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Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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Title: Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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Article Summary

1. Article focus

- What is the burden of tobacco use among the adolescent students of Dharan post legalization of anti tobacco directives in Nepal?
- What factors are likely to aggravate this burden among the students?

2. Key messages

- Significant burden of tobacco use exists among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire enabled our study for comparison with other national and international studies

4. Limitations

- 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.

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Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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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 Asia region. Tobacco use is a major proven risk factor and contributes substantially to the rising epidemic of non communicable diseases.

Objectives: To explore the burden of tobacco use and its associated factors among adolescent students of Dharan municipality

Design: Cross sectional

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

Participants: Students in middle and late adolescence (aged 14-19 years) from grades 9, 10, 11 and 12 were included. Out of the total sample of 1454, 1312 students completed the questionnaires giving the response rate of 90.23%.

Primary outcome measure: Tobacco use which was defined as one who has ever used any tobacco product.

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Methodology: Self administered questionnaire adapted from Global Youth Tobacco Survey was used assess tobacco use among the representative sample of 1312 adolescent students in Dharan from July 2011 to July 2012 using stratified random sampling

Results: Prevalence of ever use of any tobacco product was 19.7%. More than half of the tobacco users (51.9%) preferred to consume tobacco in public places whereas almost a third (75.6%) of the consumers purchased tobacco directly from the shops. Multivariate analysis showed that tobacco use was associated with late adolescence (OR: 1.92; 95%CI: 1.28-2.90), male gender (OR: 11.59; 95%CI: 7.44-18.05), Janajati ethnicity (OR: 2.11; 95%CI: 1.43-3.11) and having pocket money of more than or equal to NRs.500 per month (OR: 1.47; 95%CI: 1.06-2.05).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on the significant factors found by this study. 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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Introduction

WHO estimates that there are about 1.1 billion smokers in the world, about one-third of the global population aged 15 years and older. Nearly 70% of the world's smokers live in low and middle income countries.[1] Unless a large number of current smokers in developing countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s, of which 7 million will be in developing countries.[2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia region the major reason being the creative and targeted marketing strategies of various tobacco companies and its weak regulation. Abundant tobacco production, weak enforcement of tobacco control measures and easy accessibility and affordability of these products are other factors leading to the rise of the epidemic in the youth.[3] 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, even 1 or 2 puffs.[4] 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.[5-7]

The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 2011. This has reflected a strong will from the side of the government to comply by objectives set out in the convention. However, the implementation of

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the anti-tobacco directives has not been experienced to the fullest. A need was felt to explore this burden and the associated factors within the Nepalese youth who are the most vulnerable for adoption of this habit and continuation, in a town of Sunsari district in the background of recent endorsement of anti-tobacco directives by the government.

Methods

This was a comparative cross sectional study conducted in Dharan Municipality of Sunsari district of Nepal from July 2011 to July 2012. It was shown in a study from South Delhi that the overall prevalence of tobacco use (smoking and smokeless forms) was 20.9%.[8] 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 and late adolescence (aged 14-19 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 Organization, Nepal (PABSON). From the list of 87 schools, stratified random sampling with proportionate allocation technique based on population size was carried out. 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 was carried out using a self administered questionnaire adapted from Global Youth Tobacco Survey (2001) containing questions regarding socio-demographic profile, pattern of tobacco use, tobacco use by parents, parental occupation, awareness regarding FCTC and, pocket money received per month etc. The questionnaire to be used was pretested among the adolescent students in a different area (Itahari) and necessary corrections and modifications were

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made in order 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. The outcome variable was tobacco use which was defined as one who has ever used any tobacco product. Current tobacco use was defined as one who has used tobacco product (smoking or chewing) in the past one month. Non user was the one who had never consumed any tobacco product.

On the basis of age, participants were classified into middle (14-15 years) and late (16-19 years) adolescence. The pocket money was dichotomized based on the median amount received per month.

Ethical clearance was acquired from the ethical committee of B.P. Koirala Institute of Health Sciences at the start of the study. Informed consent was taken from all the participants. We obtained written permission from the school authorities before interaction 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 in order to prevent response bias.

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. Chi-Square test was applied to compare the difference between categorical variables among the groups. Bivariate analysis and binary logistic regression analysis were performed. Goodness of fit of the model was tested by Hosmer and Lemeshow test. Probability of significance was set at 5%.

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Results

Out of the total sample, 1312 students completed the questionnaire giving the response rate of 90.23%. Among the remaining questionnaires, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Among the participants, the mean age was 15.70 years (SD = 1.33). Proportion of students in the age group of middle adolescence (14-15 years) and late adolescence (16-19 years) were almost equal. The participation was almost equal from both the gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

Table 1: Socio-demographic 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
Education Level		
9	551	42
10	422	32.2

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11	174	13.3
12	165	12.6
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	126	9.6
Kirat	80	6.1
Others	68	5.2

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.

The prevalence of tobacco use (one who has ever used any tobacco product) was estimated to be 19.7%. The prevalence among males and females was 33.6% and 4.0% respectively. The prevalence of current smoking was 13.9% whereas that of current use of chewable tobacco was 6% in our study. (Table 2)

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Table 2: Tobacco consumption among the adolescent students in Dharan, Sunsari

Tobacco consumption status	Male (n=694) % (C.I.*)	Female (n=618) % (C.I.*)	Total (N=1312) % (C.I.*)
Tobacco user	33.6 (30.2,36.9)	4.0 (2.6,5.3)	19.7 (17.7, 21.6)
Current smoker	24.8 (21.5,28.0)	1.6 (0.6,2.5)	13.9 (12.1,15.6)
Currently using chewable tobacco	10.4 (8.2,12.5)	1.1 (0.3,1.8)	6.0 (4.7,7.2)

* *C.I. = 95% Confidence intervals*

Table 3 depicts that 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. This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000).

In the bivariate analysis, proportion of tobacco use increased significantly with age and higher amount of pocket money received monthly. Tobacco use was significantly associated with gender, grade, caste, type of family, father's occupation and awareness regarding Framework Convention on Tobacco Control (FCTC).(Table 3)

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Table 3: Different characteristics of participants and tobacco use: a bivariate analysis

Characteristics	Tobacco User N(%)	Tobacco Non User N(%)	p value
Age Group (years)			
14-15	87 (13.4)	561 (86.6)	**<0.001**
16-19	171 (25.8)	493 (74.2)	
Gender			
Male	233 (33.6)	461 (66.4)	**<0.001**
Female	25 (4.0)	593 (96.0)	
Grade			
9	82 (14.9)	469 (85.1)	**<0.001**
10	116 (27.5)	306 (72.5)	
11	29 (16.7)	145 (83.3)	
12	31 (18.8)	134 (81.2)	
Caste/Ethinicity			
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**
Janajati	189 (23.2)	627 (76.8)	
Dalit	14 (17.9)	64 (82.1)	
Terai Major Caste	6 (7.2)	77 (92.8)	
Type of Family			
Nuclear	161 (18.1)	727 (81.9)	**0.043**
Joint	97 (22.9)	327 (77.1)	
Father's Occupation (n=1269)			

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Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)	**0.002**
Rtd.Army/Unemployed	16 (27.1)	43 (72.9)	
Army/Service/Professional	49 (16.6)	247 (83.4)	
Business	67 (15.4)	367 (84.6)	
Farmer	23 (24.7)	70 (75.3)	
Pocket Money/month (NRs.)			
<500	102 (16.6)	511 (83.4)	**0.010**
≥500	156 (22.3)	543 (77.7)	
Awareness of FCTC			
Present	54 (30.0)	126 (70.0)	**<0.001**
Absent	204 (18.0)	928 (82.0)	

Students in late adolescence (16-19 years) were nearly twice as likely to be tobacco users compared to middle adolescence (14-15 years) (OR= 1.92, CI=1.28, 2.90). Male students were 11.5 times more likely to use tobacco compared to females (OR= 11.59, CI= 7.44, 18.05). The students belonging to Janajati ethnicity were more than twice likely to be users of tobacco compared to those who were Brahmin/Chhetris (OR=2.11, CI=1.43, 3.11). The adolescents who received pocket money of more than or equal to NRs.500 per month had nearly 1.5 times more chances of using tobacco compared to those who received less than NRs.500 per month (OR= 1.47, CI= 1.06, 2.05). (Table 4)

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Table 4: Association of different variables with tobacco habit of adolescent students: a multivariate analysis (N=1312)

Characteristics	Odds Ratio (95% CI)
Age Group (years)	
14-15	1.00
16-19	**1.92 (1.28,2.90)**
Gender	
Female	1.00
Male	**11.59 (7.44, 18.05)**
Grade	
9	1.00
10	1.44 (0.95, 2.17)
11	**0.51 (0.27, 0.93)**
12	0.67 (0.37, 1.23)
Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.11 (1.43, 3.11)**
Dalit	1.71 (0.83, 3.54)
Terai Major Caste	0.48 (0.19, 1.22)
Type of Family	
Joint	1.00
Nuclear	0.73 (0.52, 1.01)

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Pocket Money per month	
<500	1.00
≥500	**1.47 (1.06, 2.05)**

-2 Log likelihood=1001.860, Chi-square=11.015, df=8, p=0.201

Discussion

The WHO has defined the adolescents as persons in the 10 to 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 that such risk taking behaviours begin to manifest from the middle adolescence (14-15 years of age) onwards.[8] The present study therefore, focussed on the specific group of middle and late adolescents.

The mean age of participants was 15.70 years which was higher than National GYTS in Nepal in 2007 which included subjects from 13-15 years age group only. Almost equal proportion of male (52.9%) and female (47.1%) students were involved in our study which is similar to the participation in the study conducted in Pokhara, Nepal.[9] Participants belonging to Rai, Limbu and Newar ethnicity were more in this study which might have accounted for the higher proportion of Janajatis unlike other studies.[9]

The prevalence of tobacco use in this study was 19.7% which was more compared to similar study from western Nepal.[7] This burden was more than eight times more in the boys (33.6%) as compared to girls (4%). Similar difference of prevalence between the genders was seen in other studies conducted in Nepal and abroad.[8-11] This highlights the fact that although in most

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developing countries boys continue to smoke at a higher rate than girls, the rates in girls are in a rising trend.

The mean (SD) age for tobacco use initiation in our study was found to be 13.79 (2.21) years and 13.58 (2.11) years for smoking and chewing tobacco respectively. This is in consistency with studies from Kathmandu, Noida, and Kerala India where the mean ages of onset were 14.15 (SD 2.62), 12.4 and 13.2 years respectively.[12-14] Early and middle adolescence is more vulnerable for 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 (51%) of the adolescent tobacco users prefer public places as their most common location of tobacco use and shops as the most common source (75.6%). 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 it from the shops.[7] According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places.[6] 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 effective implementation of the regulations of the anti tobacco law in Nepal.

We found that students in late adolescence were nearly two times more likely to consume tobacco compared to those in middle adolescence. Similar results were seen in other studies where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3).[6] The burden of

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tobacco use is more likely in later adolescence thus cessation attempts need to be focused in these groups.

There was a huge gap in the likelihood of using tobacco among males and females after regression analysis in this study. Other studies have also reported similar discrepancies.[5,7,10] Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males.[15]

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Tobacco chewing was significantly more 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 females population of Dharan.[16] Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajati had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively).[17] 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.[18] This might be a possible explanation for the higher prevalence of tobacco use seen among the Janajatis in various studies across the nation including ours.

