

# Tobacco use and associated factors among adolescent students in Dharan, Eastern Nepal: a cross-sectional questionnaire survey

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## ABSTRACT

**Introduction:** The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asian region. Tobacco use is a major proven risk factor and contributes substantially to the rising epidemic of non-communicable diseases.

**Objectives:** To estimate the prevalence of tobacco use and determine associated factors among adolescent students of Dharan municipality.

**Design:** Cross-sectional study.

**Setting:** Secondary and higher secondary schools of Dharan municipality in Sunsari district of Nepal.

**Participants:** Students in middle (14–15 years) and late adolescence (16–19 years) from grades 9, 10, 11 and 12 were included.

**Primary outcome measure:** Ever tobacco use which was defined as one who had not used any form of tobacco in the past 1 month but had tried in the past.

**Methodology:** Self-administered questionnaire adapted from Global Youth Tobacco Survey was used to assess tobacco use among the representative sample of 1312 adolescent students selected by stratified random sampling from July 2011 to July 2012.

**Results:** Out of 1454 students, 1312 students completed the questionnaires with a response rate of 90.23%. Prevalence of ever use of any tobacco product was 19.7% (95% CI 17.7 to 21.6). More than half of the tobacco users (51.9%) consumed tobacco in public places whereas almost a third (75.6%) of the consumers purchased tobacco from shops. Multivariate analysis showed that tobacco use was associated with late adolescence (OR: 1.64; 95% CI 1.17 to 2.28), male gender (OR: 12.20; 95% CI 7.78 to 19.14), type of school (OR=1.72; 95% CI 1.01 to 2.94), Janajati ethnicity (OR: 2.05; 95% CI 1.39 to 3.01) and receiving pocket money  $\geq$  Nepalese rupees 500/month (OR: 1.45; 95% CI 1.04 to 2.03).

**Conclusions:** Tobacco-focused interventions are required for school/college going students to promote cessation among users and prevent initiation, focussing on late adolescence, male gender, government schools, Janajati ethnicity and higher amount of pocket money.

## ARTICLE SUMMARY

### Article focus

- What is the prevalence of tobacco use among the adolescent students of Dharan after the legalisation of antitobacco directives in Nepal?
- What are the factors associated with tobacco use among the students?

### Key messages

- Tobacco use is still prevalent among the adolescent students of Dharan despite the existence of antitobacco regulations in the country.
- Tobacco-focused interventions should target vulnerable groups to prevent uptake of the habit and support abstinence among the users taking the factors found significant in this study.

### Strengths and limitations of this study

- Use of a standard questionnaire enabled our study for comparison with other studies.
- Since tobacco use was assessed by self-administered questionnaire, chances of bias in responses exist.
- Tobacco-use status was not validated by biomarkers in our study.
- Smaller sample size limited our study to school-going adolescents only.
- The temporal association between the independent variables and tobacco use could not be established owing to the study design being cross-sectional.

### What this paper adds

- This study highlights upon the prevalence of tobacco use that still exists among the adolescent students after the endorsement of antitobacco law in Nepal in 2011.
- Ethnicity was significantly associated with tobacco use as adolescent students belonging to Janajati ethnicity had greater likelihood of using tobacco products compared with students who were Brahmins/Chhetris.

## INTRODUCTION

Nearly 70% of the world's smokers live in low- and middle-income countries. Nearly two-thirds of the world's smokers live in 10 countries, namely China, India, Indonesia, Russian Federation, the USA, Japan, Brazil, Bangladesh, Germany and Turkey.<sup>1</sup> Unless a large number of current smokers in these countries quit, it is estimated that smoking would be causing 10 million deaths per year worldwide by the 2020s or early 2030s.<sup>2</sup>

