

## Relationship between Cigarette Smoking and Blood Pressure in Adults in Nepal

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### Abstract

This study examines the relationship between cigarette smoking and blood pressure in adults in Nepal. Blood pressure is selected as the dependent variable. Similarly, friend's circles, stress, celebrity effect, interest, and social media are selected as independent variables. The study is based on primary data with 128 observations. To achieve the purpose of the study, structured questionnaire is prepared. The correlation coefficients and regression models are estimated to test the significance and importance of different factors influencing relationship between cigarette smoking and blood pressure in adults in Nepal.

The study showed that stress has a positive impact on blood pressure. It means that an increase in stress leads to increase in blood pressure among adults. Similarly, friend's circles has a positive impact on blood pressure. It indicates that bad friend's circles motivate to smoking which leads to increase in blood pressure among adults. Likewise, celebrity effect has a positive impact on blood pressure. It means that increase in celebrity influence for smoking leads to increase in blood pressure among adults. Further, interest has a positive impact on blood pressure. It shows that an increase in smoking interest leads to increase in blood pressure among adults. In addition, social media has a positive impact on blood pressure. It shows that social media influence on smoking leads to increase in blood pressure among adults.

*Keywords:* blood pressure, friend circle, social media, stress, celebrity effect, interest

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### 1. Introduction

Smoking brings greater health problems in the long-term like increased risk of stroke and brain damage (Leshargie *et al.*, 2019). Smoking brings greater health problems in the long-term like increased risk of stroke and brain damage (Leshargie *et al.*, 2019). Cigarette smoking is the most common form of tobacco smoking by men and women in Nepal (Mohn, 2017). Some studies have found a positive association between current smoking and hypertension, including in an urban Nepali population (Dhungana *et al.*, 2016).

BP has also been found to be the same or lower in many groups of smokers compared to non-smokers (Imamura, 1996). Cardiovascular disease is the leading cause of death in Nepal. Both cigarette smoking and hypertension (high blood pressure) are well-established risk factors for cardiovascular disease and are thought to act synergistically on disease development (Cesaris, 1992). The etiology of primary hypertension is complex and lifestyle risk factors such as obesity, physical inactivity; excessive alcohol consumption and high salt intake are proposed to be strongly and independently associated with its development (Carnethon, 2010).

Borland (1997) concluded that the new health warnings were more potent at stimulating both thoughts about negative effects of smoking and the appropriate consequent action of not smoking the planned cigarette. The study showed a direct association between PWLs and increased cessation and reduced smoking initiation and prevalence (Levy *et al.*, 2017). Higher levels of negative emotional reaction were positively associated with cessation behaviors, with high negative emotional reaction associated with nine times the odds of

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quitting (Cloud *et al.*, 2017).

Modesti *et al.* (2016) showed that in multivariate meta-regression analyses, SBP difference between minorities and EU populations was influenced by pan ethnicity and diabetes prevalence. Forouzanfar *et al.* (2017) found that over the past 25 years, the number of individuals with worldwide SBP levels of at least 110 to 115 mm Hg and of 140 mm Hg or higher and the estimated associated deaths have increased substantially.

Wakefield *et al.* (2003) showed that national campaign using graphic advertising to emphasize the health risks of smoking can make significant population wide contributions to improving new learning about smoking damage and positively influence attitudes about smoking risks. The findings pertaining to advertising recall, recognition, appraisal, new learning, and change in smoking related attitudes provide some degree of optimism for expecting to observe positive changes in smoking behavior. Nichter *et al.* (2009) showed that an association exists between unfavorable contextual characteristics and tobacco consumption and related measures among adults.