Adolescents who received more than or equal to NRs. 500 as pocket money were nearly 1.5 times more likely to be tobacco users as compared to those who received less. Greater likelihood of being tobacco user with higher amount of pocket money was reflected in other studies as

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well.[5,6] Having some amount of disposable money at hand might predispose the adolescents towards use of tobacco by easing the access.

Our 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 was collected through self administered questionnaire. The assessment of the tobacco use status was based entirely upon the response given by the subject and not validated by biomarkers. However, the use of standard questionnaire and a large sample size enabled our study for comparison with other national and international studies and generalization to adolescent students of this municipality. It also reflects the burden of tobacco in a rapidly urbanizing town of Eastern Nepal post legalization of anti-tobacco law and stresses urgent need to address the target group.

Conclusion

The study revealed significant burden of tobacco use among the adolescents despite the existence of anti-tobacco regulations in the country. Late adolescence, male gender, Janajati ethnicity and higher pocket money were significantly associated with tobacco use. Taking these factors into consideration, tobacco focussed interventions should target vulnerable groups to prevent uptake of the habit and support abstinence among the users. An effective implementation of Tobacco Control and Regulatory Act 2010 is the urgent need of the country.

Competing Interests

The author(s) declare that they have no competing interests.

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Contributorship statement

Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the burden of tobacco use that still exists among the adolescent students despite the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6-7*
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	8
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	

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		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	13-14
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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Article Summary

1. Article focus

- What is the burden of tobacco use among the adolescent students of Dharan post legalization of anti tobacco directives in Nepal?
- What factors are likely to aggravate this burden among the students?

2. Key messages

- Significant burden of tobacco use exists among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire and a large sample enabled our study for comparison with other national and international studies

4. Limitations

- 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.

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Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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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 Asia region. Tobacco use is a major proven risk factor and contributes substantially to the rising epidemic of non communicable diseases.

Objectives: To explore the burden of tobacco use and its associated factors among adolescent students of Dharan municipality

Design: Cross sectional

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

Participants: Students in middle and late adolescence (aged 14-19 years) from grades 9, 10, 11 and 12 were included. Out of the total sample of 1454, 1312 students completed the questionnaires giving the response rate of 90.23%.

Primary outcome measure: Tobacco use which was defined as one who has ever used any tobacco product.

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Methodology: Self administered questionnaire adapted from Global Youth Tobacco Survey was used to assess tobacco use among the representative sample of 1312 adolescent students in Dharan from July 2011 to July 2012 using stratified random sampling

Results: Prevalence of ever use of any tobacco product was 19.7%. More than half of the tobacco users (51.9%) preferred to consume tobacco in public places whereas almost a third (75.6%) of the consumers purchased tobacco directly from the shops. Multivariate analysis showed that tobacco use was associated with late adolescence (OR: 1.92; 95%CI: 1.28-2.90), male gender (OR: 11.59; 95%CI: 7.44-18.05), Janajati ethnicity (OR: 2.11; 95%CI: 1.43-3.11) and having pocket money of more than or equal to NRs.500 per month (OR: 1.47; 95%CI: 1.06-2.05).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on the significant factors found by this study. 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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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 United States, Japan, Brazil, Bangladesh, Germany and Turkey**.** [1] Unless a large number of current smokers in developing countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s, of which 7 million will be in developing countries. [2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia region including Nepal the major reason being the creative and targeted marketing strategies of various tobacco companies and its weak regulation. Abundant tobacco production, weak enforcement of tobacco control measures and easy accessibility and affordability of these products are other factors leading to the rise of the epidemic in the youth.[3] 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, even 1 or 2 puffs.[4] 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.[5-7]

The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 2011. This has reflected a strong will from the side of the

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government to comply by objectives set out in the convention. However, the implementation of the anti-tobacco directives has not been experienced to the fullest. A need was felt to explore this burden and the associated factors within the Nepalese youth who are the most vulnerable for adoption of this habit and continuation, in a town of Sunsari district in the background of recent endorsement of anti-tobacco directives by the government.

Methods

This was a comparative cross sectional study conducted in Dharan Municipality of Sunsari district of Nepal from July 2011 to July 2012. It was shown in a study from South Delhi that the overall prevalence of tobacco use (smoking and smokeless forms) was 20.9%. [8] 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 and late adolescence (aged 14-19 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 Organization, Nepal (PABSON). From the list of 87 schools (private and government), stratified random sampling with proportionate allocation technique based on population size was carried out. 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 was carried out using a self administered questionnaire adapted from Global Youth Tobacco Survey (2001) containing questions regarding socio-demographic profile, parental occupation, having heard about FCTC and pocket money received per month. The

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questionnaire to be used was pretested among the adolescent students in a different area (Itahari) and necessary corrections and modifications were made in order 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. The outcome variable was tobacco use which was defined as one who has ever used any tobacco product. Current tobacco use was defined as one who has used tobacco product (smoking or chewing) in the past one month. Non user was the one who had never consumed any tobacco product.

On the basis of age, participants were classified into middle (14-15 years) and late (16-19 years) adolescence. The pocket money was dichotomized based on the median amount received per month.

Ethical clearance was acquired from the ethical committee of B.P. Koirala Institute of Health Sciences at the start of the study. Informed consent was taken from all the participants. We obtained written permission from the school authorities before interaction 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 in order to prevent response bias.

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-Square test was applied. The following potential confounders were chosen based on the previous literature: age group, gender, type of school, grade, religion, ethnicity, type of family, parental occupation, pocket money and having heard of FCTC.

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Tobacco use was considered as the dependent variable. The independent variables which had p value of 20% or less in the bivariate analysis were then included for binary logistic regression analysis with backward elimination to estimate the adjusted odds ratio and 95% confidence intervals. The variables subjected to the model were age group, gender, grade, religion, ethnicity, type of family, occupation of the father, pocket money received per month and having heard about FCTC by the study participants**.** Goodness of fit of the model was tested by Hosmer and Lemeshow test. Probability of significance was set at 5%.

Results

Out of the total sample, 1312 students completed the questionnaire giving the response rate of 90.23%. Among the remaining questionnaires, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Among the participants, the mean age was 15.70 years (SD = 1.33). Proportion of students in the age group of middle adolescence (14-15 years) and late adolescence (16-19 years) were almost equal. The participation was almost equal from both the gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

Table 1: Socio-demographic characteristics of the adolescent students in Dharan, Sunsari (N=1312)

Characteristics	Number	Percentage
Age Group (years)		
14-15	648	49.4

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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
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	**206**	**15.7**
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. [19]**

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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.

The prevalence of tobacco use (one who has ever used any tobacco product) was estimated to be 19.7%. The prevalence among males and females was 33.6% and 4.0% respectively. The prevalence of current smoking was 13.9% whereas that of current use of chewable tobacco was 6% in our study. (Table 2)

Table 2: Tobacco consumption among the adolescent students in Dharan, Sunsari

Tobacco consumption status	Male (n=694) % (C.I.*)	Female (n=618) % (C.I.*)	Total (N=1312) % (C.I.*)
Tobacco user	33.6 (30.2,36.9)	4.0 (2.6,5.3)	19.7 (17.7, 21.6)
Current smoker	24.8 (21.5,28.0)	1.6 (0.6,2.5)	13.9 (12.1,15.6)
Currently using chewable tobacco	10.4 (8.2,12.5)	1.1 (0.3,1.8)	6.0 (4.7,7.2)

** C.I. = 95% Confidence intervals*

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. This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000).

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In the bivariate analysis, proportion of tobacco use increased significantly with age and higher amount of pocket money received monthly. Tobacco use was significantly associated with gender, grade, caste, type of family, father's occupation and having heard about Framework Convention on Tobacco Control (FCTC).(Table 3)

Table 3: Different characteristics of participants and tobacco use: a bivariate analysis

Characteristics	Tobacco User N(%)	Tobacco Non User N(%)	p value
Age Group (years)			
14-15	87 (13.4)	561 (86.6)	**<0.001**
16-19	171 (25.8)	493 (74.2)	
Gender			
Male	233 (33.6)	461 (66.4)	**<0.001**
Female	25 (4.0)	593 (96.0)	
Type of School			
Private	**230 (19.6)**	**946 (80.4)**	**0.775**
Government	**28 (20.6)**	**108 (79.4)**	
Grade			
9	82 (14.9)	469 (85.1)	**<0.001**
10	116 (27.5)	306 (72.5)	
11	29 (16.7)	145 (83.3)	
12	31 (18.8)	134 (81.2)	
Religion			
Hindu	**196 (18.9)**	**842 (81.1)**	**0.063**

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Buddhist / Kirat	**52 (25.2)**	**154 (74.8)**	
Others	**10 (14.7)**	**58 (85.3)**	
Ethnicity			
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**
Janajati	189 (23.2)	627 (76.8)	
Dalit	14 (17.9)	64 (82.1)	
Terai Major Caste	6 (7.2)	77 (92.8)	
Type of Family			
Nuclear	161 (18.1)	727 (81.9)	**0.043**
Joint	97 (22.9)	327 (77.1)	
Father's Occupation (n=1269)			
Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)	**0.002**
Rtd.Army/Unemployed	16 (27.1)	43 (72.9)	
Army/Service/Professional	49 (16.6)	247 (83.4)	
Business	67 (15.4)	367 (84.6)	
Farmer	23 (24.7)	70 (75.3)	
Mother's Occupation (n=1295)			
Housewife/Farmer	**195 (18.7)**	**847 (81.3)**	**0.383**
Foreign/Skilled/Semi Skilled	**20 (24.4)**	**62 (75.6)**	
Business/Service/Professional	**36 (21.1)**	**135 (78.9)**	
Pocket Money/month (NRs.)			
<500	102 (16.6)	511 (83.4)	**0.010**
≥500	156 (22.3)	543 (77.7)	

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Heard about FCTC			
Yes	54 (30.0)	126 (70.0)	**<0.001**
No	204 (18.0)	928 (82.0)	

Students in late adolescence (16-19 years) were nearly two times likely to be tobacco users compared to middle adolescence (14-15 years) (OR= 1.92, CI=1.28, 2.90). Male students were 11.5 times more likely to use tobacco compared to females (OR= 11.59, CI= 7.44, 18.05). The students belonging to Janajati ethnicity were twice as likely to be users of tobacco as those who were Brahmin/Chhetris (OR=2.11, CI=1.43, 3.11). The adolescents who received pocket money of more than or equal to NRs.500 per month had nearly 1.5 times more chances of using tobacco compared to those who received less than NRs.500 per month (OR= 1.47, CI= 1.06, 2.05). (Table 4)

Table 4: Association of different variables with tobacco habit of adolescent students: a multivariate analysis (N=1312)

Characteristics	Adjusted Odds Ratio (95% CI)
Age Group (years)	
14-15	1.00
16-19	**1.92 (1.28,2.90)**

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Gender	
Female	1.00
Male	**11.59 (7.44, 18.05)**
Grade	
9	1.00
10	1.44 (0.95, 2.17)
11	**0.51 (0.27, 0.93)**
12	0.67 (0.37, 1.23)
Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.11 (1.43, 3.11)**
Dalit	1.71 (0.83, 3.54)
Terai Major Caste	0.48 (0.19, 1.22)
Type of Family	
Joint	1.00
Nuclear	0.73 (0.52, 1.01)
Pocket Money per month	
<500	1.00
≥500	**1.47 (1.06, 2.05)**

-2 Log likelihood=1001.860, Chi-square=11.015, df=8, p=0.201

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Discussion

The WHO has defined the adolescents as persons in the 10 to 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.[8] The present study therefore, focussed on the specific group of middle and late adolescents.

