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Change in Tobacco Use Over Time in Urban Indian Youth: The moderating Role of Socioeconomic Status

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Abstract

This study investigates socioeconomic differences in patterns and trends of tobacco consumption over time among youth in India. Additionally, the distribution of tobacco use risk factors across social class was examined. The data were derived from a longitudinal study of adolescents, Project MYTRI. Students in eight private [high socioeconomic status (SES)] (n=2881) and eight government (lower SES) (n=5476) schools in two large cities in India (Delhi and Chennai) were surveyed annually about their tobacco use and related psychosocial risk factors from 2004 to 2006. Results suggest the relationship between SES and tobacco use over time was not consistent. At baseline (in 2004), lower SES was associated with higher prevalence of tobacco use but the relation between SES and tobacco use reversed two years later (2006). These findings were mirrored in the distribution of related psychosocial risk factors by SES at baseline (in 2004), and thereafter in 2006. Implications for prevention scientists and future intervention programs are considered.

Keywords

India; adolescence; socioeconomic status; tobacco control; longitudinal study; moderation

Introduction

Socioeconomic differences in tobacco use in adolescents can be viewed as a prelude to socioeconomic differences in tobacco use and related health hazards in adulthood. Understanding the social class gradient in tobacco use, including trends over time, and related psychosocial factors of influence is extremely important in halting the tobacco epidemic in India. According to Global Youth Tobacco Survey (GYTS), after a steady increase in prevalence of tobacco use by 13-15 year olds from 2001-2003 (GYTS, fact sheet.), the prevalence of current tobacco use has been stable among this population from

2003-2009 (Gajalakshmi & Kanimozhi, 2010; D. N. Sinha et al., 2008). However, GYTS does not contain measures of SES and therefore, cannot be used to examine differences in tobacco use by this very important demographic factor. Additionally, more than one-third of adults (age 15+) are current tobacco users (D. Sinha, Palipudi, Rolle, Asma, & Rinchen, 2011). In absolute numbers, this translates into 275 million current tobacco users in India (Ministry of Health and Family Welfare, Government of India, New Delhi., 2010) with a significant trend of decreasing prevalence with increasing wealth (Palipudi et al., 2012). By 2020, in India, tobacco attributable deaths will escalate from 1% of all deaths to over 13%, the fastest increase in these deaths worldwide, at present (Reddy & Gupta, 2004).

Globally, adult tobacco consumption is strongly and positively associated with poverty. Although most studies of adolescent tobacco use in the US conform to adult patterns of socioeconomic differentials in smoking, the associations are not as robust as those in adults (Hanson & Chen, 2007). In contrast to a large literature examining socioeconomic status (SES) and adolescent smoking in Western countries, only a single published study has examined the social disparities in tobacco use among Indian youth, and reported lower SES adolescents to be 1.5 times more likely to engage in current use of any tobacco compared to higher SES youth (C. Mathur, Stigler, Perry, Arora, & Reddy, 2008); however, that study was cross-sectional.

Studies in the US have reported an array of psychosocial factors for smoking among adolescents, ranging from the intra-personal (e.g., knowledge about health effects of tobacco use), and social-environmental (e.g., social normative beliefs) contexts (Mayhew, Flay, & Mott, 2000). Similarly, these psychosocial factors were associated with significantly greater tobacco use in our study population at baseline (C. Mathur et al., 2008; Reddy, Perry, Stigler, & Arora, 2006; M. H. Stigler, Perry, Arora, & Reddy, 2006).

The current study extends this cross-sectional study and investigates differences in tobacco use among youth in India by SES, longitudinally. Moreover, it examines, within a theory-driven context, the risk and protective factors associated with tobacco use among Indian youth, examining any differentials in this risk profile between high SES and low SES youth. Patterns and trends in tobacco use among young people are important to document as these findings would aid the development of targeted prevention and intervention programs for these sub-populations, specifically.

Methods

Study Design

This analysis was conducted on survey data collected using three repeated surveys (in 2004, 2005, and 2006) of a cohort of adolescents in the control condition of Project Mobilizing Youth for Tobacco Related Initiatives in India (Project MYTRI). Briefly, MYTRI was a group-randomized trial designed to prevent the onset and reduce the prevalence of tobacco among youth in urban schools in Delhi and Chennai, India. In 2004, thirty-two schools in these cities were recruited to participate in the trial and were randomly assigned to receive a tobacco prevention program or serve as a delayed program control. Socioeconomic status was measured using school type, a variable often applied as a proxy indicator in this setting.

