RESEARCH ARTICLE

Is Tobacco Use Associated With Academic Failure Among Government School Students in Urban India?

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ABSTRACT

BACKGROUND: Not much is known about the academic correlates of tobacco use among students in developing countries. This study investigated associations between multiple forms of tobacco use, psychosocial risk factors, and academic failure among 10- to 16-year-old government school students in Delhi and Chennai, India.

METHODS: This study was a secondary analysis of data gathered from students in 7 government schools during a larger tobacco intervention trial in India. Mixed-effects regression analyses were carried out on a cross-sectional sample of 3799 students and a retrospective cohort of 2586 students. Data on tobacco use and risk factors were collected from self-reported student surveys in 2006 and 2004. Using school records, academic failure was defined as repeating the same grade level once or twice between 2004 and 2006.

RESULTS: In 2006, academic failure was significantly more prevalent among students who reported use of chewing tobacco, bidis, or cigarettes, as compared with nonusers. Students with academic failure had greater social susceptibility and intentions for future tobacco use, and poor knowledge and self-efficacy for avoiding tobacco. Cohort analyses showed that students who had reported tobacco use in 2004 were more likely to have academic failure by 2006, as compared with nonusers.

CONCLUSIONS: School health programs that incorporate tobacco control measures should be offered to government school students with poor academic outcomes in India, along with remedial education efforts. School-based longitudinal research is needed to assess effects of tobacco use in early adolescence on academic, social, and behavioral outcomes in later adolescence and young adulthood.

Keywords: smoking and tobacco; child and adolescent health; risk behaviors; international health.

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It is well documented in the literature that onset of tobacco use in early adolescence not only predicts future tobacco use and addiction but is also often associated with other drug use, delinquent behaviors, academic, and social problems.[1-3] Tobacco use starts at an early age in India, and recent estimates indicate high rates of experimentation with and consumption of multiple types of tobacco products by school students.[4-6] Among adults in India, tobacco use is particularly prevalent among the less educated and poor.[7,8] Similarly, among school-going children, tobacco use is especially common among those attending government (ie, public) schools, which cater to children from lower socioeconomic backgrounds.[9,10] In India, as in other south Asian settings, the type of school, that is, government versus private, is commonly used as a surrogate measure for socioeconomic status in school-based surveys, with children from lower socioeconomic background more commonly attending government schools.[10,11] As compared with private schools, government schools in India are more likely to have poor infrastructure, high rates of failure, and poor learning outcomes.[12,13] Thus, government school students or students from lower socioeconomic background can be at a disproportionately high risk of tobacco use as well as academic problems. This poses a unique research question—do these 2 factors, namely, tobacco use and poor academic outcomes, coexist among adolescents attending government schools in India?

Cross-sectional studies from several countries have found associations between tobacco use and poor academic outcomes, lack of academic motivation, as well as school dropout.[14-20] Several theories have been proposed in the literature to explain this relationship.[21] In the general deviance or problem behavior theory, tobacco use and academic failure are treated as a manifestation of an overall tendency and vulnerability of adolescents toward deviant and risky behaviors, due to various underlying factors such as poor family support. Even in a study among academically successful students, emotional stability and parent education level were proposed as mediators in the association between drug use and academic achievement.[22] The psychogenic theory explains that poor academic outcomes or other problems at school can make students more susceptible to uptake of tobacco use.[21] This is supported by some longitudinal studies, which reported that low academic performance and low future expectations can lead to substance use.[23-25] More generally, researchers have argued in favor of the opposite direction by showing that early tobacco use or smoking predicts future substance use, academic, and other social problems.[26-29] This is the premise of the impaired ability theory, which proposes a negative impact of early tobacco use on future learning and school outcomes.[21] Thus, the issue of bidirectional causality remains unresolved, and depending on the setting, tobacco use behaviors have been shown to either precede or follow poor academic outcomes. Overall, however, the negative association between academic outcomes and tobacco use seems undisputed.[14-21,23-29]

