

## Peer Smoking and Smoking-related Beliefs Among College Students in Bangladesh

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**Objectives:** Smoking is a significant public health issue in Bangladesh. The purpose of this study was to examine peer smoking and smoking-related beliefs among college students in Bangladesh.

**Methods:** College students at two universities in Dhaka, Bangladesh participated in a self-administered survey in May and June 2017.

**Results:** First, being a current or former smoker is associated with lower levels of beliefs among respondents that they would not smoke even with smoker friends or nervousness, and lower levels of intentions that they would not smoke, while current smokers and former smokers have different smoking-related beliefs. Second, having smoker friends is associated with lower levels of intentions that they would not smoke. Third, higher levels of normative beliefs that it is important not to smoke are associated with higher levels of beliefs that they would not smoke even with smoker friends or nervousness, higher levels of intentions that they would not smoke, and higher levels of avoidance of smoking.

**Conclusions:** Smoking-related beliefs and perceived norms in individuals' social networks are important components in promoting tobacco cessation in Bangladesh. But it is challenging to prevent or intervene in smoking because of the high rates of smoking in this country and the high prevalence of smokers in individuals' social networks. Future studies should examine the most effective interventions to combat smoking in high-smoking social networks, such as using mobile apps or social media, and evaluate the effectiveness of such interventions.

**Key words:** Peer influence, Smoking prevention, Social networks, College students, Bangladesh

### INTRODUCTION

Smoking is a significant public health issue in Bangladesh. Among males aged 25 to 69, approximately 25% of deaths are smoking-attributable [1]. In an attempt to combat the health

problems related to high rates of smoking, in 2005, a smoking and tobacco products production, use, selling-purchasing, and advertising control law was passed by the Bangladesh National Parliament [2]. As a result of the controls put in place with this law, the prevalence of smoking among adults had declined from 34.6% in 2000 to 20.0% in 2013 [3]. The law was amended in 2013 to further control smoking in public places and restrict advertisement and sales of tobacco [4]. However, the smoking prevalence is still high in Bangladesh: smoking prevalence for those ages 25 or older was 54.8% among males and 1.3% among females in 2016 [5]. The smoking prevalence in Bangladesh is higher than the global prevalence, especially among males [6]. In fact, Bangladesh is in the top 10 rates of

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smoking in the world. Male youths ages 13-15 had 13.2% smoking prevalence in 2016 [5]. Smoking prevalence is even higher among college students—68.81% among male students and 19.56% among female students, according to a study conducted in Dhaka, Bangladesh [7]. Due to the high smoking prevalence and lack of effective tobacco control policies, exposure to tobacco smoke at home and in work and public places is very high and bears health risks even for non-smokers [8].

Health behaviors such as smoking are known to spread in social networks [9]. Peer smoking is one of the most significant predictors of smoking among youths and young adults [10-12]. Peer networks in which half or more members are smokers significantly increases the possibility of current smoking [10]. Peer smoking affects current and future smoking behaviors [11]. These findings that peer smoking is a significant factor for one's smoking are applicable to Bangladesh because of the high prevalence of smoking in that country [7].

In addition to social networks, smoking-related health beliefs are important predictors of smoking. In particular, smoking-related health beliefs are associated with the intention to quit smoking [13]. The theoretical background of this study is the Theory of Planned Behavior (TPB). According to the TPB, perceived disapproval of smoking from friends and family establishes a non-smoking norm and reduces the possibility of smoking among adolescents [14]. Besides perceived norms, attitude and personal-agency such as self-efficacy affects individuals' intention to smoke or not and thus their actual smoking behavior [15]. Empirical studies have proved that the TPB helps predict smoking behaviors among adolescents or young adults [16-18]. However, little is known about the reasons and sociocultural context of higher smoking rate of young adults and smoking-related health beliefs among college students in Bangladesh.

The purpose of this study was to examine peer smoking and smoking-related beliefs among college students in Bangladesh. The exploratory research based on existing knowledge and theory is guided by a research question that is: What factors affect smoking-related health beliefs among college students in Bangladesh? This study will examine whether smoking related beliefs and behaviors in individuals' social networks (independent variables) affect smoking-related beliefs (dependent variables) among college students in Bangladesh. The hypothesis of this study is as follows: Individuals embedded in social networks where smoking is common will exhibit

higher levels of smoking behaviors than those whose networks have low rates of smoking. Targeting college students is important because smoking initiation during young adulthood (ages 18 to 21) is common [19]. If reducing rates of smoking is a public health goal, then knowing more about how social networks contribute to smoking beliefs and behaviors is an essential part of developing health interventions.