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asian region including Nepal. One of the reasons for such high use could be the creative and targeted marketing strategies of various tobacco companies and its weak regulation. Abundant tobacco production, weak enforcement of tobacco control measures, easy accessibility and affordability of these products are other factors leading to the rise of the epidemic of tobacco use in the youth.<sup>3</sup> Although the exact burden of tobacco use among the youth has not been studied extensively in Nepal, a national Global Youth Tobacco Survey (GYTS) in 2007 reported that overall 7.9% of the students ever smoked cigarettes and 8% used other tobacco products.<sup>4</sup> Some of the factors known to be associated with tobacco use among adolescents are age, gender, having smoker friends or parents and the amount of pocket money.<sup>5–7</sup>

The WHO has defined the adolescents as persons in the 10–19 years age group. It has also estimated that 70% of premature deaths among adults are due to behavioural patterns that emerge in adolescence including smoking, violence and sexual behaviour. Studies have shown that such risk-taking behaviours begin to manifest from the middle adolescence (14–15 years of age) onwards.<sup>8</sup> The present study therefore, focused on the specific groups of middle (14–15 years) and late adolescents (16–19 years).

The Government of Nepal had signed the Framework Convention on Tobacco Control on 3 December 2003 followed by its ratification by the House of Representatives on 7 November 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the antitobacco directives of Tobacco Product Control and Regulatory Act 2010 on 4 November 2011. This has reflected a strong will from the side of the government to comply by objectives set out in the convention. A need was felt to estimate the prevalence of tobacco use among the Nepalese youth who are the most vulnerable for adoption of this habit in the background of recent endorsement of antitobacco directives by the government. The present study was carried out with the objectives to estimate the prevalence of tobacco use and determine associated factors among adolescent students of Dharan municipality of Sunsari district of Nepal.

## METHODS

### Description of study area

Dharan is a major city in the Sunsari district in Eastern region of Nepal located at an altitude of 1148 feet. It is

situated on the foothills of the Mahabharat Range in the North with the southern tip touching the edge of the Terai region. Dharan serves as a trading post between the hilly region and the plains of the Terai. The foundation of modern Dharan was laid in 1902 with the purpose to supply timber to the then East India Company. This small settlement grew steadily over time to include diverse people from various ethnicities like Rai, Limbu, Gurung, Newar, Brahmins, Chhetris and others. Dharan was once home to the British Gurkha Recruitment Center which was established in 1953. Recruits from all over Nepal flocked to join the British Gurkhas. Thus the face of Dharan was drastically altered. There was a surge in population with recruits bringing their families and others who came to seek employment and exploit business opportunities. As a result, Dharan started to emerge as one of the biggest towns in Eastern Nepal.

### Study design

This was a cross-sectional study conducted in Dharan Municipality of Sunsari district of Nepal from July 2011 to July 2012.

### Sample size and sampling method

From a similar study in South Delhi conducted among adolescents of 14–19 years, the overall prevalence of tobacco use (smoking and smokeless forms) was 20.9%.<sup>8</sup> We calculated the minimum sample size to estimate the prevalence for 95% confidence limits at an allowable error of 10% to be 1454 individuals.

Students in middle- (14–15 years) and late-adolescence (16–19 years) from grades 9, 10, 11 and 12 in different schools of Dharan Municipality were included in this study. Current list of schools in Dharan was obtained from Private and Boarding School's Organisation, Nepal. From the list of 87 schools (80 private and 7 government schools), stratified random sampling with proportionate allocation technique was carried out according to the type of schools. Since the number of students in grades 9–12 in each school was not known, a number of 100 students per school were assumed. This gave the total assumed population size to be 8700. Based on population proportionate to size, 1337 students from private and 117 students from government schools were included in the study sample. We randomly selected 15 private schools and two government schools to enrol the calculated number of students assuming 100 students from each school. This was followed by random selection of classes from the selected schools. All the students from the selected classes were included in the study.

### Data collection

Data collection was carried out using a self-administered questionnaire adapted from GYTS. The questionnaire to be used was pre-tested among the adolescent students in a different areas and necessary corrections and modifications were made to make it more understandable for the students. An elaborative briefing on the

questionnaire was done to all the students of the class prior to data collection.