The mean age of participants was 15.70 years which was higher than National GYTS in Nepal in 2007 which included subjects from 13-15 years age group only. Almost equal proportion of male (52.9%) and female (47.1%) students were involved in our study which is similar to the participation in the study conducted in Pokhara, Nepal.[9] Participants belonging to Rai, Limbu and Newar ethnicity were more in this study which might have accounted for the higher proportion of Janajatis unlike other studies.[9]

The prevalence of tobacco use in this study was 19.7% which was more compared to similar study from western Nepal.[7] This burden was more than eight times in the boys (33.6%) as compared to girls (4%). Similar difference of prevalence between the genders was seen in other studies conducted in Nepal and abroad.[8-11] This highlights the fact that although in most developing countries boys continue to smoke at a higher rate than girls, the rates in girls are in a rising trend.

The mean (SD) age for tobacco use initiation in our study was found to be 13.79 (2.21) years and 13.58 (2.11) years for smoking and chewing tobacco respectively. This is in consistency with

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studies from Kathmandu, Noida, and Kerala, India where the mean ages of onset were 14.15 (SD 2.62), 12.4 and 13.2 years respectively.[12-14] Early and middle adolescence is more vulnerable for 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 (51%) of the adolescent tobacco users prefer public places as their most common location of tobacco use and shops as the most common source (75.6%). 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 it from the shops.[7] According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places.[6] 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 effective implementation of the regulations of the anti tobacco law in Nepal.

We found that students in late adolescence were nearly two times more likely to consume tobacco compared to those in middle adolescence. Similar results were seen in other studies where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3).[6] The burden of tobacco use is more likely in later adolescence thus cessation attempts need to be focused in these groups.

There was a huge gap in the likelihood of using tobacco among males and females after regression analysis in this study. Other studies have also reported similar discrepancies.[5,7,10]

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Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males.[15]

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Tobacco chewing was significantly more 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 females population of Dharan.[16] Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajati had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively).[17] 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.[18] This might be a possible explanation for the higher prevalence of tobacco use seen among the Janajatis in various studies across Nepal including ours.

Adolescents who received more than or equal to NRs. 500 as pocket money were nearly 1.5 times more likely to be tobacco users as compared to those who received less. Greater likelihood of using tobacco with higher amount of pocket money was reflected in other studies as well.[5,6] Having some amount of disposable money at hand might predispose the adolescents towards use of tobacco by easing the access.

Our 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 was collected through self administered questionnaire. The assessment of

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the tobacco use status was based entirely upon the response given by the subject and not validated by biomarkers. However, the use of standard questionnaire and a large sample size enabled our study for comparison with other national and international studies and generalization to adolescent students of this municipality. It also reflects the burden of tobacco in a rapidly urbanizing town of Eastern Nepal post legalization of anti-tobacco law and stresses urgent need to address the target group.

Conclusion

The study revealed significant burden of tobacco use among the adolescents despite the existence of anti-tobacco regulations in the country. Late adolescence, male gender, Janajati ethnicity and higher pocket money were significantly associated with tobacco use. Taking these factors into consideration, tobacco focussed interventions should target vulnerable groups to prevent uptake of the habit and support abstinence among the users. An effective implementation of Tobacco Control and Regulatory Act 2010 is also required to address this problem.

Competing Interests

The author(s) declare that they have no competing interests.

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Contributorship statement

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Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the burden of tobacco use that still exists among the adolescent students despite the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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Title: Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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Article Summary

1. Article focus

- What is the burden of tobacco use among the adolescent students of Dharan post legalization of anti tobacco directives in Nepal?
- What factors are likely to aggravate this burden among the students?

2. Key messages

- Significant burden of tobacco use exists among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire and a large sample enabled our study for comparison with other national and international studies

4. Limitations

- 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.

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Tobacco Use and Associated Factors among Adolescent Students in Dharan: A Cross Sectional Study

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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 Asia region. Tobacco use is a major proven risk factor and contributes substantially to the rising epidemic of non communicable diseases.

Objectives: To explore the burden of tobacco use and its associated factors among adolescent students of Dharan municipality

Design: Cross sectional

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

Participants: Students in middle and late adolescence (aged 14-19 years) from grades 9, 10, 11 and 12 were included. Out of the total sample of 1454, 1312 students completed the questionnaires giving the response rate of 90.23%.

Primary outcome measure: Tobacco use which was defined as one who has ever used any tobacco product.

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Methodology: Self administered questionnaire adapted from Global Youth Tobacco Survey was used to assess tobacco use among the representative sample of 1312 adolescent students in Dharan from July 2011 to July 2012 using stratified random sampling

Results: Prevalence of ever use of any tobacco product was 19.7%. More than half of the tobacco users (51.9%) preferred to consume tobacco in public places whereas almost a third (75.6%) of the consumers purchased tobacco directly from the shops. Multivariate analysis showed that tobacco use was associated with late adolescence (OR: 1.92; 95%CI: 1.28-2.90), male gender (OR: 11.59; 95%CI: 7.44-18.05), Janajati ethnicity (OR: 2.11; 95%CI: 1.43-3.11) and having pocket money of more than or equal to NRs.500 per month (OR: 1.47; 95%CI: 1.06-2.05).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on the significant factors found by this study. 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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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 United States, Japan, Brazil, Bangladesh, Germany and Turkey.** [1] Unless a large number of current smokers in developing countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s, of which 7 million will be in developing countries. [2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia region **including Nepal** the major reason being the creative and targeted marketing strategies of various tobacco companies and its weak regulation. Abundant tobacco production, weak enforcement of tobacco control measures and easy accessibility and affordability of these products are other factors leading to the rise of the epidemic in the youth.[3] 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, even 1 or 2 puffs.[4] 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.[5-7]

The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 2011. This has reflected a strong will from the side of the

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government to comply by objectives set out in the convention. However, the implementation of the anti-tobacco directives has not been experienced to the fullest. A need was felt to explore this burden and the associated factors within the Nepalese youth who are the most vulnerable for adoption of this habit and continuation, in a town of Sunsari district in the background of recent endorsement of anti-tobacco directives by the government.

Methods

This was a comparative cross sectional study conducted in Dharan Municipality of Sunsari district of Nepal from July 2011 to July 2012. It was shown in a study from South Delhi that the overall prevalence of tobacco use (smoking and smokeless forms) was 20.9%. [8] 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 and late adolescence (aged 14-19 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 Organization, Nepal (PABSON). From the list of 87 schools (private and government), stratified random sampling with proportionate allocation technique based on population size was carried out. 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 was carried out using a self administered questionnaire adapted from Global Youth Tobacco Survey (2001) containing questions regarding socio-demographic profile, parental occupation, having heard about FCTC and pocket money received per month. The

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questionnaire to be used was pretested among the adolescent students in a different area (Itahari) and necessary corrections and modifications were made in order 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. The outcome variable was tobacco use which was defined as one who has ever used any tobacco product. Current tobacco use was defined as one who has used tobacco product (smoking or chewing) in the past one month. Non user was the one who had never consumed any tobacco product.

On the basis of age, participants were classified into middle (14-15 years) and late (16-19 years) adolescence. The pocket money was dichotomized based on the median amount received per month.

Ethical clearance was acquired from the ethical committee of B.P. Koirala Institute of Health Sciences at the start of the study. Informed consent was taken from all the participants. We obtained written permission from the school authorities before interaction 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 in order to prevent response bias.

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-Square test was applied. The following potential confounders were chosen based on the previous literature: age group, gender, type of school, grade, religion, ethnicity, type of family, parental occupation, pocket money and**

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having heard of FCTC. Tobacco use was considered as the dependent variable. The independent variables which had p value of 20% or less in the bivariate analysis were then included for binary logistic regression analysis with backward elimination to estimate the adjusted odds ratio and 95% confidence intervals. The variables subjected to the model were age group, gender, grade, religion, ethnicity, type of family, occupation of the father, pocket money received per month and having heard about FCTC by the study participants. Goodness of fit of the model was tested by Hosmer and Lemeshow test. Probability of significance was set at 5%.

Results

Out of the total sample, 1312 students completed the questionnaire giving the response rate of 90.23%. Among the remaining questionnaires, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Among the participants, the mean age was 15.70 years (SD = 1.33). Proportion of students in the age group of middle adolescence (14-15 years) and late adolescence (16-19 years) were almost equal. The participation was almost equal from both the gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

Table 1: Socio-demographic characteristics of the adolescent students in Dharan, Sunsari (N=1312)

Characteristics	Number	Percentage
Age Group (years)		

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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
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	**206**	**15.7**
Others	68	5.2

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***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. [19]**

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.

The prevalence of tobacco use (one who has ever used any tobacco product) was estimated to be 19.7%. The prevalence among males and females was 33.6% and 4.0% respectively. The prevalence of current smoking was 13.9% whereas that of current use of chewable tobacco was 6% in our study. (Table 2)

Table 2: Tobacco consumption among the adolescent students in Dharan, Sunsari

Tobacco consumption status	Male (n=694) % (C.I.*)	Female (n=618) % (C.I.*)	Total (N=1312) % (C.I.*)
Tobacco user	33.6 (30.2,36.9)	4.0 (2.6,5.3)	19.7 (17.7, 21.6)
Current smoker	24.8 (21.5,28.0)	1.6 (0.6,2.5)	13.9 (12.1,15.6)
Currently using chewable tobacco	10.4 (8.2,12.5)	1.1 (0.3,1.8)	6.0 (4.7,7.2)

** C.I. = 95% Confidence intervals*

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. This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-

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200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000).

