REVIEW ARTICLE

PREVALENCE OF CURRENT TOBACCO USE AMONG SECONDARY STUDENTS IN NEPAL: A META-ANALYSIS

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ABSTRACT

Tobacco use continues to rise among young people in middle and low income countries, causing high premature death and disability. Most importantly, its initiation starts mainly during adolescence and persists for whole life. We conducted this meta-analysis to estimate the prevalence of current tobacco use among lower secondary to higher secondary students in Nepal. We searched and identified the studies which were published between 2003 and 2013 using MEDLINE, Google Scholar and NEPJOL. From five selected studies, total 7,832 eligible students were included in analysis. Considering the high degree of variability (Q = 82.6, I2 = 95%) among selected studies, we used random effects model to estimate the weighted prevalence of current tobacco use and found as 13.9 % (10.2-17.5). This result shows that current tobacco use among lower secondary to higher secondary students still remains high, which compels an effective implementation of tobacco control programs and policies.

Key Words: Smoking, Secondary students, Smokeless tobacco use.

INTRODUCTION

Globally more than one billion people use tobacco, comprising 80 % people form low and middle income countries, and nearly a quarter of 15 years above world's population.[1] Smoking or use of smokeless tobacco claims 12% of all the deaths among adults aged 30 years and over becoming the leading cause of preventable death worldwide.[2,3] Of those adults aged 30-44 years who die from ischemic heart disease, 38% of the deaths are attributable to tobacco.[3] It also heightens the risk of dying from lung cancer and chronic respiratory diseases.[1] Smoking or use of smokeless tobacco exists in one third of Nepalese, that causes eight percent of all deaths in Nepal.[3,4]

Majority of people are likely to initiate smoking or start using smokeless tobacco products primarily during adolescence.[5,6] Eighty eight percent of adult American smokers who smoke daily reported that they started smoking by the age of 18 years.[5,6] An estimation showed that 5,500 Indian adolescents start using tobacco every day, joining the four million young people under the age of 15 who are regularly using tobacco.[7] This situation is almost alike in Nepal where nearly one fifth of all 15-19 aged male are currently using any tobacco products.[8]

Recent downward shift (below18 years) of initiation of tobacco use is one of the major threats of tobacco epidemics.[9] This changed pattern ultimately results in increased rate of tobacco use in whole population.[10] More than that, early initiation of tobacco use produces various adverse health effects among young people.[11] A precise estimate of rate of tobacco use among lower secondary, secondary and higher secondary students using a valid data can be utilized to depict the changes in trends. It also helps to reduce the discrepancies among available study findings. Therefore, we aimed to extract available and published data, and estimate the prevalence of current tobacco use among lower secondary, secondary and higher secondary school in Nepal.

METHOD

Literature searches

We searched all primary epidemiological studies on prevalence of current tobacco use among lower secondary, secondary and higher secondary Nepalese students conducted between 2003 and 2013, using three electronic databases: MEDLINE, Google Scholar and NEPJOL. We used the keywords "Smoking OR Tobacco Consumption AND Prevalence AND Nepal" for searching and identifying the articles. Results were also supplemented by useful references cited in key articles.

STUDY SELECTION AND EVALUATION

After a quick screening of title, we eliminated 15 papers that were duplicated and 76 papers that were clearly not relevant to meta-analysis. In second step, the remaining papers were assessed individually by two authors of this study. Twenty two articles did not meet the inclusion criteria of: population based cross-sectional study, lower secondary, secondary and