### Definition of the variables

**Ever user:** Ever user was defined as one who had not used any form of tobacco (smoked or chewed) in the past 1 month but had tried in the past. To assess the ever use, participants were asked, 'Prior to the past 30 days, have you ever smoked or chewed tobacco?' An affirmative response to this question was followed-up with questions on type of tobacco used.

**Current user:** Current user was defined as one who had used any form of tobacco (smoked or chewed) in the past 1 month.

Ever tobacco use was considered as the dependent variable.<sup>7</sup> The following explanatory variables were chosen based on the previous literature: age group,<sup>8</sup> gender,<sup>5, 7</sup> type of school,<sup>6, 9</sup> religion,<sup>7</sup> ethnicity,<sup>9</sup> type of family,<sup>8</sup> parental occupation,<sup>10</sup> pocket money<sup>5-7</sup> and parental tobacco use.<sup>5, 7</sup> Type of school was categorised into private and government as a higher number of smokers was reported in private than government schools.<sup>9</sup> Ethnic groups were broadly classified into Brahmin/Chhetri, Janajati, Dalit and Terai Major Caste as each ethnic group is a collection of many castes which have common customs, socio-economic, cultural and traditional values. Type of family was divided into nuclear and joint. Families with a married couple and their dependent children were categorized as nuclear, whereas families with a number of married couples and their children living together in the same household were considered joint.<sup>11</sup> We used parental occupation as one of the explanatory variables since it was not possible to assess valid socioeconomic status (SES) of the family from the students. The pocket money was dichotomised based on the median amount received per month as there was a wide variation in the amounts and data were not normally distributed.

### Data analysis

Collected data were entered into MS Windows Excel in the form of codes. Analysis was performed using Statistical Package for Social Sciences (SPSS) 17 version. In bivariate analysis with categorical variables,  $\chi^2$  test was applied. Binary logistic regression analysis with backward elimination was used to determine the independence of associations observed in bivariate analysis by controlling for potential confounding factors. Goodness of fit of the model was tested by Hosmer and Lemeshow test. Probability of significance was set at 5%. Mann-Whitney U-test was applied to detect significant differences for non-parametric data.

### Ethical clearance

Ethical clearance was acquired from the ethical committee of B.P. Koirala Institute of Health Sciences at the beginning of the study. Informed consent was taken from all the participants. We obtained written permission from the school authorities before interacting with

the students. All the students present at the time of the visit were included in the study. Participation in the study was entirely voluntary and full confidentiality of the responses was maintained after clear explanation of the objectives of the study. Absence of any school personnel or teacher at the time of data collection was ensured to prevent response bias.

## RESULTS

Of the total sample of 1454, 1312 students completed the questionnaires giving the response rate of 90.23%. Among the remaining questionnaires, 80 were incomplete, whereas 62 did not match the age criteria therefore were excluded from the data analyses.

### Sociodemographic characteristics

Among the participants, median age was 16 years (IQR 15–17 years). Proportion of students in the age group of middle adolescence (14–15 years) and late adolescence (16–19 years) were almost equal. Age showed positive correlation with grade (Pearson correlation coefficient=0.756,  $p<0.001$ ). Participation was almost equal from both the genders (male:female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions included Christianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism) (table 1).

**Table 1** Sociodemographic characteristics of the adolescent students in Dharan, Sunsari ( $n=1312$ )

Characteristics	Number	Percentage
Age group (years)		
14–15	648	49.4
16–19	664	50.6
Gender		
Male	694	52.9
Female	618	47.1
School		
Private	1176	89.6
Government	136	10.4
Education level		
9	551	42
10	422	32.2
11	174	13.3
12	165	12.6
Caste/ethnicity*		
Janajati	816	62.2
Brahmin/Chhetri	335	25.5
Terai major caste	83	6.3
Dalit	78	5.9
Religion		
Hindu	1038	79.1
Buddhist/Kirat	126	9.6
Kirat	80	6.1
Others	68	5.2

\*Janajati: Rai, Limbu, Magar, Newar; Brahmin/Chhetri: Baral, Neupane, Oli, Paudel Terai Major Caste: Agrawal, Das, Jha, Roy, Sah, Yadav; Dalit: Bafna, Kuki, Mardi, Tamli, etc.<sup>(12)</sup>

Of the respondents' fathers who were alive, majority (34.2%) were involved in business. Almost four-fifths (80.5%) of the respondent's mothers who were alive were housewives and farmers.