Recent reviews have called for more research on the impact of early tobacco use on future social and behavioral outcomes.[3,30] Most of the research evidence that forms the basis for the known associations between tobacco use and academic outcomes comes from developed countries. Apart from 1 cross-sectional study cited here, not much is known about the academic correlates of tobacco use among school-going adolescents in India.[18] Furthermore, most of the literature focuses exclusively on the association between cigarette use and academic outcomes. It is not clear whether these associations hold for other tobacco products such as chewing tobacco and bidis (hand-rolled local cigarettes), which are more commonly consumed than cigarettes in India.[31] Given this background, this study investigated the association between multiple forms of tobacco use, its psychosocial risk factors, and academic failure among government school students in 2 cities, Delhi and Chennai, in India. In this study, we hypothesized that all forms of tobacco use (cigarettes, bidis, and chewing tobacco) and its psychosocial risk factors were associated with academic failure among government school students. For this purpose, we used data gathered in 2006 and 2004 using student surveys in government schools, during a larger school-based tobacco intervention trial called Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India).[31-33]

METHODS

This study is a secondary (cross-sectional and cohort) analysis of data gathered from government school students with the original purpose to ascertain efficacy of Project MYTRI interventions. By 2006,

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the trial had modified tobacco use and its risk factors among intervention students.[33] Therefore, only students from government schools in the control condition (4 schools in Chennai and 3 schools in Delhi) in the trial were included in this study.

Subjects

Two samples of government school students were analyzed: (1) the 2006 cross-sectional sample and (2) a 2004 to 2006 cohort sample. The cross-sectional sample of 3799 students (average age in 2006, 14 years) consisted of all government school control students from the 2 cities who participated in the 2006 survey. Of these 3799 students, 1874 (49%) were males and 2662 (70%) attended schools in Chennai. Response rate of students in this sample was 86.8%; over 70% of the nonresponse was primarily caused by refusal of one control school (n = 431) due to scheduling conflicts. Data on academic failure were available for this entire sample. For the cohort analyses, a retrospective cohort design was used to select participants. That is, from the cross-sectional sample of 3799 students with data on academic failure (outcome), we selected those students who had also provided data on tobacco use (past exposure) in 2004. This gave us a cohort sample of 2586 students (average age in 2006, 14 years; in 2004, 12 years), of which 1446 (56%) were males and 1848 (72%) attended schools in Chennai.

Procedures

Schools that were willing to commit to 2 years of full participation had been selected in the larger intervention trial using convenient sampling methods. However, appropriate attention was given to ensure that the sampled schools were representative of the mix of types of schools typically present in Indian cities, such as government, private, same-sex, and coeducational schools.[5] Trained field staff introduced and distributed the survey forms to students for completion in the classrooms. The survey forms had unique student identification codes that ensured confidentiality and allowed us to track data provided by each student at different points in time. Passive, but informed, parental consent and active student assent were obtained for the surveys by field staff before survey administration, as required by the ethics boards. Further details about survey implementation have been previously published.[31-33]

Instruments

All data on tobacco use and risk factors were self-reported by students. Survey questions were adapted from established instruments such as the Global Youth Tobacco Survey and the survey underwent rigorous pilot testing to ensure reliability and validity among school students in India.[6,31,34] Surveys were administered in the local language in each city, that is, in Hindi in Delhi and Tamil in Chennai.

For this study, prevalence of ever (lifetime) use, past year use, and current use of cigarettes, bidis, chewing tobacco, and any tobacco were selected as the tobacco-use variables. Ever use was measured by asking, ''How old were you when you first chewed tobacco in any form/put a lit cigarette/bidi in your mouth?'' Current use was measured by asking, ''During the last 30 days, did you chew tobacco in any form/smoke 1 or more bidis/cigarettes?'' Past year use was measured by asking, ''During the past 1 year did you chew tobacco in any form/smoke 1 or more bidis/cigarettes?'' Dichotomous variables for ever use, past year use, and current use were created by assigning ''0'' to those who reported never engaging in these behaviors, and ''1'' to those who did. For ever use, current use, and past year use, a composite variable for ''any tobacco'' was also created with a ''0'' for those who did not use any of the 3 specific tobacco products (chewing tobacco, cigarettes, or bidis) and ''1'' for those who used 1 or more of these products. Psychosocial risk factors that are known to be associated with tobacco use among youth in India were also assessed.[31] Multiple 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 this 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 1, to enable comparisons across scales.

