Research Article

To assess the influence of tobacco use by family members, peers and role models on tobacco use status of adolescents living in urban slums of Delhi, India: Results from a longitudinal study

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How to cite this article: Bassi S, Gupta VK, Arora M et al. To assess the influence of tobacco use by family members, peers and role models on tobacco use status of adolescents living in urban slums of Delhi, India: Results from a longitudinal study. *Ind J Youth Adol Health* 2016; 3(3): 17-24.

ISSN: 2349-2880

Abstract

Objective: To assess the longitudinal relationship between tobacco use by family members, peers and role models on tobacco use behavior of adolescents living in low socio-economic communities of Delhi, India.

Methods: Project ACTIVITY (Advancing Cessation of Tobacco in Vulnerable Indian Tobacco Consuming Youth), a community-based cluster-randomized trial. Adolescents (n=1720) belonging to low socio-economic status from control communities of Project ACTIVITY, including resettlement colonies and adjacent Jhuggi-Jhopris (JJs), who were non-tobacco users at baseline and participated in all the three repeated surveys (2009, 2010, 2011). The main outcome measure in the study was current tobacco use at the endline. Tobacco use by family members, friends and role models was measured at baseline.

Results: The influence of tobacco use by friends on the onset of youth tobacco use was significant (OR=2.68, 95% CI=1.27-5.64) and by brother was even stronger (OR=4.36, 95% CI=1.66-11.45). Both effects were consistent across gender, age group and were also stronger than the effects of tobacco use by father (OR=1.51, 95% CI=0.70-3.23).

Conclusion: Thus, study highlights the need to engage siblings and peers in efforts to prevent tobacco use and promote tobacco cessation among adolescents in resource-poor, slum communities in India.

Keywords: Tobacco, Adolescents, Familial influence, Low socio-economic status, Community, Tobacco cessation, Tobacco use prevention.

Introduction

Tobacco use causes one in six non-communicable diseases (NCDs) and is a risk factor for six out of the world's eight leading causes of death.[1] Worldwide, tobacco use causes nearly six million deaths per year[2] out of which nearly one million deaths take place in India only.[3] The Global Adult Tobacco Survey, 2010 reveals that more than one-third of the Indian population (15 years and above) uses tobacco in some form or the other.[4]

The landscape of tobacco use is changing and marketing efforts of the tobacco companies are capitalizing on the vulnerability of adolescents in developing countries such as India. The use of tobacco by adolescents is a major public health concern worldwide and has been referred to as both a "pediatric disease"[5] and a "pediatric epidemic."[6] India is also the youngest major nation in the world with 50% of the population below the age of 25 years.[7] Research reveals that 5500 Indian youth initiate tobacco use every day[8] with current prevalence of tobacco use being 14.6% (among 13-15 years old school-going youth).[9]

In India, 60-80% of youth and adolescents belong to low socio-economic status (SES),[10] and several studies have established that adolescents from low SES are more likely to engage in risky health behaviors,[11] including tobacco use.[12] Evidence suggests that tobacco use starts as early as six years of age in low-SES communities in India.[13] It is imperative to understand various factors that influence and persuade adolescents to start tobacco use, viz., family history of tobacco use by elders, peer influence, experimentation, availability, accessibility, underlying emotional and psychological problems and aggressive marketing strategies of the tobacco industry.[14] Social cognitive theory suggests that adolescents are influenced by their social environment, i.e., behavior and attitudes of parents, siblings and close friends.[15] The behavior of the family members/ people in the environment of the adolescents plays a key role in potentiating or protecting them against the risky behaviors. Accumulating evidence from the world suggests that parental and sibling smoking behavior is an important source of vulnerability to smoking initiation among adolescents and is perceived as a positive and acceptable behavior.[16,17] The results from several longitudinal studies conducted in developed countries reported significant relationships between concurrent smoking use by parents, siblings, close friends and influence on adolescent's smoking behavior.[18,19] The likelihood of adolescents smoking initiation increased with the number of smoking parents and the duration of exposure to parental smoking, suggesting a dose-response relationship between parental smoking and youth smoking.[20] It is not clear if this holds true for developing countries like India, because there is very limited research base. The level of family influence on adolescents in the Indian context is stronger than that of the Western countries. In the context of Indian culture, family retains a high influence on adolescents' behaviors and youth become independent later than adolescents in the Western countries.