In India, students from higher SES backgrounds typically attend Private schools, while those from lower SES backgrounds attend Government schools (Sharma, 1999). Therefore, in accordance with earlier similar studies in India, school type was used as a proxy measure for SES (C. Mathur et al., 2008; Reddy et al., 2006; M. Stigler et al., 2010). The total sample for the current analysis was 6316. At baseline, 54.9% of the participants were male (v female), and 63% were in Government schools (v. Private schools). At baseline, the mean age of participants was 12 years, 54.9% were male (v female), and 63% were in Government schools (v. Private schools). Ethical clearances for the trial were obtained from Independent Ethics Committee, India and the Institutional Review Board at the University of Minnesota.

Survey implementation

A self-administered paper and pencil survey was implemented in all classrooms in these schools by two-person teams of trained staff using standardized protocols during a regularly-scheduled class time. Prior to implementation, passive (but informed) parental consent and active student assent were required and obtained by staff. To ensure confidentiality, teachers were not present during the survey implementation and no personal identification was attached to the survey. A unique identification number was used to link student surveys over time.

Measures

Tobacco use

Current use of chewing tobacco was measured with a single dichotomous variable (yes or no). Current use of smoking bidis or cigarettes was measured with two dichotomous variables (yes or no). Using the response to the three items, a composite variable to measure current use of *any* tobacco was created. Based on the responses a binary variable was created. Yes to one or more of the questions was coded as 1 on this variable (“yes”) else 0 (“no”).

Psychosocial risk factors

Multiple-item, summative scales were created to measure 19 psychosocial risk factors hypothesized to be related to tobacco use among youth in India. Factor selection was guided by social cognitive theory and theories of youth health promotion as well as prior research on the etiology of tobacco use in the West (Bandura & McClelland, 1977; Mayhew et al., 2000; Perry, 1999; US Department of Health and Human Services., 1994).

These included the following measures: knowledge about health effects of tobacco use; beliefs about social consequences; reasons to use tobacco; reasons not to use tobacco; refusal skills self-efficacy; social susceptibility (chewing); social susceptibility (smoking); normative beliefs; perceived prevalence (chewing); perceived prevalence (smoking); intentions (chewing); intentions (smoking); normative expectations of use; knowledge about tobacco control policies; support for these policies; advocacy skills self-efficacy; and exposure and receptivity to advertising. All scales had adequate psychometric properties (e.g., Chronbach’s α ranged from 0.64 to 0.98) (Stigler et al., 2006). Scale scores were

standardized before being used in the analyses, to ease interpretation of parameter estimates and allow for comparison between scales. A higher score on all scales indicate less risk.

Analysis

Differences in tobacco use over time between schools were examined using covariance pattern modeling, estimated by mixed-effects regression (Hedeker & Gibbons, 2006). In other words, the interaction between SES and time was evaluated. These models are appropriate to study change in behavior over time (repeated measures) while also accounting for nested study designs. These models were first used to examine differences in change in prevalence of current tobacco use over time between SES, from 2004 to 2006. Next, the models were used to examine the temporal relationship between psychosocial risk factors in 2004 and current use of any tobacco in 2006, by school type (i.e., SES) after adjusting for baseline tobacco use in 2004. A single regression model ("Model 1") was used to examine the relationship between a single psychosocial factor and tobacco use, for each factor separately. Then, backwards stepwise regression was used to build a multiple regression model ("Model 2") to evaluate which factors were most strongly related to tobacco use. All psychosocial factors were entered into this regression model to begin, and then factors not significantly related to tobacco use in the model ($> .05$) were eliminated, until only significant factors remained. Finally, differences in psychosocial risk factors by school type in 2004 and in 2006 were investigated. All regression models were adjusted for grade, gender, and age. All analyses were conducted in SAS for Windows (version 9.1; SAS Institute Inc., Cary, NC).

Results

Figure 1 graphically depicts the change in prevalence of current use of tobacco over time by SES. There was a significant between-SES difference in prevalence of current use of any tobacco at baseline (2004) ($p < .05$), with higher prevalence for lower SES students (4.99%) compared to higher SES students (3.47%). At the second time point (2005), the prevalence rates were equivalent across SES. By the third time point (2006), the prevalence of tobacco use among lower SES students had decreased to the point that it was lower than the higher SES students (2.66% v 3.89%, respectively), although this difference was not statistically significant. The overall trend over time of tobacco use was significantly different across SES ($p < .05$). Even though, there was a slight decline in overall prevalence of tobacco use, the prevalence in private schools was highest in 2006. However, in comparison to 2004, the prevalence in government schools lowered considerably by 2006 (5% v 2.7%).