Cigarette smoking has a broad impact on genome-wide methylation that persists many years after smoking cessation (Joehanes *et al.*, 2016). Many of the differentially methylated genes were novel genes with respect to biological effects of smoking and might represent therapeutic targets for prevention or treatment of tobacco-related diseases. Beaney *et al.* (2018) found that blood pressure was higher in association with antihypertensive medication, diabetes, cerebrovascular disease, smoking, and alcohol consumption. Lopez *et al.* (1994) stated that biological changes are more likely to occur in older versus younger adults, and these differences could influence tobacco dependence treatment. For example, age-related cognitive changes might contribute to additional challenges in quitting smoking. Age-related deficits in executive function were associated with a decreased likelihood of a successful quit attempt among older smokers, (> 60 years) possibly by disrupting behaviors essential for treatment success. Physiological changes that occur with age (e.g., increases in body fat; decreases in lean body tissue, liver size, and liver blood flow) could affect medication metabolism or adverse effects.

Systolic blood-pressure elevation had a greater effect on outcomes; both systolic and diastolic hypertension independently influenced the risk of adverse cardiovascular events, regardless of the definition of hypertension (Flint *et al.*, 2019). Banegas *et al.* (2018) found that ambulatory blood-pressure measurements were a stronger predictor of all-cause and cardiovascular mortality than clinic blood-pressure measurements. White-coat hypertension was not benign, and masked hypertension was associated with a greater risk of death than sustained hypertension. Human behavioral laboratory studies offer an efficient method of screening potential pharmacological treatments for smoking and of identifying behavioral mechanisms by which such treatments work, but they have been criticized on the grounds that they often fail to detect effects of medications that are known to be clinically effective. This insensitivity may be due, at least in part, to the fact that participants in these studies typically are not trying to quit smoking permanently (Perkins *et al.*, 2006).

Cigarette smoking influences some cardiovascular parameters, including blood pressure (Li *et al.*, 2017). However, research results on the relationship between smoking cessation and blood pressure vary. Some researchers found a paradoxical association between cigarette smoking and blood pressure, with current smokers showing lower blood pressure

than ex-smoker or non-smoker (Gumus, 2013). A change in the smoking behavior of more than one contact may be required for a subject to quit, and there may be additive or even threshold effects whereby a subject's probability of smoking cessation depends on smoking cessation by not one contact, but by two or more (Centola *et al.*, 2007).

Despite the considerable importance of smoking attitudes in predicting smoking intentions among college students, little is known about how social media usage affects students' attitudes toward smoking (Freeman, 2012). Several studies have shown that smokers exhibit a blunted cortisol response to stress compared to nonsmokers, even after controlling for baseline cortisol concentrations, HRV is lower in smokers compared to non-smokers in heavy smokers compared to light smokers (Kupari, 1993). In a recent study that evaluated youth and young adults' preferences for online tobacco education, participants recommended social media as a way to engage them in tobacco communications (Lazard *et al.*, 2018).

In the context of Nepal, Basnet (2019) investigated association of smoking with coronary artery disease in Nepalese populations. The study found that the magnitude of smoking as a risk factor for coronary artery disease in the Nepalese Population. Rai (2022) investigated hypertension among current cigarette smokers visiting outpatient department of a tertiary care center. The study found that hypertension is a common physical condition with high blood pressure for a prolonged period.

Aryal *et al.* (2015) found that nicotine dependence is prevalent among Nepalese smoking population. Gnanakshi (2014) investigated knowledge and attitude on ill effects of smoking among adults residing in Lekhnath, Kaski, Nepal. The study found that still few people residing in the community are having poor knowledge and attitude on ill effects of smoking. Pradhan *et al.* (2016) showed that 56.1% smoker started their first puff with friend, 30% take alone, which is supported by the similar types of study conducted in India, where most of the women started their first puff mainly with their friends (54%) and (21%) of women take alone which conclude that peer are the comfortable group for smoker in initiation of smoking.

Nepal *et al.* (2017) found that prevalence of tobacco smoking among young women in squatter settlement was alarming. Niroula (2014) revealed that the mean age of tobacco smoking initiation was 15.4 years, which is supported by the prevalence of smoking and pattern (current and daily) use increased with age group which is consistent with findings of previous study conducted in Nepal.

The above discussion shows that empirical evidences vary greatly across the studies on the relationship between cigarette smoking and blood pressure in adults. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The major objective of the study is to examine the relationship between cigarette smoking and blood pressure in adults in Nepal. Specifically, it examines the relationship of friend circle, stress, celebrity effect, interest and social media with blood pressure in adults in Nepal.

