RESEARCH COMMUNICATION

Patterns of Tobacco Use and Psychosocial Risk Factors Among Students in 6th through 10th Grades in India: 2004-2006

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Abstract

Introduction: In 2004, baseline surveys of Project MYTRI, a randomized intervention trial in Chennai and Delhi, India, found that tobacco use among 6th graders was greater than that among 8th graders. These results were surprising - typically, tobacco use increases with grade level. The present study aimed to assess whether this unique differential was sustained over time, as students moved into higher grades. Methods: Self-reported data from a sample of youth (n=3404) present at three annual surveys (2004, 2005, 2006) were analyzed. Mixed-effects regression models were used to compare prevalence of lifetime tobacco use and nine psychosocial risk factor scales between two student cohorts, 6th grade (or younger) cohort and 8th grade (or older) cohort. Stratified analyses were also conducted by gender, age, city and school type. Results: From 2004 to 2006, the 6th grade (or younger) cohort of students reported higher rates of lifetime tobacco use, and these differences were maintained over two years, even when the study sample was stratified by gender, age, city and school type. Similarly, students in the 6th grade (or younger) cohort scored greater risk for tobacco use on all psychosocial risk factors analyzed here. Discussion: Tobacco use was found to be problematic among students in two Indian cities, particularly so for those in younger grades. Projections of health impact due to tobacco may be larger than anticipated if these adolescents continue to use tobacco as young adults. Further epidemiologic research and interventions to curb tobacco use among young(er) adolescents are warranted.

Key Words: Youth - India - tobacco use - epidemiology - survey

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Introduction

In India, tobacco is consumed widely and in multiple forms – as chewing tobacco (e.g., gutkha), cigarettes, and bidis (hand-rolled cigarettes). This exacerbates the health, social and economic consequences of its use. Projections in India predict an exponential increase in tobacco-related mortality over the next two decades - from 1.4% of all deaths in 1990 to 13.3% in 2020 - the largest increase that any country worldwide will experience during this period (Reddy & Gupta, 2004). It is estimated that in 2010, smoking will cause about 930,000 adult deaths in India, with 70% of these deaths occurring among 30-69 year olds – the most productive years of life (Jha et al., 2008). Tobacco use is especially problematic among Indian youth. A 2004 survey of 10-16 year old students in Chennai and Delhi reported that 7% and 15% of the students in these cities had ever used cigarettes or any tobacco, respectively (Reddy et al., 2006). The first national report on tobacco control in India used the Global Youth Tobacco Survey (GYTS) to estimate that nearly one-fourth of the 13-15 year olds surveyed in the period 2000-2004 reported ever use of any tobacco. Lifetime use of any tobacco ranged from 4% in the state of Himachal Pradesh in Northern India to 75% in Mizoram in Eastern India (Reddy & Gupta, 2004). In the 2006 GYTS, 12% of a nationally representative sample of 13-15 year old students reported ever smoking cigarettes, and youth tobacco prevalence showed no significant decline from previous estimates (9.5% in 2003) (Sinha et al., 2008). Thus, tobacco use among Indian youth continues to be a public health concern that needs both etiologic investigation and early intervention. Epidemiologic evidence is needed to establish the patterns and risk factors for tobacco use among youth to support both planning and monitoring of tobacco control policies (Eissenberg & Balster, 2000). Such evidence can be used to prevent more adolescents and young people from joining the already high number of Indians that use tobacco, leading to a huge disease and death burden (Reddy & Gupta, 2004; Jha et al., 2008).

Worldwide, epidemiologic studies on youth tobacco use are undertaken to document the demographic and psychosocial risk factors that may lead to uptake or prevent cessation of tobacco use. Factors such as age, school grade, gender, socioeconomic status, self-efficacy, social skills and exposure to tobacco advertising, along

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with the prevalence of tobacco use among peers, family members and society at large, are commonly found to be associated with youth tobacco use (Abrams et al., 1991; Johnson et al., 2002; Hedman et al., 2007; Damianaki et al., 2008). Identification of such patterns and correlates can enable public health program planners to design appropriate interventions for youth and also, to examine if certain vulnerable subgroups are particularly resistant to benefits from population-based tobacco control policies. Much of this evidence comes from developed countries in North America and Europe, although data from developing countries are now becoming available due to initiatives such as the Global Tobacco Surveillance System (Warren et al., 2006).

