cheap tobacco products, lack of strong and effective tobacco control regulations and weak enforcement of existing regulations21, 22. In previous studies, smoking prevalence among students of universities located in the capital of Bangladesh was 31.0%23 and 41.0%24 respectively. Among medical students in the north-west part of Bangladesh (Rajshahi division), smoking prevalence (20.0%) was comparatively lower among graduate level students25. Previous study also found the significant factor for tobacco smoking initiation was friend’s influence22, perception of social appearance21, family history of smoking22.

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 covering the Dhaka division as a research location. However, undergraduate students form a large proportion of the student population compared to medical students and there are many universities situated 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 income in Bangladesh. This division is a comparatively conservative area of the country in respect of norms and values as well as life patterns compared to 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 is to investigate the prevalence and to identify possible predictors of tobacco smoking among university students in the north east of 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, that is, the Shahjalal University of Science and Technology (SUST) and the Sylhet Agriculture University (SAU) and four private universities, that is, Leading University (LU), Sylhet Metropolitan University (SMU), Sylhet International University (SIU), and North-East University (NEU).

**Study sample**

This study covered university students at 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 aged 18 years and above. A sample of 418 students was calculated based on the estimated prevalence of current tobacco smokers that were aged >18 years in Bangladesh of 23.0%19, confidence interval of 95.0%, margin of error 5.0% and non-response rate of 10.0%. According to 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.

Figure 1: Sampling Design for the Study

**Instrument of the study**

The standardized questionnaire was developed based on the GATS (Global Adult Tobacco Survey) questionnaire. The questionnaire covered socio-economic information (age, gender, marital status, religion, family member, parents’ education, profession, family income, personal expenditure etc.), tobacco smoking; health issues; knowledge and attitude of adverse health effects of tobacco smoking and tobacco control policy related questions. For this study, the relevant domains for analyzing 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 they smoked any kind of tobacco products at least once a day over a period of at least six months. In addition, if a student smoked previously but had stopped at least one year before, he/she was classified as a non-smoker. The smoking behavior of students consisted of the number of smokes per day, time taken up by smoking, expenditure around smoking, preferred place for smoking and so on. Tobacco products in this study included cigarette, bidi, hukkah, pipe and e-cigarette. 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 around 30-45 minutes 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 plus 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 was verified with the completed questionnaire. Descriptive statistics were performed to calculate frequencies and percentages of different socio-economic variables. A Chi-square test was used for testing association between socio-economic variables and outcome variables (smoking status) and the significant level of p-value 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 on the dependency on several variables as:

*p =* 1/(1+e-z) or *p =* ez/(1+ez) ……………………………………………………………… (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 on 0 to 1 on an S shaped curve and z is the linear combination. The linear combination ‘z’ can be defined as:

z = b0+b1x1+ b2x2+… +bnxn …………………………………………………………………(2)

Where b0 is the intercept of the model. The bi (i= 0, 1, 2,….., n) are the slope coefficients of the multiple logistics regression and the xi (i= 0, 1, 2,….., n) are the independent variables26. Odds ratios (OR), adjusted odds ratios (AOR) and their 95% confidence intervals were calculated and statistical analysis performed using SPSS (Statistical Package for the Social Sciences) for Windows version 21.

**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 division27. Ages were between 18 to 29 years and the mean age of respondents was 22.4±1.4 years.

**Prevalence of smoking**

The overall prevalence of tobacco smoking was found to be 37.0% among the study participants. According to the association between smoking status and socio-economic characteristics of the participants (Table 1), it was found that almost half of the male students were smokers (49.8%). Smokingstatus was also found to be higher among the older age group indicating asteady increase of smoking prevalence among 18-21 year old students (29.9%) to 26-29 year old students (41.7%). Smoking prevalence was also found to be higher among Masters’ students (46.0%) than second year students (33.3%).

**Associations of smoking**

According to Table 1, more students reported as being smokers where their parents were involved in business compared to 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 in mess (47.4%) compared to those living at home (31.0%). Analysis of the data also showed that smoking status is significantly associated with gender, parent occupations, living expenditure and residence type. However, the association is not significant when related to age, religion, between university, level of academic study (in year), enrolled academic faculty or monthly family income.