higher secondary student as study unit, and study duration between 2003 and 2013.[1] Two articles were removed after the qualitative evaluation as the study populations were not the representative of general population.[12,13] Finally, five papers were included in the meta-analysis.[14,15,16,17,18]
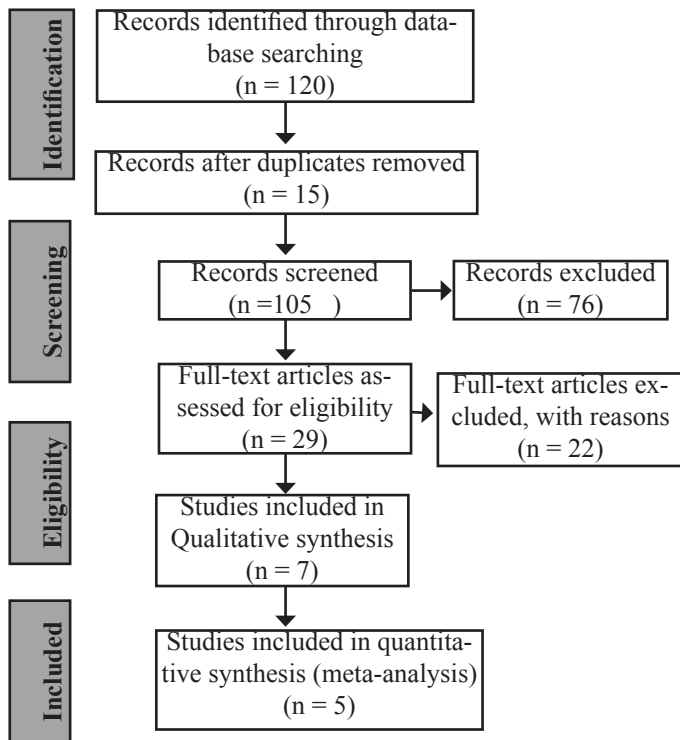

Figure 1- Study selection flow diagram

Data extraction

First, the definition of "current tobacco use" was adopted from Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services to ensure its uniformity among studies. The current tobacco use was defined as the smoking or use of smokeless tobacco products on at least one day during the past 30 days.[19] Then, Data collection form was used to extract information about "place of study, study design, study group, sample size and reported prevalence rate."
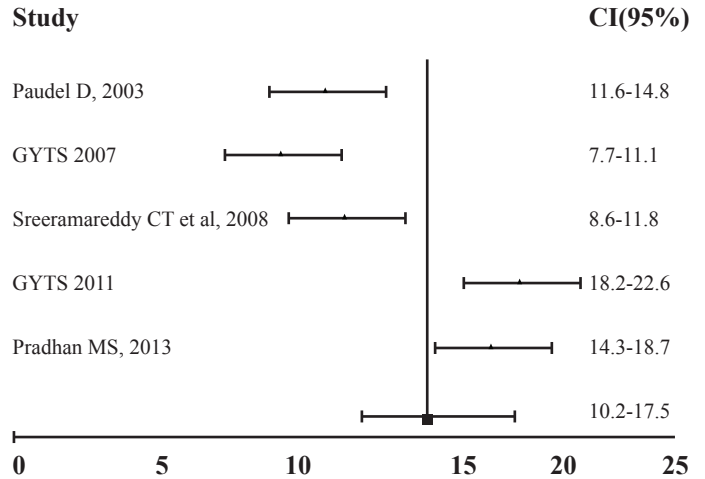

Figure 2: Comparison of estimated result with prevalence of selected studies

Data analysis

Extracted summary statistics were analyzed using Microsoft Office Excel 2007. We followed the detailed steps of meta-analysis as explained in article "Meta-analyses and Forest plots using a Microsoft excel spreadsheet: step-by-step guide focusing on descriptive data analysis." [20] Standard error for prevalence of tobacco use in each study was calculated based on the binary distribution formula. The weights of studies were calculated taking inverse of the variance. The test of heterogeneity (Q statistic or Hedge's Q test) was conducted taking the ratio of the (squared) deviations between the effect sizes to the (squared) expected deviation. The significance level for this statistic was set as 0.05. Based on the results of the heterogeneity test, random effects model ($P < 0.05$) was used to estimate the weighted mean effect size and standard error of mean effect size of the studies. Forest plot was designed using same version of excel and later it is added with each article IDs using Adobe Photoshop version 8.0.

RESULT

We located five studies that met the inclusion criteria. A total of 7,832 lower secondary, secondary and higher secondary students were eligible and included in analysis (Table 1). Among five selected studies, two studies belonged to Global Youth Tobacco Survey. The lowest and highest primary research rates were 5 and 20.