The patterns and correlates of tobacco use among youth can be unique to specific parts of the world or even to particular countries and communities. This emerged, for example, in a 2004 tobacco prevalence study carried out among 6th and 8th grade students in Chennai and Delhi as part of a larger tobacco prevention intervention trial called Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives) in India (Perry et al., 2009). As reported in a baseline study from this trial, researchers found that contrary to what is commonly reported in scientific literature, tobacco use was greater in lower school grades, i.e. 6th grade students reported higher rates of tobacco use than 8th grade students (Reddy et al., 2006). A further etiologic investigation indicated that 6th grade students were at greater psychosocial risk making them more susceptible to tobacco use (Stigler et al., 2006). This led the researchers to report that their findings might be indicative of a recent trend in India, with younger cohorts of students experimenting with or initiating tobacco use at much younger ages (Reddy et al., 2006). It also raised an interesting research question, i.e. would this unique differential (i.e. younger students in the lower grade reporting more tobacco use than older students in the higher grade) be maintained, if information on tobacco use and risk factors was collected from follow-up on all or some of these students. Data from the control arm of the MYTRI trial offered us an excellent opportunity to answer this question by examining the natural history of tobacco use among students in Chennai and Delhi, India from 2004 to 2006.

Thus, the present study was conducted on a group of students who participated in three repeated surveys in 2004, 2005 and 2006 to examine whether being in the lower or younger grade was associated with a higher prevalence of tobacco use and risk factors at each survey. We also tested whether this unique differential in tobacco use by grade, if present in all three years, would be maintained within demographic subgroups, namely, by gender, city and socioeconomic status.

Materials and Methods

Study Design & Participants

In 2004, students in the 6th and 8th grades were recruited from 32 schools in Delhi (n=16) and Chennai (n=16) and were subsequently randomized to intervention and control condition for the MYTRI trial. Three annual follow-up surveys were administered to students to gather data on their tobacco use behaviors and psychosocial risk factors, in 2004, 2005 and 2006. At each of the three repeated surveys, all students in the eligible grades in intervention and control schools were invited to participate. The present study focused exclusively on students in control schools (n=16) to examine the prevalence of tobacco use in this study population under natural conditions (i.e. absence of any intervention). The sample size of Project MYTRI control students was 6368 in 2004, 5953 in 2005 and 4956 in 2006. Response rates for control students were 94% in 2004, 85.6% in 2005 and 79.6% in 2006.

For inclusion in the present study, we identified those students who participated in all three surveys and progressed academically each year from 2004 to 2006, i.e. those students that moved from 6th and 8th grades in 2004 to 7th and 9th grades in 2005, and finally, to 8th and 10th grades in 2006. This generated a set of longitudinal, or cohort, data on a sample of students in two grade cohorts, i.e. the 6th grade cohort and 8th grade cohort. Students who were in 6th grade and 8th grade when they first provided data in 2004 belong to the 6th grade cohort and 8th grade cohort, respectively. The final sample (n=3404) included 1837 students in the 6th grade cohort and 1567 students in the 8th grade cohort. Of this sample, 1808 students were girls (53%), 2243 students (66%) were from Chennai and 2110 students (62%) were from government schools (or low socio-economic status). Average age in years of the 6th grade cohort was 10.9 in 2004, 12 in 2005 and 12.9 in 2006. Average age in years of the 8th grade cohort was 12.7 in 2004, 13.8 in 2005 and 14.7 in 2006.

Attrition analyses were carried out to compare our final sample (n=3404) to those students who provided data only at the baseline survey in 2004, i.e. students who were excluded from our study (n=2964) as they were absent at one or both of the subsequent two follow-up surveys. These analyses indicated no statistically significant differences in drop-out rates between 6th and 8th grade students. Furthermore, although tobacco users were more likely to drop-out than non-tobacco users, this did not differ by grade (the primary independent variable in our analyses) and therefore, was unlikely to confound interpretation of differences in tobacco use by grade.

Data Collection

At all three surveys, data was collected using self-administered surveys completed by the students in classrooms after obtaining passive parental informed consent and active student assent, as mandated by the ethics boards. The survey forms had unique student identification codes to ensure confidentiality. Details about survey design and implementation have previously been published (Mishra et al., 2005; Reddy et al., 2006; Stigler et al., 2006; Stigler et al., 2007).

