Education Quarterly Vol. 4 No.1, (1-16)

Predicting Smokeless Tobacco Consumption Behavior of Adolescent Students Through Protection Motivation Theory

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ABSTRACT

Smokeless tobacco, a type of tobacco product that is consumed without burning, is detrimental to health but its consumption among youths of Nepal is increasing. In this regard, the main purpose of this paper is to predict SLT consumption behavior of students based on protection motivation theory (PMT), which is mostly used to study health related protective behaviors. For this study, descriptive research design was followed. Adolescent students of Class 9 and 10 of community schools of Siraha districts comprised the population of the study and the sample was selected by applying multiple-cluster sampling method. Although the sample size was 240, which was determined by using Yamane formula, only data of 225 students were analyzed due to discarding 15 incomplete questionnaires. Anonymous questionnaire was the tool of data collection that contained behavioral, socio-demographic and PMT scale sections. Data were collected through enumerators. The study found that threat appraisal was significant predictor of SLT consumption behavior of students and their intention to consume it. It is concluded that higher proportion of students consumes SLT that should be minimized by developing and implementing tobacco cessation policies and programs based on threats related to its consumption at local and national level.

Keywords: Coping appraisal, extrinsic reward, intention, response efficacy, threat appraisal.

Introduction

Smokeless tobacco (SLT) is nicotine-containing tobacco that is consumed without burning through mouth or nose (Gupta et al., 2017). Users of SLT keep it in their mouth

or between gum and cheek, and it is sucked on and juice of it is spitted, therefore, it is also called 'spitting tobacco' (Bajracharya et al., 2011). SLT includes betel quid (BQ)/pan with tobacco, *gutka, kharra, mainpuri, dohra, mawa,khaini, zarda, khiwam*, chewing tobacco, and loose tobacco leaf (Gupta et al., 2016). Other SLTs are *mishri, gul, gudakhu, tapkeer/bajjar*/snuff, tobacco-containing toothpowder, creamy snuff/ toothpaste and *tuibur*.

Approximately 4000 chemicals are found in SLT that are toxic, mutagenic, and carcinogenic (Bhisey & Stanfill, 2016). SLT is rich in tobacco-specific nitrosamines (TSNAs), a dominant carcinogen among 36 recognized carcinogens. Many diseases such as cancer of mouth and pharynx (Shastri et al., 2016), hypertension, increased heartbeat, stroke and heart attack (Salahuddin et al., 2016)and inflammation of gingiva, decaying of teeth, oral sub mucous fibrosis, and development of leukoplakia (Mathur et al., 2016) are attributed to consumption of SLT. By 2030, globally, above 8 million deaths will be occurred if tobacco cessation program is not accelerated where lower and middle-income countries will contribute 80% deaths, and in Nepal, above 60% deaths are caused by non-communicable diseases (NCDs) where 11% (15% men and 2% women) deaths are concerned with tobacco use (National Health Education Information and Communication Centre, 2018).

Use of tobacco is not only detrimental to health but also challenging to economy and educational attainment of students. Over 1.4 trillion US dollar is expended in the world (National Health Education Information and Communication Centre, 2018) whereas 27.5 billion US dollar was expended in India for tobacco attributable diseases and other aspects in 2017/18 (John et al., 2021). Among annual income, 3% income is spent for tobacco consumption and 57,215 Nepali rupees, above per capita income of Nepali, is spent for each term of hospitalization (Sagtani et al., 2015).Similarly, smoking negatively affects cognition, concentration and information processing of smokers (Jacobsen et al., 2005), and it has negative correlation with students' achievement (Kawafha, 2014).

Although tobacco use has detrimental effects, its prevalence is high. Around 12% of adolescents (12-15 years) i.e. 43.8 million adolescents consume one or more types of tobacco products in the world where the highest number of adolescent who consume tobacco reside in the South-East Asian countries(World Health Organization, 2019). Among adolescents of 13-15 years old, the rate of tobacco consumption is higher in low and middle-income countries ranging from 11-13% than high-income countries that is below 10%. In Nepal, 9% of adolescent students (male-11.8%, female-5.4%)

currently use tobacco (Aryal et al., 2017). One in five (20.4%) adolescents (boys- 24.6%, girls- 16.4%) consumed any types of tobacco ("Nepal 2011," n.d.). Similarly, 9% (boys- 11.4%, girls- 6.5%) consumed the smoked tobacco, and 16.2% (boys- 19.7%, girls- 12.9%) consumed smokeless tobacco. Tobacco consumption among adolescents has become burden for Nepal because over 1 million users or prevalence equals to or over 10% in a state is consider as high burden of SLT for that state (Mehrotra et al., 2017).