Table 1: Characteristics of studies included in meta-analysis

SN	Article ID	Place of Study	Study design	Study group	Sample size	Prevalence	Time of Study
1	Paudel D, 2003	Pokhara	Cross sectional	Secondary School Students	2032	13.2 %	2003
2	Pradhan PMS et al, 2013	Dharan	Cross sectional	Secondary and Higher Secondary School students	1312	16.46 %	2013
3	Sreeramareddy CT et al, 2008	Pokhara	Cross sectional	Higher Secondary students	1590	10.2%	2007

| 4 | GYTS, 2007 | Nationwide | Cross sectional | Lower secondary and Secondary School students | 1296 | 9.4 % | 2007 |
| 5 | GYTS, 2011 | Nationwide | Cross sectional | Lower Secondary and Secondary School students | 1602 | 20.4% | 2011 |

In test of heterogeneity, Q value exceeded the critical Chi-square value showing significant between-studies variability given the four degree of freedom and five percent level of statistical significance. The percentage of variability (I_2) among the effect sizes existed between the studies relative to the total variability of effect sizes was 95%. After adjusting the weight of the study with a between-studies variance component v (0.001657) in random effects model, Q (χ_2=4.7) was found to be statistically insignificant (Table 2).

Table 2: Summary calculation of prevalence of current tobacco use among lower secondary, secondary and higher secondary Nepalese students

Study ID	Sample size	es	SE	Var	W	W*es	w*es2	w2	Wv	Wv*es	Wv*(es)2	Wv2
Paudel D,2003	2032	0.132	0.00806	6.49606E-05	15393.94	2032	268.224	236973370	580.6841	76.65031	10.11784	337194.1
Pradhan MS, 2013	1312	0.1646	0.011201	0.000125457	7970.838	1312	215.9552	63534264.7	560.9773	92.33687	15.19865	314695.5
Sreeramareddy CT et al, 2008	1590	0.102	0.008009	6.41509E-05	15588.24	1590	162.18	242993080	580.9573	59.25764	6.04428	337511.4
GYTS 2007	1296	0.094	0.008517	7.25309E-05	13787.23	1296	121.824	190087823	578.1427	54.34541	5.108469	334249
GYTS 2011	1602	0.204	0.011285	0.000127341	7852.941	1602	326.808	61668685.1	560.3852	114.3186	23.32099	314031.6
				Sums	60593.19	7832	1094.991	795257222	2861.147	396.9088	59.79023	1637682

K = 5 Df = 4	V = 0.001657
Q = 82.66249 I2 = 95.16105 es(fixed) = 0.129255	Qv = 4.729574157 I2v = 15.42578957 es (random) = 0.139 SEes (random) = 0.018695192 CI = 0.10208111, 0.175366

The weighted mean effect size was calculated in random effects model and was found to be 0.139 with standard error of 0.0187, which gave the weighted prevalence of the studies as 13.9 % (CI=10.2 -17.5)

DISCUSSION
We conducted this study to estimate the overall prevalence of current tobacco use among lower secondary, secondary and higher secondary Nepalese students. The weighted prevalence was 13.9 % (CI=10.2 -17.5). This rate is two times higher than the prevalence of currently reported any tobacco use among 14 to 19 adolescents in NDHS 2006 (7.7%).[21] It is also well comparable with the prevalence of any current tobacco use among Indian (14.6%) and Bangladeshi (6.9%) adolescents students.[22]

After a review of five studies, we found a noticeable incongruity among the given prevalence rates. The GYTS 2011 rate (20.4%) was two times higher than GYTS 2009 rate (9.4%).[14,15,17] The percentage of any tobacco use in same group was just 7.8 in 2001.[23] This contrasts with linear decline in current cigarette smoking among middle school and high school American youth between 2000 and 2011.[19] But, the findings substantiate the fact that tobacco use is on the rise among youth in low and middle income countries.[24,25]

According to WHO, in recent years, tobacco industries have shifted the target towards low and middle income countries (LMCs) in order to increase sales and profits because of reduction in number of cigarette smokers in developed nations.[25] Apart from this, increase in cigarettes sale among LMCs is also associated with recent exploding of young population, weak implementation of tobacco control policies and lower levels of health awareness.[26] Some studies have also suggested that social

norms portrayed in tobacco advertising, smoking scenes used in movies and peer pressure are some reasons behind high proportion of tobacco use among youth.[5,6]

This study has limitations. Only five studies were eligible and included in analysis. Among them, only two studies could represent whole population. We could not consider separate analysis of sex, age and grade levels because of insufficient studies.

CONCLUSION

This meta-analysis provides the evidence of high variability among available study findings. After meta-analysis, the precise estimate remains to be 13.9%, which demonstrates the increasing trend of tobacco use among study groups, necessitating the effective endorsement of national and international efforts to protect them from its deleterious effects.

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