## METHODS

### Data and Participants

Data were collected using a paper self-administered survey at one public university (the University of Dhaka) and one private university (the North South University, NSU) in Dhaka, Bangladesh in May and June 2017. The University of Dhaka is the oldest and top ranked university in Bangladesh and has approximately 30 000 students. The University of Dhaka offers a wide variety of academic programs. NSU has approximately 14 000 students and primarily focuses on social science, humanities, business, engineering, and life sciences. These two universities were selected because these universities accept students from all social classes with diverse social backgrounds. The University of Dhaka especially has a competitive admission test processes which draw students from every part of the nation. In terms of diversity, as the NSU has higher tuition rates and fees more than the University of Dhaka, it is less likely to have students from diverse social classes. After all, the sample from the two institutions still has the diverse student body drawing from around the country. Participants were college students of one of these universities, were aged 18 years or older, and spoke and read Bengali. The survey instrument and consent cover letter were available in Bengali which is a national and official language of Bangladesh and is primarily spoken by the survey participants. The English versions of the survey instrument and consent cover letter were translated into Bengali by a bilingual translator. Another bilingual translator conducted back-translation from Bengali to English. The third bilingual translator checked the accuracy of the translation. Sampling was based on a convenience sample. Research assistants approached potential participants and distributed the consent cover letter and survey instrument in classrooms at the universities. Students who agreed to participate in the survey filled out a paper survey and returned it to a research assistant in the classroom. The consent cover letter and the survey instrument were handed to those who expressed inter-

ests. Consent was obtained from each participant.

## Measures

### **Smoking-related self-efficacy (avoidance of smoking), beliefs and intention**

Smoking-related self-efficacy (avoidance of smoking), beliefs and intention were measured using a scale developed by Sterling and colleagues (4-point Likert scale: 1, definitely yes; 4, definitely no) [20]. It has three sub-scales: 1) self-efficacy to avoid smoking (1-item: "If your friends offer you a cigarette, are you able not to smoke?"); 2) smoking-related beliefs (3-items: "If you are with friends who smoke, are you able not to smoke?," "If you feel nervous, are you able not to smoke?," and "Do you believe cigarette smoking helps people relax?"; Cronbach alpha, 0.832); and 3) intention to continue smoking (6 items: "Do you think smoking cigarettes helps people feel more comfortable at parties and in other social situations?," "Do you think young people who smoke cigarettes have more friends?," "Do you think smoking cigarettes makes young people look cool or fit in?," "Do you think you will smoke a cigarette at any time during the next year?," "Do you think you will be smoking cigarettes 5 years from now?," and "If one of your best friends offered you a cigarette, would you smoke it?"; Cronbach alpha, 0.797). Since reliability of all three items of the belief sub-scale was low, one of the items was dropped. The value of the Kaiser-Meyer Olkin measure of sampling adequacy (0.873) suggested that it would be worthwhile to conduct factor analysis. The results of factor analysis indicated that there were only two components and the sub-scale 1 (self-efficacy to avoid smoking) and the sub-scale 2 (smoking-related beliefs) might be in the same component. Eigenvalues that are useful in determining the number of factor extractions show that component 1 had 51.86% of variance while component 2 had 13.03% of variance. However, these sub-scales were in the separate regression analyses and did not interact each other in the statistical model. Scoring for the belief and intention sub-scales was based on the mean of the items. Higher scores indicate lower avoidance of smoking, lower levels of not smoking even with smoker friends or nervousness, and higher levels of not continuing smoking.

### **Beliefs related to third-hand smoking**

Beliefs related to third-hand smoking were measured using a scale, the Beliefs About Third Hand Smoke (BATHS) (5-point Likert scale: 1, strongly disagree; 5, strongly agree) [21]. The

BATHS contains two subscales: 1) awareness of persistence of third hand smoking (4-items: e.g., "Smoke particles can remain in a room for days."; Cronbach alpha, 0.624) and 2) awareness of health risks of third hand smoking (5-items: e.g., "Particles in rooms where people smoked yesterday can cause cancer."; Cronbach alpha, 0.742). Since reliability of the persistence sub-scale using all four items was low, one of the items was dropped to improve reliability. Scoring was based on the mean of all items in each sub-scale. Higher scores indicate higher levels of awareness of persistence or health risks of third-hand smoking.