School records were used to obtain data on academic status. The variable used to measure academic status was a dichotomous variable that was assigned a ''0'' if the student had progressed academically each year during the project period, that is, the student progressed to the successive higher grade for each of the 3 surveys from 2004 to 2005 and then from 2005 to 2006. These students were in grades 8 or 10 in 2006. Academic status was defined as academic ''failure'' and assigned a ''1'' for those students who had repeated the same grade level once or twice between 2004 and 2006. These students were in grades 6, 7, 8, or 9 in 2006.

Data Analysis

Cross-sectional analyses were carried out to test for any associations of ever, past year, and current tobacco use with academic failure in 2006. Here, academic status in 2006 was the dependent variable and tobacco use in 2006 was the independent variable. This approach was also used to test for

Table 1. Multi-Item Summative Scales Used to Measure Psychosocial Risk Factors, Delhi and Chennai, 2006

	Risk Factor Scale*	Items	Range	Mean	SD	$\alpha^\dagger$	Example of Item
1.	Intentions to chew tobacco	4	0 to 12	0.54	1.74	0.89	Do you think you will try chewing tobacco in the next month?
2.	Intentions to smoke tobacco	5	0 to 12	0.48	1.72	0.90	Do you think you will try smoking when you are an adult?
3.	Susceptibility to chew tobacco	4	0 to 12	0.45	1.68	0.91	If a close friend gave you tobacco, would you chew it?
4.	Susceptibility to smoke tobacco	4	0 to 12	0.39	1.57	0.92	If someone at a party gave you tobacco, would you smoke it?
5.	Knowledge of health effects	5	0 to 10	7.76	2.40	0.79	Are all kinds of tobacco dangerous?
6.	Knowledge of policy	3	0 to 6	3.55	1.84	0.73	Does your state have a law that bans tobacco sales to minors?
7.	Refusal skills efficacy	5	0 to 15	4.47	6.50	0.98	Could you say no if a close friend gave you tobacco?
8.	Advocacy skills efficacy	8	0 to 24	14.93	9.41	0.97	Do you think you could help a friend stop using tobacco?

*For risk factor scales, 1 to 4, a higher mean score represents greater risk for tobacco use. For risk factor scales 5-8, a lower mean score represents greater risk for tobacco use.
$\dagger$Cronbach's αs, means, and SD estimates for the raw scales are from 2006 cross-sectional sample (n = 3799).

associations between psychosocial risk factors and academic failure in 2006. The psychosocial risk factor scales were the dependent variables and academic status was the independent variable in these analyses. Next, the retrospective cohort sample was used to test whether ever or current tobacco use in 2004 predicted academic failure in 2006. For this, academic status in 2006 was treated as the dependent variable and tobacco use in 2004 as the independent variable. Given the nested sampling design, that is, students nested within schools, mixed-effects regression models were used to take into account the variability in the dependent variable (eg, tobacco use) that would exist between students as well as between schools. All models were adjusted for age, gender, and city, and analyses were conducted in STATA (Version 10) statistical software.[35]

RESULTS

Table 2 presents the overall rates of tobacco use in the 2 samples used in this study. In the cross-sectional sample, ever use of chewing tobacco was most prevalent (5.53%) among the students in 2006, as compared with bidis (3.31%) and cigarettes (4.62%). Similarly, in the retrospective cohort sample, ever use of chewing tobacco was most prevalent (8.36%) among the students in 2004, as compared with bidis (7.16%) and cigarettes (6.32%). The prevalence of academic failure in 2006 was nearly 15%, in both samples.