Only a handful of the psychosocial factors evaluated here were significantly associated with future use of tobacco after adjusting for baseline use of tobacco (results not shown). Among Government school (lower SES) students, only 4 factors were significantly predicted future tobacco use ($p < 0.05$). These were beliefs about social consequences of tobacco use, intentions, and susceptibility to chewing, and advocacy skills efficacy. Among Private school (higher SES) students, of the nineteen factors evaluated, only 4 significantly predicted future tobacco use ($p < 0.05$): knowledge about health effects, beliefs about social consequences of tobacco use, reasons to use and refusal skills. After adjusting for other

psychosocial factors ("Model 2"), two factors significantly predicted future use of tobacco in Government school students and these were intentions to chew and advocacy skills efficacy. Similarly, in Private school students a single factor was associated and this was knowledge about health effects.

We also tested for differences in psychosocial risk factors by school type in 2004 and 2006 (Table 1). There were significant differences across schools in the distribution of eleven psychosocial risk factors in 2004 and fifteen psychosocial risk factors in 2006 ($p < .05$). In 2004, lower SES students scored lower on all of these factors except for three, indicating higher risk for tobacco use. In contrast, in 2006, higher SES students scored lower on eleven of these risk factors, thereby indicating higher vulnerability to tobacco use.

Overall, lower SES students consistently scored significantly lower than higher SES students on four factors over time and these were beliefs about social consequences, reasons not to use tobacco, refusal skills efficacy, and advocacy skills efficacy. Similarly, higher SES students consistently scored significantly lower than lower SES students at both time points on social susceptibility to chewing and perceived access.

Discussion

The overall goal of this study was to examine change in tobacco use over time across social strata. Also, in order to more fully understand differences between higher (v lower) SES students, their risk profiles were compared across time, in 2004, and thereafter in 2006.

At baseline, in 2004, the prevalence of tobacco use was higher among lower (v higher) SES students. Over time this difference disappeared, with no statistically significant differences in prevalence in 2005 or 2006. Importantly, though, the trends in increasing tobacco use were greater among students in the higher SES schools. This unusual reversal in association could be attributed to "westernization", which has been defined as a type of acculturation whereby people in non-western countries (e.g., India) come under the influence of western culture in matters such as language, lifestyle, values and/beliefs (Salant & Lauderdale, 2003). In this era of globalization, India is experiencing an ever-increasing influence of western culture which is especially appealing to and accessible among higher SES populations in this context (Singh, 1996). A recent study by Stigler and colleagues on "westernization" and tobacco use among our study population found higher SES students identify with a western lifestyle more than lower SES students (Stigler et al., 2010). Also, increased westernization was significantly associated with more tobacco use, including use of both chewing and smoking tobacco.

Recent data indicates the prevalence of tobacco use has stabilized (Gajalakshmi & Kanimozhi, 2010), whereas in our current analysis we found the prevalence had declined from 2004-2006. An explanation for this unusual finding might be that our study focuses on Delhi and Chennai alone, and the GYTS, given its national focus, is able to capture the very large regional variation in tobacco use, by state. Therefore, our study does not reflect the nationwide trend.

Our findings are not consistent with the direction of majority of longitudinal studies in the US, where greater cigarette smoking was consistently associated with lower parental SES (Hanson & Chen, 2007; Mathur, C., Erickson, D.J., Stigler, Forster, & Finnegan, In-Press). However, the tobacco epidemic in India is an earlier stage at present than the US and is still unfolding (Reddy & Gupta, 2004), such that this comparison may not be the most robust one. Similar longitudinal studies from other countries in a similar stage of the tobacco epidemic as India are not available for comparison.

After adjusting for other psychosocial factors, a single factor that significantly predicted use of tobacco in Private school students was knowledge about health effects of tobacco consumption. In contrast, among Government schools students' intentions to chew tobacco and advocacy skills efficacy were significant predictors of future tobacco use. Strong advocacy skills efficacy can be a potent influence in instigating behavior change among peers. A study by Flanagan and colleagues reported significantly higher likelihood of intervening proactively (e.g., talking to a friend) if a friend had started smoking or tried drugs among younger students compared to older students (Flanagan, Elek-Fisk, & Gallay, 2004). This finding underscores the salience of social nature of risk behavior in adolescence and friends as a potential resource in prevention. It is important to note, the psychosocial factor(s) predicting future tobacco use across SES were different and this could indicate the different pathways through which SES exerts its effect on adolescent tobacco use. Future studies exploring these potential mechanisms are certainly warranted.

In accordance with a previous cross-sectional study, in 2004, lower (v higher) SES students scored lower on eleven of the nineteen psychosocial factors studied here, pointing to their being more vulnerable to increased levels of tobacco use. These findings were reflected as higher prevalence of tobacco use in 2004 among lower SES youth. In 2006, higher (v lower) SES students scored lower on fifteen of the nineteen psychosocial factors that made them more likely to use tobacco. The reversal in risk profile and the resultant potential for increased tobacco consumption is substantiated by higher prevalence of tobacco in 2006 among higher (v lower) SES students. Other results from this study provide some guidance for the design of future interventions, for both higher and lower SES students, as they highlight which risk factors are strong predictors of future tobacco use and so would be good candidates to target for behavioral change through intervention.