To reduce this burden of tobacco use many efforts and initiations such as signing World Health Organization Framework Convention on Tobacco Control (WHO FCTC) Treaty on 7 November 2006 (Khanal & Khatri, 2021; National Health Education Information and Communication Centre, 2018; Nepal Development Research Institute, 2019), following MPOWER policy package since 2007 (Dhimal et al., 2020), passing Tobacco Product (Control and Regulatory) Act 2011 (Khanal & Khatri, 2021; National Health Education Information and Communication Centre, 2018; Nepal Development Research Institute, 2019), and the Tobacco Product (Control and Regularization) Regulation Act 2011, the provision to cover 90% parts of cigarette package with graphic health warnings were made by the Government of Nepal.

The literatures show that in spite of many initiations and efforts have been adopted to control consumption of tobacco, consumption of SLT was increasing among youths of Nepal compared to youths of other East Asian countries (Kishore & Jena, 2018). It indicates the need of theory based studies to describe SLT consumption behavior of adolescents because advanced countries emphasize the need of theory-leaden etiological research to tackle risk behaviors regarding health (MacDonell et al., 2013).

Protection motivation theory (PMT) is broadly used to study health related behavior of people. PMT is used as theoretical guide and conceptual framework for many protective behaviors such as use of tobacco, alcohol consumption and for interventional studies and programs such as tobacco cessation program, programs regarding HIV (MacDonell et al., 2013). PMT was developed by Ronald Rogers in 1975 to study the influence of fear appeals on behavior of people (Maddux & Rogers, 1983; Rogers, 1975). It was extended in 1983 by Rogers by adding rewards and self-efficacy in the model as main construct (Maddux & Rogers, 1983; Rogers, 1983) and offer a more common explanation of effect of influencing communication and emphasized basic rational course (Rogers, 1983). Perception of severity, vulnerability, extrinsic and intrinsic rewards, response and self-efficacy, and response cost are the main constructs

of PMT that are can be categorized into two broad categories—threat appraisal score and coping appraisal score.

Theory based studies especially those regarding SLT are rarely found. Although over 300 million people of the world consume SLT (Siddiqi et al., 2017) and more adolescents are attracting towards consumption of SLT and more adolescents are attracting towards consumption of SLT(National Cancer Institute and Centers for Disease Control and Prevention, 2014), and it has become drastic challenge regarding health and economy especially for lower and middle income countries (Mishu et al., 2020), researchers and policy makers are still seen focused on cigarette rather than other form of tobacco (Mishu et al., 2020; National Cancer Institute and Centers for Disease Control and Prevention, 2014; Siddiqi et al., 2017; Yadav et al., 2020). There is scarce of studies regarding to SLT control activities following WHO FCTC (Siddiqi et al., 2017). Since only few researches have followed PMT (Thrul et al., 2013) and lack of studies of SLT based on PMT are seen, this study aims to predict SLT consumption behavior of adolescent students based on the constructs of PMT..

Method

Research Design and Setting

Descriptive research design, that is centered on explaining particular facts and characteristics of individual, group or situation by following rigid structure to provide complete and accurate information(Kothari, 2004),was followed to complete this study. Community secondary schools of Siraha district were the study area for this study.

Population of the Study

Students of Class 9 and 10 of community secondary school of Siraha district were the population of the study and the primary sources of data.