### **Approval of smoking by peers or parents**

Approval of smoking by peers or parents was measured using three items of the scale of normative beliefs involving smoking among adolescents (4-point Likert scale: 1, strongly disagree; 4, strongly agree) [22]. The following items were included: "According to my parents, it is very important for me to not smoke cigarettes;" "According to my friends, it is very important for me to not smoke cigarettes;" and "According to most people my age, it is very important for me to not smoke cigarettes." Scoring was based on a mean of the three items. Higher scores indicate the presence of stronger normative anti-smoking beliefs. Cronbach alpha of this study population was 0.722.

### **Stress**

Stress can affect smoking behaviors among college students. For example, stressful events such as exams increase the participation of smoking [23]. Stress was measured using the College Student Stress Scale which has 11 items (5-point Likert scale: 1, never; 5, very often) [24]. It asks how often a participant is distressed, anxious, or questions their abilities in a number of areas, including "personal relationships" and "academic matters." Higher scores indicate higher levels of stress. The mean score among US college students was 29.3 [24]. Cronbach alpha of this study population was 0.815.

### **Smoking-related participant characteristics**

The following smoking-related information was collected from participants: participant's smoking status (current, former or never), father's smoking status (current or former, or never), mother's smoking status (current or former, or never), whether a participant has a sibling who smokes, and whether a participant has friends who are smokers.

### Socio-demographic characteristics

Participants were asked the following demographic questions: age, gender, type of university they attend (public or private), year in college (for analysis-4th or 5th year at college), types of residence (living with family or not), types of home town (urban or rural), whether father has a college degree, whether mother has a college degree, and annual family income (for analysis-family income below 110 000 Bangladesh taka, which is an approximate mean value among the participants, or not).

### Ethics Approval

This project was approved by the institutional review board (IRB) of at a US institution. These universities in Bangladesh did not have IRBs. The IRB of the US institution has policies for international research, including those when local institutions outside the US do not have IRBs. This study followed the policies.

### Data Analysis

Data were analyzed using SPSS version 22 (IBM Corp., Amok, NY, USA). Descriptive statistics were performed to describe the characteristics of participants and variables. Current smokers and former smokers were compared regarding smoking-related beliefs using independent samples *t*-tests. Multiple regression analyses were conducted to examine associations between smoking-related self-efficacy (avoidance of smoking), beliefs and intentions, and participant characteristics, beliefs related to third-hand smoking, approval of smoking by peers or parents, and stress. Multicollinearity was tested using Variance Inflation Factor. There was no significant multicollinearity issue among variables.

## RESULTS

Table 1 shows the characteristics of 386 participants and descriptive statistics of variables. More than 60% of the participants were male. Respondents were split roughly in half between attendance at public and private universities. Approximately one third of the participants were current or former

**Table 1.** Participant characteristics

Variables	Total (n=386)	Current smoker (n=73)	Former smoker (n=46)	F	p-value
Participant current or former smoker	119 (30.8)				
Male	248 (64.2)	71 (97.3)	43 (93.5)		NS
Public university	184 (47.7)	27 (37.0)	20 (43.5)		NS
4th or 5th year at college	171 (44.3)	33 (45.2)	20 (43.5)		NS
Living with family	179 (46.4)	35 (47.9)	20 (43.5)		NS
Urban hometown	208 (53.9)	42 (57.5)	23 (50.0)		NS
Father has a college degree	199 (51.6)	44 (60.3)	24 (52.2)		NS
Mother has a college degree	131 (33.9)	32 (43.8)	16 (34.8)		NS
Family income below 110 000 BDT	233 (60.4)	41 (56.2)	31 (67.4)		NS
Father current or former smoker	181 (46.9)	42 (57.5)	25 (54.3)		NS
Mother current or former smoker	5 (1.3)	1 (1.4)	1 (2.2)		NS
Sibling smoker	128 (33.2)	25 (34.2)	13 (28.3)		NS
Have friends who smoke	323 (83.7)	71 (97.3)	43 (93.5)		NS
Age (y)	21.97 ± 2.26	22.65 ± 2.20	22.28 ± 2.13	0.10	NS
Avoidance of smoking	1.69 ± 1.06	3.26 ± 0.73	1.98 ± 0.89	1.90	<0.01
Beliefs	1.68 ± 0.96	3.23 ± 0.64	1.76 ± 0.70	0.24	<0.01
Intention	3.17 ± 0.71	2.20 ± 0.63	3.11 ± 0.58	0.56	<0.01
Third hand smoking: persistence	2.95 ± 0.66	2.65 ± 0.77	2.84 ± 0.65	1.23	NS
Third hand smoking: health risks	3.33 ± 0.69	3.03 ± 0.75	3.18 ± 0.74	0.02	NS
Approval	3.44 ± 0.56	3.16 ± 0.60	3.39 ± 0.48	2.77	<0.05
Stress	30.43 ± 7.52	30.33 ± 7.13	30.50 ± 6.91	0.004	NS