The current study has limitations worth noting. First, there was attrition over time, and this attrition could bias results. However, the analytic model employed was able to use all available data (i.e., not discard participants who only provided data at one time point), but did not impute or fill in missing values. This technique results in unbiased estimates when assumptions about the type of missingness can be made (e.g., missing at random), although it is not clear how reasonable those assumptions are in this dataset. Second, data on parent's occupation and family's caste/tribe was not collected in this study. This information, therefore, could not be used to determine a child's socioeconomic status, or to examine how these variables related to tobacco use, independent of school type. However, school type is correlated with SES and can be used as a proxy for SES in this setting (Sharma, 1999). Future research should examine the effects of other measures of SES on youth tobacco.

A large sample size makes the findings robust, and the study is representative of two large metropolitan cities, one each in Southern and Northern India. The findings should be replicated in other geographic populations. Most importantly, there has been no research on effects of SES on tobacco use longitudinally in Indian youth to date.

Patterns and trends in tobacco use among young people are important to document as these findings would help inform the development of appropriate preventive intervention programs for youth particularly by taking into account the cultural preferences of Indian adolescents. This study suggests that *both* lower SES and higher SES youth are at risk for tobacco use and should be the target of intervention programs. Based on their psychosocial risk profile, however, programs may require tailoring to address specific needs in these two sub-populations.

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Figure 1.
Patterns of current use of any tobacco across socioeconomic status

Table 1Distribution of selected factors by school type (SES), adjusted, standardized scores¹

	Time 1 (2004)			Time 3 (2006)		
	Private (n=2344)	Government (n=3972)	Difference ²	Private (n=2344)	Government (n=3972)	Difference ²
	Mean (SE)	Mean (SE)		Mean (SE)	Mean (SE)	
<i>Intra-personal factors</i>						
Knowledge (health effects)	.08(.04)	-.03(.03)	.11*	-.07(.06)	.001(.06)	.07
Beliefs (social consequences)	.27(.10)	-.23(.10)	.50*	.15(.08)	-.15(.08)	.30*
Meanings (reasons to use)	.01(.05)	-.01(.04)	.02	-.25(.06)	.02(.06)	.27*
Meanings (reasons not to use)	.57(.06)	-.44(.06)	1.01*	.38(.08)	-.40(.08)	.78*
Self-efficacy (refusal skills)	.47(.08)	-.42(.07)	.89*	.70(.07)	-.35(.07)	1.05*
Intentions (chewing)	-.06(.05)	.03(.04)	.09	-.15(.06)	.01(.05)	.16*
Intentions (smoking)	.05(.05)	-.04(.04)	.09	-.16(.07)	.03(.07)	.19*
Social susceptibility (chewing)	-.12(.06)	.08(.05)	.20*	-.22(.05)	.02(.05)	.24*
Social susceptibility (smoking)	.01(.04)	-.06(.04)	.07	-.20(.07)	.004(.06)	.20*
<i>Social-environmental factors</i>						
Normative beliefs	-.04(.03)	.02(.03)	.06	-.22(.07)	.09(.07)	.31*
Normative expectations	.17(.06)	-.16(.05)	.33*	-.15(.07)	.07(.07)	.22*
Perceived access	-.22(.06)	.18(.06)	.40*	-.56(.09)	.23(.09)	.79*
Perceived prevalence (chewing)	-.01(.06)	-.24(.06)	.23*	.03(.10)	.002(.10)	.03
Perceived prevalence (smoking)	.09(.07)	-.22(.07)	.31*	-.04(.10)	.02(.10)	.06
Knowledge (public policy)	-.13(.05)	.07(.04)	.20*	-.23(.05)	-.08(.05)	.15*
Support (public policy)	-.06(.05)	-.04(.05)	.02	-.20(.09)	.16(.09)	.36*
Self-efficacy (advocacy skills)	.15(.06)	-.16(.06)	.66*	.10(.08)	-.26(.08)	.36*
<i>Other factors</i>						
Receptivity to advertising	-.05(.04)	-.02(.04)	.03	-.11(.06)	.08(.06)	.19*
Exposure to advertising	.001(.05)	-.07(.06)	.07	-.14(.10)	.10(.10)	.15

³ A higher score on all multi-item scales for all factors indicate less risk* Significant at ($p < .05$)¹ Estimates are generated from mixed-effects models adjusted for city, class/grade, gender, age using standardized scale scores² Difference represents the absolute or total “distance” between scores for factors, which are centered at 0