Model of No-Tobacco-Use-in-School (NTUIS) on Tobacco Use Knowledge, Attitude, Intention and Behavior among Bhutanese Adolescents: A Quasi-Experimental Study

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Background: Tobacco use among the 13 to 15 years old is a major public health concern in Bhutan.

Objective: To determine the changes in the student's tobacco use when the knowledge, attitude, intention, and behavior is developed from the peer-led health education package called "No-Tobacco-Use in Schools" (NTUIS) model at rural secondary schools in Wangdue Phodrang District, Bhutan.

Materials and Methods: The quasi-experimental study was conducted between May and December 2016 involving 378 eighth-grade students in four schools. The peer educators executed the NTUIS model in the intervention schools while the health workers disseminated the general health messages in the control schools. The knowledge on the harms of tobacco use, attitude towards tobacco use, intention to use tobacco in the future, and maintenance of non-user status of tobacco among the students were assessed at baseline, post-test, 3-month follow-up, and 6-month follow-up using a self-administered questionnaire. ANOVA was used to find the overall effect.

Results: Post assessments, the mean knowledge scores in the intervention group increased more than the control group at every follow-up, and the model's effect on knowledge was high (p<0.001, d=0.64). More students in the intervention schools than their counterparts in the control schools intended to remain tobacco free for the next five years (p<0.001) and for lifetime (p<0.001). However, there was no overall effect on the student's attitudes in both groups. Similarly, the model did not have its effects either on the student's smoking cigarettes (p=0.380) nor on the use of smokeless tobacco products (p=0.361). Nevertheless, the student's tobacco use did not increase during the study period.

Conclusion: The NTUIS model had high effects on the student's tobacco harm knowledge and intentions to remain tobacco free but showed no effects on their attitudes and tobacco use behavior.

Keywords: Adolescent tobacco users, Tobacco use prevention, Peer-led health education, Bhutan

Tobacco use is one of the major preventable causes of death in the world and considered as one of the highest risk factors for deaths from non-communicable diseases[1]. Tobacco use kills over six million people every year[2]. Around 600,000 non-users die due to secondhand tobacco smoking, and of which 170,000 of the victims are children[3]. There are more than 4,000 chemicals in tobacco smoke, and most of them are harmful to the health. The tobacco use among adolescents is prevalent throughout the world, and on an average, one in every twenty adolescents uses some types of tobacco products[4]. Over half of those who use tobacco will die prematurely, depriving their families of income, raising the cost of health care, and hindering economic development[5,6].

Tobacco use starts at a young age, and most adult smokers started using tobacco in their adolescence.

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Adolescents are too young to understand the great risk of nicotine addiction, and the tragic health consequences of tobacco use[7]. Between 80,000 to 100,000 young people worldwide become addicted to tobacco every day[8]. The younger they are when they first try tobacco, the more likely they are to become regular users. Adolescents who use tobacco face higher risk of getting a host of health problems in adulthood when compared with those who initiate later or do not start at all[9-11]. However, the adolescent's uptake of tobacco can be stopped or delayed.

About 29% of Bhutanese students aged 13 to 17 years old are current users of tobacco[12]. More boys (28.6%) than girls (11.1%) are currently smoking tobacco. In addition, 27.2% of boys and 19.8% of girls are currently using smokeless tobacco (SLT). These figures are one of the highest in South-East Asia[13]. The tobacco use trends among the Bhutanese youth remained almost the same between 2007 and 2013. This situation may be hinting at the lack of or limited health education programs on the use of tobacco and its harms to the health of adolescents. The school-based prevention programs have been shown to improve adolescents' tobacco harm knowledge, attitude, and reduce smoking intention and behaviors[14]. In the present context, the authors evaluated a quasi-experimental study at four schools in Wangdue Phodrang District in Bhutan to test the hypothesis that a school-based peer education model could bring changes to the student's tobacco harm knowledge, attitudes towards tobacco use, intentions to use tobacco, and tobacco use behavior. The study outcomes will have far-reaching implications on tobacco control policies and programs aimed at preventing tobacco use among adolescents.

