

Community-based model for preventing tobacco use among disadvantaged adolescents in urban slums of India

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SUMMARY

Tobacco consumption in multiple forms presents an emerging, significant and growing threat to the health of Indian adolescents, especially those from low socio-economic communities. Research in two phases was undertaken among economically disadvantaged adolescents in two urban slums of Delhi. In phase I, qualitative research methods such as focus group discussions and in-depth interviews were used to explore and understand the determinants influencing tobacco use among these adolescents. Prevalence of tobacco use was higher among boys than girls. Adolescents reported using tobacco in multiple forms, chewing tobacco being the most popular. Peer pressure, easy availability and affordability were important reasons associated with tobacco initiation and continued use. Though they had some knowledge about the harmful effects of tobacco, this was not sufficient to

motivate them to abstain or quit. The community-based intervention model developed on the basis of the results of phase I was evaluated in phase II in a demonstration study with two slum communities. One was treated as the intervention and the other as control. A significant difference in current use of tobacco was observed between the study groups ($p = 0.048$), with the intervention group showing a reduction in use, compared with an increase in use among the control group. Post-intervention, the intervention group reported significantly lower fresh uptake (0.3%) of tobacco use compared with the control group (1.7%). No significant change was found for quit rate ($p = 0.282$) in the two groups. Community-based interventions can be effective in preventing adolescents from initiating tobacco use in a low-resource setting such as India.

Key words: tobacco control; adolescents; community intervention; low-SES

INTRODUCTION

Socio-economic inequality is widely prevalent in India, especially in urban areas (Perry, 2006). Socio-economic disadvantage is inextricably linked to several behaviours that influence health, and tobacco use is one such behaviour (Jarvis and Wardle, 2006). The rate of smoking is expected to rise by about 3% per year and

will cause around 1 million deaths annually in 2010 in India (Jha *et al.*, 2008). Mortality due to tobacco disproportionately affects young adults.

India, with more than 400 million adolescents (Singh, 2005), has the highest number of adolescents in the world (UNICEF, 2004). Sixty to 80% of the children in India live in low-resource settings (PLAN, 2005) and consume myriad varieties of tobacco products [Centers

for Disease Control and Prevention (CDC) website: http://www.cdc.gov/tobacco/global/gyts/factsheets/searo/2006/India_factsheet.htm].

Thus, adolescents are a highly vulnerable group in a developing country such as India.

India is the second highest consumer of tobacco in the world, after China. Currently, about 230 million males and 11.9 million females consume tobacco in India (Shafey *et al.*, 2009). Strategies designed to alleviate tobacco use in India are challenged by the fact that tobacco is consumed in multiple forms such as smoked and smokeless forms. Owing to the variety of tobacco products consumed in India, varying health consequences are encountered, e.g. higher rate of oral cancer (World Health Organization, 1997) and increased incidence of tuberculosis (TB) (Gajalakshmi *et al.*, 2003). The economic cost of treating four major tobacco-related diseases—cancer, cardiovascular diseases, respiratory diseases and TB in India is as high as US\$1.7 billion (John *et al.*, 2009), which does not include the indirect and other social costs associated with these diseases.

Tobacco use poses a major public health threat particularly for adolescents in India, with the current prevalence of tobacco use being 14% among 13–15-year-old school-going youth as determined by the Global Youth Tobacco Survey (GYTS) (CDC website: http://www.cdc.gov/tobacco/global/gyts/factsheets/searo/2006/India_factsheet.htm). The risk is particularly high for adolescents belonging to the lower socio-economic strata (SES), as suggested in another school-based study, ‘Mobilising Youth for Tobacco Related Initiatives’ (MYTRI). This study, conducted among 10–16-year-old students in Delhi and Chennai, found the prevalence of tobacco use to be twice as high among government schools (low SES) when compared with private schools (high SES) (Mathur *et al.*, 2008).

The higher rates of tobacco use reported among adolescents living in urban, low-SES areas in India (Nichter *et al.*, 2004; Mishra *et al.*, 2005; Mohan *et al.*, 2005; Stigler *et al.*, 2006) may be due to increased uptake by them or less successful quit attempts (Bobak *et al.*, 2000; Jarvis and Wardle, 2006). Tobacco use among adolescents is influenced by multiple aetiological factors, including individual, socio-cultural and environmental factors (Poland *et al.*, 2006). Further research is required to delineate the complex aetiology of tobacco use

among the adolescents living in urban slums in India to effectively prevent tobacco uptake and promote cessation among this vulnerable subgroup.