Measures

Prevalence of ever or lifetime use of cigarettes, bidis, chewing tobacco and any tobacco were selected as the tobacco-use outcomes in this study. Lifetime use, a

measure that is commonly used in tobacco surveillance around the world was measured by asking, "How old were you when you first chewed tobacco in any form/put a lit cigarette/bidi in your mouth?"(US Department of Health and Human Services, 1994; Warren et al., 2006; Johnston et al., 2008). A dichotomous tobacco use variable was created for each of the three tobacco products with '0' for those who reported never using these products, and '1' for those who did. In addition, a composite variable for 'any tobacco use' was created with a '0' for those who did not report any use of either chewing tobacco, cigarettes or bidis, and '1' for those who reported having used one or more of these products. As is common in longitudinal studies of substance use, we detected some reporting inconsistencies such as recanting or denial of previously reported tobacco use in a subsequent survey, or inconsistency within the same survey, e.g. reporting no lifetime use, while indicating current or past year use (Fendrich & Rosenbaum 2003; Percy et al., 2004). We adjusted for these inconsistencies by treating the reporting of lifetime tobacco use at the baseline study as valid; thus, students who reported lifetime tobacco use in 2004 (and 2005) were treated as users in 2005 (and 2006), respectively (Fendrich & Rosenbaum 2003; Reddy et al., 2006).

Nine psychosocial risk factors that are known to be associated with tobacco use among youth in India were assessed (Stigler et al., 2006). Multi-item summative scales were created by adding up the scores of responses to selected items in the surveys. Table 1 provides an overview of the scales used in the present study, along with mean scores, the Cronbach's alpha and example of an item for each scale. All scale scores were standardized and then used in the analyses. That is, the mean score of each scale was set to zero and the standard deviation was set to one, to enable comparisons across scales.

Data Analysis

All analyses were carried out using STATA (version 10). Mixed-effects regression models were used for the analyses, given the nested design of the present study (i.e., students nested within schools) (Raudenbush & Bryk, 2002; Rabe-Hesketh & Skrondal, 2008). A series of analyses at three points in time (i.e., 2004, 2005, 2006) were carried out on the overall sample (n=3404) to examine differences in tobacco use and psychosocial risk factor scales, with cohort membership (6th vs. 8th grade cohort) as the primary independent variable. In addition, stratified analyses were carried out by selected demographic factors such as city, gender and school type (a proxy for socioeconomic status). The level of statistical significance was set at $p<0.05$ and 95% confidence intervals or standard errors are reported for all estimates.

Results

Tobacco use

Overall, the proportion of students that reported lifetime use of any tobacco products in this study was 10.5% in 2004, 15.4% in 2005 and 20.3% in 2006. In all three years, prevalence of chewing tobacco was highest, followed by smoking cigarettes and bidis, in that order.

Results from the mixed-effects regression analyses on the lifetime use of tobacco products by grade cohort are shown in Table 2. We found statistically significant differences in use of any tobacco ($p<0.001$), chewing tobacco ($p<0.001$), bidis ($p<0.001$) and cigarettes ($p<0.001$), between the two cohorts in all three years. For example, in 2004, the proportion of students in the 6th grade cohort that reported ever chewing tobacco was over four times the proportion of students in the 8th grade cohort. In 2005 and 2006, three times as many students in the 6th grade cohort compared to the 8th grade cohort reported ever chewing tobacco. Thus, lifetime use of chewing tobacco was greater in the 6th grade cohort students from 2004 to 2006. Similar findings were obtained for smoking bidis and cigarettes, as well. From 2004 to 2006, prevalence of all tobacco products increased within both cohorts (as all students became older in age), but the unique differential between the grade cohorts was maintained.

Table 3 presents results from stratified analyses by selected sociodemographic factors, namely, gender, city and school type (or socioeconomic status). Within all demographic strata, lifetime use of any tobacco product was greater in the 6th grade cohort than the 8th grade

Table 1. Multi-item Summative Scales used to Measure Psychosocial Risk Factors, Delhi and Chennai