Table 2. Prevalence of Tobacco Use and Academic Failure in the 2 Study Samples, Delhi and Chennai, 2006 and 2004

Cross-Sectional Sample 2006 (n = 3799)			Retrospective Cohort Sample 2004 and 2006 (n = 2586)		
	Percent*	95% CI		Percent*	95% CI
Ever use, 2006			*Ever use, 2004*		
Any tobacco	7.67	5.60-10.43	Any tobacco	12.84	8.59-18.75
Chewing tobacco	5.53	4.08-7.45	Chewing tobacco	8.36	5.08-13.46
Bidis	3.31	2.03-5.37	Bidis	7.16	4.58-11.04
Cigarettes	4.62	3.12-6.79	Cigarettes	6.32	3.85-10.21
Past-year use, 2006					
Any tobacco	3.03	1.83-4.99			
Chewing tobacco	1.47	0.97-2.22			
Bidis	0.88	0.37-2.10			
Cigarettes	1.42	0.75-2.65			
Current use, 2006			*Current use, 2004*		
Any tobacco	2.24	1.39-3.58	Any tobacco	3.64	2.49-5.31
Chewing tobacco	1.05	0.67-1.67	Chewing tobacco	2.40	1.61-3.56
Bidis	0.81	0.49-1.34	Bidis	1.44	0.81-2.55
Cigarettes	1.35	0.70-2.59	Cigarettes	1.30	0.75-2.27
Academic failure, 2006	14.73	8.38-24.59	*Academic failure, 2006*	14.99	7.63-27.34

*Prevalence estimates of tobacco use and academic failure for the overall samples generated using mixed-effects regression models. School was specified as a nested random effect.

Association Between Tobacco Use and Academic Failure in 2006

Table 3 presents results from the cross-sectional analyses of government school students in 2006. Statistically significant differences were found in academic status of students by their reports of ever use of any tobacco (p < .001), chewing tobacco (p < 001), bidis (p < .001), and cigarettes (p < .001). For example, in 2006, students who reported ever use of cigarettes and chewing tobacco were nearly 2 and 3 times more likely, respectively, to have repeated a grade in the last 2 years, as compared with those who did not report such use. Statistically significant differences in rates of academic failure were also found by past year tobacco use (bidis, p < .001) and current tobacco use (bidis, p < .001; chewing tobacco, p < .05) among students. For example, students who reported being current bidi smokers at the survey in 2006

were over 3 times more likely to have repeated a grade in the last 2 years, as compared with those who were not current bidi smokers. No statistically significant differences were found for academic status by past year of chewing tobacco or cigarettes, and current use of cigarettes. For ever, past year, and current use, the magnitude of association between academic status and tobacco use was strongest for bidi smoking.

Association Between Psychosocial Risk Factors and Academic Failure in 2006

As shown in Table 4, statistically significant differences were found between students with and without academic failure for all 8 psychosocial risk factors (p < .001) considered here. Those who had failed reported greater intentions to chew and smoke tobacco and were also more socially susceptible to use tobacco,

Table 3. **Prevalence of Academic Failure for Tobacco Users and Nonusers, Delhi and Chennai, Cross-Sectional Sample, 2006 (n = 3799)**

	Users in 2006		Nonusers in 2006		Ratio[†]	p-Value
	Percent*	95% CI	Percent	95% CI		
Ever use						
Any tobacco	25.35	18.92-33.07	11.18	8.75-14.18	2.27	<.001
Chewing tobacco	30.67	22.99-39.59	11.22	8.87-14.10	2.73	<.001
Bidis	36.84	26.84-48.11	11.39	8.94-14.41	3.23	<.001
Cigarettes	23.62	16.76-32.19	11.88	9.51-14.73	1.99	<.001
Past-year use						
Any tobacco	20.89	13.85-30.25	11.92	9.75-14.49	1.75	.005
Chewing tobacco	15.28	7.96-27.34	12.36	10.03-15.14	1.24	.497
Bidis	32.52	19.76-48.54	11.97	9.71-14.67	2.72	<.001
Cigarettes	17.85	9.74-30.45	12.17	9.82-14.98	1.47	.190
Current use						
Any tobacco	23.91	15.19-35.55	11.93	9.59-14.74	2.00	.002
Chewing tobacco	23.40	12.22-40.13	12.16	9.81-15.02	1.92	.042
Bidis	40.52	23.44-60.26	12.12	9.81-14.89	3.34	<.001
Cigarettes	18.97	10.48-31.90	12.26	9.85-15.16	1.55	.127