Sampling and Sample Size

Sample for the study was selected by applying multi-stage cluster sampling method. At first, two local levels, one urban and one rural, were randomly selected from all 17 local levels of Siraha district. Selected local levels contained 17 community secondary schools (Urban-14, Rural- 4). Then, based on probability proportional to

size (PPS) (Neuman, 2014), total five community secondary schools, 4 from urban and one f$n = \frac{N}{1+Ne^2}$ were selected. Sample size was calculated by applying Yamane formula ( ) (Israel, 1992/2013), where 'n' is sample size; 'N' is population and 'e' is precision level; was applied to calculate sample size at 95% confidence level, 0.5 proportion and ± 10% precision level, two as design effect (Lwanga & Lameshow, 1991) and 10% non-response (Israel, 1992/2013). Calculated numbers of students were selected by applying PPS. Although the applied formula provided sample size 240 at population ≥ 10000 only data of 225 students were analyzed as 15 questionnaires were discarded due to their incompleteness.

Research Tools

For this study, anonymous questionnaire was taken as tool that mainly contained closed type questions. It had three main sections—SLT consumption behavior and attitude, socio-demographic aspect and PMT scale (MacDonell et al., 2013).Some questions related to behavior and attitude were sampled from 2020- Core Questionnaire of The Reporting Instrument of Who FCTC, freely available on online, and modified into SLT consumption behavior and attitude. PMT scale was modified into SLT related questions and developed in Nepali language for data collection. PMT scale contained 21 questions, three questions for each seven constructs, with 7-point scale ranging from definitely disagree (1) to definitely agree (7).

Reliability and Validity of Tool

Reliability of tool was assured through Cronbach alpha. Review of related literatures and feedbacks received from pre-test of tool among 15 students of Class 9 and 10 underpinned to determine validity of tool.

Process of Data Collection

Data were collected from 2022 May 30 to 2022 June 6 after preparing all necessities of data collection. For this, written approval of schools was received. After that, written informed consent of parents and verbal informed assent from students were taken. School teacher supported to select students based on sampling plan and managed a separate classroom for data collection. After that, questionnaire were distributed to students to collect data, and before filling questionnaire, they were again informed about purpose of study and how to response it. Collection of data and assisting the students for their confusion and hesitation were the responsibility of enumerators.

Variables of Study and their Measurements

In this study, SLT consumption behavior of students and their intention to consume SLT in upcoming one year were dependent variables that were measured in nominal scale "yes" and "no".

Similarly, constructs of PMT with threat appraisal score and coping appraisal score were the independent variables for this paper that were measured in continuous scale. Mean scores of each construct of PMT that range from 1 to 7 were calculated by adding the value of each statement of respective constructs provided by the students and dividing it by 3. Threat appraisal score was calculated by subtracting mean score of external rewards and intrinsic rewards from mean score of severity and vulnerability. Likewise, coping appraisal was measured by reducing mean score of response cost from mean score of response efficacy and self-efficacy.

Statistical Analysis and Interpretation of Data

Statistical package for social science (SPSS) version 20 was applied to perform statistical analysis. Frequency and percent were used to analyze and interpret data related to SLT consumption behavior of students' and their intention to consume SLT. Similarly, mean and standard deviation were used to describe constructs of PMT, threat appraisal score and coping appraisal score. To show the association of SLT consumption behavior of students and their intention to consume SLT independent sample t-test was applied. To predict dependent variables binary logistic regression was performed, and analyzed data are presented in tables and texts.

Ethical Considerations

Written approval of selected schools, written informed parental consent and assent of students were assured in the study. Voluntary participation, freedom to leave, anonymity and benefit regarding the students were maintained.

Findings

Background Information of Students

The percentage of girls was 52% in the study. Most students were from rural area (85.8%) and belonged to Hindu religion (93.8%). More than half students were from Class 9 (54.2%) and fell under the age group up to 15 years (57.3%).

Table 1: Background Information of Students

Characteristics		n	%
Sex	Male	108	48
	Female	117	52
Address	Rural	193	85.8
	Urban	32	14.2
Religion	Hindu	211	93.8
	Islam	14	6.2
Class	Nine	122	54.2
	Ten	103	45.8
Age	Up to 15 years	129	57.3
	16 years and above	96	42.7

Students who Consumed SLT

Among all students, 20.4% (boys-17.8%, girls- 2.7%) consumed SLT. For boys only, 37.04% boys and for girls only, 5.13% girls consumed SLT. One in five (19.1%) students mentioned that they had probability of consumption of SLT in upcoming one year (Table 2).