Risk Factor Scale[1]	Items	Range	Mean	S.D.	α[2]	Example of item
1 Intentions to chew tobacco	4	0-12	0.70	1.82	0.84	Do you think you will try chewing tobacco in the next month?
2 Intentions to smoke tobacco	5	0-12	0.35	1.23	0.83	Do you think you will try smoking when you are an adult?
3 Susceptibility - chew tobacco	4	0-12	0.56	1.70	0.86	If a close friend gave you tobacco, would you chew it?
4 Susceptibility - smoke tobacco	4	0-12	0.29	1.19	0.86	If someone at a party gave you tobacco, would you smoke it?
5 Knowledge of health effects	5	0-10	7.94	2.12	0.66	Are all kinds of tobacco dangerous?
6 Knowledge of policy	3	0- 6	3.44	1.82	0.70	Does your state have a law that bans tobacco sales to minors?
7 Self-efficacy (Refusal skills)	5	0-15	5.62	6.85	0.98	Do you think you could say "No" if a close friend gave you tobacco?
8 Self-efficacy (Advocacy skills)	8	0-24	18.0	7.31	0.93	Do you think you could ask an adult to stop smoking around you?
9 Reasons not to use tobacco	5	0-15	8.26	5.50	0.84	I would not want to use tobacco as I would be breaking my school's rules

[1]For risk factor scales, 1-4, a higher mean score represents greater risk for tobacco use. For risk factor scales 5-9, a lower mean score represents greater risk for tobacco use; [2]Cronbach's alphas, means and standard deviation (S.D.) estimates for the raw scales are from the compliant sub-sample (n=3,404) of students in 2004

Table 2. Prevalence of Lifetime Tobacco Use by Grade Cohort, Delhi and Chennai, 2004, 2005, 2006 (n=3404)

	6th grade (n=1837)		8th grade (n=1567)			
	%[1]	95% CI	%	95% CI	Ratio[2]	p-value
Any tobacco						
2004	15.1	12.6-18.0	4.88	3.71-6.41	3.09	<0.001
2005	21.6	18.5-25.0	8.35	6.68-10.4	2.58	<0.001
2006	25.9	22.1-30.0	12.2	9.82-15.0	2.12	<0.001
Chewing tobacco						
2004	11.7	9.8-14.0	2.7	1.96-3.71	4.34	<0.001
2005	17.1	14.6-19.9	5.1	3.98-6.60	3.33	<0.001
2006	21.0	18.1-24.3	6.7	5.28-8.47	3.14	<0.001
Bidis						
2004	4.66	3.36-6.42	1.56	1.00-2.41	2.99	<0.001
2005	6.92	5.14-9.26	2.27	1.54-3.35	3.05	<0.001
2006	9.46	7.29-12.2	4.26	3.06-5.90	2.22	<0.001
Cigarettes						
2004	5.21	3.89-6.95	1.59	1.04-2.43	3.28	<0.001
2005	8.75	6.92-11.0	3.51	2.55-4.81	2.49	<0.001
2006	11.61	9.25-14.5	6.10	4.59-8.07	1.90	<0.001

[1]Prevalence estimates for tobacco use generated using mixed-effects regression models, with ever tobacco use as dependent variable and grade cohort as independent variable. School was specified as a nested random effect. All models adjusted for age, school-type, gender and city; [2]Prevalence ratio, computed as ratio of tobacco use among students in 6th grade cohort versus those in 8th grade cohort

cohort, each year. For example, in both private schools and government schools, rates of ever use of any tobacco product among the 6th grade cohort students were nearly two to four times greater than those among the 8th grade cohort students. Within both cohorts in each subgroup (i.e. boys and girls, Chennai and Delhi students, private and government school students), lifetime prevalence of tobacco use increased from 2004 to 2006.

Analyses were also conducted to test for differences in tobacco use between the two cohorts, by age strata. As shown in Table 4, tobacco use was significantly greater in the 6th grade cohort as compared to the 8th grade cohort for students within selected age strata each year, i.e. for students who were 12 years or older in 2004; 13 years old and 15 years or older in 2005, and 14 years or older in 2006. Each year, tobacco use was higher for older students within each grade cohort. For example, within the 6th grade cohort in 2005, nearly twice as many students who were 15 years or older reported ever using any tobacco as compared to the students who were 12 years or younger. Tests for possible interaction between grade and age showed that such increase in tobacco use with age was similar in both grade cohorts.

Psychosocial risk factors

As shown in Table 5, analyses on the nine psychosocial risk factor scales indicated statistically significant differences between students in the two cohorts. Students in the 6th grade cohort had greater intentions and susceptibility to chew and smoke tobacco at all three surveys. Similarly, the 6th grade cohort reported poorer knowledge about health effects of tobacco use and tobacco control policy; poorer self-efficacy to refuse offers of tobacco products and to advocate for tobacco control, and had fewer reasons not to use tobacco. Differences on all risk factor scale scores were statistically significant in all three years, except for the two intentions and two susceptibility scales in 2006.

