

# Tobacco use in Indian high-school students

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To assess the prevalence rate of tobacco use among high-school students in India, we had done a systematic review. Through an extensive search in the indexed literature and website-based population survey reports, 15 epidemiologic studies were identified of tobacco use among Indian high-school (6<sup>th</sup>-12<sup>th</sup> classes) students from 200 potentially relevant articles during 1991-2007. We included those articles that had been included at least once in life-time experience as positive cases. Wide differences in samples and primary outcome variables in these studies were observed. The median prevalence of ever users of tobacco was 18.15% and IQR 9.42-53.9%. In 13-15 years old male and female students had the prevalence of 14.00% with IQR 8.50-22.50% and 6.34% with IQR 1.90-20.00%, respectively. This new finding indicates the that prevalence of tobacco ever use among high-school students in India is quiet high.

**Key words:** Ever users, tobacco, high school students

## INTRODUCTION

On the current pattern of tobacco use, it is estimated that 250 million from the current population would die because of tobacco, most of them currently living as young and adolescents in developing countries.<sup>[1]</sup> In India, tobacco use is estimated to cause 800,000 deaths annually.<sup>[2,3]</sup> The prevention of tobacco use in young people appears as the single greatest opportunity for preventing non-communicable disease in the world today.<sup>[4]</sup> The epidemic of tobacco use is shifting from developed to developing countries, including India, where increased use is expected to result in a large disease burden in the future. Changes in the prevalence of tobacco use in adolescents are important to monitor, since increased use by young people might be a precursor to increased rates in the population.<sup>[5]</sup> Smoking and tobacco use is a major public health issue in developing countries. Tobacco use is one of the major preventable causes of death and disability worldwide. WHO estimates that 4.9 million deaths annually are attributable to tobacco.<sup>[6]</sup> This figure is expected to rise to 10 million in 2030, with 7 million of these deaths occurring in developing countries, mainly China and India. India is a home for one-sixth of the global population. Currently about one-fifth of all worldwide deaths attributed to tobacco occur in India, more than 8,00,000 people die and 12 million people become ill as a result of tobacco use each year. The deaths attributable to tobacco, in India, are expected to rise from 1.4% of all deaths in 1990 to 13.3% in 2020.<sup>[7]</sup> It is estimated that 5500 adolescents

start using tobacco every day in India, joining the 4 million young people under the age of 15 who already are regularly using tobacco.<sup>[8]</sup>

We performed a review to determine the prevalence of tobacco-use among Indian high-school children.

### Aim

Smoking and tobacco use is a major public health issue in developing countries. Studies have identified the prevalence rate of tobacco use among high-school students. However, the true nature of these findings remains confounded in many studies, producing inconsistent evidence. To look for sources of potential bias and try to uncover consistent patterns of prevalence, the meta-analysis was conducted on studies published between 1991 and 2007 to determine the prevalence of tobacco-use among high-school children in India.

## MATERIALS AND METHODS

### Literature Search for Data Sources

We attempted the comprehensive, annotated assembly of survey results by different sources; published surveys and field studies in which tobacco use among Indian high-school students were reported, meeting presentations and personal communications about recent surveys were not included in previous analyses. Through an extensive search in indexed literatures and website-based population survey reports, 15 epidemiologic studies were identified of the tobacco use among Indian high-school students from 200 potentially relevant articles. All published articles in indexed journals available from various institutional libraries of India and websites on epidemiologic studies on tobacco use among

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Indian high-school students published between 1991 and 2007 were included in this study. Studies were identified by searching Pubmed-entrez and abstracts from scientific meetings (1991-2007). Reviews of citations and reference lists were performed to identify additional eligible studies. The search terms included ever user, students, prevalence, Indian children and tobacco. Where possible, sources were contacted for further information on survey data not readily available in the public domain. Manual searches were conducted from review articles and previous meta-analyses. When necessary, we contacted authors for additional information or for translations from languages other than English.