Table 2: Percentage of Students who Consumed Smokeless Tobacco (SLT)

	Yes		No	
	n	%	n	%
Among all students				
Boys	40	17.8	68	27.1
Girls	6	2.7	111	48.9
Total	46	20.4	179	79.6
Among boys only	40	37.04	68	62.96
Among girls only	6	5.13	111	94.87
Probability of smokeless tobacco (SLT) consumption in upcoming year	43	19.1	182	80.9

Scores of Constructs of PMT

Table 3 shows that mean score of severity was highest (5.8815) followed by mean score of vulnerability (5.7141) and mean score of response cost (4.2785). Similarly, threat appraisal score and coping appraisal score were (2.1659) and (-1.2644), respectively.

Table 3: Score of Constructs of Protection Motivation Theory (PMT)

	n	M	SD
Mean score of severity	225	5.8815	.83854
Mean score of vulnerability	225	5.7141	.94372
Mean score of extrinsic rewards	225	3.3689	1.34582
Mean score of intrinsic rewards	225	3.8948	1.42932
Mean score of response efficacy	225	2.9126	1.53004
Mean score of self-efficacy	225	3.1156	1.81224
Mean score of response cost	225	4.2785	1.42625
Threat appraisal score	225	2.1659	1.44179
Coping appraisal score	225	-1.2644	1.99766

Association of SLT consumption Behavior and Intention with Constructs of PMT

Mean score of response efficacy of students who consumed SLT and who did not consume SLT, significantly differ ($t = -2.820$, $df = 223$, $p < 0.006$) with modest effect size (0.42). Likewise, mean score of extrinsic rewards of students who mentioned that they had probability of consumption of SLT in upcoming one year and who did not mention so had moderate (effect size = 0.40) significant difference ($t = -2.394$, $df = 223$, $p < 0.017$).

Binary logistic regression analysis was performed to predict SLT consumption behavior and intention of consumption of SLT in upcoming year of students based on threat appraisal score and coping appraisal score. For this, default enter method of binary logistic regression was applied. Only threat appraisal score significantly predicted SLT consumption behavior (B= -.238, S. E.= .139, Wald= 4.114, df= 1, p= .043, Exp(B)= .754, 95% CI of .573 to .991) and intention (B= -.356, S. E.= .146, Wald= 5.994, df= 1, p= .014, Exp(B)= .700, 95% CI of .526 to .931) of students. However, the model only explains 2.3 to 3.6% variance for SLT consumption and 2.8 to 4.5% for intention of SLT consumption, which is considered as negligible. However, the model correctly classified 79.6% cases for SLT consumption and 80.9% for intention of SLT consumption. Increase in one unit of threat appraisal score decreases the probability of falling in SLT consumption behavior and intention to consume SLT group 0.754 times and 0.7 times, respectively.

Discussion

This paper aims to describe whether constructs of PMT predict SLT consumption behavior of students and their intention to consume SLT. In the study, 100% response

rate of selected schools and students was achieved. The study found that higher proportion of students consumed SLT. More than half of the students were girls and belonged to rural area. Similarly, above half of the students were from class nine and age group up to 15 years old.

This study found that proportion of boys who consumed SLT was much higher than girls who consumed SLT, and nearly the same proportion of students who consumed SLT had intention to consume SLT in upcoming year. Different from this study, Joshi et al. (2020) reported that 6% and 40.5% students consumed SLT and betel nut. Unlike to this study, Gansky et al. (2009) found much lower proportion (9.8%) of students consumed SLT. Similarly, Pradhan et al. (2013) reported that only 8% students consumed SLT. A study (Chaudhary & Bhandari, 2016) shows that among 15.6 % of ever tobacco users, 70.8% smoked and remaining consumed SLT. But, Bhaskar et al. (2016) found that among 25.3 % (boys- 31%, girls- 14.4%) users, 7.7 % and 17.6% students smoked and consumed SLT, respectively. Likewise, Upreti (2018) found that among tobacco consumer, most students smoked (44.4%) and 25% and 11.2% consumed paan-parag and gutkha, respectively. A study from Pakistan shows that SLT and/or BQ was consumed by 42.6% of students, and proportion of boys was higher than proportion girls who consumed it (Hussain et al., 2017). But a study (Ullah et al., 2018) from Bangladesh presents that 9.5% (male- 6.46%, female- 3.04%) and 3.67% (male- 2.41%, female- 1.27%) adolescent students ever and currently consumed SLT, respectively, that is much lower proportion than the findings of my study. Similarly, only 3.8% students of high schools of United States consumed SLT (Creamer et al., 2020).