Materials and Methods

The present study used the Health Belief Model[15] and the Theory of Reasoned Behavior[16] in developing the intervention package and designing instruments to predict deliberate behaviors of the participants. The peer educators employed the principles of the Diffusion of Innovation Theory[17], when the intervention package was being implemented, as part of strategies to spread information effectively among the study participants.

Study design

A quasi-experimental design was used to evaluate the peer-led No-Tobacco-Use in Schools (NTUIS) model on the tobacco use-related knowledge, attitude,
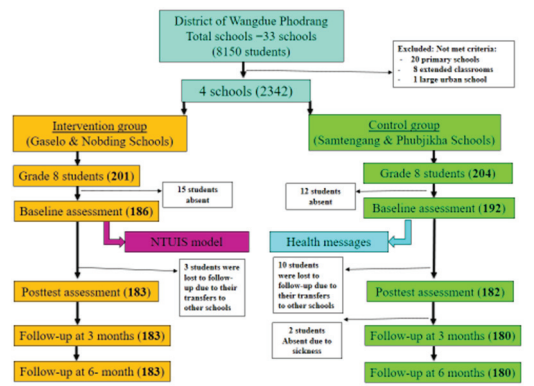

Figure 1. The study design and participation flow chart.

intention, and behavior among students. The present study had an intervention and a control group, both of which were subjected to a pre-test at baseline and a post-test immediately after the intervention, and then a follow-up at the third and sixth months to compare the differences in outcome variables before and after the intervention. A multi-stage sampling was used to select schools and subjects. Out of the 33 public schools, only four were eligible for recruitment. The selected schools were stratified by school type to form two pairs of matched schools to reduce the risk of potential baseline differences between the schools. From each matched group, one school was randomly selected for the intervention group while the other went to the control group with a 50% chance of being allocated to either group. Then, the students of the eighth grade were purposively selected to be the study subjects (Figure 1).

Participants and study sites

In accordance to the purpose and design of the study, four secondary schools of Nobding, Gaselo, Samtengang, and Phubjikha were designated as the study sites. These schools were about 40 to 80 Km apart from one another. The present study recruited eighth-grade, regular students currently studying in these schools. Using the Hemming et al's formula for clustered randomized trials[18], the sample size was estimated with an 80% power to detect an absolute between-group difference in the primary outcome measure at a 2-sided alpha level of 0.05 and an effect size of 0.8. After accounting for the 10% dropout, the total sample size was 310. However, all the eighth-grade students in four schools had been considered for the study as desired by the school authorities. Three hundred seventy-eight students were enrolled,

with 186 students in the intervention schools and 192 students in the control schools.

The Research Ethics Board of Health, Ministry of Health, Royal Government of Bhutan approved the study (REBH/Approval/2016/028). Before commencement of the intervention, written informed consents were obtained from the parents or guardians of all the participants, and a formal administrative approval sought from the district administration.

Intervention program

The peer education-based model, intended to provide the knowledge to the students about the important aspects of tobacco and health consequences of its use, was designed to engage student participants in a range of activities that would facilitate in learning and sharing the information among themselves. Before the model commenced, the health workers trained ten peer educators, five males and five females, from the intervention schools on the intervention package and their roles in the study implementation. Thus, these designated peer educators rolled out this model in Gaselo and Nobding schools and implemented it for five weeks after the baseline assessment, and a two-week booster before the final follow-up assessment. They organized classroom sessions, discussions, quiz, easy-writing competition, and sports based on anti-tobacco themes. With support from teachers and health workers, they distributed information leaflets, displayed anti-tobacco posters, and screened video clippings on the consequences of tobacco use. Whereas, the control schools received some health awareness sessions on various public health topics except for those related to tobacco.