The purpose of the present article is to assess the longitudinal relationship between tobacco use by family members (including parents and siblings), peers and role models (film star/sports persons) on tobacco use behavior of adolescents living in low-socio-economic communities of Delhi, India.

Methods

Study Design

Project ACTIVITY (Advancing Cessation of Tobacco in Vulnerable Indian Tobacco Consuming Youth) was a community-based, cluster-randomized trial, which aimed to test the efficacy of an intervention to reduce and prevent tobacco use among adolescents (10-19 years) residing in 14 low-socio-economic status (SES) communities in Delhi, India. The present study focuses exclusively on the adolescents from the control groups of Project ACTIVITY who were non-tobacco users at baseline and participated in all three surveys (before the intervention began in 2009; after one year intervention in 2010; and after two years of intervention in 2011). The analyses presented here are longitudinal by design.

Study Setting

In 2008, fourteen slum communities in Delhi, each inclusive of resettlement colonies and adjacent Jhuggi-Jhopris (JJs), were matched and randomized to intervention (n=7) and control (n=7) conditions. A resettlement colony is a community of permanent structure with water and electricity. JJs are roughly built shelters made of mud, wood or metal that surrounds a resettlement colony. Communities were recruited systematically from a list of registered resettlement colonies (n=44) and nearby JJs (n=1079) obtained from the Municipal Corporation of Delhi.[21] Further information on the eligibility criteria is detailed elsewhere.[22]

Ethical clearances for the study were obtained from appropriate Ethics Boards in India (Independent Ethics Committee, Mumbai) and the United States (Institutional Review Board, University of Texas Health Science Center at Houston).

Study Participants

Overall, 6954 adolescents participated in one or more of the three surveys of Project ACTIVITY; 3605 (51.84%) adolescents completed three surveys, 1956 (28.13%) completed two surveys, and 1393 (20.03%) completed one survey. Among adolescents who completed all the three surveys, 1828 were in intervention group and 1777 were in control group. The present study focused on 1720 adolescents from control group who were non-tobacco users at baseline. Out of these, 45.06% were boys and 54.94% were girls; 58.14% were from age group 10-14 years and 41.86% were 15-19 years old. Also, 55% belonged to resettlement colonies and 45% were from JJs and most of the adolescents (88.90%) went to schools. Mean age of study participants was 14 years (SD=2.6 years).

Data Collection

The study used pre-tested 40-minute interviews in Hindi (local language) with a mix of open- and close-ended

responses to gather data from both literate and illiterate participants. These interviews were conducted outside the home or in a private space inside the local community, where only the interviewee and the interviewer were present. A unique identification number, not recognizable to adolescent or parents, was used to track each participant, across repeated surveys. Pilot testing with 100 adolescents (50 each from a JJ and a resettlement colony) was undertaken before survey administration to ensure its feasibility, reliability and to avoid any ambiguity.[22] Research staff visited the home to schedule the interview, which was conducted as per the convenience of the interviewee. Informed, active consent was taken from parents and adolescents (aged 10-17 years). No parental consent was taken from participants older than 17 years, though informed, active consent from the participants was taken. These consent procedures were approved by the appropriate ethics boards in India and the United States.