Table 3. Prevalence of Lifetime Use of any Type of Tobacco by Grade Cohort, Gender, City and School-type, Delhi and Chennai, 2004, 2005, 2006 (n=3404)

		6th grade cohort (n=1837)		8th grade cohort (n=1567)			
		%[1]	95% CI	%	95% CI	Ratio[2]	p-value
2004							
Gender	Girls (n=1808)	10.90	7.88 – 14.89	3.26	2.04 – 5.19	3.34	<0.001
	Boys (n=1596)	22.13	18.8 – 25.86	8.01	5.92 – 10.74	2.76	<0.001
City	Chennai (n=2243)	13.63	10.52 – 17.47	5.31	3.83 – 7.33	2.57	<0.001
	Delhi (n=1161)	17.08	13.79 – 20.96	4.25	2.56 – 6.96	4.02	<0.001
School	Private (n=1294)	11.48	7.83 – 16.53	4.98	3.22 – 7.60	2.31	0.013
	Government (n=2110)	17.21	13.40 – 21.82	5.11	3.50 – 7.39	3.37	<0.001
2005							
Gender	Girls (n=1808)	17.59	12.95 – 23.44	5.99	3.99 – 8.91	2.94	<0.001
	Boys (n=1596)	28.11	24.53 – 32.01	12.51	9.77 – 15.90	2.25	<0.001
City	Chennai (n=2243)	21.67	17.70 – 26.25	8.84	6.84 – 11.37	2.45	<0.001
	Delhi (n=1161)	21.42	16.99 – 26.63	7.32	4.58 – 11.49	2.93	<0.001
School	Private (n=1294)	21.07	15.01 – 28.74	5.99	3.91 – 9.06	3.52	<0.001
	Government (n=2110)	18.03	14.19 – 22.64	4.51	3.08 – 6.56	4.00	<0.001
2006							
Gender	Girls (n=1808)	20.96	15.79 – 27.28	8.62	5.99 – 12.25	2.43	<0.001
	Boys (n=1596)	33.72	29.47 – 38.26	18.30	14.6 – 22.75	1.84	.<0.001
City	Chennai (n=2243)	25.47	20.28 – 31.47	12.17	9.25 – 15.86	2.09	<0.001
	Delhi (n=1161)	25.33	21.22 – 29.95	13.58	9.41 – 19.20	1.87	0.003
School	Private (n=1294)	24.56	18.32 – 32.10	12.63	9.02 – 17.41	1.94	0.005
	Government (n=2110)	26.65	21.81 – 32.12	11.97	9.00 – 15.76	2.23	<0.001

[1]Prevalence estimates for tobacco use generated using mixed-effects regression models, with ever tobacco use as dependent variable and grade cohort as independent variable. School was specified as a nested random effect. All models adjusted for age, and also adjusted for (when not stratified by) gender, city and school type. 2Prevalence ratio, computed as ratio of tobacco use among students in 6th grade cohort versus those in 8th grade cohort

Table 4. Prevalence of Lifetime Use of any Type of Tobacco by Grade Cohort and Age, Delhi and Chennai, 2004, 2005, 2006 (n=3404)

		6th grade cohort (n=1837)		8th grade cohort (n=1567)			
		Number[1]	Prevalence[2]	Number	Prevalence	Ratio[3]	p-value
2004	<=11 years	1,540	11.20 (9.20 – 13.6)	96	8.86 (4.19 – 17.8)	1.27	0.528
	12 years	206	24.77 (18.8 – 31.9)	602	4.36 (2.95 – 6.41)	5.68	<0.001
	13 years	62	13.79 (7.03 – 25.3)	574	5.92 (4.16 – 8.35)	2.33	0.019
	>=14 years	19	17.40 (5.92 – 41.4)	290	5.96 (3.10 – 11.2)	2.92	0.036
		1,827		1,562			
2005	<=12 years	1,436	16.69 (14.3 – 19.4)	88	11.46 (5.92 – 21.0)	1.46	0.235
	13 years	328	26.18 (20.7 – 32.5)	573	7.38 (5.27 – 10.3)	3.55	<0.001
	14 years	48	16.61 (8.30 – 30.5)	599	10.16 (7.34 – 13.9)	1.63	0.159
	>=15 years	18	32.31 (14.2 – 57.9)	305	13.34 (8.84 – 19.6)	2.42	0.030
		1,830		1,565			
2006	<=13 years	82	20.95 (17.9 – 24.3)	1,551	20.38 (12.0 – 32.5)	1.03	0.914
	14 years	622	28.36 (21.4 – 36.6)	217	9.70 (7.06 – 13.2)	2.92	<0.001
	>=15 years	862	33.81 (22.1 – 47.9)	60	17.69 (14.3 – 21.7)	1.91	0.003
		1,828		1,566			