Values are presented as number (%) or mean ± standard deviation.

Categorical variables: *p*-values are from chi-square tests; Continuous variables: *F* and *p*-values are from independent samples *t*-tests. BDT, Bangladeshi taka; NS, not significant.

**Table 2.** Predictors of continuity of smoking-related self-efficacy (N=386)

Variables	Avoidance		Beliefs		Intention	
	$\beta$	<i>p</i> -value	$\beta$	<i>p</i> -value	$\beta$	<i>p</i> -value
Age (y)	-0.02	NS	-0.01	NS	0.002	NS
Male	0.04	NS	0.12	NS	0.23	NS
Public university	0.03	NS	-0.11	NS	0.12	NS
Living with family	-0.05	NS	-0.08	NS	0.02	NS
4th or 5th year in college	0.05	NS	-0.01	NS	-0.02	NS
Family income below 110 000 BDT	0.05	NS	0.004	NS	0.02	NS
Home town in urban	-0.02	NS	0.02	NS	-0.07	NS
Father has college degree	0.15	NS	-0.05	NS	0.03	NS
Mother has college degree	-0.08	NS	-0.06	NS	0.16	<0.05
Current smoker	2.00	<0.01	1.87	<0.01	-1.08	<0.01
Former smoker	0.85	<0.01	0.46	<0.01	-0.30	<0.01
Father current or former smoker	-0.09	NS	0.05	NS	0.06	NS
Sibling smoker	-0.02	NS	-0.08	NS	-0.001	NS
Friend smoker	0.11	NS	0.05	NS	-0.24	NS
Approval	-0.19	<0.05	-0.21	<0.01	0.21	<0.01
Stress	0.01	NS	0.01	NS	-0.004	NS
(Constant)	1.85	<0.01	2.15	<0.01	2.83	<0.01
$R^2$	0.63		0.69		0.51	
<i>F</i>	30.14		37.89		17.37	
<i>p</i> -value	<0.01		<0.01		<0.01	

*p*-value denotes significance from multivariate regression analysis. NS, not significant; BDT, Bangladeshi taka.

smokers (n= 119, 30.8%), though the percentage was very different between males and females. Among male participants, 46% were current or former smokers. However, among female participants, only 3.6% were current or former smokers. While nearly half of the participants' fathers were ever smokers (46.9%), only 1.3% of their mothers were ever smokers. One third of the participants had at least one sibling who smoked (33.2%). More than 80% of the participants had friends who were smokers (83.7%).

Table 1 also presents the comparison between current and former smokers in smoking-related beliefs. There was no significant difference in demographic characteristics between the two groups. Current smokers reported lower levels of avoidance of smoking ( $p < 0.01$ ), lower levels of not smoking with smoker friends or nervousness ( $p < 0.01$ ), lower levels of intention of not smoking ( $p < 0.01$ ), and lower levels of perceived norms of not smoking from friends or family ( $p < 0.05$ ).

Table 2 describes the results of regression analyses. If a participant's mother had a college degree, he/she had higher levels of intention of not smoking ( $p < 0.05$ ). Both current and former smokers reported lower levels of avoidance of smoking,

lower levels of beliefs that they would not smoke even with smoker friends or nervousness, and lower levels of intention of not smoking ( $p < 0.01$ ). Higher levels of disapproval of smoking from friends or family were associated with higher levels of avoidance of smoking ( $p < 0.05$ ), higher levels of beliefs that they would not smoke even with smoker friends or nervousness ( $p < 0.01$ ), and higher levels of intention of not smoking ( $p < 0.01$ ). Since the results of the factor analysis suggest avoidance and beliefs may be in the same component, it is not surprising that the results for these dependent variables are similar to each other. The only difference is that the association between approval and avoidance was at the 0.05 significance level while the association between approval and beliefs was at the 0.01 significance level.