Measures

The main outcome variable in the study was current tobacco use which was measured as binary variable; if adolescent answered 'yes' to using any of three forms, i.e., smoking (e.g., cigarettes or bidis), chewing (e.g., gutkha), or other smokeless products (e.g., paste) in the past 30 days. Use of chewing and other smokeless products was further combined as use of any smokeless tobacco product. Adolescents were asked to share the information about tobacco use in their family. The information was gathered for the family members who live in the same household pertaining to *their age, their relationship with the adolescent and tobacco use status (tobacco user or non-user).* Tobacco use by friends was assessed using the question "Do any of your friends use tobacco products?" and tobacco use by role models was gauged using the question "Does your favorite film star/ sports person use tobacco products?" Both of these had four options "Yes", "No", "Don't know" and "Refused to answer". All the three options except "yes" were combined to make these variables binary. Other socio-demographic variables included age, gender, dwell type, school going or non-school going adolescents and community.

Data Analysis

Descriptive statistics were provided for the demographic profile of adolescents. Chi-square test was used to compare tobacco use prevalence between different groups of demographic variables. Three logistic regression models were used to test the association between tobacco use by family members at baseline and tobacco use by adolescents at the end line. First model is mixed-effect logistic regression model with dependent variable tobacco use by adolescent at endline and independent variable tobacco use by family members at baseline unadjusted. Second model is mixed-effect logistic regression model in which all the demographic variables were adjusted for the association and in the third model, tobacco use by friends and role models were also included in the model. Community was treated as random effect in all the three models. Simple logistic regression models were used where mixed-effect models did not converge. Results were considered significant at five percent level of significance. All the analyses were done in statistical software Stata 11.0.

Results

Table 1.Demographic Profile and Tobacco Use Prevalence at Endline among Adolescents from Control Group, Who Were Non-Tobacco Users at Baseline and Participated in All Surveys, 2009-2011

Demographic Profile	N (%)	Tobacco Use at Endline (%)	p-value
Overall	1720	2.15	
Gender			
Boys	775 (45.06)	4.26	<0.001
Girls	945 (54.94)	0.42	
Dwelling Type			
Resettlement	946 (55.00)	1.90	0.434
Jhuggi-Jhopri	774 (45.00)	2.45	
School Going Status			
School going	1529 (88.90)	2.03	0.314
Non-school going	191 (11.10)	3.14	
Age			
10-14 years	1000 (58.14)	1.20	0.001
15-19 years	720 (41.86)	3.48	

 ISSN: 2349-2880

Overall, 943 (54.8%) out of 1720 non-tobacco using adolescents had family members using some form of tobacco in their home at baseline. Current tobacco use incidence was 2.15% at endline among adolescents who were non-tobacco users at baseline. The current tobacco use incidence was 4.26 and 0.42% among boys and girls, respectively (p<0.001) and this incidence was significantly more among the age group of 15-19 years (3.48%) as compared to the 10-14 years (1.20%), p<0.001. Current tobacco use at endline was not significantly associated with dwelling types or school going status.

Table 2.Association between Tobacco Use by Family Members at Baseline and Adolescent's Tobacco Use at Endline from Control Group, 2009-2011

Demographic Profile	Tobacco Use					
	Model I[‡]		Model II[‡‡]		Model III[‡‡‡]	
	Odds Ratio† (95% CI)	p value	Odds Ratio† (95% CI)	P value	Odds Ratio† (95% CI)	p value
Gender						
Boys	2.51 (1.11-5.66)	0.027	2.62 (1.12-6.10)	0.026	2.62 (0.97-5.34)	0.059
Girls	0.86 (0.12-6.13)	0.880	0.83 (0.11-6.17)	0.854	1.07 (0.14-8.46)	0.951
Dwelling Type						
Resettlement	1.53 (0.60-3.91)	0.375	1.67 (0.63-4.40)	0.301	1.45 (0.54-3.88)	0.465
Jhuggi-Jhopri	4.36 (1.00-19.02)	0.050	4.22 (0.95-18.62)	0.058	3.96 (0.89-17.59)	0.071
School Going Status						
School going	1.87 (0.87-4.01)	0.124	1.86 (0.84-4.08)	0.124	1.67 (0.75-3.69)	0.207
Non-school going	--	--	--	--	--	--
Age						
10-14 years	2.34 (0.63-8.70)	0.204	1.79 (0.47-6.90)	0.396	1.66 (0.43-6.45)	0.461
15-19 years	2.37 (0.98-5.75)	0.056	2.41 (0.95-6.09)	0.063	2.09 (0.82-5.34)	0.123

†Odds ratio shows the odds of using tobacco at endline for non-users who had family member(s) using tobacco at baseline than those who had no tobacco user in the family.