### Selection Criteria

Few criteria were developed to select studies from among peer-reviewed articles. Firstly, studies with a broad criterion to define both smokeless and smoking form of tobacco use in Indian children were taken; Secondly, class cutoff for students was from 6<sup>th</sup> to 12<sup>th</sup> classes in high schools in India on tobacco use were included. Thirdly, indexed publications of research reports based on population survey on substance use among high-school students in India using anonymous pre-tested self-administered questionnaire were included in this systematic analysis. Finally, the definition of ever user (lifetime user) was accepted from WHO international definition as all the users who used or abused drugs irrespective of time and frequency in his/her life. Thus, the total number of at least once in lifetime experience i.e. 'ever user' had been considered as positive case of ever user of tobacco during calculations of prevalence rates in this study population.<sup>[9]</sup>

### Main Outcome Variable

Ever users of tobacco in high-school students.

### Statistical Analysis

SPSS 10.0 for windows was used to calculate different central tendencies and dispersions. Median and inter-quartile ranges of prevalence were found most suitable to determine the magnitude of on tobacco use among high-school students during 1991-2007.

### Data Abstraction and Synthesis

Wide differences in samples and primary outcome variables in these studies were observed. To be more precise, heterogeneity varied from age groups, rural-urban samples to criteria for positive diagnosis and study instruments. Thereby, results varied to a large extent regarding overall prevalence in majority studies with few studies those using different parameters viz. past, ever, current in few studies. The lack of consistency in case definition within studies and age category altered summary prevalence in our study. After adjusting for these confounding characteristics, consistent

patterns of tobacco use among Indian high-school students were calculated. The number of tobacco users among high-school students during 1991-2007 in each publication formed a corpus of 22 figures on the prevalences found in our search reported in the respective literature.

Details of the studies were reviewed along with their estimated prevalence rates of at least once in lifetime experience were tabulated in Table 1.<sup>[4,5,10-22]</sup> From there, we have calculated the ever users by different extrapolations which we have mentioned in the addendum to Table 1.

From these important community survey reports, the median prevalence from these studies conducted during 1991-2007 was determined. The median prevalence of ever users on tobacco use among high-school students during 1991-2007 was determined to be 18.15% with the inter-quartile range (IQR) = 9.42% - 53.97%.

The median prevalence in 13- to 15-year-old male students was 14.00% with the inter-quartile range (IQR) = 8.50%- 22.50%. Corresponding figures for female students were median and inter-quartile range being 6.34% and 1.90-20.00, respectively.

Male predominance with wide inter-regional variation in prevalence was observed.

Our data were collected from articles published between 1991 and 2007 and show no definite pattern or trend of tobacco use except in the study by Rao *et al.* in 2002 on grade 8-10 students ever users of tobacco and alcohol combined who showed an increase in the rates as the age advanced from 10 years (24.5%) to 20 years (35%).

## DISCUSSIONS

In our study, in the absence of data on overall 'ever user', all the prevalence data were taken as the prevalence of 'ever user' for this review. The median prevalence of ever users on tobacco use among high-school students was 18.15%. The corresponding figures in 13- to 15-year-old male and female students were 14.00 and 6.34%, respectively.

Global Youth Tobacco Survey data on Indian states revealed the median prevalence 24.5% in 13-to 15-year-old male students with the inter-quartile range (IQR) = 12.47%-59.67%. Corresponding median and inter-quartile range figures for female students were 20.75% and 6.72-43.12, respectively.<sup>[22]</sup>

India – Sikkim FACT SHEET; Global Youth Tobacco Survey found that 24.5% of students had ever smoked cigarettes (male = 31.9%, female = 15.5%); 54.7% currently use any