*Prevalence estimates for academic failure in 2006 generated using mixed-effects regression models, with 2006 academic status (failure vs. progress) as dependent variable and 2006 tobacco use (user vs. nonuser) as independent variable. School was specified as a nested random effect. All models were adjusted for age, gender, and city.
[†]Prevalence ratio of academic failure in 2006, computed as ratio of failure among students who reported tobacco use in 2006 versus those who reported no tobacco use in 2006.

Table 4. **Psychosocial Risk Factors for Tobacco Use by Academic Status, Delhi and Chennai, Cross-Sectional Sample, 2006 (n = 3799)**

	Academic Status — Failure (n = 583)		Academic Status — Progress (n = 3216)		p-Value
Risk Factor Scales*	Mean[†]	SE	Mean	SE	
1. Intentions to chew tobacco	0.12	0.042	−0.10	0.023	<.001
2. Intentions to smoke tobacco	0.11	0.041	−0.08	0.021	<.001
3. Susceptibility to chew tobacco	0.14	0.039	−0.11	0.017	<.001
4. Susceptibility to smoke tobacco	0.12	0.039	−0.09	0.019	<.001
5. Knowledge of health effects	−0.54	0.061	0.02	0.046	<.001
6. Knowledge of policy	−0.48	0.058	0.02	0.043	<.001
7. Refusal skills efficacy	−0.66	0.104	−0.29	0.098	<.001
8. Advocacy skills efficacy	−0.75	0.092	−0.08	0.083	<.001

*Standardized scales used in all analyses. Risk factor scale score estimates generated using mixed-effects regression models, with the risk factor as dependant variable and academic status as independent variable. School was specified as a nested random effect. All models were adjusted for age, gender, and city.
[†]For risk factor scales, 1 to 4, a higher mean score represents greater risk for tobacco use. For risk factor scales 5 to 8, a lower mean score represents greater risk for tobacco use.

Table 5. Prevalence of Academic Failure for Tobacco Users and Nonusers, Delhi and Chennai, Retrospective Cohort Sample, 2006 and 2004 (n = 2586)

	Users in 2004		Nonusers in 2004		Ratio[†]	p-Value
	Percent*	95% CI	Percent*	95% CI		
Ever use, 2004						
Any tobacco	20.75	14.45-28.87	10.27	7.35-14.18	2.02	<.001
Chewing tobacco	18.35	12.25-26.57	11.38	8.24-15.50	1.61	.002
Bidis	24.21	16.19-34.57	10.73	7.60-14.94	2.26	<.001
Cigarettes	23.34	15.50-33.57	11.15	8.02-15.31	2.09	<.001
Current use, 2004						
Any tobacco	24.97	15.40-37.83	11.18	8.17-15.10	2.23	<.001
Chewing tobacco	17.41	9.01-30.99	11.76	8.56-15.95	1.48	.195
Bidis	28.30	14.51-47.87	11.83	8.56-16.12	2.39	.007
Cigarettes	35.81	19.17-56.74	11.40	8.21-15.63	3.14	<.001

*Prevalence estimates for academic failure in 2006 generated using mixed-effects regression models, with 2006 academic status (failure vs. progress) as dependent variable and 2004 tobacco use (user vs. nonuser) as independent variable. School was specified as a nested random effect. All models were adjusted for age, gender, and city.
[†]Prevalence ratio of academic failure in 2006, computed as ratio of failure among students who reported tobacco use in 2004 versus those who reported no tobacco use in 2004.

as compared with those who did not fail. Similarly, students who had failed at school reported less knowledge about health effects of tobacco use and tobacco control policies. Furthermore, students who had failed reported poorer self-efficacy with regard to refusing offers of tobacco and advocating for cessation of tobacco use among their families and friends.