Evidence from developed countries suggests that programme- and policy-based interventions have been successful in reducing the prevalence of tobacco use, though most of the reductions have been among the affluent class relative to the poor (Jarvis and Wardle, 2006). As childhood and adolescence is the period when experimentation with tobacco products is mostly reported, interventions targeting adolescents, both users and non-users, can be highly effective in tobacco control, though it is unclear how best to intervene among this age group. There are no published tobacco prevention and cessation studies among socio-economically disadvantaged adolescents in developing countries, including India.

A study was thus undertaken to assess the efficacy of a community-based intervention model in a low-SES community in India, focusing on the individual as well as socio-environmental factors contributing to tobacco use. An evidence-based ‘best practices’ model developed by the Canadian Tobacco Control Research Initiative (CTCRI) with the CDC (Milton *et al.*, 2004) was adapted so that it would be culturally appropriate for India. This paper reports the results of the formative research and a multi-component demonstration study conducted with the following aims:

- (1) To explore the aetiology of tobacco use in multiple forms among adolescents from low SES using qualitative research methods.
- (2) To evaluate the efficacy of a multi-component community-based intervention model (with intervention and control groups) for the prevention of uptake and cessation of tobacco use among adolescents from low SES, using quantitative research methods.

METHODS

Study subjects and design

The study was conducted in two phases. In phase I (formative phase), extensive qualitative work was conducted in two low-SES communities of Delhi in the year 2005. An attempt was made to understand the determinants that

trigger the onset of tobacco use, dynamics of regular use of tobacco and factors that motivate the user to quit tobacco. Ethics clearance for this study was sought from Independent Ethics Committee in Mumbai. Written informed consent was taken from all the participants and their parents or guardians.

Five focus group discussions (FGDs) were conducted with 37 young persons (boys 31; girls 6), aged 10–19 years living in two urban slums in Delhi. Out of these, two FGDs were conducted with groups of migrant self-employed boys living in night shelters, two with groups of boys residing with family members and one with girls residing with family members.

In-depth interviews were conducted with multiple stakeholder groups to assess the demand for tobacco cessation in this age group. These included three community leaders and health professionals at two tobacco cessation clinics in Delhi.

In phase II (intervention phase), two low-SES communities in Delhi were identified, other than the ones selected in phase I. Each of them had a slum area and a low-SES housing colony (resettlement colony) as a combined unit. This was a demonstration study, with one community serving as the intervention community and other as the control community. These communities were recruited on the basis of comparable socio-demographic characteristics. Locally credible non-government organizations (NGOs) working in each of these communities were identified to provide a channel for establishing rapport.

A questionnaire was developed on the basis of the findings of the qualitative research in phase I to assess knowledge, behaviour and attitudes towards tobacco consumption and cessation. The questionnaire at baseline was administered in Hindi (local language) in September 2006 before the implementation of the intervention and was repeated after 1 year with the same sample at endline to assess the efficacy of the intervention. Since the sample comprised both literate and illiterate respondents, the questionnaire was administered by a trained interviewer as per the convenience of the respondents.

All adolescents aged 10–19 years (tobacco users and non-users) living in the selected households of the two communities were eligible for the survey. Cluster sampling and random sampling techniques were used to identify the households in the communities. In the first stage of sampling, blocks were selected

(based on the density of population in the blocks) in each of the two communities to provide the required sample size. Nine out of 21 blocks in the intervention community and 1 out of 3 blocks in the control community were selected. A random sampling technique was used to select 772 and 834 households with 2154 and 2204 eligible adolescents, respectively, in the intervention and control communities. Out of these eligible adolescents, 1229 during baseline and 1162 during endline were surveyed in the intervention community, and 1152 at baseline and 1083 at endline were surveyed in the control community. Confidentiality of the survey results was maintained.

Intervention

A community-based multi-component intervention model was developed, implemented and evaluated in the intervention community. The intervention model addressed numerous socio-environmental and intra-personal factors that trigger the onset of tobacco use and other determinants that influence tobacco cessation. Peer leaders, adult community leaders and NGO personnel were identified and trained to facilitate the intervention programme. The intervention comprised interactive activities, pre-tested posters, audio and video films, lectures, street plays; in addition, pictorial handouts, booklets and pamphlets were distributed for knowledge enhancement by trained youth peer leaders and community leaders. An awareness rally was organized to reach and sensitize the masses and positively influence tobacco use norms in the community.

Multiple sessions (three to seven) of four interactive activities were conducted at different strategic locations in the community to disseminate information about the prevention of uptake and cessation of tobacco use. On an average, 40–50 adolescents attended each session. Data on process measures were collected to assess the fidelity with which the intervention components were implemented.