Instruments and study procedures

The study used a self-administered questionnaire with closed-ended questions in five parts, namely socio-demographic information, tobacco knowledge, attitude, intention, and tobacco use behavior. The knowledge component contained 51 questions and accorded a score each for the correct response. The attitude variable, consisting of 13 questions, was being measured on a 4-point Likert scale. Intending to stay tobacco free in the future was measured on a 7-point scale to determine the seriousness of the intention. Regarding the tobacco use behavior, proportions of non-tobacco users were estimated and changes over the time measured. The students with higher scores were considered knowledgeable on the harms of tobacco use. Likewise, students who scored high on Likert scale were regarded as having strong anti-tobacco use attitudes. The higher the points the students scored on intention scale, the higher the likelihood of intentions expressed by them being true. Differences in the proportions of non-users of tobacco were compared between the intervention and control schools.

At baseline, the authors collected data from the student participants in both the intervention and control schools. The post-test data were collected immediately after implementation of the model for five weeks. Exactly after three and six months from the post-test, the first and second follow-up assessments were carried out respectively. The entire duration of study from the baseline till the last follow-up assessment was around seven months (between May and December 2016). The researchers and health workers regularly met with the school and health authorities to ensure the smooth implementation of the model and to monitor the quality of data collection.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS version 22). All statistical tests were conducted with a 95% confidence interval and considered statistically significant only with a p-value of less than 0.05. Descriptive statistics such as percentage and frequency have been used to describe general characteristics of the students, including the tobacco use by their family members and peers, alcohol use, and personality type. The mean and standard deviation were used for describing outcome variables. The chi-squared (χ^2), Independent t-test and Mann-Whitney test were used to compare the differences in baseline characteristics between the intervention and control schools. The Independent t-test helped in comparing the differences in tobacco knowledge and intention scores between the intervention and control schools. The Mann-Whitney test compared the differences in attitudes between the two groups at the post-test, 3-month, and 6-month follow-up assessments. The Wilcoxon signed-rank test indicated where the changes in attitudes took place in the two groups. The Cochran's Q test compared the differences in proportions of tobacco users and non-users at the baseline, posttest and follow-up assessments. The repeated-measures ANOVA was performed to test the overall changes in tobacco knowledge and intention scores between the two groups after the model had been implemented while the Friedman ANOVA was used to find out the total changes in attitudes and tobacco use since these outcomes had non-normal data.

Table 1. Comparisons of differences in knowledge, attitude and intention scores between the groups at baseline, posttest, 3-month follow-up, and 6-month follow-up

Point of data collection	Intervention group Mean±SD	Control group Mean±SD	95% CI	t	p-value
Tobacco harm knowledge					
Baseline	26.80±8.96	26.78±7.73	–1.73 to 1.64	–0.05	0.958
Posttest	38.74±12.97	26.58±8.06	10.04 to 14.27	11.31	0.001
3-month follow-up	43.90±8.75	27.07±8.93	15.00 to 18.66	18.12	0.001
6-month follow-up	44.81±9.40	24.88±11.07	17.80 to 22.04	18.48	0.001
Attitude towards tobacco use, Median					
Baseline	33	34	0.00 to 2.00	16319	0.147
Posttest	36	35	–1.00 to 1.00	16220	0.667
3-month follow-up	34	34	–1.00 to 2.00	15599	0.382
6-month follow-up	33	34	1.00 to 4.00	13439	0.002
Intention to stay tobacco free for five years					
Baseline	5.90±1.89	5.89±2.04	–0.40 to 0.39	–0.036	0.972
Posttest	5.92±2.07	5.43±2.44	–0.97 to –0.025	2.071	0.039
3-month follow-up	5.72±2.27	4.82±2.77	–1.42 to –0.37	–3.387	0.001
6-month follow-up	5.05±2.62	4.20±2.86	–1.42 to –0.29	–2.973	0.003
Intention to stay tobacco free for lifetime					
Baseline	5.66±2.06	5.83±2.08	–0.24 to 0.60	0.833	0.406
Posttest	6.07±1.91	5.77±2.19	–0.71 to 0.13	–1.350	0.178
3-month follow-up	5.70±2.31	5.18±2.65	–1.04 to –0.01	–2.000	0.046
6-month follow-up	5.08±2.60	4.42±2.83	–1.22 to –0.10	–2.320	0.021