The remainder of this study is organized as follows: section two describes the sample, data, and methodology. Section three presents the empirical results and final section

draws the conclusion.

## 2. Methodological aspects

The study is based on the primary data. The data were gathered from 128 respondents through questionnaire. The study employed convenience sampling method. The respondents' views were collected on friend circle, stress, celebrity effect, interest and social media on blood pressure in adults in Nepal. This study is based on descriptive as well as causal comparative research designs.

### *The model*

The model tries to find out the relationship between cigarette smoking and blood pressure in adults in Nepal. The dependent variable selected for the study is blood pressure. Similarly, the selected independent variables are friend circle, stress, celebrity effect, interest and social media. Therefore, the model takes the following form:

$$BP = \beta_0 + \beta_1 FC + \beta_2 S + \beta_3 CE + \beta_4 INT + \beta_5 SM + e$$

Where,

BP = Blood pressure

FC = Friend circle

S = Stress

CE = Celebrity effect

INT = Interest

SM= Social media

$\beta_0$  = Intercept of the dependent variable

e = error term

Friend circle was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Smoking is a common social activity within our friend group.", "The majority of our friends are non-smokers." and so on. The reliability of the items was measured by computing the Cronbach's alpha ( $\alpha = 0.896$ ).

Celebrity effect was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Celebrities who smoke have a responsibility to be mindful of their influence on fans.", "I am more likely to try smoking if a celebrity I admire is seen smoking." and so on. The reliability of the items was measured by computing the Cronbach's alpha ( $\alpha = 0.905$ ).

Social media was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Social media platforms should take more responsibility for preventing the promotion of smoking.", "Seeing posts of people smoking on social media

makes smoking seem appealing.” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ( $\alpha = 0.906$ ).

Stress was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “I am more likely to smoke when I am feeling stressed”, “Stressful situations make smoking more appealing to me.” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ( $\alpha = 0.894$ ).

Interest was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Non-smokers tries to smoke for the first time due to his/her interest to taste a new flavor.”, “Interest of a person helps him/her to start smoking and also quit smoking.” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ( $\alpha = 0.837$ ).

Blood pressure was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “I am aware that smoking can contribute to high blood pressure.”, “I believe that my blood pressure is influenced by my smoking habits.” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ( $\alpha = 0.861$ ).

The following section describes the independent variables used in this study along with the hypothesis formulation.

#### *Friend circle*

Adults who had peer pressure from their friends were more likely to smoke cigarette. Birhanu *et al.* (2015) stated that friend’s circles are one of the key factors contributing to cigarette smoking. Wakefield *et al.* (2003) revealed that the pertaining to advertising recall, recognition, appraisal, new learning, and change in smoking related attitudes provide some degree of optimism for expecting to observe positive changes in smoking behavior. Adolescents with a higher density friendship group, meaning that a higher proportion of the friends were friends with each other, had lower odds of smoking (Ennett *et al.*, 2006). Based on it, this study develops the following hypothesis:

H<sub>1</sub>: There is a positive relationship between friend circle and blood pressure.

#### *Celebrity effect*

Celebrities provide a convenient model for social comparison, role modeling, and vicarious experiences of alternative social identities (Cohen *et al.*, 2008). Celebrities endorsing cigarette brands on social media may exert a strong influence on cigarette uptake (Barrington, 2016). Song *et al.* (2007) stated that celebrities have the power to influence the attitudes, intentions, and behaviors of college students toward smoking through the amount and type of media coverage. Amos *et al.* (2008) proposed that the use of celebrities in advertising campaigns is a popular strategy for generating favorable consumer responses. Celebrity endorsers also rated significantly higher on trustworthiness, expertise, goodwill and attractiveness, compared to non-celebrities (Thompson *et al.*, 2016). Possible self has been studied as a predictor of addictive behaviors and substance usage among youth and

college students (Comello, 2015). Based on it, the study develops the following hypothesis:

H<sub>2</sub>: There is a positive relationship between celebrity effect and blood pressure.