Outcome measures

The two outcome measures used from the survey questionnaire were 'ever use' and 'current use' of tobacco at baseline and endline. 'Ever users' were those who had consumed tobacco in any form in their life time. 'Current

users' were those who had consumed tobacco in any form in the past 1 week. Current use at baseline and endline were compared to calculate the 'quit rate' and 'rate of fresh uptake'. Quit rate of tobacco use among the communities was estimated as the proportion of adolescents who became non-users at endline from among those who were current users in the baseline survey. Rate of fresh uptake was estimated as the proportion of adolescents who reported themselves as ever users or current users at endline from among those who were never users at the baseline survey.

To validate self-reported tobacco consumption or abstinence, salivary cotinine levels of a subsample (25% of the sample at baseline and endline) were also measured. Salivary cotinine was biochemically analysed by enzyme-linked immunosorbent assay (ELISA) using kits from Salimetrics, USA.

Data analysis

During phase I of the study, FGDs and in-depth interviews were recorded and transcribed. The transcripts were read repeatedly, and thematic analysis was performed on the qualitative data. With regard to phase II, which involved quantitative data, comparisons between groups were done using the χ^2 test. Repeated measure logistic regression was used to compare the control and intervention communities over the study period. An interaction model between year and community was used to assess the difference between the communities over the period of the study. Logistic regression was used to calculate the odds of fresh uptake and quitting. SAS 9.1 version was used for the analysis of quantitative data.

RESULTS

Phase I (formative phase)

Socio-demographic description of participants

The participants were boys and girls in the age group of 10–19 years. Most of them had migrated from neighbouring states and villages. They had left home for various reasons such as to escape violence at home and to earn a livelihood. The majority of participants were illiterate and engaged in part-time/non-regular employment such as rag picking, carrying lamps at wedding processions and caterers. Their monthly income

ranged from INR 300–4000 (US\$7–90) per month. They usually obtained free food from religious institutions and used their earnings to support their multiple addictions. The following determinants were identified as being associated with tobacco initiation, regular use and cessation.

Determinants that define initiation of tobacco use

The participants reported that they started using tobacco at a very early age as early as 6 years and used tobacco regularly. Some of them reported initiation of tobacco use after they had left alcohol, *ganja* (a form of cannabis) or other addictive substances.

I have been smoking bidi (made by rolling a dried, rectangular piece of tenburni leaf [Diospyros melanoxylon] with sundried flaked tobacco) for the past four years, a boy said that it feels good and after that I got addicted to it (16-year-old boy).

When asked about the prevalence of the types of addiction among participants, the group responded unanimously and said,

We smoke bidi, cigarette, chew gutkha (a preparation of crushed betel nut, tobacco, catechu, lime and sweet or savory flavorings), drink alcohol and beer, bhang (Indian hemp) and ganja and also smell solution (white correction fluid containing toluene) (Group's view).

Different social, environmental and personal factors were cited for the onset of tobacco consumption among participants. Some of these included: imitating elders (particularly family members), peer group influence and to have 'fun'. Some of the respondents stated that they had started using *gutkha* after their friends or family members offered it to them. In many cases, parents and family members also consumed tobacco, both in chewed and smoked forms.

I started all these addictions when I was staying at home. I started bidi first. I smoke two packets of cigarettes in a day (16-year-old boy).

I started because my friends smoked. I didn't know how to smoke a bidi, my friend taught me and then I learned how to smoke it. The taste of bidi is like Pepsi (12-year-old boy).

Determinants that define regular use of tobacco

Accessibility and affordability. The majority of participants mentioned that tobacco is easily available everywhere, i.e. at roadside stalls, general stores and paan (betel-leaf) shops.

Since myriad varieties of tobacco products are available, they are available over a wide price range. Money is not a barrier for most of the children as they earn a minimum of INR 50 (US\$1.11) per day and can easily afford to buy cheap tobacco products such as bidi and gutkha [one packet of bidi/gutkha costs INR 1–7 (approximately US cents 2–14)].

Consequences of tobacco use. Most of the participants reported awareness of the negative consequences of tobacco use on health, for example tooth decay, TB and discoloration of the teeth. They could not, however, distinguish between the short and long-term health consequences. Almost all of them believed that tobacco is injurious to health.

Cigarette has harmful ingredients and all. We also get many diseases because of this. We feel burning sensation after chewing gutkha. This gives us the feeling of high (Group's view).

Knowledge of tobacco control. Most of the participants were aware of the Tobacco Control Act in India.

The sale of bidi is banned below the age of 18 years. I saw at India Gate that children less than 18 years do not get any bidi or gutkha. It is written on the board (10-year-old boy).

Social influences. The participants reported that they get influenced by their peer group. Most of them admitted that they find it difficult to resist such peer group influence.