**Table 1: Tobacco use in Indian high-school students**

Year	Name of principal investigators	Category number of students surveyed (N)	Prevalence of tobacco use (%)					
			Ever user %			Current user %		
			M	F	T	M	F	T
2007	Singh V, Pal HR, Mehta M, Kapil U, Singh V	10-18 years; N = 3422	*	*	9.8	4.6	0.8	5.4
2006	Reddy KS, Perry CL Stigler MH, Arora M	Grade 6-8; N = 6165 (6 <sup>th</sup> ), N = 5477 (8 <sup>th</sup> )	*	*	1529 (24.8)	*	*	413 (6.7)
					509 (9.3)			159 (2.9)
2006	Madan Kumar PD, Poorni S, Ramachandran S	Grade 8-10 (13-15 years); N = 1255; 808 (64.4%); boys 447 (35.6%) girls	41.6	30.2	37.6	46.3	31.6	41.1
2006	Singh V, Singh V, Gupta R. Singh V, Singh V	Class 9-12 (13-18 years); boys 2866, girls 939	*	*	1.97	592.1	161.7	1.97
2005	Jindal SK, Aggarwal AN, Gupta D, Kashyap S, Chaudhary D	9319Ω	2.9	1.5	2.9, 8.5	-	-	-
			8.5	9.8	1.5, 9.8			
2004	Sinha DN, Gupta PC, Pednekar M	Grade 8-10 (13-15 years); N = 2636*	76.5	57.2	71.8	61.4	51.2	58.9
2004	Gajalakshmi V, Asma S, Warren CW	Grade 8-10 (13-15 years); N = 4820	*	*	10.0	-	-	-
2004	Pednekar M, ¥ Gupta PC	-	*	*	13.5	*	*	4.5
2003	Sinha DN, Gupta PC, Pednekar MS	Grade 8-10 (13-15 years)	*	*	75.3 to 40.1	*	*	63.0 to 36.1
2003	Tsering D	Grade 8-10	15.69	6.34	12.5	6.57	0.70	4.57
2002	Rao EV, Mishra K, MohapatraB**	Grades 8-10	*	*	4.8	-	-	-
1999-2002	Warren CW for Global Youth Tobacco survey (GTYS), ¢ and Sinha DN, Gupta PC, PednekarMS, Tobacco use among students in Eight North-eastern states of India. WHO, SEARO, New Delhi, OSH/CDC, Atlanta (Report on North-eastern GYTS)	Students 13-15 years	46.4	25.2	40.1	45.2	25	36.1
		Assam	10.0	5.7	59.2	54.2	43.9	49.8
		Andhra Pradesh 2001	64.4	52.1	69	74.4	47.2	61.7
		Arunachal Pradesh	63.5	51.6	67.7	54.7	32.0	43.9
		Bihar 2000	4.5	2.8	75.3	58.4	48.7	53.5
		Delhi 2002	3.7	3.2	73.3	69.1	56.4	63
		Goa 2000	12.0	7.1	56.4	68.1	38.3	54.7
		Maharashtra 2000	78.6	58.1	46.7	50.4	36.9	44.4
		Manipur	63.2	43.7				
		Meghalay	78.6	72.0				
		Mizoram	81.1	64.8				
		Nagaland	71.2	10.5				
		Orissa 2002	70.8	38.8				
		Sikkim	69.8	3.9				
		Tamil Nadu 2000	52.6	39.4				
		Tripura	51.4	13.4				
		Uttaranchal 2002	24.5	16.3				
		Uttar Pradesh 2002	23.5	6.6				
		West Bengal 2000	160	6	ñ 11.98	*	*	7.1
1995	Kapoor SK, Anand K, Kumar G	1130 males and 256 females	(14.2)	(2.3%)				
1994	George A, Varghese C, Sankaranarayanan R, Nair MK	146	*	*	31	-	-	-
1991	Jayant K, Notani PN, Gulati SS, Gadre VV	Final year; 1278 boys; 353 girls	22.5; 6.9; 13.8	1.1	22.5; 6.9; 13.8	-	-	-

h Weighted mean has been calculated from the sample of 1130 male and 256 female students, respectively, having the prevalence of 160 (14.2%) and 6 (2.3%) for this review.

\*\*In the absence of data on overall 'ever user', all the prevalence data have been taken as the prevalence of ever user for this review. ¢Smoked cigarettes or used other tobacco products on ≥ 1 of the 30 days preceding the survey.

tobacco product (male = 68.1%, female = 38.3%); 18.0% currently smoke cigarettes (male = 24.1%, female = 10.5%); 37.9% currently use other tobacco products (male = 45.5%, female = 28.6%) and 46.1% of never smokers are likely to initiate smoking next year.<sup>[23]</sup>

The possible explanations may be put forward for these differences that we used data on prevalence from whole range of high-school students i.e. from Class 6<sup>th</sup> to 12<sup>th</sup> for our study to reach better findings based on data published from 1991 to 2007. This outcome analysis of our systematic review was

definitely lesser than Global Youth Tobacco Survey which was collected in 13- to 15-year-old students from 1999 to 2002.