SD=standard deviation; CI=confidence interval
Significant at p<0.05

Results
Characteristics of participants
Of 378 students enrolled at baseline, 15 were lost to follow-up due to relocation of students to other schools. Three hundred sixty-three students (96%) were included in the final analysis. There were relatively more female (52.9%) than the male student participants (47.1%). Their ages ranged from 11 to 19 years with the mean age of 14.9±1.39 years. Most of the students lived in the school hostels (82%). The parents of the students were primarily farmers working in the rural areas (63% fathers and 45.8% mothers). Most students perceived themselves as introverts (55.4%) and rated as having a moderate level of self-esteem (69.3%). The age, gender, residence, personality of students, and tobacco use by parents did not differ significantly between the intervention and the control schools at baseline. However, there were significant differences in the variables, such as parent's occupation, sibling's and friend's use of

tobacco, student's alcohol use, and levels of self-esteem between the groups. Nonetheless, the main study outcome variables, the knowledge on tobacco, attitude towards tobacco use, intention to use tobacco and tobacco use behavior were not significantly different.

Changes in knowledge, attitude and intention
The intervention group that received the NTUIS program showed an almost two-fold increase in mean knowledge scores from baseline till the follow-up at 6 months while the control group did not show any overall change. Although mean scores for knowledge at the baseline did not differ between the intervention and the control groups (t=–0.05, p=0.958), significant differences in their mean scores were observed at the post-test (t=11.31, p<0.001), 3-month follow-up (t=18.12, p<0.001), and at the 6-month follow-up (t=18.48, p<0.001), indicating that changes have taken place in the intervention group following the

execution of the model. As for the attitude scores, no significant differences between the two groups were observed at baseline, post-test and 3-month follow-up except for the final assessment at sixth month (U=13,439, p=0.002). This indicated that the model had no effect on the student's attitudes. Regarding the intentions to remain tobacco free for five years, mean scores between the two groups were not different at baseline (t=–0.036, p=0.972). However, the scores were significantly different between them at post-test (t=2.071, p=0.039), 3-month follow-up (t=–3.387, p=0.001), and at 6-month follow-up (t=–2.973, p=0.003). Similarly, the mean scores for the students who intended to stay tobacco free for lifetime were not different between the intervention and the control groups at baseline (t=0.833, p=0.406) and post-test (t=–1.350, p=0.178). However, they significantly differed at the 3-month follow-up (t=–2.000, p=0.046) and at 6-month follow-up (t=–2.320, p=0.021) (Table 1). This reflected that the model had an effect on student's intention to stay tobacco free in the intervention group.

Model's overall effects on knowledge, attitude and intentions

The overall effects of the model were high for tobacco harm knowledge (F=645.64, p<0.001, d=0.64), intentions to remain tobacco free for five years (F=284.603, p<0.001, d=0.446), and tobacco-free for lifetime (F=331.590, p<0.001, d=0.484). These results showed that, after implementation of the model, the students in the intervention schools had significantly improved their knowledge on the harms of tobacco use and had high intentions of staying tobacco free in the future as compared to those in the control schools. Even though the effect on the attitude was significant (p=0.009), student's attitudes became more negative towards the end of the study, indicating that the model had no effect (Table 2).

Non-smoker status for cigarettes/bidis

The proportions of students in the intervention schools who did not smoke cigarettes/bidis at baseline (88.7%) remained non-smokers at the post-test (89.1%), 3-month follow-up (89.1%), and 6-month follow-up (89.1%). However, the differences between the proportions of non-smokers and smokers across four points of measurements were not significant (χ^2=0.043, p=0.998). In the control schools, the proportions of students who were non-smokers dropped from 89.6 percent at baseline to 86.7 percent at six-month follow-up assessment. However, the

Table 2. Overall effects of the NTUIS model on the tobacco harm knowledge, attitude towards tobacco use, and intentions to remain tobacco free (after adjusting for covariates)