### *Stress*

Stress is an important risk factor for smoking relapse (Cohen *et al.*, 1990). Stress may activate the sympathetic nervous system and the hypothalamic pituitary adrenal axis and generate hemodynamic and hormonal responses (Inoue, 2014). Stress can induce unhealthy conditions, e.g. tobacco use, alcohol use, obesity, or high blood pressure (Rosengren *et al.*, 2015). Cigarette smoking is associated with increased cardiovascular activation, which is mediated in part nicotinic receptor stimulation (Haass *et al.*, 1997). Dobbs *et al.* (1981) found that increased smoking in response to stress, using more precise measures of smoking topography. Pomerleau *et al.* (1983) demonstrated significant, dose-related increases in circulating ACTH and cortisol following the smoking of high-nicotine cigarettes after overnight deprivation. Based on it, the study develops the following hypothesis:

H<sub>3</sub>: There is a positive relationship between stress and blood pressure.

### *Interest*

Andrews *et al.* (2004) showed that attitudes related to the campaign, prior trial behavior, and social behaviors directly influence interest. Noar *et al.* (2016) found that cigarette smoking expectancies were systematically related to interest to quit smoking in adult smokers without psychiatric illness, but little is known about these relationships in smokers with serious mental illness. Tidey & Rohsenow (2009) opined that compared to male smokers, female smokers did not smoke at greater rates they did not experienced more intense symptoms of nicotine withdrawal, and they were not less motivated to quit. Morrell *et al.* (2008) revealed that school-based programs that involve both social competence training and peer-led social influence have positive influence on reducing smoking habit. Based on it, this study develops the following hypothesis:

H<sub>4</sub>: There is a positive relationship between blood pressure and interest.

### *Social media*

Health and well-being challenges such as smoking, alcoholism, and impulsive eating are known to be influenced by individuals' social environment, which are moving online, as social media sites become more popular (Galea *et al.*, 2004). Social media can function as an effective channel through which college students easily share their thoughts on smoking, which in turn foster their perceived peer norms on smoking (White *et al.*, 2008). A person may perceive influences of media on others and adapt their own attitudes and behaviors to correspond to that perception (Gunther, 2003). Social media in particular is an ideal platform for tobacco promotion since social media are inexpensive, under regulated, and widely popular among young people (Jackler *et al.*, 2018). Based on it, this study develops the following hypothesis:

H<sub>5</sub>: There is a positive relationship between social media and blood pressure.

### 3. Results and discussion

#### *Correlation analysis*

On analysis of data, correlation analysis has been undertaken first and for this purpose, Kendall's Tau correlation coefficients along with mean and standard deviation has been computed and the results are presented in Table 1.

Table 1

#### **Kendall's Tau correlation coefficients matrix**

This table presents Kendall's Tau coefficients between dependent and independent variables. The correlation coefficients are based on 128 observations. The dependent variable is BP (Blood pressure). The independent variables are FC (Friend's circles), CE (Celebrity effect), STR (Stress), INT (Interest) and SM (Social media).

Variables	Mean	S. D	BP	FC	CE	STR	INT	SM
FC	2.43	0.727	0.353**	1				
CE	1.97	0.639	0.438**	0.378**	1			
STR	2.03	0.588	0.379**	0.362**	0.497**	1		
INT	2.12	0.739	0.493**	0.318**	0.510**	0.438**	1	
SM	1.85	0.707	0.314**	0.169**	0.266**	0.234**	0.242**	1

Note: the asterisk signs (\*\*) and (\*) indicate that the result is significant at one percent and five percent level respectively.

Table 1 shows that there is positive correlation between friend's circles and blood pressure. It indicates that bad friend's circles motivate to smoking which leads to increase in blood pressure among adults. Likewise, there is positive relationship between celebrity effect and blood pressure. It means that increase in celebrity influence for smoking leads to increase in blood pressure among adults. Similarly, the result shows that there is positive correlation between stress and blood pressure. It means that an increase in stress leads to increase in blood pressure among adults. In addition, the result shows that there is positive correlation between interest and blood pressure. It shows that an increase in smoking interest leads to increase in blood pressure among adults. Moreover, there is positive relationship between social media and blood pressure. It shows that social media influence on smoking leads to increase in blood pressure among adults.