## DISCUSSION

This study examined the association between smoking beliefs and behaviors in individuals' social networks and smoking-related beliefs among college students in Bangladesh. Three main findings emerged from the data. First, being a cur-

rent or former smoker is associated with lower levels of beliefs that respondents would not smoke even with smoker friends or nervousness, and lower levels of intentions that they would not smoke, while current smokers and former smokers have different smoking-related beliefs. Second, having smoker friends and family is associated with lower levels of intentions that respondents would not smoke. Third, higher levels of normative beliefs that it is important not to smoke are associated with higher levels of beliefs that they would not smoke even with smoker friends and family or nervousness, higher levels of intentions that they would not smoke, and higher levels of avoidance of smoking.

Participants who were current or former smokers were more likely to report lower levels of beliefs that they would not smoke even with smoker friends or nervousness, and lower levels of intentions that they would not smoke compared to those who had never smoked. Smoking-related beliefs are associated with smoking cessation before and/or after. The World Health Organization recommends tobacco control strategies for governments which focus on public health, health systems and surveillance and information [25]. Further research on former smokers and their smoking-related beliefs and tobacco avoidance strategies may help to develop effective smoking cessation programs in Bangladesh and other low resource countries.

The results that a person is less likely to have intentions of not smoking if friends smoke indicate that peer smoking is a significant factor that affects smoking. The results are consistent with previous studies that showed the impact of social networks on smoking [10-12]. Reducing influence from friends and the popularity of smokers in the social networks can decrease the prevalence of smoking [26]. It is very important to develop non-smoker social networks. Future studies should develop strategies of how to support non-smokers in social networks containing smokers as well as how to build and maintain social networks of non-smokers in an environment with a high smoking prevalence.

Furthermore, the results of this study suggest that whether smoking is approved or disapproved by peers or parents is an important factor for smoking behaviors. The results are consistent with the TPB [13] and previous studies conducted in other Asian countries such as Thailand [27] and Vietnam [28]. Since more than 80% of the participants had friends who were smokers, it is possible that most social groups among college students in Bangladesh have smokers. Non-smokers, especial-

ly male non-smokers, may be "minorities" in some social groups. Further studies should examine how smoking status (current, former or never smoker) affects membership and status in social groups as well as their health outcomes.

While this study provides the information about smoking-related beliefs among college students in Bangladesh, there are limitations. This study is cross-sectional and is unable to determine causal directions among variables. The data were collected in two universities in Bangladesh. The degree to which the results can be generalized is limited. There is a possibility that the sample was skewed because this study used a convenience sample. For example, students who were interested in smoking-related issues might be more likely to have participated in this study. Furthermore, an actual response rate is not known due to convenience sampling. There are some potential confounding variables such as the quantity of daily smoking, and smoking duration. In addition, the population surveyed, college students, represents a small percentage of the Bangladeshi population. Future research should expand exploration of smoking-related beliefs and behaviors into other socioeconomic groups as well as among subjects in different age categories. This study used a scale developed outside of Bangladesh. Some of the items were dropped from the original scales to increase reliability. The key scale that measured smoking-related self-efficacy (avoidance of smoking), beliefs and intention was originally developed to have three sub-scales. But among the participants of this study, it was possible that there are only two components.

Smoking-related beliefs, social network and perceived norms through friends are important components to promote tobacco cessation in Bangladesh. Using mobile phone apps specifically designed as smoking interventions may be one of the ways to provide interventions to college students who are in a smoker social network [29]. Interventions using social media such as Facebook or Twitter are found acceptable and effective in the US and may also show efficacy in a Bangladeshi setting [30], because social media is becoming popular among college students in Bangladesh [31]. Due to a high smoking rate in Bangladesh, college students have lots of ties with smokers. Future studies should develop interventions that may overcome a smoker social network peer influences and evaluate the effectiveness of such interventions. Furthermore, future studies should focus on developing intervention strategies that would target peer networks and peer influences on higher prevalence of smoking.

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## CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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