[‡]Mixed effect logistic regression model. No covariates were included in the model. Simple logistic regression was applied where mixed-effect model did not converge.

[‡‡]Mixed-effect logistic regression model. Age groups, gender, school-going status and dwell-type were included as covariates and community was included as random effect. A variable was excluded if the analysis was segregated by that variable. For girls and school going youth, multiple logistic regression model was used because of non-convergence of mixed-effect models.

[‡‡‡]Mixed-effect logistic regression model. Age group, gender, school-going status, dwell-type, tobacco use by friends and role models were included as covariates and community was included as random effect. A variable was excluded if the analysis was segregated by that variable. For girls and school going youth, multiple logistic regression model was used because of non-convergence of mixed-effect models.

Estimates were not produced because of very few or no tobacco users in the group.

Table 2 depicts the effect of tobacco use by any family member at baseline on tobacco use by adolescents at endline. Crude results showed that boys were 2.5 times more likely (95% CI=1.12-6.13) to use tobacco if there was any tobacco user in their family than those who had no tobacco user family members. Similarly, adolescents from JJ with tobacco user family members were 4.36 times more likely (95% CI=1.00-19.02) to use tobacco than those who had no tobacco user in their family. No significant association between tobacco use by family members at baseline and tobacco use by adolescents at endline was observed among girls, adolescents from resettlement colonies, school going adolescents and in different age groups. However, the significance lapsed when other socio-demographic variables and tobacco use by friends were included in the model.

Table 3 represents the association between tobacco use by specific family members, friends and role models at baseline and tobacco use by adolescent at endline. From crude results, it was found that odds of using tobacco were 3.98 (95% CI=1.78-8.91) among those adolescents whose brothers were tobacco users at baseline than those who do not have tobacco users brothers. Odds of tobacco use were 7.11 (95% CI=1.78-8.91) for adolescents whose friends were tobacco users at baseline than others. Although the odds ratios of tobacco use for adolescents whose father and mother were tobacco user was 1.97 (95% CI= 0.98-3.97) and 2.45 (95% CI=0.85-7.08), respectively than others, but these results were not statistically significant. After adjusting age group, gender, dwell-type and school going status, the odds ratio of tobacco use was 4.26 (95% CI=1.75-10.44) for adolescents whose brother(s) were tobacco users and 2.95 (95% CI=1.42-6.11) for adolescents whose friends were tobacco users. When tobacco use by each of the family members, friends and role models (film star/sports persons) was adjusted along with demographic variables, the odds ratio of

tobacco use at endline was observed as 4.36 (95% CI=1.66-11.45) for adolescents whose brothers were tobacco users and 2.68 (95% CI=1.27-5.64) for adolescents whose friends were tobacco users.

Table 3.Association between Tobacco Use by Family Members at Baseline and Adolescent's Tobacco Use at Endline from Control Group, 2009-2011

Family Members		Tobacco Use		
		Model I‡	Model II‡‡	Model III‡‡‡
		Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Father	No (n=795)	1.00	1.00	1.00
	Yes (n=818)	1.95 (0.96-3.94)	1.85 (0.88-3.87)	1.51 (0.70-3.23)
Mother	No (n=1587)	1.00	1.00	1.00
	Yes (n=81)	2.41 (0.83-7.02)	2.59 (0.82-8.17)	2.08 (0.59-7.39)
Brother	No (n=1601)	1.00	1.00	1.00
	Yes (n=117)	3.97 (1.77-8.93)*	4.28(1.75-10.44)*	4.36(1.66-11.45)*
Other family members	No (n=1641)	1.00	1.00	1.00
	Yes (n=77)	0.61 (0.08-4.52)	0.63 (0.08-4.83)	0.80 (0.10-6.39)
Friends	No (n=1437)	1.00	1.00	1.00
	Yes (n=283)	7.17 (3.68-13.96)*	2.95 (1.42-6.11)*	2.68 (1.27-5.64)*
Role models	No (n=1141)	1.00	1.00	1.00
	Yes (n=577)	1.09 (0.55-2.17)	0.86 (0.42-1.74)	0.79 (0.38-1.64)

‡Mixed-effect logistic regression model. No covariates were included in the model. Simple logistic regression was applied where mixed-effect model did not converge.