### Prevalence of ever and current tobacco use

The prevalence of ever tobacco use was 19.7% (95% CI 17.7% to 21.6%) in our study. The prevalences among male and female students were 33.6% (95% CI 30.2% to 36.9%) and 4% (95% CI 2.6% to 5.3%), respectively. Prevalence of current tobacco users was 16.46% (95% CI 15.37% to 17.42%).

Among the ever smokers whose prevalence was 17.9%, 98.7% (232/235) had smoked cigarettes whereas 1.3% (3/235) had smoked hukka or cigar. Median number of sticks smoked per day was 2 (IQR 1–3). The prevalence of ever tobacco chewers was 8%. Among the ever chewers of tobacco, 34.28% (36/105) consumed Gutkha (a mixture of crushed areca nut, tobacco, catechu, paraffin, lime and sweet or savoury flavourings), 26.66% (28/105) Paan masala (a balanced mixture of betel leaf with lime, areca nut, clove, cardamom, mint, tobacco, essence and other ingredients), 7.61% (8/105) Surti (dried tobacco leaves for chewing), 21.90% (23/105) Khaini (mixture of sun-dried tobacco and slaked lime) and 9.52% (10/105) Zarda (small pieces of tobacco leaves with slaked lime and spices boiled and dried).

The median age of initiating tobacco smoking and chewing was 14 years (IQR=13–15). The mean age of initiating tobacco smoking was 13.79 years (SD=2.21), whereas that of initiating tobacco chewing was 13.58 years (SD=2.11). More than half of the users (51.9%) preferred to consume tobacco in public places followed by friend's house (14%). Almost a third (75.6%) of the users purchased tobacco directly from the shops. Majority of the students started using tobacco out of curiosity (41.1%) followed by those who used it to relieve tension (26.7%) and owing to peer pressure (25.5%).

### Pocket money and expenditure on tobacco

This study found the median expenditure on tobacco to be Nepalese rupees (NRs.) 100/month (IQR 30–200; NRs. 3.33 or 0.037 USA dollar per day), which was one-fifth of their pocket money (Median 500, IQR 300–1000). Median pocket money (NRs.) received per month by the ever users (Median=500, IQR=300–1000) was significantly different from the non-users (Median=500, IQR=247.50–600;  $p<0.001$ ).

### Bivariate analysis

In the bivariate analysis, students in the late adolescence were more likely to ever use tobacco than those in middle adolescence (OR=2.24; 95% CI 1.67 to 3.01). Male students were more likely to ever use tobacco than female students (OR=11.98; 95% CI 7.79 to 18.43). Students in grade 10 had more than two times the odds of ever using tobacco than those in grade 9 (OR=2.17; 95% CI 1.56 to 3.02). Compared with Brahmins/

Chhetris, students belonging to Janajati ethnicity were more likely to ever use tobacco (OR=1.76; 95% CI 1.23 to 2.52). Students from nuclear families were less likely to ever use tobacco than those from joint families (OR=0.75; 95% CI 0.56 to 1.00). Students whose fathers were working abroad in skilled or semiskilled work were more likely to ever use tobacco than those whose fathers were in service or professionals (OR=1.69; 95% CI 1.13 to 2.52). Students who received pocket money of more than or equal to NRs. 500/month were more likely to ever use tobacco than those who received less (OR=1.44; 95% CI 1.08 to 1.92; table 2).