Although the mean score of severity and vulnerability was not significant to SLT consumption behavior of students and their intention to consume SLT, it was found higher than other variables whereas mean score of response efficacy and self-efficacy was the least among other constructs of PMT. Among all constructs of PMT, only mean score of response efficacy significantly differed among students who consume SLT and who did not consume SLT. Likewise, only mean score of extrinsic rewards significantly differed among students who had intention to consume SLT in upcoming year and who had no such intention. Different from the findings of this study, Lin et al. (2021) found that all constructs of PMT had significant association with quitting intention of smoking among low nicotine dependence group whereas only perceived vulnerability was significantly associated with quitting intention among moderate and high nicotine dependence group. Not similar to the findings of this study, MacDonell et al. (2013) found that all constructs of PMT significantly correlated to smoking

behavior of students and their intention to smoke. A review study (Rajendran & Shenbagaraman, 2017) partially supports the findings of our study regarding the association between SLT consumption behavior of students and constructs of PMT. They mentioned that higher self-efficacy and response efficacy had negative association with the smoking intention and smoking behaviors. Behavior and intention of students to consume tobacco significantly associate with all constructs of PMT (Sabzmakan et al., 2018; Yan et al., 2015) however, self-efficacy (Sabzmakan et al., 2018; Yan et al., 2015) and intrinsic rewards (Sabzmakan et al., 2018) have more impact on it that do not match with the findings of my study.

Only, threat appraisal scores significantly predicted SLT consumption behavior of students and their intention to consume SLT. Salmani (2021) reported that threat appraisal components of PMT produced better result to minimize intention of vaping and somewhat to reduce its practice among students of university. Likewise, Sabzmakan et al. (2018) mentioned that intention and behavior of tobacco consumption were significantly predicted by coping appraisal and threat appraisal but coping appraisal impacted more than threat appraisal did that partially echo with the findings of my study. MacDonell et al. (2013) partially support these findings of my study. They reported that both threat appraisal path and coping appraisal path were significantly associated with smoking behavior and intention. Similarly, coping appraisal influences behavioral intention more than threat appraisal does (Rajendran & Shenbagaraman, 2017), which does not coincide with the findings of my study. A longitudinal study by Thrul et al. (2013) shows that smoking intention and behavior of student is predicted by self-efficacy that is not confirmed by constructs of threat appraisal. A study among Chinese adolescents' evidence that perceived efficacy mainly self-efficacy dominantly predict smoking behavior at individual level (Yan et al., 2015).

As this study followed descriptive research design, it could not establish the causal relationship. There might be biases in response as data was collected through self-administered questionnaire. The findings of the study could not be generalized among all adolescents as this study was limited to students of Class 9 and 10 of community secondary schools. However, this study appreciates to develop contents of health education based on constructs of PMT especially contents related to threats and rewards to minimize SLT consumption.

Conclusion

Based on the findings of the study, I concluded that higher proportion of students consume SLT where proportion of boy who consume SLT is much higher than proportion of girl who consume SLT. Among all constructs of PMT, only response efficacy and extrinsic rewards significantly differentiate students who consume SLT and who do not consume SLT, and students who have intention to consume SLT and who do not have intention to consume SLT, respectively. Threat appraisal is significant predictor for SLT consumption behavior and intention to consume SLT. SLT cessation policies and programs should be developed and implemented by local and national authorities in school especially focusing on threats, efficacy and rewards related to its consumption.

Acknowledgement

I am grateful to Research Center, Rector's Office, and Tribhuvan University for supporting financially to conduct this study. Similarly, I am thankful to school administrations, teachers, students, and enumerators for their coordination and cooperation to conduct study.

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