Impact of Tobacco Use in 2004 on Academic Status After 2 Years

As shown in Table 5, ever or current tobacco users in 2004 were more likely to repeat the same grade level once or twice by 2006. For example, students who were ever or current bidi users in 2004 were twice as likely to have failed by 2006, as compared with nonusers. Similarly, current cigarette users in 2004 were 3 times more likely to have failed by 2006, as compared with nonusers. This temporal association between tobacco use in 2004 and academic failure by 2006 was statistically significant for all tobacco use variables (p < .001 or p < .01), except current use of chewing tobacco in 2004 (p = .195).

DISCUSSION

In this study of 10- to 16-year-old government school students in Delhi and Chennai, we found that students who reported lifetime (ever) use of chewing tobacco, cigarettes, and bidis in 2006 were significantly more likely to have repeated a grade once or twice between 2004 and 2006, as compared with those who did not report such use. Consistent with our research hypothesis and previous cross-sectional studies, this confirmed the coexistence of lifetime tobacco use with academic failure among government school students, who are typically from a low socioeconomic background.[14-20] Students who reported past-year use of bidis and current use of chewing tobacco or bidis

were also significantly more likely to have failed at school, when compared with nonusers. Recent global youth prevalence studies have found high prevalence of noncigarette tobacco products among students, and in our study, similar to a study on water pipes from Israel, such use was strongly associated with academic failure.[34,36]

Students who had failed at school expressed greater intentions to consume tobacco and had greater social susceptibility to accept offers of tobacco products. These psychosocial risk factors are strongly associated with tobacco use behaviors for the student population from which our sample was selected.[10,31] With a risk profile of greater susceptibility and poorer self-efficacy, students who had failed at school would be more likely to initiate and increase tobacco use as young adults. Similarly, in addition to failing at academic exams, students who failed had lower scores on knowledge scales for health outcomes of tobacco and tobacco control policies.

Findings from the retrospective cohort analyses indicated that tobacco use was a predictor of poor academic outcomes (ie, failure), similar to findings from other longitudinal studies that previously examined this question.[26-29] In fact, in this study, lifetime and current use of chewing tobacco, bidis, and cigarettes measured at 12 years of age could already predict poor academic outcomes after 2 years. As proposed by the impaired ability theory, this academic failure could have been, in part, due to a low interest in studying and decreased learning ability caused by tobacco use in our study population, which was already at risk of poor learning outcomes in the government schools.[12,13,21] Given the nature of our data, we were unable to test the reverse question, that is, whether academic failure led to initiation of tobacco use, as has been reported in some studies.[23-25]

Coexistence of tobacco use, its psychosocial risk factors, and academic problems can significantly hinder future health and development of young students. This is compounded by the fact that tobacco is commonly a "gateway drug," indicative of other substance use and health risk behaviors among adolescents.[37] As noted earlier, the negative association between tobacco use and academic outcomes is extremely complex, has multiple theoretical interpretations, and it is difficult to confirm directionality.[21] Even so, the strong association between high rates of tobacco use and poor school outcomes remains undisputed, and our study confirmed this association in government schools in 2 large cities in India.

This study makes an important addition to the sparse literature on school health in India in several respects. First, by focusing on government school students in 2 large cities, it captures a vulnerable segment of the student population in India.[9-13] Second, it addresses a largely neglected research question, since other than 1 study among schoolboys in Kerala, we found no other published studies on the associations between tobacco use and academic outcomes in India.[18] Third, with 2 waves of data, it is able to investigate this association using both cross-sectional and retrospective cohort study designs. To our knowledge, this is the first attempt to longitudinally examine the effects of early tobacco use on future academic problems and thus, a novel study on adolescent tobacco use in India. Fourth, in addition to cigarette smoking, it assesses the associations of academic failure with chewing tobacco and bidis, as well as with known psychosocial risk factors for tobacco use in India.[31] Finally, unlike several other studies on this topic, it uses school records to assign academic failure as an objective measure of poor academic outcomes.