### Multivariate analysis

After multivariate analysis, students in late adolescence (16–19 years) were more likely to be ever tobacco users compared with middle adolescence (14–15 years) (OR=1.64; 95% CI 1.17 to 2.28). Male students were more likely to ever use tobacco compared with female students (OR=12.20; 95% CI 7.78 to 19.14). The students from government schools were more likely to ever use tobacco than those from private schools (OR=1.72; 95% CI 1.01 to 2.94). Students from Janajati ethnicity were more than two times likely to be ever users of tobacco than those who were Brahmin/Chhetris (OR=2.05, 95% CI 1.39 to 3.01). Students belonging to nuclear families were less likely to ever use tobacco than those belonging to joint families (OR=0.71, 95% CI 0.51 to 0.99). The adolescents who received pocket money of more than or equal to NRs. 500/month had higher odds of ever using tobacco compared with those who received less (OR=1.45, 95% CI 1.04 to 2.03; table 3).

### DISCUSSION

National GYTS in Nepal in 2007 was conducted among students from 13 to 15 years age group only whereas our study included students from 14 to 19 years. Almost equal proportions of male and female students were involved in our study. Participants belonging to Janajati ethnicity were predominant. Similar study from Pokhara, Nepal reported nearly equal proportions of males and females with predominance of Brahmin ethnicity.<sup>9</sup>

The prevalence of ever use of tobacco in this study was more compared with a study from western Nepal.<sup>7</sup> The prevalence of ever smokers of tobacco (17.9%) was high compared with National GYTS where 7.9% of students had ever smoked.<sup>4</sup> Regarding tobacco chewing, prevalence in our study (8%) was low compared with a similar study among college students from western Nepal (21.2%).<sup>13</sup> Inclusion of students from secondary and higher-secondary level in our study could have attributed to this difference in prevalence.

The mean age for tobacco use initiation (smoking and chewing) in our study was found to be in consistency with studies from Kathmandu, Noida, and Kerala, India where the mean ages of onset were 14.15, 12.4 and 13.2 years, respectively.<sup>10 14 15</sup> Early- and middle-adolescents are

**Table 2** Different characteristics of participants and tobacco use: bivariate analysis

Characteristics	Ever user n(%)	Non-user n(%)	p Value	Crude OR (95% CI)
Age group (years)				
14–15	87 (13.4)	561 (86.6)	<0.001	1
16–19	171 (25.8)	493 (74.2)		2.24 (1.67 to 3.01)
Gender				
Female	25 (4.0)	593 (96.0)	<0.001	1
Male	233 (33.6)	461 (66.4)		11.98 (7.79 to 18.43)
Type of school				
Private	230 (19.6)	946 (80.4)	0.775	1
Government	28 (20.6)	108 (79.4)		1.07 (0.67 to 1.69)
Grade				
9	82 (14.9)	469 (85.1)	<0.001	1
10	116 (27.5)	306 (72.5)		2.17 (1.56 to 3.02)
11	29 (16.7)	145 (83.3)		1.14 (0.70 to 1.86)
12	31 (18.8)	134 (81.2)		1.32 (0.82 to 2.13)
Caste/ethnicity				
Brahmin/chhetri	49 (14.6)	286 (85.4)	<0.001	1
Janajati	189 (23.2)	627 (76.8)		1.76 (1.23 to 2.52)
Dalit	14 (17.9)	64 (82.1)		1.28 (0.63 to 2.56)
Terai major caste	6 (7.2)	77 (92.8)		0.45 (0.17 to 1.16)
Type of family				
Joint	97 (22.9)	327 (77.1)	0.043	1
Nuclear	161 (18.1)	727 (81.9)		0.75 (0.56 to 1.00)
Father's occupation (n=1269)				
Service/professional	49 (16.6)	247 (83.4)	0.002	1
Rtd.army/unemployed	16 (27.1)	43 (72.9)		1.88 (0.93 to 3.76)
Farmer	23 (24.7)	70 (75.3)		1.66 (0.91 to 3.01)
Business	67 (15.4)	367 (84.6)		0.92 (0.60 to 1.40)
Foreign/skilled/semi skilled	97 (25.1)	290 (74.9)		1.69 (1.13 to 2.52)
Mother's occupation (n=1295)				
Service/professional	36 (21.1)	135 (78.9)	0.983	1
Foreign/skilled/semi skilled	20 (24.4)	62 (75.6)		1.21 (0.62 to 2.36)
Housewife/farmer	195 (18.7)	847 (81.3)		0.86 (0.57 to 1.31)
Pocket money/month (NRs.)				
<500	102 (16.6)	511 (83.4)	0.010	1
≥500	156 (22.3)	543 (77.7)		1.44 (1.08 to 1.92)
Parental tobacco use				
Absent	139 (19.4)	579 (80.6)	0.760	1
Present	119 (20.0)	475 (80.0)		1.04 (0.79 to 1.38)