‡‡Mixed-effect logistic regression model. Age group, gender, school-going status and dwell type were included as covariates and community was included as random effect.

‡‡‡Mixed-effect logistic regression model. All the variables in the table along with age group, gender, school going status and dwell-type were included as covariates and community was included as random effect.

*p<0.05

Table 4.Association between Tobacco Use by Family Members, Peers and Role Models at Baseline and Adolescent's Tobacco Use at End line by Demographic Profile from Control Group, 2009-2011

Demographic Profile	Tobacco Use by Family Member, Peers and Role Models					
	Father	Mother	Brother	Others	Friends	Role Models
	Odds Ratio† (95% CI)	Odds Ratio† (95% CI)	Odds Ratio† (95% CI)	Odds Ratio† (95% CI)	Odds Ratio† (95% CI)	Odds Ratio† (95% CI)
Gender						
Boys	1.46 (0.65-3.29)	2.37 (0.62-9.08)	5.93 (2.09-16.84)*	0.87 (0.10-7.32)	2.81 (1.29-6.13)*	0.85 (0.39-1.85)
Girls	--	--	--	--	--	--
Dwelling Type						
Resettlement	1.16 (0.43-3.17)	3.74 (0.37-37.62)	--	0.86 (0.10-7.2)	2.76 (0.97-7.87)	0.68 (0.24-1.93)
Jhuggi-Jhopri	2.57 (0.69-9.56)	1.72 (0.39-7.72)	5.66 (1.98-16.14)*	--	2.83 (0.93-8.59)	0.87 (0.3-2.49)
School Going Status						
School going	1.54 (0.69-3.47)	1.25 (0.22-7.05)	4.99 (1.63-15.23)*	0.99 (0.12-7.89)	2.46 (1.09-5.57)*	0.68 (0.3-1.53)
Non-school going	2.53 (0.19-33.99)	8.7 (0.62-21.74)	10.74 (0.51-224.87)	--	3.69 (0.26-52.51)	1.23 (0.16-9.61)
Age						
10-14 years	1.06 (0.29-3.93)	2.77 (0.46-16.62)	4.7 (1.10-20.05)*	--	3.48 (0.98-12.39)	0.91 (0.25-3.24)
15-19 years	1.82 (0.72-4.61)	1.68 (0.29-9.80)	4.14 (1.08-15.90)*	0.97 (0.11-8.62)	2.37 (0.94-5.95)	0.67 (0.27-1.66)

†Mixed-effect logistic regression model was used. Tobacco use by youth was dependent-variable. Age group, gender, school-going status, dwell-type and tobacco use by father, mother, brother, others, friends and role models were included as independent variables and community was included as random effect.

Estimates were not produced because of very few or no tobacco users in the group.

*p<0.05

 ISSN: 2349-2880

Table 4 shows the association between tobacco use by different family members, friends and role models at baseline and tobacco use by adolescents at endline by different demographic groups. Effect of brothers was found significant for almost all the groups, as among boys tobacco use was 5.93 times more likely (95% CI=2.09-16.84) for those who had tobacco user brother at baseline than others; among adolescents from Jhuggi-Jhopri tobacco use was 5.66 times more likely (95% CI=1.98-16.14) for those who had tobacco user brother at baseline than others; among school-going adolescents, it was 4.99 (95% CI=–1.63-15.23), among 10-14 years old adolescents it was 4.70 (95% CI=1.10-20.05) and among 15-19 years old adolescents it was 4.14 (95% CI=1.08-15.90). For girls from resettlement colonies, the data for tobacco use by adolescents was not sufficient to produce odds ratios and among non-school going adolescents, the association was not statistically significant. Other strong social influence was tobacco use by friends which was significantly associated with tobacco use by adolescents at endline among boys and school going adolescents. The odds ratio was 2.81 (95% CI=1.29-6.13) for tobacco use among adolescents who had tobacco user friends than those who had not. Similarly, the odds ratio was 2.46 (95% CI= 1.09-5.57) for tobacco use among adolescents who had tobacco user friend than who had not.