**Peer smoking status**

This study discovered a very significant association between the smoking status of university students and the smoking habits of the closest five friends (Table 1). The results indicate that almost all students that smoked (96.8%) had close friends that smoked whereas 43.5% of students that smoked had more than 4 out of 5 friends that smoked. Only 32.8% of non-smoking students did not have any friends that smoked while 67.2% of non-smoking students were exposed to passive smoking. Table 2 shows that there is a significant association between the students’ own monthly expenditure and their monthly expenditure for smoking. Result also shows that there has significant association between students own expenditure and monthly expenditure for smoking as well as between number of smoking and living expenditure among students (Table 3).

**Predictors of smoking**

A binary and multiple logistic regression analysis was conducted to determine 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 R2 = 0.5). Students that were spending >$100 on their living expenditure (OR = 2.2, 95% CI: 1.1, 4.1) had higher odds than those that were not. However, when this was adjusted to include other factors such as present residence, mother’s occupation and peer smoking status then living expenditure became a protective factor (AOR = 0.7, 95% CI: 0.3, 1.8). The students who were staying in mess were more likely to be smokers (AOR = 1.8, 95% CI: 1.3, 1.8) than those living at home or in hall. Other significant predictors were mother’s occupation, where if a mother was involved with business, her university going child was more likely to be a smoker than would the child of a housewife (AOR = 4.1, 95% CI: 1.2, 16.4). Peer smoking status increased the chances of smoking among closest friends (AOR = 2.1, 95% CI: 1.7, 2.4).

**Discussion**

The overall prevalence of tobacco smoking among university students in the Sylhet region was 37.0%. The GATS study however, found that the overall prevalence of tobacco smoking in Bangladesh was 23.0%19 that 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 were smoking that is consistent with the GATS study19. However, smoking prevalence among male students was found to be higher compared to 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 South-East Asian Countries.

This study also revealed that those who spend more money for their livelihood are more likely to be smokers. When students had more money in their hands, for example, they may become confident and desperate and might also start to show high-risk behaviors. This finding is similar to previous studies in El Salvador, where high smoking consumption was associated with good and regular economic conditions31. In India, pocket money provided strong predictors among young adults32 for smoking and in Nepal, students who received pocket money of more than 500 NRs per month were more likely to smoke33. If, however, students stayed at home with their family members, they had little opportunity to take part in high-risk behaviors, at least freely.

This study also found that the risk of being a smoker is 1.8 times higher for those living in mess than in halls or at home. In a student hostel, many senior and junior students live there, so smoking there is difficult. Ozecbe et al. performed a study of smoking habits among university students in Turkey and found a high prevalence of smoking among students that were living with friends34. 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 those mothers who were housewives or were in service. This may be due to housewives and those in service being 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 was a smoker, there was 2.1 times more likely chance that the other friends would become smokers. Those who were non-smokers but had at least one close friend that did smoke were exposed to second hand smoking. Most of the time, those that smoked tried to influence their non-smoker friends into taking up the habit by offering them free cigarettes, for example. Similar findings were observed in previous studies conducted in a number of countries such as Saudi Arabia35, Turkey34, India32, and Pakistan3.

**Limitations**

The findings of this study are based on students self-reporting that potentially 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 constraint. The data might be affected in some aspects due to under-reporting especially among women students, as smoking among women is socially and culturally unacceptable in Bangladesh. In this study, authors only included Public and private university students and excluded colleges which are medical colleges which are medical, engineering, nursing college students, though they are studying graduate level. In the short and long term, 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 could be measured very precisely if it is possible to conduct research among students from all public, private, national universities and included all kinds of graduate institutions in all divisions in Bangladesh.