Strengths

Strengths of this study include the use of reliable and valid instruments for student surveys, and use of schools records as an objective measure of academic failure between 2004 and 2006.[31-33] Given the high response rate in 2006, the findings from our cross-sectional analyses should be representative of the study population and may be replicable in other similar settings in India. Statistical methods that account for the nested nature of the study were applied in all analyses, and models were adjusted for appropriate demographic variables.[35]

Limitations

This study has some limitations that should be noted. First, there were some students in the 2006 sample who were not present at the baseline survey (n = 1213, 32%) and therefore excluded from the retrospective cohort sample. Because we were unable to trace past tobacco use for these students, this article cannot comment on the likely direction of any resultant bias in the findings. Therefore, results from the retrospective cohort analyses may not be as generalizable outside the study population and should be interpreted accordingly. Yet, our findings can be considered as indicative of the academic impact of tobacco use during early adolescence among government school students in India. Also, there is precedence for the approach of selecting a student cohort subsample from larger studies based on survey participation at particular points of interest.[38] Second, this study used data that were primarily collected to evaluate Project MYTRI. Thus, no information was available on factors such as parental education, family support, academic aspirations, and other problem behaviors, which may be confounders or mediators in the associations tested here. Third, our focus was on tobacco use and academic failure among government school students in urban India. Hence, our findings may not generalize to adolescents attending private schools, those who are out of school, or those who live in rural areas. Research would be needed in these different settings to assess if our findings are replicable there. Finally, all measures of tobacco use in this study were self-reported without any biochemical validation, the latter being complex and costly in India due to multiple forms of tobacco use. Self-reported school-based tobacco surveys are commonly conducted around the world to understand the tobacco control "climate" in society at large and are known to be reliable for substance use studies among adolescents.[6,31,34]

Conclusions

This study from government schools in 2 cities in India showed that tobacco use was associated with both concurrent and subsequent academic failure among 10- to 16-year-old students. Investments in tobacco control and school health programs, coupled with remedial education efforts, are recommended for young students with poor academic outcomes in India. These programs are likely to pay rich dividends for young Indians, through improved academic outcomes in schools, reduced risky health behaviors in adolescence, and improved health status in adulthood.

IMPLICATIONS FOR SCHOOLS

Our findings have several important implications for school health practitioners, especially those who work in low resource settings such as government schools in developing countries or public schools serving low-income neighborhoods in developed countries. Young students from government schools in India who were

experimenting with and/or using tobacco products had alarmingly higher rates of academic failure. Recall that students attending government schools in India are often from low socioeconomic background and may be faced with multiple social problems in addition to poor learning support at school.[10-13] It is likely that such students would benefit from targeted tobacco-use prevention and cessation programs offered by school health clinics, in addition to comprehensive tobacco control policies. Simultaneously, school health planners could enhance remedial education programs for low-performing government school students by incorporating measures to reduce their vulnerability to risk factors such as tobacco use. School health programs and smoke-free school policies should be considered for reducing the negative academic effects of early tobacco use among school students.[39,40] School teachers should be sensitized to such risky behaviors among their pupils and have access to resources for provision of academic and tobacco cessation support to students. Programs that can effectively reduce the uptake and maintenance of multiple forms of tobacco use in government school students have the potential to improve their academic performance and reduce other subsequent problem behaviors. Intervention research will be required to test combined public health and educational strategies for designing school health programs in government schools in India. School-based longitudinal research will also be needed to further examine the impact of tobacco use in early adolescence on academic, social, and behavioral outcomes in late youth and early adulthood.

Human Subjects Approval Statement

Study protocols were approved by the University of Texas Health Science Center Institutional review board.

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