In our study, male predominance with wide inter-regional variation in prevalence was observed. The most unexpected finding from Global Youth Tobacco Survey was the lack of gender difference in rates of cigarette smoking and other tobacco use at most sites.<sup>[22]</sup>

In the study by Sinha *et al.* in 2004 on grade 8-10 (13-15 years), of the 2636 respondents, 71.8% (76.5% boys, 57.2% girls) were

ever tobacco users; of them 48.9% had used tobacco before 10 years of age. Current any tobacco use was reported by 58.9% boys 61.4%, girls 51.2%); smokeless tobacco by 55.6% (boys 57.6%, girls 49.2%) and smoking by 19.4% (boys 23.0%, girls 7.8%). Current tobacco use prevalence among students (boys 61.4%, girls 51.2%) was high.

In the study by Sinha *et al.* in 2003 on grade 8-10 (13-15 years), ever users of tobacco ranged from 75.3% (Mizoram) to 40.1% (Assam) and current tobacco use (any product) was 63% (Nagaland) to 36.1% (Assam). Current smokeless tobacco use ranged from 49.9% (Nagaland) to 25.3% (Assam). Mizoram reported the highest current smoking (34.5%, mainly cigarette) and Assam reported the lowest (19.7%, again mainly cigarette). Current smoking among girls (8.3%-28.2%) was also quite high.

In the study by Sing and Gupta on class 9-12 (13-18 year) of both sexes, smoking cigarettes or bidis was present in 43 boys (1.5%, 72.8% of users) and 8 girls (0.8%, 50.0% of users).

The reported prevalence of Jayant *et al.* in 1991 on final year private English-medium school boys revealed that ever usage (including experimenters/tryers) was 22.5%, while Indian language schools was 6.9% and municipal Indian language schools 13.8%. Girls from only Indian language schools were entered into the study and the proportion of tobacco users in them was very low (1.1%). Most (86%) boys who used tobacco were smokers.

Pednekar reported in 2004 that ever tobacco use was 13.5%, of which over 40% reported initiation at 10 years of age or earlier. The current tobacco use (any product) was reported by 4.5%, without much difference in smokeless tobacco use (2.8%) and smoking (3.0%). Smokeless tobacco was used mainly in the form of applying mishri, tobacco containing toothpaste or toothpowder. Smoking among boys was 3.5% and in girls was 2.2%.

George found in 1994 among 146 rural children and teenagers pan-tobacco-chewing, smoking, and drinking habits were 29%, 2% and 3%, respectively.

Moreover, our study revealed wide inter-regional variation in prevalence. The probable explanations of the above two findings were the inherent strength as well as weakness of our incredible India with different socio-economic-geographic and cultural pattern. On the top of everything, we lack related national data on this sensitive issue for our further discussions.

#### Limitations of Study

With the best of our efforts, we had to limit our data

published in peer-reviewed journals. Moreover, in the remote north-eastern state of Sikkim, we have limited availability of printed full published articles. So, we had to depend on on-line availability.

#### CONCLUSIONS

Substance use affects large numbers of high-school students in India. However, nationally representative data on the prevalence, risk factors and health consequences of substance use among high-school students are lacking within the region and globally, representing a future public health research priority. This kind of systematic review would be of immense impact if this activity could be replicated to bring out knowledge and positive change in attitude of health planners and help optimum quality life for our future generations.