more vulnerable to initiation of tobacco use; hence, a target group is highlighted for early intervention to reduce the uptake of this habit.

Our study has shown that more than half of the adolescent tobacco users prefer public places as their most common location of tobacco use and shops as the most common source. Similar results have been obtained in the study from Pokhara, Nepal, which showed that most of the respondents (66.7%) smoked in public places like tea stalls or restaurants and majority purchased tobacco from the shops.<sup>7</sup> National GYTS in 2007 reported that more than two-thirds (69.5%) of the students were not refused tobacco purchase in stores because of their age.<sup>4</sup> According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places.<sup>6</sup> Provision of unrestricted access to tobacco products in the shops especially to the

adolescents including minors, and its open use in public places pose a great challenge to the implementation of the regulations of the antitobacco law in Nepal.

Curiosity, relieving tension and pressure from friends were the major reasons for initiating tobacco use in this study. In developing countries, documented factors implicated in the initiation of tobacco use among youth include experimentation, peer pressure and sense of feeling more matured.<sup>16</sup>

Students in late adolescence were more likely to consume tobacco compared with those in middle adolescence. Similar results were seen in a study from Kerala where students aged 16 years and above were nearly three times more likely to be tobacco users compared with those who were 13-year olds (adjusted OR=2.9, CI 1.6 to 5.3).<sup>6</sup> Tobacco use is more common in later adolescence, thus cessation attempts need to be focused in these groups.

**Table 3** Association of different variables with tobacco use among adolescent students: multivariate analysis (n=1312)

Characteristics	Adjusted OR (95% CI)
Age group (years)	
14–15	1.00
16–19	1.64 (1.17 to 2.28)
Gender	
Female	1.00
Male	12.20 (7.78 to 19.14)
Type of school	
Private	1.00
Government	1.72 (1.01 to 2.94)
Caste/ethnicity	
Brahmin/Chhetri	1.00
Janajati	2.05 (1.39 to 3.01)
Dalit	1.67 (0.81 to 3.46)
Terai major caste	0.51 (0.20 to 1.29)
Type of family	
Joint	1.00
Nuclear	0.71 (0.51 to 0.99)
Pocket money per month	
<500	1.00
≥500	1.45 (1.04 to 2.03)

–2 Log likelihood=996.385,  $\chi^2=5.98$ , df=8, p=0.649.

Type of family can influence tobacco use. Ever use of tobacco was two times more likely in students belonging to nuclear families compared with joint families (adjusted OR=1.96, 95% CI 1.11 to 3.45) in a study from India.<sup>8</sup> However, in our study tobacco use was less likely among students belonging to nuclear families. Close contact among parents and children in nuclear families might play a protective role against taking up risky behaviour like tobacco use.

Prevalence of ever-tobacco use of any tobacco product was 19% (95% CI 16.6 to 21.4) for government school students compared with 10.1% (95% CI 7.7 to 12.5) for private school students in a study among urban youth of India.<sup>17</sup> As students from higher SES tend to study in private schools and those from lower SES study in government schools, findings from our study highlights the socioeconomic differences that exist in tobacco use in our setting.