In the bivariate analysis, proportion of tobacco use increased significantly with age and higher amount of pocket money received monthly. Tobacco use was significantly associated with gender, grade, caste, type of family, father's occupation and having heard about Framework Convention on Tobacco Control (FCTC).(Table 3)

Table 3: Different characteristics of participants and tobacco use: a bivariate analysis

Characteristics	Tobacco User N(%)	Tobacco Non User N(%)	p value
Age Group (years)			
14-15	87 (13.4)	561 (86.6)	**<0.001**
16-19	171 (25.8)	493 (74.2)	
Gender			
Male	233 (33.6)	461 (66.4)	**<0.001**
Female	25 (4.0)	593 (96.0)	
Type of School			
Private	**230 (19.6)**	**946 (80.4)**	**0.775**
Government	**28 (20.6)**	**108 (79.4)**	
Grade			
9	82 (14.9)	469 (85.1)	**<0.001**
10	116 (27.5)	306 (72.5)	
11	29 (16.7)	145 (83.3)	

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12	31 (18.8)	134 (81.2)	
Religion			
Hindu	**196 (18.9)**	**842 (81.1)**	**0.063**
Buddhist / Kirat	**52 (25.2)**	**154 (74.8)**	
Others	**10 (14.7)**	**58 (85.3)**	
Ethnicity			
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**
Janajati	189 (23.2)	627 (76.8)	
Dalit	14 (17.9)	64 (82.1)	
Terai Major Caste	6 (7.2)	77 (92.8)	
Type of Family			
Nuclear	161 (18.1)	727 (81.9)	**0.043**
Joint	97 (22.9)	327 (77.1)	
Father's Occupation (n=1269)			
Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)	**0.002**
Rtd.Army/Unemployed	16 (27.1)	43 (72.9)	
Army/Service/Professional	49 (16.6)	247 (83.4)	
Business	67 (15.4)	367 (84.6)	
Farmer	23 (24.7)	70 (75.3)	
Mother's Occupation (n=1295)			
Housewife/Farmer	**195 (18.7)**	**847 (81.3)**	**0.383**
Foreign/Skilled/Semi Skilled	**20 (24.4)**	**62 (75.6)**	
Business/Service/Professional	**36 (21.1)**	**135 (78.9)**	

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Pocket Money/month (NRs.)			
<500	102 (16.6)	511 (83.4)	**0.010**
≥500	156 (22.3)	543 (77.7)	
Heard about FCTC			
Yes	54 (30.0)	126 (70.0)	**<0.001**
No	204 (18.0)	928 (82.0)	

Students in late adolescence (16-19 years) were nearly two times likely to be tobacco users compared to middle adolescence (14-15 years) (OR= 1.92, CI=1.28, 2.90). Male students were 11.5 times more likely to use tobacco compared to females (OR= 11.59, CI= 7.44, 18.05). The students belonging to Janajati ethnicity were twice as likely to be users of tobacco as those who were Brahmin/Chhetris (OR=2.11, CI=1.43, 3.11). The adolescents who received pocket money of more than or equal to NRs.500 per month had nearly 1.5 times more chances of using tobacco compared to those who received less than NRs.500 per month (OR= 1.47, CI= 1.06, 2.05). (Table 4)

Table 4: Association of different variables with tobacco habit of adolescent students: a multivariate analysis (N=1312)

Characteristics	Adjusted Odds Ratio (95% CI)

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Age Group (years)	
14-15	1.00
16-19	**1.92 (1.28,2.90)**
Gender	
Female	1.00
Male	**11.59 (7.44, 18.05)**
Grade	
9	1.00
10	1.44 (0.95, 2.17)
11	**0.51 (0.27, 0.93)**
12	0.67 (0.37, 1.23)
Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.11 (1.43, 3.11)**
Dalit	1.71 (0.83, 3.54)
Terai Major Caste	0.48 (0.19, 1.22)
Type of Family	
Joint	1.00
Nuclear	0.73 (0.52, 1.01)
Pocket Money per month	
<500	1.00
≥500	**1.47 (1.06, 2.05)**

-2 Log likelihood=1001.860, Chi-square=11.015, df=8, p=0.201

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Discussion

The WHO has defined the adolescents as persons in the 10 to 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.[8] The present study therefore, focussed on the specific group of middle and late adolescents.

The mean age of participants was 15.70 years which was higher than National GYTS in Nepal in 2007 which included subjects from 13-15 years age group only. Almost equal proportion of male (52.9%) and female (47.1%) students were involved in our study which is similar to the participation in the study conducted in Pokhara, Nepal.[9] Participants belonging to Rai, Limbu and Newar ethnicity were more in this study which might have accounted for the higher proportion of Janajatis unlike other studies.[9]

The prevalence of tobacco use in this study was 19.7% which was more compared to similar study from western Nepal.[7] This burden was more than eight times in the boys (33.6%) as compared to girls (4%). Similar difference of prevalence between the genders was seen in other studies conducted in Nepal and abroad.[8-11] This highlights the fact that although in most developing countries boys continue to smoke at a higher rate than girls, the rates in girls are in a rising trend.

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The mean (SD) age for tobacco use initiation in our study was found to be 13.79 (2.21) years and 13.58 (2.11) years for smoking and chewing tobacco respectively. This is in consistency with studies from Kathmandu, Noida, and Kerala, India where the mean ages of onset were 14.15 (SD 2.62), 12.4 and 13.2 years respectively.[12-14] Early and middle adolescence is more vulnerable for 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 (51%) of the adolescent tobacco users prefer public places as their most common location of tobacco use and shops as the most common source (75.6%). 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 it from the shops.[7] According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places.[6] 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 effective implementation of the regulations of the anti tobacco law in Nepal.

We found that students in late adolescence were nearly two times more likely to consume tobacco compared to those in middle adolescence. Similar results were seen in other studies where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3).[6] The burden of tobacco use is more likely in later adolescence thus cessation attempts need to be focused in these groups.

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There was a huge gap in the likelihood of using tobacco among males and females after regression analysis in this study. Other studies have also reported similar discrepancies.[5,7,10] Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males.[15]

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Tobacco chewing was significantly more 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 females population of Dharan.[16] Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajati had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively).[17] 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.[18] This might be a possible explanation for the higher prevalence of tobacco use seen among the Janajatis in various studies across Nepal including ours.

Adolescents who received more than or equal to NRs. 500 as pocket money were nearly 1.5 times more likely to be tobacco users as compared to those who received less. Greater likelihood of using tobacco with higher amount of pocket money was reflected in other studies as well.[5,6] Having some amount of disposable money at hand might predispose the adolescents towards use of tobacco by easing the access.

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Our 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 was collected through self administered questionnaire. The assessment of the tobacco use status was based entirely upon the response given by the subject and not validated by biomarkers. However, the use of standard questionnaire and a large sample size enabled our study for comparison with other national and international studies and generalization to adolescent students of this municipality. It also reflects the burden of tobacco in a rapidly urbanizing town of Eastern Nepal post legalization of anti-tobacco law and stresses urgent need to address the target group.

Conclusion

The study revealed significant burden of tobacco use among the adolescents despite the existence of anti-tobacco regulations in the country. Late adolescence, male gender, Janajati ethnicity and higher pocket money were significantly associated with tobacco use. Taking these factors into consideration, tobacco focussed interventions should target vulnerable groups to prevent uptake of the habit and support abstinence among the users. An effective implementation of Tobacco Control and Regulatory Act 2010 **is also required to address this problem.**

Competing Interests

The author(s) declare that they have no competing interests.

Acknowledgement

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Contributorship statement

Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the burden of tobacco use that still exists among the adolescent students despite the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6-7*
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	8
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	

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		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	13-14
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Tobacco Use and Associated Factors among Adolescent Students in Dharan, Eastern Nepal: A Cross Sectional Questionaire Survey

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Article Summary

1. Article focus

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

2. Key messages

- Tobacco use is still prevalent among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire enabled our study for comparison with other studies

4. Limitations

- 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.

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- The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

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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 Asia 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 one month but had tried in the past.

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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: Of the total 1454 students, 1312 students completed the questionnaires giving the response rate of 90.23%. Prevalence of ever use of any tobacco product was 19.7% (95% CI: 17.7-21.6). More than half of the tobacco users (51.9%) preferred to consume tobacco in public places whereas almost a third (75.6%) of the consumers purchased tobacco from the shops. Multivariate analysis showed that tobacco use was associated with late adolescence (OR: 1.89; 95% CI: 1.25-2.85), male gender (OR: 11.81; 95% CI: 7.52-18.54), Janajati ethnicity (OR: 2.03; 95% CI: 1.37-3.00) and receiving pocket money ≥NRs.500 per month (OR: 1.48; 95% CI: 1.06-2.06).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on late adolescence, male gender, Janajati ethnicity and higher amount of pocket money.

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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 United States, Japan, Brazil, Bangladesh, Germany and Turkey.** [1] Unless a large number of current smokers in these countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s. [2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia 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 [3]. 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 [4]. 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 [5-7].

The WHO has defined the adolescents as persons in the 10 to 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 [8]. The present study therefore, focussed on the specific groups of middle (14-15 years) and late adolescents (16-19 years).

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The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 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 within the Nepalese youth who are the most vulnerable for adoption of this habit in the background of recent endorsement of anti-tobacco 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

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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% [8]. 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 Organization, Nepal (PABSON). 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 to 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 2 government schools in order to enroll the calculated number of students assuming 100 students

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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 Global Youth Tobacco Survey. The questionnaire to be used was pretested among the adolescent students in a different area and necessary corrections and modifications were made in order 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 one 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?" Affirmative response to this question was followed up with questions on type of tobacco used. Ever tobacco use was considered as the dependent variable [7]. The following explanatory variables were chosen based on the previous literature: age group [8], gender [5,7], type of school [6,9], grade [6], religion [7], ethnicity [9], type of family [8], parental occupation [13], pocket money [5-7] and parental tobacco use [5,7]. Type of school was categorized into private and government as more number of smokers was reported in private than government school [9]. 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. The family

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with a married couple and their dependent children was nuclear whereas family with a number of married couples and their children living together in the same household was considered joint [25]. Grade was incorporated because transition from secondary to higher secondary level education (Grade 11 and 12) is a major challenge and stress to all students in context of current education system of Nepal. We used parental occupation as one of the explanatory variables since it was not possible to assess valid socioeconomic status of the family from the students. The pocket money was dichotomized based on the median amount received per month as there was a wide variation in the amounts and data was 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-Square 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 start of the study. Informed consent was taken from all the participants. We

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obtained written permission from the school authorities before interaction 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 in order 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, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Socio-demographic characteristics

Among the participants, median age was 16 years (Inter-quartile range 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 gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

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Table 1: Socio-demographic 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

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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. [19]**

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 tobacco use

The prevalence of ever tobacco use was 19.7% (95% CI: 17.7-21.6) in our study. The prevalence among males and females was 33.6% (95% CI: 30.2-36.9) and 4.0% (95% CI: 2.6-5.3) respectively. Among the ever smokers, 98.7% (232/235) were smoking cigarettes whereas 1.3% (3/235) were smoking hukka or cigar. Median number of sticks smoked per day was 2 (IQR 1-3). Among the ever chewers of tobacco, 34.28% (36/105) were found to be consuming Gutkha (a mixture of crushed areca nut, tobacco, catechu, paraffin, lime and sweet or savory flavorings), 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).

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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 to relieve tension (26.7%) and peer pressure (25.5%).

Pocket money and expenditure on tobacco

This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000). Median pocket money (NRs.) received per month by the ever users (Median=500, IQR=300-1000) was significantly different than the non users (Median= 500, IQR=247.50-600) ($p<0.001$).