**Conclusions**

In conclusion, the findings from this study indicated 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 were 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 help prevent smoking among university students. Different kinds of tobacco free messages, leaflets, posters, banners etc. would circulate among students to promote tobacco control health promotion programs. This study as well as previous studies found that smoking initiation among female students is negligible, so gender-specific health promotion and intervention would be 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 is followed, each university should have its own tobacco control regulation and monitoring team. If university authorities promote tobacco control awareness programs smoking cessation training, workshop and counseling, motivational speech, peer education and learning, theatre in smoking prevention etc. among students within university campuses, student halls and messes, it would be very effective in helping to control tobacco use among university students.

**Authors’ contribution**

MSH was responsible for the study design and implementation of the research, writing the manuscript. He was the principal investigator of the research project. MSH and MKH were responsible for the data analysis and interpretation of the result, reading and approval of the final version. HTK was responsible for the data interpretation and approval of the final version.

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**Conflict of interest**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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**Table 1.** Socio-economic characteristics, by smoking status

|  |  |  |  |
| --- | --- | --- | --- |
| Characteristics | Total (N) | 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** |  |  |  | 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 |
|  Govt. University | 213 | 88 (41.3) | 125 (58.7) |  |
|  Private University | 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) |
| **Faculty** |  |  |  | 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 |
|  Govt. Job | 122 | 38 (31.1) | 84 (68.3) |  |
|  Non-govt. 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\* |
|  Govt. Job | 43 | 14 (31.7) | 29 (68.3) |  |
|  Non-govt. Job | 18 | 08 (37.5) | 10 (62.5) |
|  Business | 13 | 10 (76.9) | 03 (23.1) |
|  House Wife | 342 | 122 (35.7) | 220 (64.3) |
| **Family Income (BDT)** |  |  |  | 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 (BDT)** |  |  |  | 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) |
|  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) |

 N = 416, \*P<.05; \*\*P<.01; \*\*\*P<.001, 1 USD = 80 BDT

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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Expenditure for smoking (BDT), n (%) | χ2 |
| Total | <1000 | 1000-2000 | >2000 |
| **Living Expenditure (BDT)** |  |  |  |  | 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) |

 N = 154, \*\*\*P<.001, 1 USD = 80 BDT

**Table 3.** Association between number of smoking and living expenditure among students

|  |  |  |  |
| --- | --- | --- | --- |
| Living expenditure | Total | Number of cigarette per week n (%) | *χ2* |
| <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<.01

**Table 4.** Predictors of smoking among university students

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  Predictors | OR | 95% CI | AOR1 | 95% CI |
| **Living Expenditure (BDT)** |  |  |  |  |
|  <$50 | 1.0 | 1.0 | 1.0 | 1.0 |
|  $50 - $100 | 1.0 | 0.6 – 1.8 | 0.7 | 0.4 – 1.3 |
|  >$100 |  2.2\* | 1.1 – 4.1 | 0.7 | 0.3 – 1.8 |
| **Present Residence** |  |  |  |  |
|  Home | 1.0 | 1.0 | 1.0 | 1.0 |
|  Mess  |  2.0\*\* | 1.3 – 3.2 |  1.8\* | 1.3 – 3.3 |
|  Hall | 0.9 | 0.6 – 1.7 | 0.9 | 0.5 – 1.8 |
| **Mother’s Occupation** |  |  |  |  |
|  House Wife | 1.0 | 1.0 | 1.0 | 1.0 |
|  Govt. Job | 0.9 | 0.4 – 1.7 | 0.7 | 0.3 – 1.6 |
|  Non-govt. Job | 1.4 | 0.5 – 3.7 | 0.8 | 0.2 – 2.6 |
|  Business |  4.5\*\* | 1.4 – 14.6  |  4.1\* | 1.2 – 16.4 |
| **Peer Smoking Status** |  2.1\*\*\* | 1.7 – 2.4 |  2.1\*\*\* | 1.7 – 2.4 |

 Note: OR = Odds Ratio, AOR = Adjusted Odds Ratio, CI = Confidence Interval, \*P<.05, \*\*P<.01,

 \*\*\*P<.001 1Each variable was adjusted with other three variables



Figure 1: Sampling Frame of the study