Source	Sum of squares	df	Mean square	F	p-value
Knowledge					
Intervention	62,763.39	1	62,763.39	645.64	<0.001*
Error	34,412.60	354	97.21		
Attitude (rank)					
Intervention	1.45	1	-	-	0.009#
Control	1.55				
Intention					
Five years					
• Intervention	1,612.511	1	1,612.511	284.603	<0.001*
• Error	2,005.703	354	5.666		
Lifetime					
• Intervention	1,771.955	1	1,771.955	331.590	<0.001*
• Error	2,005.703	354	5.666		

* Used Huynh-Feldt correction factor, # Friedman ANOVA test

Table 3. Proportions of current smokers of cigarettes/bidis in the intervention and control schools at the baseline, posttest, 3-month follow-up, and 6-month follow-up

Point of data collection	n	Non-smoker n (%)	Smoker n (%)	p-value
Intervention				0.998
Baseline	186	165 (88.7)	21 (11.3)	
Posttest	183	163 (89.1)	20 (10.9)	
3-month follow-up	183	163 (89.1)	20 (10.9)	
6-month follow-up	183	163 (89.1)	20 (10.9)	
Control				0.375
Baseline	192	172 (89.6)	20 (10.4)	
Posttest	182	161 (88.5)	21 (11.5)	
3-month follow-up	180	153 (85.0)	27 (15.0)	
6-month follow-up	180	156 (86.7)	24 (13.3)	

Significant at p<0.05

differences between the proportions of non-smokers and smokers were not statistically significant (χ^2=3.107, p=0.375) (Table 3).

Non-user status for smokeless tobacco

Most students in the intervention schools who were not using any SLT or baba at the baseline (89.2%) maintained their non-user status until the final follow-

Table 4. Proportions of current users of SLT/baba in the intervention and control schools at the baseline, posttest, 3-month follow-up, and 6-month follow-up

Point of data collection	n	SLT non-user n (%)	SLT user n (%)	p-value
Intervention				0.989
Baseline	186	163 (89.2)	20 (10.8)	
Posttest	183	164 (89.6)	19 (10.4)	
3-month follow-up	183	164 (89.1)	19 (10.4)	
6-month follow-up	183	165 (90.2)	18 (9.8)	
Control				0.968
Baseline	192	170 (88.5)	22 (11.5)	
Posttest	182	162 (89.0)	20 (11.0)	
3-month follow-up	180	158 (87.8)	22 (12.2)	
6-month follow-up	180	157 (87.2)	23 (12.8)	

SLT=smokeless tobacco

Significant at p<0.05

Table 5. Overall effect of the NTUIS model on the smoking and SLT user status among students in the intervention and control groups using a Friedman ANOVA test (unadjusted)

Variable	Median (IQR)	Chi-square	df	p-value
Smoking status		0.771	1	0.380
Intervention	20 (1)			
Control	23 (5)			
SLT use status		0.834	1	0.361
Intervention	19 (1)			
Control	22 (2)			

SLT=smokeless tobacco; IQR=interquartile range

Significant at p<0.05

up assessment at sixth month (90.2%). However, the differences in proportions of users and non-users of SLT across all points of measurements were not statistically significant (χ^2=0.112, p=0.989). Similarly, there were no noticeable changes in the proportions of both the users and non-users of SLT products over the period of six months in the control schools, and the differences between them were not statistically significant (χ^2=0.256, p=0.968) (Table 4).

Model's overall effects on the use of cigarettes and smokeless tobacco

The model did not have significant effect on the student's smoking status (χ^2=0.771, p=0.380) and SLT user status (χ^2=0.834, p=0.361). The results indicated that the student's use of tobacco products was not determined by the presence or absence of the model (Table 5).

Discussion

The primary objective of the present study was to explore the NTUIS model for its potential in preventing the uptake of tobacco products by students through a peer-based health education program. It was anticipated that the findings from the present study would arouse some interests and motivations among the concerned authorities in addressing the issue of tobacco use among adolescents in Bhutan, and provide firsthand evidence for informed planning and programming the tobacco control measures in schools, and helping students in preventing an uptake of tobacco use in the future.