Bi-variate 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: 1.67-3.01). Males were more likely to ever use tobacco than females (OR= 11.98; 95% CI: 7.79-18.43). 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: 1.56-3.02). Compared to Brahmins/Chhetris, students belonging to Janajati ethnicity were more likely to ever use tobacco (OR=1.76; 95% CI: 1.23-2.52). Students from nuclear families were less likely to ever use tobacco than those from joint families (OR=0.75; 95% CI: 0.56-1.00). Students

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whose fathers were working abroad in skilled or semi skilled work were more likely to ever use tobacco than those whose fathers were in service or professionals (OR=1.69; 95% CI:1.13-2.52). Students who received pocket money of more than or equal to NRs. 500 per month were more likely to ever use tobacco than those who received less (OR=1.44; 95% CI: 1.08-1.92). (Table 2)

Table 2: Different characteristics of participants and tobacco use: Bi-variate 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 (1.67-3.01)
Gender				
Female	25 (4.0)	593 (96.0)	**<0.001**	1
Male	233 (33.6)	461 (66.4)		11.98 (7.79-18.43)
Type of School				
Private	**230 (19.6)**	**946 (80.4)**	**0.775**	1
Government	**28 (20.6)**	**108 (79.4)**		1.07 (0.67-1.69)
Grade				
9	82 (14.9)	469 (85.1)	**<0.001**	1
10	116 (27.5)	306 (72.5)		2.17 (1.56-3.02)
11	29 (16.7)	145 (83.3)		1.14 (0.70-1.86)

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12	31 (18.8)	134 (81.2)		1.32 (0.82-2.13)
Religion				
Hindu	196 (18.9)	842 (81.1)	0.572	1
Buddhist	31 (24.6)	95 (74.4)		1.40 (0.89-2.21)
Kirat	21 (26.3)	59 (73.8)		1.53 (0.88-2.65)
Others	10 (14.7)	58 (85.3)		0.74 (0.35-1.53)
Caste/Ethnicity				
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**	1
Janajati	189 (23.2)	627 (76.8)		1.76 (1.23-2.52)
Dalit	14 (17.9)	64 (82.1)		1.28 (0.63-2.56)
Terai Major Caste	6 (7.2)	77 (92.8)		0.45 (0.17-1.16)
Type of Family				
Joint	97 (22.9)	327 (77.1)	**0.043**	1
Nuclear	161 (18.1)	727 (81.9)		0.75 (0.56-1.00)
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 (0.93-3.76)
Farmer	23 (24.7)	70 (75.3)		1.66 (0.91-3.01)
Business	67 (15.4)	367 (84.6)		0.92 (0.60-1.40)
Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)		1.69 (1.13-2.52)
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 (0.62-2.36)

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Housewife/Farmer	195 (18.7)	847 (81.3)		0.86 (0.57-1.31)
Pocket Money/month (NRs.)				
<500	102 (16.6)	511 (83.4)	**0.010**	1
≥500	156 (22.3)	543 (77.7)		1.44 (1.08-1.92)
Parental tobacco use				
Absent	139 (19.4)	579 (80.6)	0.760	1
Present	119 (20.0)	475 (80.0)		1.04 (0.79-1.38)

Multivariate analysis

After multivariate analysis, students in late adolescence (16-19 years) were more likely to be ever tobacco users compared to middle adolescence (14-15 years) (OR= 1.89; 95% CI: 1.25-2.85). Male were more likely to ever use tobacco compared to females (OR= 11.81; 95% CI: 7.52-18.54). The students in grade 10 were more likely to ever use tobacco than grade 9 (OR=1.51; 95% CI: 1.00-2.28) whereas those in grade 11 were less likely to ever use tobacco than grade 9 (OR=0.50; 95% CI: 0.27-0.93). Students from Janajati ethnicity were more than two times likely to be ever users of tobacco than those who were Brahmin/Chhetris (OR=2.03, CI=1.37-3.00). The adolescents who received pocket money of more than or equal to NRs.500 per month had higher odds of ever using tobacco compared to those who received less (OR= 1.48, CI= 1.06, 2.06). (Table 3)

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

Characteristics	Adjusted Odds Ratio (95% CI)
Age Group (years)	
14-15	1.00
16-19	**1.89 (1.25,2.85)**
Gender	
Female	1.00
Male	**11.81 (7.52, 18.54)**
Grade	
9	1.00
10	1.51 (1.00, 2.28)
11	**0.50 (0.27, 0.93)**
12	0.69 (0.37, 1.29)
Caste/Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.03 (1.37, 3.00)**
Dalit	1.76 (0.85, 3.65)
Terai Major Caste	0.47 (0.18, 1.21)
Type of Family	
Joint	1.00
Nuclear	0.73 (0.52, 1.02)

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Pocket Money per month	
<500	1.00
≥500	**1.48 (1.06, 2.06)**

-2 Log likelihood=1001.860, Chi-square=11.015, df=8, p=0.201

Discussion

National GYTS in Nepal in 2007 was conducted among students from 13-15 years age group only whereas our study included students from 14-19 years. Almost equal proportion of male (52.9%) and female (47.1%) students were involved in our study. Participants belonging to Janajati ethnicity were predominant in this study. Similar study from Pokhara, Nepal reported nearly equal proportion of males and females with predominance of Brahmin ethnicity [9].

The prevalence of ever use of tobacco in this study was more compared to a study from western Nepal [7]. Prevalence of ever smokers of tobacco (17.9%) was high compared to National GYTS where 7.9% of students had ever smoked [4]. Regarding tobacco chewing, prevalence in our study (8.0%) was low compared to similar study among college students from western Nepal (21.2%) [20]. 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 [12-14]. Early and middle adolescence is more vulnerable for initiation of tobacco use hence; a target group is highlighted for early intervention to reduce the uptake of this habit.

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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 it from the shops [7]. National GYTS in 2007 reported that more than two-third (69.5%) of the students were not refused tobacco purchase in stores because of their age [4]. According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places [6]. 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 anti tobacco law in Nepal.

Curiosity, relieving tension and pressure from friends were the major reasons behind 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 feeling more matured [21].

We found that students in late adolescence were nearly two times more likely to consume tobacco compared to those in middle adolescence. Similar result was seen in a study from Kerala where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3) [6]. Tobacco use is more common in later adolescence thus cessation attempts need to be focused in these groups.

Type of family can influence tobacco use. Ever use of tobacco was two times more likely in students belonging to nuclear families compared to joint families (Adjusted OR=1.96, 95% CI: 1.11-3.45) in a study from India [8]. In our study tobacco use was less likely among students

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belonging to nuclear families. Close contact among parents and children in nuclear families might play a protective role in taking up risky behavior like tobacco use.

In context of Nepal, transition from secondary to higher secondary level education (Grade 11 and 12) is a major stress factor. Taking this into account, we took grade as a separate entity although it was significantly correlated with age. Likelihood of ever using tobacco was less in grades 11 and 12 than lower grades in our study. The start of higher secondary level education presents new peer groups and different environment which could have influenced the tobacco use among the students.

Prevalence of ever tobacco use was more than eight times in the boys as compared to girls in our study. Similar difference of prevalence between males and females was seen in other studies conducted in Nepal and abroad [8-11]. Males were more likely to ever smoke than females in a study from western Nepal (Adjusted OR=4.0; 95% CI=2.9-5.6) [22] and Haryana, India (Adjusted OR= 4.67; 95% CI=1.91-11.4) [10]. Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males [15]. In context of Nepal, teen smoking is viewed as an acceptable behavior 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 behavior associated with their transition to adulthood [23]. This striking gender differences in tobacco use was also observed among Nepalese population aged 15 to 59 years [24]. 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 modernization is likely to narrow the gender differences in smoking and is likely to result in high prevalence of

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smoking among teen girls in Asian countries [23]. Dharan, a town on the verge of rapid urbanization is likely to face this scenario in the near future.

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Janajatis is the broad ethnic group comprising castes mainly from the hills of Nepal. Tobacco chewing was significantly more 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 females population of Dharan [16]. Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajatis had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively) [17]. 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 [18]. 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 [5,6]. 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 be the reason behind the significance of the association for which further studies are required.

Our 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

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the findings as the data was 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 only. The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

Conclusion

The study revealed tobacco use is prevalent among the adolescent students despite the existence of anti-tobacco regulations in the country. Late adolescence, male gender, Janajati ethnicity and higher pocket money were significantly associated with tobacco use. Taking these factors into consideration, tobacco focussed 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.

Competing Interests

The author(s) declare that they have no competing interests.

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Contributorship statement

Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the prevalence of tobacco use that still exists among the adolescent students after the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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Title: Tobacco Use and Associated Factors among Adolescent Students in Dharan, Eastern Nepal: A Cross Sectional Questionnaire Survey

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Article Summary

1. Article focus

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

2. Key messages

- Tobacco use is still prevalent among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire enabled our study for comparison with other studies

4. Limitations

- 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.

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- The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

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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 Asia 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 one month but had tried in the past.

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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: Of the total 1454 students, 1312 students completed the questionnaires giving the response rate of 90.23%. Prevalence of ever use of any tobacco product was 19.7% (95% CI: 17.7-21.6). More than half of the tobacco users (51.9%) preferred to consume tobacco in public places whereas almost a third (75.6%) of the consumers purchased tobacco from the shops. Multivariate analysis showed that tobacco use was associated with late adolescence (OR: 1.89; 95% CI: 1.25-2.85), male gender (OR: 11.81; 95% CI: 7.52-18.54), Janajati ethnicity (OR: 2.03; 95% CI: 1.37-3.00) and receiving pocket money ≥NRs.500 per month (OR: 1.48; 95% CI: 1.06-2.06).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on late adolescence, male gender, Janajati ethnicity and higher amount of pocket money.

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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 United States, Japan, Brazil, Bangladesh, Germany and Turkey.** [1] Unless a large number of current smokers in these countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s. [2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia 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 [3]. 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 [4]. 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 [5-7].

The WHO has defined the adolescents as persons in the 10 to 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 [8]. The present study therefore, focussed on the specific groups of middle (14-15 years) and late adolescents (16-19 years).

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The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 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 within the Nepalese youth who are the most vulnerable for adoption of this habit in the background of recent endorsement of anti-tobacco 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

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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% [8]. 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 Organization, Nepal (PABSON). 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 to 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 2 government schools in order to enroll the calculated number of students assuming 100 students

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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 Global Youth Tobacco Survey. The questionnaire to be used was pretested among the adolescent students in a different area and necessary corrections and modifications were made in order 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 one 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?" Affirmative response to this question was followed up with questions on type of tobacco used. Ever tobacco use was considered as the dependent variable [7]. The following explanatory variables were chosen based on the previous literature: age group [8], gender [5,7], type of school [6,9], grade [6], religion [7], ethnicity [9], type of family [8], parental occupation [13], pocket money [5-7] and parental tobacco use [5,7]. Type of school was categorized into private and government as more number of smokers was reported in private than government school [9]. 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. The family

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with a married couple and their dependent children was nuclear whereas family with a number of married couples and their children living together in the same household was considered joint [25]. Grade was incorporated because transition from secondary to higher secondary level education (Grade 11 and 12) is a major challenge and stress to all students in context of current education system of Nepal. We used parental occupation as one of the explanatory variables since it was not possible to assess valid socioeconomic status of the family from the students. The pocket money was dichotomized based on the median amount received per month as there was a wide variation in the amounts and data was 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-Square 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 start of the study. Informed consent was taken from all the participants. We

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obtained written permission from the school authorities before interaction 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 in order 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, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Socio-demographic characteristics

Among the participants, median age was 16 years (Inter-quartile range 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 gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

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Table 1: Socio-demographic 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

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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. [19]**

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 tobacco use

The prevalence of ever tobacco use was 19.7% (95% CI: 17.7-21.6) in our study. The prevalence among males and females was 33.6% (95% CI: 30.2-36.9) and 4.0% (95% CI: 2.6-5.3) respectively. Among the ever smokers, 98.7% (232/235) were smoking cigarettes whereas 1.3% (3/235) were smoking hukka or cigar. Median number of sticks smoked per day was 2 (IQR 1-3). Among the ever chewers of tobacco, 34.28% (36/105) were found to be consuming Gutkha (a mixture of crushed areca nut, tobacco, catechu, paraffin, lime and sweet or savory flavorings), 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).