#### *Regression analysis*

Having indicated the Kendall's Tau correlation coefficients, the regression analysis has been carried out and the results are presented in Table 2. More specifically, it shows the regression results of friend's circles, stress, celebrity effect, interest, and social media on blood pressure in adults in Nepal.

Table 2

#### **Estimated regression result of friend's circles, stress, celebrity effect, interest, and social media on blood pressure in adults in Nepal**

The results are based on 128 observations using linear regression model. The model is  $BP = \beta_0 + \beta_1 FC + \beta_2 CE + \beta_3 STR + \beta_4 INT + \beta_5 SM$  where, the dependent variable is BP (Blood pressure). The independent variables are FC

(Friends circles), CE (Celebrity effect), STR (Stress), INT (Interest) and SM (Social media).

Model	Intercept	Regression coefficients of					Adj. R <sub>bar</sub> <sup>2</sup>	SEE	F-value
		FC	CE	STR	INT	SM			
1	1.104 (5.913)**	0.349 (4.232)**					0.360	0.660	17.910
2	1.401 (6.297)**		0.186 (2.115)**				0.190	0.690	4.470
3	1.207 (5.994)**			0.328 (3.368)**			0.290	0.670	11.340
4	1.215 (5.376)**				0.313 (2.931)**		0.260	0.680	8.590
5	1.316 (6.917)**					0.253 (2.981)**	0.260	0.680	8.880
6	1.049 (4.495)**	0.266 (2.621)**	0.186 (2.115)**				0.110	0.660	8.970
7	0.92 (3.886)**	0.266 (2.621)**		0.133 -0.971	0.313 (2.931)**		0.120	0.660	6.630
8	0.937 (3.690)**	0.27 (2.604)**	0.02 (0.192)**	0.133 -0.971	0.313 (2.931)**		0.110	0.660	4.940
9	0.937 (3.659)**	0.271 (2.393)**	0.02 (0.190)**	0.134 -0.936	0.313 (2.931)**	0.002 (0.020)	0.100	0.660	3.910

Notes:

- i. Figures in parenthesis are t-values.
- ii. The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent level respectively.
- iii. Dependent variable is blood pressure.

Table 2 shows that the beta coefficients of friends circle are positive with blood pressure. This indicates that friends circle has positive impact in increase in blood pressure. This finding is consistent with the findings of Ennett *et al.* (2006). Similarly, the beta coefficients of celebrity effect are positive with blood pressure. This indicates that celebrity effect has positive impact on blood pressure. This finding is consistent with the findings of Song *et al.* (2007). The beta coefficients of stress are positive with blood pressure. This indicates that stress has positive impact on blood pressure. This finding is consistent with the findings of Cohen *et al.* (1990). Likewise, the beta coefficients of interest are positive with blood pressure. This indicates that interest has positive impact on blood pressure. This finding is consistent with the findings of Andrews *et al.* (2004). Additionally, the beta coefficients of social media are positive with blood pressure. This indicates that social media have positive impact on blood pressure. This finding is consistent with the findings of Galea *et al.* (2004).

#### 4. Summary and conclusion

Cigarettes smoking are a complex, dynamic, and reactive mixture of around thousands chemicals. Cigarette smoking potentially harms nearly every organ of the human body, causes innumerable diseases, and impacts the health of smokers and those interacting with the smokers. Smoking brings greater health problems in the long-term like increased risk of stroke and brain damage.

This study attempts to examine the factor affecting relationship between cigarette smoking and blood pressure in adults in Nepal. The study is based on primary data of 128 respondents.

The study showed that of friend’s circles, stress, celebrity effect, interest, and social media have positive impact on blood pressure. The study also concludes that friend’s circles followed by stress and interest are the most influencing factors that affect cigarette smoking

and blood pressure among Nepalese adults.

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