Higher odds of tobacco use existed among boys as compared with girls. Similar difference of prevalence between males and females was seen in other studies conducted in Nepal and abroad.<sup>8–10 18</sup> Male participants were more likely to ever smoke than female participants in a study from western Nepal (adjusted OR=4.0; 95% CI 2.9 to 5.6)<sup>19</sup> and Haryana, India (adjusted OR=4.67; 95% CI 1.91 to 11.4).<sup>20</sup> Tobacco use can be considered as part of a constellation of risk-taking behaviours that is more prevalent among men.<sup>21</sup> In context of Nepal, teen smoking is viewed as an acceptable behaviour for boys but not for girls, especially among the unmarried. Large proportions of teens in Asian countries, especially boys,

pick up smoking as a part of normal behaviour associated with their transition to adulthood.<sup>22</sup> This striking gender differences in tobacco use was also observed among Nepalese population aged 15–59 years.<sup>23</sup> However, the rising trend of tobacco use among the girls should not be ignored. It has been mentioned that when the prevalence of smoking among teen girls increases in Asian countries, it seems to increase first in metropolitan areas. Continuing modernisation is likely to narrow the gender differences in smoking and is likely to result in high prevalence of smoking among teen girls in Asian countries.<sup>22</sup> Dharan, a town on the verge of rapid urbanisation is likely to face this scenario in the near future.

Janajatis were two times more likely to consume tobacco compared with Brahmins/Chhetris in our study. Janajatis is the broad ethnic group comprising castes mainly from the hills of Nepal. Tobacco chewing was significantly higher among the hill native castes which included Rai, Limbu, Magar, Tamang, Gurung, whereas smoking was significantly higher among the hill occupational castes which included Biswakarma, Pariyar and Sarki in a study conducted among female population of Dharan.<sup>24</sup> Nepal Adolescent and Youth Survey in 2010 showed similar results in which relatively advantaged Janajatis were found to have a higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71%, respectively).<sup>25</sup> The population of hill region is more diverse than the Terai region in its ethnic, caste and religious composition and the attitude towards smoking is more permissive among the people from the hills.<sup>26</sup> This might be a possible explanation for the higher prevalence of tobacco use seen among the Janajatis in various studies across Nepal including ours.

Greater likelihood of using tobacco with higher amount of pocket money was reflected in other studies as well.<sup>5 6</sup> Having some amount of disposable money at hand might predispose the adolescents towards use of tobacco by easing the access. However, asking for more pocket money to buy tobacco products could also be the reason behind the significance of the association for which further studies are required.

The present study had few limitations. Even though the participation in the study was entirely voluntary with an assurance of non-disclosure of identity and confidentiality, chances of bias may occur in the findings as the data were collected through self-administered questionnaire. The assessment of the tobacco-use status was based entirely upon the response given by the subject believing that false reporting was very unlikely. However, this was not validated by biomarkers. Sample size of the study was small and limited to school-going adolescents of Dharan only, hence cannot be generalised to the rest of eastern Nepal. Peer pressure was found to be one of the reasons to start tobacco use but was not included as part of the analysis. The temporal association between the independent variables and tobacco use could not be established owing to the study design being cross-sectional.

## CONCLUSION

The study revealed that tobacco use is prevalent among the adolescent students despite the existence of anti-tobacco regulations in the country. Late adolescence, male gender, Janajati ethnicity, type of school and higher pocket money were significantly associated with tobacco use. Taking these factors into consideration, tobacco-focused interventions should target vulnerable groups to prevent uptake of the habit and support abstinence among the users. Further researches are needed to explore the vulnerability of certain ethnic groups towards tobacco use to generate an effective awareness campaign.

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**Contributors** PMSP conceptualised the research, designed the protocol, developed the questionnaire, participated in data collection and drafted the manuscript for publication. PKP, SRN, AG and SBS helped conceptualise the research and revised earlier drafts of the manuscript. PMSP and SRN were responsible for undertaking data analysis. PKP, SRN, AG and SBS provided critical analysis to the earlier drafts of the manuscript. All the authors read and approved the final version of the manuscript for publication in a scientific journal.

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