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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 to relieve tension (26.7%) and peer pressure (25.5%).

Pocket money and expenditure on tobacco

This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000). Median pocket money (NRs.) received per month by the ever users (Median=500, IQR=300-1000) was significantly different than the non users (Median= 500, IQR=247.50-600) ($p<0.001$).

Bi-variate 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: 1.67-3.01). Males were more likely to ever use tobacco than females (OR= 11.98; 95% CI: 7.79-18.43). 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: 1.56-3.02). Compared to Brahmins/Chhetris, students belonging to Janajati ethnicity were more likely to ever use tobacco (OR=1.76; 95% CI: 1.23-2.52). Students from nuclear families were less likely to ever use tobacco than those from joint families (OR=0.75; 95% CI: 0.56-1.00). Students

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whose fathers were working abroad in skilled or semi skilled work were more likely to ever use tobacco than those whose fathers were in service or professionals (OR=1.69; 95% CI:1.13-2.52). Students who received pocket money of more than or equal to NRs. 500 per month were more likely to ever use tobacco than those who received less (OR=1.44; 95% CI: 1.08-1.92). (Table 2)

Table 2: Different characteristics of participants and tobacco use: Bi-variate 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 (1.67-3.01)
Gender				
Female	25 (4.0)	593 (96.0)	**<0.001**	1
Male	233 (33.6)	461 (66.4)		11.98 (7.79-18.43)
Type of School				
Private	**230 (19.6)**	**946 (80.4)**	**0.775**	1
Government	**28 (20.6)**	**108 (79.4)**		1.07 (0.67-1.69)
Grade				
9	82 (14.9)	469 (85.1)	**<0.001**	1
10	116 (27.5)	306 (72.5)		2.17 (1.56-3.02)
11	29 (16.7)	145 (83.3)		1.14 (0.70-1.86)

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12	31 (18.8)	134 (81.2)		1.32 (0.82-2.13)
Religion				
Hindu	196 (18.9)	842 (81.1)	0.572	1
Buddhist	31 (24.6)	95 (74.4)		1.40 (0.89-2.21)
Kirat	21 (26.3)	59 (73.8)		1.53 (0.88-2.65)
Others	10 (14.7)	58 (85.3)		0.74 (0.35-1.53)
Caste/Ethnicity				
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**	1
Janajati	189 (23.2)	627 (76.8)		1.76 (1.23-2.52)
Dalit	14 (17.9)	64 (82.1)		1.28 (0.63-2.56)
Terai Major Caste	6 (7.2)	77 (92.8)		0.45 (0.17-1.16)
Type of Family				
Joint	97 (22.9)	327 (77.1)	**0.043**	1
Nuclear	161 (18.1)	727 (81.9)		0.75 (0.56-1.00)
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 (0.93-3.76)
Farmer	23 (24.7)	70 (75.3)		1.66 (0.91-3.01)
Business	67 (15.4)	367 (84.6)		0.92 (0.60-1.40)
Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)		1.69 (1.13-2.52)
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 (0.62-2.36)

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Housewife/Farmer	195 (18.7)	847 (81.3)		0.86 (0.57-1.31)
Pocket Money/month (NRs.)				
<500	102 (16.6)	511 (83.4)	**0.010**	1
≥500	156 (22.3)	543 (77.7)		1.44 (1.08-1.92)
Parental tobacco use				
Absent	139 (19.4)	579 (80.6)	0.760	1
Present	119 (20.0)	475 (80.0)		1.04 (0.79-1.38)

Multivariate analysis

After multivariate analysis, students in late adolescence (16-19 years) were more likely to be ever tobacco users compared to middle adolescence (14-15 years) (OR= 1.89; 95% CI: 1.25-2.85). Male were more likely to ever use tobacco compared to females (OR= 11.81; 95% CI: 7.52-18.54). The students in grade 10 were more likely to ever use tobacco than grade 9 (OR=1.51; 95% CI: 1.00-2.28) whereas those in grade 11 were less likely to ever use tobacco than grade 9 (OR=0.50; 95% CI: 0.27-0.93). Students from Janajati ethnicity were more than two times likely to be ever users of tobacco than those who were Brahmin/Chhetris (OR=2.03, CI=1.37-3.00). The adolescents who received pocket money of more than or equal to NRs.500 per month had higher odds of ever using tobacco compared to those who received less (OR= 1.48, CI= 1.06, 2.06). (Table 3)

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

Characteristics	Adjusted Odds Ratio (95% CI)
Age Group (years)	
14-15	1.00
16-19	**1.89 (1.25,2.85)**
Gender	
Female	1.00
Male	**11.81 (7.52, 18.54)**
Grade	
9	1.00
10	1.51 (1.00, 2.28)
11	**0.50 (0.27, 0.93)**
12	0.69 (0.37, 1.29)
Caste/Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.03 (1.37, 3.00)**
Dalit	1.76 (0.85, 3.65)
Terai Major Caste	0.47 (0.18, 1.21)
Type of Family	
Joint	1.00
Nuclear	0.73 (0.52, 1.02)

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Pocket Money per month	
<500	1.00
≥500	**1.48 (1.06, 2.06)**

-2 Log likelihood=1001.860, Chi-square=11.015, df=8, p=0.201

Discussion

National GYTS in Nepal in 2007 was conducted among students from 13-15 years age group only whereas our study included students from 14-19 years. Almost equal proportion of male (52.9%) and female (47.1%) students were involved in our study. Participants belonging to Janajati ethnicity were predominant in this study. Similar study from Pokhara, Nepal reported nearly equal proportion of males and females with predominance of Brahmin ethnicity [9].

The prevalence of ever use of tobacco in this study was more compared to a study from western Nepal [7]. Prevalence of ever smokers of tobacco (17.9%) was high compared to National GYTS where 7.9% of students had ever smoked [4]. Regarding tobacco chewing, prevalence in our study (8.0%) was low compared to similar study among college students from western Nepal (21.2%) [20]. 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 [12-14]. Early and middle adolescence is more vulnerable for initiation of tobacco use hence; a target group is highlighted for early intervention to reduce the uptake of this habit.

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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 it from the shops [7]. National GYTS in 2007 reported that more than two-third (69.5%) of the students were not refused tobacco purchase in stores because of their age [4]. According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places [6]. 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 anti tobacco law in Nepal.

Curiosity, relieving tension and pressure from friends were the major reasons behind 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 feeling more matured [21].

We found that students in late adolescence were nearly two times more likely to consume tobacco compared to those in middle adolescence. Similar result was seen in a study from Kerala where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3) [6]. Tobacco use is more common in later adolescence thus cessation attempts need to be focused in these groups.

Type of family can influence tobacco use. Ever use of tobacco was two times more likely in students belonging to nuclear families compared to joint families (Adjusted OR=1.96, 95% CI: 1.11-3.45) in a study from India [8]. In our study tobacco use was less likely among students

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belonging to nuclear families. Close contact among parents and children in nuclear families might play a protective role in taking up risky behavior like tobacco use.

In context of Nepal, transition from secondary to higher secondary level education (Grade 11 and 12) is a major stress factor. Taking this into account, we took grade as a separate entity although it was significantly correlated with age. Likelihood of ever using tobacco was less in grades 11 and 12 than lower grades in our study. The start of higher secondary level education presents new peer groups and different environment which could have influenced the tobacco use among the students.

Prevalence of ever tobacco use was more than eight times in the boys as compared to girls in our study. Similar difference of prevalence between males and females was seen in other studies conducted in Nepal and abroad [8-11]. Males were more likely to ever smoke than females in a study from western Nepal (Adjusted OR=4.0; 95% CI=2.9-5.6) [22] and Haryana, India (Adjusted OR= 4.67; 95% CI=1.91-11.4) [10]. Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males [15]. In context of Nepal, teen smoking is viewed as an acceptable behavior 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 behavior associated with their transition to adulthood [23]. This striking gender differences in tobacco use was also observed among Nepalese population aged 15 to 59 years [24]. 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 modernization is likely to narrow the gender differences in smoking and is likely to result in high prevalence of

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smoking among teen girls in Asian countries [23]. Dharan, a town on the verge of rapid urbanization is likely to face this scenario in the near future.

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Janajatis is the broad ethnic group comprising castes mainly from the hills of Nepal. Tobacco chewing was significantly more 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 females population of Dharan [16]. Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajatis had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively) [17]. 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 [18]. 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 [5,6]. 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 be the reason behind the significance of the association for which further studies are required.

Our 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

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the findings as the data was 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 only. The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

Conclusion

The study revealed tobacco use is prevalent among the adolescent students despite the existence of anti-tobacco regulations in the country. Late adolescence, male gender, Janajati ethnicity and higher pocket money were significantly associated with tobacco use. Taking these factors into consideration, tobacco focussed 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.

Competing Interests

The author(s) declare that they have no competing interests.

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Contributorship statement

Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the prevalence of tobacco use that still exists among the adolescent students after the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	4
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	4-5
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	8
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*9*
Bias	9	Describe any efforts to address potential sources of bias	10-11
Study size	10	Explain how the study size was arrived at	8-9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	10
		(*c*) Explain how missing data were addressed	10
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	

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		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	11
		(b) Give reasons for non-participation at each stage	11
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11-12
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9,14-19
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	19-23
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	23
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	23
Generalisability	21	Discuss the generalisability (external validity) of the study results	23
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Tobacco Use and Associated Factors among Adolescent Students in Dharan, Eastern Nepal: A Cross Sectional Questionaire Survey

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Title: Tobacco Use and Associated Factors among Adolescent Students in Dharan, Eastern Nepal: A Cross Sectional Questionnaire Survey

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Article Summary

1. Article focus

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

2. Key messages

- Tobacco use is still prevalent among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire enabled our study for comparison with other studies

4. Limitations

- 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.

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- The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

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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 Asia 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 one month but had tried in the past.

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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 response rate of 90.23%. Prevalence of ever use of any tobacco product was 19.7% (95% CI: 17.7-21.6). 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: 1.17-2.28), male gender (OR: 12.20; 95% CI: 7.78-19.14), type of school (OR=1.72; 95% CI: 1.01-2.94), Janajati ethnicity (OR: 2.05; 95% CI: 1.39-3.01) and receiving pocket money ≥NRs.500 per month (OR: 1.45; 95% CI: 1.04-2.03).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on late adolescence, male gender, government schools, Janajati ethnicity and higher amount of pocket money.

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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 United States, Japan, Brazil, Bangladesh, Germany and Turkey.** [1] Unless a large number of current smokers in these countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s. [2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia 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 [3]. 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 [4]. 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 [5-7].

The WHO has defined the adolescents as persons in the 10 to 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 [8]. The present study therefore, focussed on the specific groups of middle (14-15 years) and late adolescents (16-19 years).

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The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 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 within the Nepalese youth who are the most vulnerable for adoption of this habit in the background of recent endorsement of anti-tobacco 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

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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% [8]. 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 Organization, Nepal (PABSON). 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 to 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 2 government schools in order to enroll the calculated number of students assuming 100 students

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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 Global Youth Tobacco Survey. The questionnaire to be used was pretested among the adolescent students in a different area and necessary corrections and modifications were made in order 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 one 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?" 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 one month.