Discussion

Considerable evidence suggests that the behavior of the family members/people in the environment of the adolescents plays a key role in increasing the risk for adolescent smoking initiation. Families and peers are the most significant socializing contexts for the emergence of risky behavior. The majority of prior longitudinal studies have been undertaken in developed countries to study the influence of smoking by family members and peers and risk of initiation among adolescents[16,18,19,23] and limited work has been done in the developing countries.[24] To best of our knowledge, only one study in India examined the possible familial influence (including parents and siblings) for tobacco initiation among school and college students.[25] This is the first study of its kind in India that has explored a longitudinal relationship between the influences of tobacco use by family members, friends and role models on tobacco use status among adolescents from low socio-economic status.

The findings of our study showed an association between the tobacco use by family members-specifically brothers, and tobacco use status of adolescents and are consistent with the World Health Organization (WHO) observation.[26] Other studies conducted around the world have reflected a greater impact of smoking by parents on their children to experiment with smoking products. One possible reason which has been highlighted in these is the easy access to smoking products in the households.[18,27] On the contrary, the results of our study did not show any significant effect of parental tobacco use on adolescents from low socio-economic communities. Adolescents from Jhuggi-Jhopri with tobacco user family members were four times more likely to use tobacco than those who had no tobacco user in their family. This group is of a lower SES than the resettlement colony.

Overall, the findings from our study indicated that the influence of tobacco use by friends is significant but the influence of tobacco use by brother was stronger. The odds ratio of using tobacco was approximately four times higher among adolescents whose brothers were tobacco users at baseline than those who do not have tobacco user brothers. These findings are consistent with the other literature from India conducted with school and college adolescents.[25] The effect of tobacco use by brothers was consistent across age groups and genders.

The results also showed that as compared to girls, the odds ratio of using tobacco was more among boys if there was any tobacco user in their family than those who had no tobacco user family member. Males had four times higher odds of smoking compared to females.[28] In most developing countries, boys are more likely to smoke than girls, although rates in girls are increasing faster.[29] Though the literature has shown the influence of tobacco use by their favourite film stars and sports personalities among Indian school going adolescents but we did not find any association in this study.[30] Therefore, future work is still required to study this association among this particular population.

The main strength of this study is the longitudinal data, which strengthens the possibility of a causal relationship between tobacco use by brothers and tobacco use behavior of adolescents from low socio-economic status. The study focused on adolescents from the low socio-economic status; to the best of our knowledge there is no research conducted to examine the etiology of tobacco use in this population. This longitudinal study was undertaken to address these research gaps.

This study has limitations, too. The study sample was not representative of all Indian adolescents, so the results cannot be generalized. The results rely on the data collected from the adolescents and not from the tobacco user directly so chances of misreporting.

Intentional deception, poor memory, or misunderstanding of the question can contribute to an underestimation or overestimation of the true prevalence of tobacco use. Further, the incidence of tobacco use in this population over the course of this study was not high, which may have underpowered some of these analysis.

Implications and Contributions

The study indicated a stronger influence of tobacco use by brothers and friends on tobacco use of adolescents, than parents. Thus, this study highlights the need to engage siblings and peers to prevent tobacco use and promote tobacco cessation among adolescents living in low-income communities in India.

Conflict of Interest: Nil

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Date of Submission: 27th May 2016

Date of Acceptance: 11th Oct. 2016