[1]Analysis sample differed (in 2004, n=3389; in 2005, n=3395; in 2006, n=3394), according to number of students who did not report age each year; [2]Prevalence estimates for tobacco use generated using mixed-effects regression models, with ever tobacco use as dependent variable and grade cohort as independent variable. Figures in parentheses are 95% CI. School was specified as a nested random effect. All models adjusted for gender, city and school type; [3]Prevalence ratio, computed as ratio of tobacco use among students in 6th grade cohort versus those in 8th grade cohort

Table 5. Psychosocial Risk Factors for Tobacco Use by grade cohort, Delhi and Chennai, 2004, 2005, 2006 (n=3404)

	6th grade (n=1837)		8th grade (n=1567)		
Risk factor scales[1]	Mean[2]	S.E.	Mean	S.E.	p-value
1 Intentions to chew tobacco					
2004	-0.03	0.041	-0.31	0.043	<0.001
2005	0.00	0.029	-0.23	0.032	<0.001
2006	-0.04	0.036	-0.09	0.039	0.407
2 Intentions to smoke tobacco					
2004	-0.11	0.025	-0.27	0.028	<0.001
2005	-0.08	0.031	-0.17	0.033	0.049
2006	-0.05	0.044	-0.08	0.046	0.480
3 Susceptibility to chew tobacco					
2004	-0.05	0.056	-0.21	0.057	<0.001
2005	-0.03	0.031	-0.16	0.034	0.005
2006	-0.03	0.046	-0.05	0.049	0.753
4 Susceptibility to smoke tobacco					
2004	-0.10	0.026	-0.26	0.028	<0.001
2005	-0.08	0.036	-0.16	0.039	0.041
2006	-0.06	0.048	-0.05	0.051	0.784
5 Knowledge of health effects					
2004	-0.04	0.039	0.31	0.041	<0.001
2005	-0.06	0.037	0.14	0.040	<0.001
2006	-0.09	0.047	0.08	0.049	0.001
6 Knowledge of policy					
2004	-0.03	0.045	0.21	0.047	<0.001
2005	-0.19	0.039	0.26	0.042	<0.001
2006	-0.16	0.036	0.10	0.039	<0.001
7 Refusal skills efficacy					
2004	-0.26	0.073	0.26	0.075	<0.001
2005	-0.11	0.059	0.34	0.061	<0.001
2006	-0.07	0.055	0.45	0.057	<0.001
8 Advocacy skills efficacy					
2004	-0.14	0.060	0.42	0.062	<0.001
2005	-0.07	0.046	0.33	0.048	<0.001
2006	0.01	0.064	0.24	0.065	<0.001
9 Reasons not to use tobacco					
2004	-0.18	0.061	0.25	0.062	<0.001
2005	-0.12	0.056	0.33	0.057	<0.001
2006	-0.13	0.059	0.35	0.061	<0.001

[1]Standardized scales used in all analyses. Risk factor scale score estimates generated using mixed-effects regression models, with the risk factor as dependent variable and grade cohort as independent variable. School was specified as a nested random effect. All models adjusted for age, gender, city and school-type; [2] For risk factor scales, 1-4, a higher mean score represents greater risk for tobacco use. For risk factor scales 5-9, a lower mean score represents greater risk for tobacco use

Discussion

The overall prevalence estimates of tobacco use among school students in India in this study confirm that consumption of multiple forms of tobacco products is an important risk to adolescent health and future chronic disease burden in India. For example, similar to other reports, we found a greater prevalence of chewing tobacco than smoking bidis or cigarettes at all three annual surveys (Reddy & Gupta, 2004.). Similarly, in 2006, when students were 12-16 years old, 10% of the entire sample in our study reported ever smoking cigarettes (not shown in Table). This is comparable to the 2006 estimate reported from a national GYTS where 12% of 13-15 year old students reported ever smoking cigarettes (Sinha et al., 2008). Experimentation with tobacco use at younger ages is generally predictive of future use; thus more efforts are needed to investigate youth tobacco use and implement tobacco prevention policies and programs in India (Eissenberg & Balster, 2000; Fidler et al., 2006; Reddy et al., 2005; Warren et al., 2006).