Ever tobacco use was considered as the dependent variable [7]. The following explanatory variables were chosen based on the previous literature: age group [8], gender [5,7], type of school [6,9], religion [7], ethnicity [9], type of family [8], parental occupation [13], pocket money [5-7] and parental tobacco use [5,7]. Type of school was categorized into private and government as more number of smokers was reported in private than government school [9]. Ethnic groups were broadly classified into Brahmin/Chhetri, Janajati, Dalit and Terai Major

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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. The family with a married couple and their dependent children was nuclear whereas family with a number of married couples and their children living together in the same household was considered joint [25]. We used parental occupation as one of the explanatory variables since it was not possible to assess valid socioeconomic status of the family from the students. The pocket money was dichotomized based on the median amount received per month as there was a wide variation in the amounts and data was 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-Square 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 start of the study. Informed consent was taken from all the participants. We obtained written permission from the school authorities before interaction with the students. All the students present at the time of the visit were included in the study. Participation in the study

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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 in order 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, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Socio-demographic characteristics

Among the participants, median age was 16 years (Inter-quartile range 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 gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

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Table 1: Socio-demographic 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

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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. [19]**

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: 17.7-21.6) in our study. The prevalence among males and females was 33.6% (95% CI: 30.2-36.9) and 4.0% (95% CI: 2.6-5.3) respectively. Prevalence of current tobacco users was 16.46% (95% CI: 15.37-17.42).

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) had consumed Gutkha (a mixture of crushed areca nut, tobacco, catechu, paraffin, lime and sweet or savory flavorings), 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).

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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 to relieve tension (26.7%) and peer pressure (25.5%).

Pocket money and expenditure on tobacco

This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000). Median pocket money (NRs.) received per month by the ever users (Median=500, IQR=300-1000) was significantly different than the non users (Median= 500, IQR=247.50-600) ($p<0.001$).

Bi-variate 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: 1.67-3.01). Males were more likely to ever use tobacco than females (OR= 11.98; 95% CI: 7.79-18.43). 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: 1.56-3.02). Compared to Brahmins/Chhetris, students belonging to Janajati ethnicity were more likely to ever use tobacco (OR=1.76; 95% CI: 1.23-2.52). Students from nuclear families were less likely to ever use tobacco than those from joint families (OR=0.75; 95% CI: 0.56-1.00). Students

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whose fathers were working abroad in skilled or semi skilled work were more likely to ever use tobacco than those whose fathers were in service or professionals (OR=1.69; 95% CI:1.13-2.52). Students who received pocket money of more than or equal to NRs. 500 per month were more likely to ever use tobacco than those who received less (OR=1.44; 95% CI: 1.08-1.92). (Table 2)

Table 2: Different characteristics of participants and tobacco use: Bi-variate 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 (1.67-3.01)
Gender				
Female	25 (4.0)	593 (96.0)	**<0.001**	1
Male	233 (33.6)	461 (66.4)		11.98 (7.79-18.43)
Type of School				
Private	**230 (19.6)**	**946 (80.4)**	**0.775**	1
Government	**28 (20.6)**	**108 (79.4)**		1.07 (0.67-1.69)

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Grade				
9	82 (14.9)	469 (85.1)	**<0.001**	1
10	116 (27.5)	306 (72.5)		2.17 (1.56-3.02)
11	29 (16.7)	145 (83.3)		1.14 (0.70-1.86)
12	31 (18.8)	134 (81.2)		1.32 (0.82-2.13)
Caste/Ethnicity				
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**	1
Janajati	189 (23.2)	627 (76.8)		1.76 (1.23-2.52)
Dalit	14 (17.9)	64 (82.1)		1.28 (0.63-2.56)
Terai Major Caste	6 (7.2)	77 (92.8)		0.45 (0.17-1.16)
Type of Family				
Joint	97 (22.9)	327 (77.1)	**0.043**	1
Nuclear	161 (18.1)	727 (81.9)		0.75 (0.56-1.00)
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 (0.93-3.76)
Farmer	23 (24.7)	70 (75.3)		1.66 (0.91-3.01)
Business	67 (15.4)	367 (84.6)		0.92 (0.60-1.40)
Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)		1.69 (1.13-2.52)
Mother's Occupation (n=1295)				
Service/Professional	36 (21.1)	135 (78.9)	0.983	1

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Foreign/Skilled/Semi Skilled	20 (24.4)	62 (75.6)		1.21 (0.62-2.36)
Housewife/Farmer	195 (18.7)	847 (81.3)		0.86 (0.57-1.31)
Pocket Money/month (NRs.)				
<500	102 (16.6)	511 (83.4)	**0.010**	1
≥500	156 (22.3)	543 (77.7)		1.44 (1.08-1.92)
Parental tobacco use				
Absent	139 (19.4)	579 (80.6)	0.760	1
Present	119 (20.0)	475 (80.0)		1.04 (0.79-1.38)

Multivariate analysis

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

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

Characteristics	Adjusted Odds Ratio (95% CI)
Age Group (years)	
14-15	1.00
16-19	**1.64 (1.17,2.28)**
Gender	
Female	1.00
Male	**12.20 (7.78, 19.14)**
Type of school	
Private	1.00
Government	**1.72 (1.01, 2.94)**
Caste/Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.05 (1.39, 3.01)**
Dalit	1.67 (0.81, 3.46)
Terai Major Caste	0.51 (0.20, 1.29)
Type of Family	
Joint	1.00
Nuclear	**0.71 (0.51, 0.99)**
Pocket Money per month	

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<500	1.00
≥500	**1.45 (1.04, 2.03)**

-2 Log likelihood=996.385, Chi-square=5.98, df=8, p=0.649

Discussion

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

The prevalence of ever use of tobacco in this study was more compared to a study from western Nepal [7]. Prevalence of ever smokers of tobacco (17.9%) was high compared to National GYTS where 7.9% of students had ever smoked [4]. Regarding tobacco chewing, prevalence in our study (8.0%) was low compared to similar study among college students from western Nepal (21.2%) [20]. 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 [12-14]. Early and middle adolescence is more vulnerable for initiation of tobacco use hence; a target group is highlighted for early intervention to reduce the uptake of this habit.

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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 [7]. National GYTS in 2007 reported that more than two-third (69.5%) of the students were not refused tobacco purchase in stores because of their age [4]. According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places [6]. 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 anti tobacco law in Nepal.

Curiosity, relieving tension and pressure from friends were the major reasons behind 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 feeling more matured [21].

Students in late adolescence were more likely to consume tobacco compared to those in middle adolescence. Similar result was seen in a study from Kerala where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3) [6]. Tobacco use is more common in later adolescence thus cessation attempts need to be focused in these groups.

Type of family can influence tobacco use. Ever use of tobacco was two times more likely in students belonging to nuclear families compared to joint families (Adjusted OR=1.96, 95% CI: 1.11-3.45) in a study from India [8]. However, in our study tobacco use was less likely among

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students belonging to nuclear families. Close contact among parents and children in nuclear families might play a protective role against taking up risky behavior like tobacco use.

Prevalence of ever-tobacco use of any tobacco product was 19.0% (95% CI: 16.6-21.4) for government school students compared to 10.1% (95% CI: 7.7-12.5) for private school students in a study among urban youth of India [26]. As students from higher socioeconomic status (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 to girls. Similar difference of prevalence between males and females was seen in other studies conducted in Nepal and abroad [8-11]. Males were more likely to ever smoke than females in a study from western Nepal (Adjusted OR=4.0; 95% CI=2.9-5.6) [22] and Haryana, India (Adjusted OR= 4.67; 95% CI=1.91-11.4) [10]. Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males [15]. In context of Nepal, teen smoking is viewed as an acceptable behavior 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 behavior associated with their transition to adulthood [23]. This striking gender differences in tobacco use was also observed among Nepalese population aged 15 to 59 years [24]. 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 modernization is likely to narrow the gender differences in smoking and is likely to result in high prevalence of smoking among teen girls in

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Asian countries [23]. Dharan, a town on the verge of rapid urbanization is likely to face this scenario in the near future.

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Janajatis is the broad ethnic group comprising castes mainly from the hills of Nepal. Tobacco chewing was significantly more 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 females population of Dharan [16]. Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajatis had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively) [17]. 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 [18]. 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 [5,6]. 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.

Our 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

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the findings as the data was 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 generalized to the rest of eastern Nepal. Peer pressure was found to be one of the reasons to start tobacco use but was not included in the analysis part. The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

Conclusion

The study revealed 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 focussed 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.

Competing Interests

The author(s) declare that they have no competing interests.

Acknowledgement

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Contributorship statement

Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the prevalence of tobacco use that still exists among the adolescent students after the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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Title: Tobacco Use and Associated Factors among Adolescent Students in Dharan, Eastern Nepal: A Cross Sectional Questionnaire Survey

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Article Summary

1. Article focus

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

2. Key messages

- Tobacco use is still prevalent among the adolescent students of Dharan despite the existence of anti-tobacco regulations in the country.
- Tobacco focussed 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

3. Strengths

- Use of a standard questionnaire enabled our study for comparison with other studies

4. Limitations

- 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.

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- The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

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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 Asia 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 one month but had tried in the past.

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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 response rate of 90.23%. Prevalence of ever use of any tobacco product was 19.7% (95% CI: 17.7-21.6). 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: 1.17-2.28), male gender (OR: 12.20; 95% CI: 7.78-19.14), type of school (OR=1.72; 95% CI: 1.01-2.94), Janajati ethnicity (OR: 2.05; 95% CI: 1.39-3.01) and receiving pocket money ≥NRs.500 per month (OR: 1.45; 95% CI: 1.04-2.03).

Conclusion: Tobacco focussed interventions are required for school/college going students in order to promote cessation among users and prevent initiation, focusing on late adolescence, male gender, government schools, Janajati ethnicity and higher amount of pocket money.

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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 United States, Japan, Brazil, Bangladesh, Germany and Turkey.** [1] Unless a large number of current smokers in these countries quit, it is estimated that smoking will be causing 10 million deaths per year worldwide by the 2020s or early 2030s. [2]

The tobacco use among the youth, in both smoking and smokeless forms, is quite high in the South East Asia 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 [3]. 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 [4]. 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 [5-7].

The WHO has defined the adolescents as persons in the 10 to 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 [8]. The present study therefore, focussed on the specific groups of middle (14-15 years) and late adolescents (16-19 years).

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The Government of Nepal had signed the Framework Convention on Tobacco Control (FCTC) on December 3, 2003 followed by its ratification by the House of Representatives on November 7, 2006. In what was regarded as a landmark in the nation's campaign against tobacco, the government finally assented to the anti-tobacco directives of Tobacco Product Control and Regulatory Act 2010 on November 4, 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 within the Nepalese youth who are the most vulnerable for adoption of this habit in the background of recent endorsement of anti-tobacco 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

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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% [8]. 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 Organization, Nepal (PABSON). 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 to 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 2 government schools in order to enroll the calculated number of students assuming 100 students

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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 Global Youth Tobacco Survey. The questionnaire to be used was pretested among the adolescent students in a different area and necessary corrections and modifications were made in order 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 one 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?" 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 one month.