#### REFERENCES

1. Peto R, Lopez AD, Boreham J, Thun M, Heath C Jr. Developing populations: the future health effects of current smoking patterns. In: Mortality from smoking in developed countries, 1950-2000. Oxford, Oxford University Press, 1994. A101-103.
2. Country profile India. J Indian Med Assoc 1999;97:377-8.
3. Murti PR, Bhonsle RB, Gupta PC, Daftary DK, Pindborg JJ, Mehta FS. Etiology of oral submucous fibrosis: Role of areca nut chewing. J Oral Pathol Med 1995;24:145-52.
4. Sinha DN, Gupta PC, Pednekar MS. Tobacco use among students in Eight North-eastern states of India. WHO, SEARO, New Delhi, OSH/CDC, Atlanta (Report on North-eastern GYTS). Available from: [http://intranet/EN/Section1174/section1462/pdfs/GYTS\\_Reports/GYTS\\_NES.pdf](http://intranet/EN/Section1174/section1462/pdfs/GYTS_Reports/GYTS_NES.pdf). [accessed on 2007 Oct 8].
5. Reddy KS, Perry CL, Stigler MH, Arora M. Differences in tobacco use among young people in urban India by sex, socioeconomic status, age, and school grade: Assessment of baseline survey data. Lancet 2006;367:589-94.
6. Health Organisation; Reducing Risks, Promoting Healthy Life. World Health Report 2002. Geneva: World Health Organisation; 2002.
7. Patel DR. Smoking and children. Indian J Pediatr 1999;66:817-24.
8. Sinha DN, Gupta PC, Pednekar M. Tobacco use among students in Bihar (India). Indian J Public Health 2004;48:111-7.
9. Smart RG, Hughes PH, Johnston LD. A methodology of student drug use surveys. WHO offset publication No. 50, 1980.
10. Singh V, Pal HR, Mehta M, Kapil U. Tobacco consumption and awareness of their health hazards amongst lower income group school children in National Capital Territory of Delhi. Indian Pediatr 2007;44:293-5.
11. Madan Kumar PD, Poorni S, Ramachandran S. Tobacco use among school children in Chennai city, India. Indian J Cancer 2006;43:127-31.
12. Singh V, Gupta R. Prevalence of tobacco use and awareness of risks among school children in Jaipur. J Assoc Physicians India 2006;54:605-7.
13. Jindal SK, Aggarwal AN, Gupta D, Kashyap S, Chaudhary D. Prevalence of tobacco use among school going youth in North Indian States. Indian J Chest Dis Allied Sci 2005;47:161-6.
14. Gajalakshmi V, Asma S, Warren CW. Tobacco survey among youth in South India. Asian Pac J Cancer Prev 2004;5:273-8.
15. Pednekar MS, Gupta PC. Tobacco use among school students in Goa, India. Indian J Public Health 2004;48:147-52.

16. Sinha DN, Gupta PC, Pednekar MS. Tobacco use among students in the eight North-eastern states of India. *Indian J Cancer* 2003;40:43-59.
17. Tsering D. A comparative study of substance abuse between the students of an urban high school and a rural high school in West Bengal, MD Thesis accepted in the West Bengal University of Health Sciences as the requirement for the degree of Doctor of Medicine (M.D.) in Community Medicine. 2003; 52, 53-70.
18. Rao EV, Mishra K, Mohapatra B. Prevalence of substance abuse among school going adolescents of various high schools of cuttack city. 2002: IPHA 2004, Bhubaneshwar souvenir;AB:28;56-57.
19. Kapoor SK, Anand K, Kumar G. Prevalence of tobacco use among school and college going adolescents of Haryana. *Indian J Pediatr* 1995;62:461-6.
20. George A, Varghese C, Sankaranarayanan R, Nair MK. Use of tobacco and alcoholic beverages by children and teenagers in a low-income coastal community in south India. *J Cancer Educ* 1994;9:111-3.
21. Jayant K, Notani PN, Gulati SS, Gadre VV. Tobacco usage in school children in Bombay, India: A study of knowledge, attitude and practice. *Indian J Cancer* 1991;28:139-47.
22. Global Youth Tobacco Survey Collaborating Group. Differences in worldwide tobacco use by gender: Findings from the Global Youth Tobacco Survey. *J Sch Health* 2003;73:207-15.
23. India – Sikkim FACT SHEET; Global Youth Tobacco Survey (GYTS). Available from: [http://intranet/EN/Section1174/section1462/pdfs/GYTS\\_Factsheets/india\\_sikkimfactsheet.pdf](http://intranet/EN/Section1174/section1462/pdfs/GYTS_Factsheets/india_sikkimfactsheet.pdf). [accessed on 2007 Oct 8].

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