In answer to our research question, we confirmed that

the prevalence of lifetime tobacco use was greater in the 6th grade cohort students than the 8th grade cohort, when they were followed up at three annual surveys as part of the larger intervention trial. The 6th grade cohort also reported greater intentions and susceptibility to use tobacco than the 8th grade cohort, and had a significantly smaller score on the scales for knowledge and self-efficacy related to tobacco control. Thus, the students in lower grades were more socially susceptible to tobacco use compared to those in higher grades. These findings are different from results of youth tobacco prevalence studies from other countries that have typically reported an increase in tobacco (and other drug) use with school grade (Abrams et al., 1999; Damianaki et al., 2008; Hedman et al., 2007; Johnson et al., 2002; Johnston et al., 2008; Leatherdale, Hammond & Ahmed, 2008; US Department of Health and Human Services, 1994). Our results, based on an urban school-going sample from two cities may be indicative of a recent trend in India with larger numbers of younger students in lower grades starting to experiment with tobacco, as compared to students before them.

Findings from key surveillance systems in the United States suggest that if one class cohort shows an "unusually high rate of smoking at an early age relative to other cohorts, the rate is likely to remain high throughout the life cycle relative to that of the other class cohorts at equivalent ages" (Johnston et al., 2008, p. 29). Our results indicate that such a cohort effect may generalize to this study population in India, as well. For example, the prevalence of ever use of chewing tobacco was 21% in the 6th grade cohort in 2006 as compared to only 2.7% in the 8th grade cohort in 2004, when these students, on average, were 13 years old. Thus, we confirmed a cohort effect by finding that students that belonged to the 6th grade cohort maintained their unusually high rate of tobacco use compared to the 8th grade cohort at equivalent ages over the follow-up period.

The strengths of this study include a large sample size of students with high participation rates at each of the three surveys (Reddy et al., 2006; Stigler et al., 2006). The issue of validity was addressed during survey design, pilot implementation and finally, during the actual data collection. Measures of tobacco use and psychosocial risk factors that have been shown to be valid and reliable in urban Indian settings were used (Stigler et al., 2006). Administration of surveys was done in a confidential manner to increase reliability and validity of self-reported data, and research staff remained available in the classrooms during survey administration to answer any questions (US Department of Health and Human Services, 1994; Stigler et al., 2006). Finally, mixed effects regression models were applied as appropriate to the nested study design with students nested within schools (Raudenbush & Bryk, 2002; Rabe-Hesketh & Skrondal, 2008).

Weaknesses include reliance on self-reported data on tobacco use since data collection on biochemical markers can be complicated in the Indian setting due to costs and the multiple forms of tobacco use. However, self-reported tobacco use has been shown to be a valid measure among youth in other settings and is commonly used to report youth tobacco prevalence from India (Komro et al., 2004; Post et al., 2005; Sinha et al., 2008). Reporting inconsistencies had to be corrected before analyses, in order to adjust for recanting of previously reported tobacco use. Recanting by the students could be due to various reasons such as failure to recall tobacco use in the past; confusion with regard to the reference timeframe of lifetime use in follow-up surveys or concerns about disclosure of tobacco use in repeated surveys. Such recanting is almost universally encountered in longitudinal studies that administer school-based self-administered surveys and warrants appropriate adjustment in data analyses, which was the approach followed in this study (Fendrich & Rosenbaum 2003; Percy et al., 2004). Finally, all results are based on a sample of students from selected schools in only two cities in India. Furthermore, although attrition analyses indicated no significant difference in loss to follow-up by grade cohort, significantly more tobacco users in 2004 dropped out of the study than non-tobacco users. These factors are likely to limit the generalizability of our study results.

This research paper, specific to the period 2004 to 2006, contributes to the epidemiological evidence for tobacco use in India by examining tobacco use and its psychosocial risk factors among the same set of students at three annual follow-up surveys. Findings showed that younger students in lower grades in Chennai and Delhi, India were using tobacco at higher rates than older students before them. It is recommended that epidemiological and policy research for tobacco use and its prevention in urban India should consider targeting young(er) age groups.

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