Ever tobacco use was considered as the dependent variable [7]. The following explanatory variables were chosen based on the previous literature: age group [8], gender [5,7], type of school [6,9], religion [7], ethnicity [9], type of family [8], parental occupation [13], pocket money [5-7] and parental tobacco use [5,7]. Type of school was categorized into private and government as more number of smokers was reported in private than government school [9]. Ethnic groups were broadly classified into Brahmin/Chhetri, Janajati, Dalit and Terai Major

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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. The family with a married couple and their dependent children was nuclear whereas family with a number of married couples and their children living together in the same household was considered joint [25]. We used parental occupation as one of the explanatory variables since it was not possible to assess valid socioeconomic status of the family from the students. The pocket money was dichotomized based on the median amount received per month as there was a wide variation in the amounts and data was 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-Square 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 start of the study. Informed consent was taken from all the participants. We obtained written permission from the school authorities before interaction with the students. All the students present at the time of the visit were included in the study. Participation in the study

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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 in order 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, eighty were incomplete whereas sixty two did not match the age criteria therefore were excluded from the data analyses.

Socio-demographic characteristics

Among the participants, median age was 16 years (Inter-quartile range 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 gender (Male: Female=1.1:1). Participants who were Janajati by ethnicity were predominant. Other religions comprised of Chritianity, Muslim, Jainism, Sahajyog and Heavenly path or Premwaad (Lovism). (Table 1)

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Table 1: Socio-demographic 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

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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. [19]**

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: 17.7-21.6) in our study. The prevalence among males and females was 33.6% (95% CI: 30.2-36.9) and 4.0% (95% CI: 2.6-5.3) respectively. Prevalence of current tobacco users was 16.46% (95% CI: 15.37-17.42).

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) had consumed Gutkha (a mixture of crushed areca nut, tobacco, catechu, paraffin, lime and sweet or savory flavorings), 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).

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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 to relieve tension (26.7%) and peer pressure (25.5%).

Pocket money and expenditure on tobacco

This study found the median expenditure on tobacco to be Nepalese Rupees (NRs). 100 per month (Inter-quartile range 30-200) (NRs. 3.33 or 0.037 United States Dollar per day), which was one fifth of their pocket money (Median 500, Inter-quartile range 300-1000). Median pocket money (NRs.) received per month by the ever users (Median=500, IQR=300-1000) was significantly different than the non users (Median= 500, IQR=247.50-600) ($p<0.001$).

Bi-variate 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: 1.67-3.01). Males were more likely to ever use tobacco than females (OR= 11.98; 95% CI: 7.79-18.43). 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: 1.56-3.02). Compared to Brahmins/Chhetris, students belonging to Janajati ethnicity were more likely to ever use tobacco (OR=1.76; 95% CI: 1.23-2.52). Students from nuclear families were less likely to ever use tobacco than those from joint families (OR=0.75; 95% CI: 0.56-1.00). Students

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whose fathers were working abroad in skilled or semi skilled work were more likely to ever use tobacco than those whose fathers were in service or professionals (OR=1.69; 95% CI:1.13-2.52). Students who received pocket money of more than or equal to NRs. 500 per month were more likely to ever use tobacco than those who received less (OR=1.44; 95% CI: 1.08-1.92). (Table 2)

Table 2: Different characteristics of participants and tobacco use: Bi-variate 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 (1.67-3.01)
Gender				
Female	25 (4.0)	593 (96.0)	**<0.001**	1
Male	233 (33.6)	461 (66.4)		11.98 (7.79-18.43)
Type of School				
Private	**230 (19.6)**	**946 (80.4)**	**0.775**	1
Government	**28 (20.6)**	**108 (79.4)**		1.07 (0.67-1.69)

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Grade				
9	82 (14.9)	469 (85.1)	**<0.001**	1
10	116 (27.5)	306 (72.5)		2.17 (1.56-3.02)
11	29 (16.7)	145 (83.3)		1.14 (0.70-1.86)
12	31 (18.8)	134 (81.2)		1.32 (0.82-2.13)
Caste/Ethnicity				
Brahmin / Chhetri	49 (14.6)	286 (85.4)	**<0.001**	1
Janajati	189 (23.2)	627 (76.8)		1.76 (1.23-2.52)
Dalit	14 (17.9)	64 (82.1)		1.28 (0.63-2.56)
Terai Major Caste	6 (7.2)	77 (92.8)		0.45 (0.17-1.16)
Type of Family				
Joint	97 (22.9)	327 (77.1)	**0.043**	1
Nuclear	161 (18.1)	727 (81.9)		0.75 (0.56-1.00)
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 (0.93-3.76)
Farmer	23 (24.7)	70 (75.3)		1.66 (0.91-3.01)
Business	67 (15.4)	367 (84.6)		0.92 (0.60-1.40)
Foreign/Skilled/Semi Skilled	97 (25.1)	290 (74.9)		1.69 (1.13-2.52)
Mother's Occupation (n=1295)				
Service/Professional	36 (21.1)	135 (78.9)	0.983	1

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Foreign/Skilled/Semi Skilled	20 (24.4)	62 (75.6)		1.21 (0.62-2.36)
Housewife/Farmer	195 (18.7)	847 (81.3)		0.86 (0.57-1.31)
Pocket Money/month (NRs.)				
<500	102 (16.6)	511 (83.4)	**0.010**	1
≥500	156 (22.3)	543 (77.7)		1.44 (1.08-1.92)
Parental tobacco use				
Absent	139 (19.4)	579 (80.6)	0.760	1
Present	119 (20.0)	475 (80.0)		1.04 (0.79-1.38)

Multivariate analysis

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

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

Characteristics	Adjusted Odds Ratio (95% CI)
Age Group (years)	
14-15	1.00
16-19	**1.64 (1.17,2.28)**
Gender	
Female	1.00
Male	**12.20 (7.78, 19.14)**
Type of school	
Private	1.00
Government	**1.72 (1.01, 2.94)**
Caste/Ethnicity	
Brahmin/Chhetri	1.00
Janajati	**2.05 (1.39, 3.01)**
Dalit	1.67 (0.81, 3.46)
Terai Major Caste	0.51 (0.20, 1.29)
Type of Family	
Joint	1.00
Nuclear	**0.71 (0.51, 0.99)**
Pocket Money per month	

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<500	1.00
≥500	**1.45 (1.04, 2.03)**

-2 Log likelihood=996.385, Chi-square=5.98, df=8, p=0.649

Discussion

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

The prevalence of ever use of tobacco in this study was more compared to a study from western Nepal [7]. Prevalence of ever smokers of tobacco (17.9%) was high compared to National GYTS where 7.9% of students had ever smoked [4]. Regarding tobacco chewing, prevalence in our study (8.0%) was low compared to similar study among college students from western Nepal (21.2%) [20]. 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 [12-14]. Early and middle adolescence is more vulnerable for initiation of tobacco use hence; a target group is highlighted for early intervention to reduce the uptake of this habit.

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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 [7]. National GYTS in 2007 reported that more than two-third (69.5%) of the students were not refused tobacco purchase in stores because of their age [4]. According to a study from Kerala, India, the most preferred places for smoking were friends' house and public places [6]. 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 anti tobacco law in Nepal.

Curiosity, relieving tension and pressure from friends were the major reasons behind 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 feeling more matured [21].

Students in late adolescence were more likely to consume tobacco compared to those in middle adolescence. Similar result was seen in a study from Kerala where students aged 16 years and above were nearly three times more likely to be tobacco users compared to those who were 13 years old (Adjusted OR=2.9, CI=1.6-5.3) [6]. Tobacco use is more common in later adolescence thus cessation attempts need to be focused in these groups.

Type of family can influence tobacco use. Ever use of tobacco was two times more likely in students belonging to nuclear families compared to joint families (Adjusted OR=1.96, 95% CI: 1.11-3.45) in a study from India [8]. However, in our study tobacco use was less likely among

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students belonging to nuclear families. Close contact among parents and children in nuclear families might play a protective role against taking up risky behavior like tobacco use.

Prevalence of ever-tobacco use of any tobacco product was 19.0% (95% CI: 16.6-21.4) for government school students compared to 10.1% (95% CI: 7.7-12.5) for private school students in a study among urban youth of India [26]. As students from higher socioeconomic status (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 to girls. Similar difference of prevalence between males and females was seen in other studies conducted in Nepal and abroad [8-11]. Males were more likely to ever smoke than females in a study from western Nepal (Adjusted OR=4.0; 95% CI=2.9-5.6) [22] and Haryana, India (Adjusted OR= 4.67; 95% CI=1.91-11.4) [10]. Tobacco use can be considered as part of a constellation of risk-taking behaviors that is more prevalent in the males [15]. In context of Nepal, teen smoking is viewed as an acceptable behavior 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 behavior associated with their transition to adulthood [23]. This striking gender differences in tobacco use was also observed among Nepalese population aged 15 to 59 years [24]. 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 modernization is likely to narrow the gender differences in smoking and is likely to result in high prevalence of smoking among teen girls in

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Asian countries [23]. Dharan, a town on the verge of rapid urbanization is likely to face this scenario in the near future.

Jajajatis were two times more likely to consume tobacco compared to Brahmins/Chhetris in our study. Janajatis is the broad ethnic group comprising castes mainly from the hills of Nepal. Tobacco chewing was significantly more 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 females population of Dharan [16]. Nepal Adolescent and Youth Survey (NAYS) in 2010 showed similar results in which relatively advantaged Janajatis had higher prevalence of liquor (32.60%) and tobacco use (16.62%) followed by disadvantaged Janajatis (27.83% and 13.71% respectively) [17]. 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 [18]. 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 [5,6]. 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.

Our 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

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the findings as the data was 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 generalized to the rest of eastern Nepal. Peer pressure was found to be one of the reasons to start tobacco use but was not included in the analysis part. The temporal association between the independent variables and tobacco use could not be established due to the study design being cross sectional.

Conclusion

The study revealed 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 focussed 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.

Competing Interests

The author(s) declare that they have no competing interests.

Acknowledgement

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Contributorship statement

Dr. Pranil Man Singh Pradhan was involved in designing the protocol, collection, entering and analysis of data and preparation of the final document. Prof. Paras Kumar Pokharel was responsible for the overall review of the protocol and final report and provided critical analysis where needed. Dr. Surya Raj Niraula assisted in data entry and analysis and concentrated on presentation of the results. Dr. Anup Ghimire and Dr. Suman Bahadur Singh were involved in the critical review of the final report and provided necessary feedback.

What this paper adds

This study highlights upon the prevalence of tobacco use that still exists among the adolescent students after the endorsement of anti tobacco 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 to Brahmins/Chhetris.

Data sharing statement

Extra data is available by emailing Dr. Pranil Man Singh Pradhan (pranil.pradhan@gmail.com)

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STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	4
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	4-5
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	8
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*9*
Bias	9	Describe any efforts to address potential sources of bias	10-11
Study size	10	Explain how the study size was arrived at	8-9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	10
		(*c*) Explain how missing data were addressed	10
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	

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		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	11
		(b) Give reasons for non-participation at each stage	11
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11-12
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9,14-19
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	19-23
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	23
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	23
Generalisability	21	Discuss the generalisability (external validity) of the study results	23
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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