The study results indicated that the model was effective in increasing the student's tobacco harm knowledge. Indeed, this finding is largely consistent with past studies that a school-based tobacco prevention program had a positive effect on student's tobacco related knowledge[19-24]. A review of 11 schools in South Korea found that 73% of smoking prevention programs helped in improving participants knowledge about smoking[25]. The effect for knowledge was higher in the present study (d=0.64) as compared to other studies where the sizes ranged from 0.36 to 0.45[19,26,27]. Contrary to the results from the past studies that a peer-based prevention intervention in schools improved anti-smoking attitudes among students[21,24-28], the current study had a negative effect on the students' attitudes. Past findings also suggested that school-based interventions might not affect attitudes because they are more stable and resistant to change as compared to knowledge[24,29]. This could also be due, in part, to the adolescent's inability to understand their susceptibility to tobacco use and the severity of the addictive nature of tobacco[30].

According to the global atlas tobacco report, 19% of adolescents said they were susceptible to take up cigarette smoking in the following year[31]. The current study revealed the proportions of students who would use tobacco products if offered by their best friends increased from 3.8% to 13.7% in the intervention group, and 3.6% to 16.7% in the control group. Even though the model had a positive effect on the students' intention, it is difficult to comprehend whether such pledged intentions would be true in reality. Because adolescents have an increased vulnerability to tobacco use due to a host of factors, including a lack of skills to resist peer pressure, an

increasing access to affordable tobacco products, and exposure to tobacco advertising[30,32]. The past findings point out to the fact that good intentions do not always translate into anticipated behaviors[33-35]. For the tobacco use behavior, since the proportions of non-users of cigarettes/bidis and SLT/baba remained similar in both groups at all follow-up assessments, this indicate that there was no significant effect on tobacco use behavior. This outcome is in agreement with a number of studies showing only insignificant changes in the tobacco use behavior[19,20,24,25,36]. The pooled results from one meta-analysis consisting of 49 studies followed up to one year or less, found no overall effect of interventions on the onset of smoking[14].

The present study is constrained by some limitations. Although self-reported measures of adolescent tobacco use have shown good validity and reliability when confidentiality is assured[37,38] through self-administration of questionnaire and maintaining anonymity within classroom settings, the confidence of the present study would have been boosted if we would have used biochemical validation[39] (salivary or urine cotinine test). Since the use of tobacco is prohibited in all schools throughout the country[40], students may have underreported fearing reprisals from the school authority. Secondly, the shorter duration of the intervention period may have restrained the ability of the study to detect and find out the model's real and long-term effects. Finally, generalizability of the findings is limited due to the social, economic, and demographic variations across the student populations in different schools. The four schools involved in the present study from one district may not represent schools in other districts. Despite these limitations, the study is the first of its kind attempting at assessing the effectiveness of the school-based tobacco use prevention model in Bhutan.

Conclusion

The study revealed the peer-based tobacco use prevention program in schools can improve the knowledge of students on the harms of tobacco use, and their intentions to remain tobacco free in the future, even though it did not change the student's attitudes or reduce tobacco use behavior. Schools can use this model to effectively inform the students since it is the first step towards educating them, and eventually, preventing them from becoming new tobacco users. However, a confirmatory study designed to detect the model's long-term effectiveness with appropriate study duration and adequate geographical representation is recommended.

What is already known on this topic?

There have been prevention programs on tobacco use in the school settings for decades, putting emphasis on averting the students from initiating the use of tobacco products. Such programs had proven to improve the knowledge on the harmful consequences of tobacco use among students. However, in most studies, only small or no effects were found on the initiation of tobacco use among students depending on the type and duration of the intervention, and in the context of social norms and existing policy measures.

What this study adds?

The NTUIS program had focused on adolescents because the tobacco use prevalence among Bhutanese adolescents is high, when compared with many countries in South-East Asia. The authors study results demonstrated that the NTUIS model not only significantly increased the tobacco knowledge among students but also influenced their intentions to remain tobacco free in the future as intention is an important element of behavioral change. The current findings suggest that the NTUIS model has potentials in pursuing students to stay away from tobacco products if it is implemented effectively by taking care of study limitations. The model such as NTUIS represents an opportunity for tobacco control in Bhutanese Schools.

Conflicts of interest

The authors declare no conflict of interest.

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