I take gutkha daily, I started because I saw villagers taking this. When I smoked bidi for the first time, I fainted. Gutkha is better than bidi and I take 4–5 packets of gutkha daily and it is also easily available at the shop (13-year-old boy).

Determinants related to quitting behaviour

Lack of motivation to quit. The children were not confident of having the skills to resist peer group influences and they expressed a minimal desire to quit. Some of them had attempted to quit but were unsuccessful and started another addiction.

I tried to quit and I tried this continuously for 3 days. One day I didn't take but on second day I felt like having it. I am not able to quit this addiction and I started it again (10-year-old boy).

Perspectives of health professionals (tobacco cessation experts) and community leaders

In-depth interviews with tobacco cessation experts (clinical psychologist and pulmonologist) revealed that no youth in the age group of 10–19 years visits tobacco cessation centres to avail the facilities. Health professionals and community leaders reported that tobacco consumption is common among both adults and young persons in the community and they all felt the need for an extensive community development programme to prevent tobacco uptake and promote tobacco cessation among youth.

Phase II (intervention phase)

The prevalence rates of ever use and current use of tobacco at baseline and endline in the two communities are presented in Table 1. Prevalence of both current use and ever use increased in the control community and decreased in the intervention community (Fig. 1) at endline. At baseline, both current use and ever use did not differ significantly between the two communities. However, at endline, the intervention group showed significantly lower prevalence of tobacco use among the males as well as the total sample. Repeated measure logistic regression showed that the intervention group showed significant decline in current use for males and the total sample. The prevalence for both ever use and current use was significantly higher in boys compared with girls.

Classification of adolescents on the basis of the salivary cotinine level among self-reported users and non-users is presented in Table 2. Adolescents were classified as tobacco user if the amount of cotinine present in the saliva was more than or equal to 10 ng/ml. Of the adolescents in the intervention and control communities who self-reported that they were non-users, 13–17% were classified as users on the basis of the cotinine level at baseline and endline. False negative reporting of tobacco use was not significantly different between the two communities (for baseline, $p = 0.551$; for endline, $p = 0.354$). In contrast, 0–21% of adolescents were classified as non-users on the basis of the cotinine level among those adolescents who self-reported that they were users.

Rate of fresh uptake and quit rates for the two communities are presented in Tables 3 and 4, respectively. The rate of fresh uptake of tobacco differed significantly between the intervention

Table 1: Prevalence of current use and ever use of any tobacco product at baseline (2006) and endline (2007) by study condition

			Control			Intervention			χ^2	<i>p</i> -value
			Total	<i>N</i>	% (CI)	Total	<i>N</i>	% (CI)		
Current use	Baseline	Male	637	57	8.95 (6.73–11.16)	641	46	7.18 (5.18–9.17)	1.354	0.245
		Female	510	3	0.59 (0.00–1.25)	577	2	0.35 (0.00–0.83)	0.345	0.557
		Total	1147	60	5.23 (3.94–6.52)	1218	48	3.94 (2.85–5.03)	2.256	0.133
	Endline	Male	595	62	10.42 (7.97–12.88)	602	38	6.31 (4.37–8.35)	6.595	0.010
		Female	483	3	0.62 (0.00–1.32)	549	1	0.18 (0.00–0.54)	1.282	0.257
		Total	1078	65	6.03 (4.61–7.45)	1151	39	3.39 (2.34–4.43)	8.731	0.003
Ever use	Baseline	Male	637	71	11.15 (8.70–13.59)	641	57	8.89 (6.69–11.10)	1.801	0.180
		Female	510	3	0.59 (0.00–1.25)	577	4	0.69 (0.02–1.37)	0.047	0.829
		Total	1147	74	6.45 (5.03–8.03)	1218	61	5.01 (3.78–6.23)	2.286	0.131
	Endline	Male	595	69	11.60 (9.02–14.17)	602	46	7.64 (5.52–9.76)	5.391	0.020
		Female	483	4	0.83 (0.02–1.64)	549	3	0.55 (0.00–1.16)	0.302	0.582
		Total	1078	73	6.77 (5.27–8.27)	1151	49	4.26 (3.09–5.42)	6.803	0.009

All comparisons between males and females significant at $p < 0.0001$.

Repeated measure logistic regressions (GEE coefficients for year and community interaction effect presented; estimates for intervention community at endline with reference to the rest). Current use—male: estimate -0.307 (p -value 0.048); female: estimate -0.306 (p -value 0.058). Total: estimate -0.318 (p -value 0.045).

Ever use—male: estimate -0.222 (p -value 0.074); female: estimate -0.210 (p -value 0.112). Total: estimate -0.231 (p -value 0.068).

Bold p values indicate that though there was no difference between the intervention and control groups at baseline, there was significant difference ($p < 0.05$) between these groups at the endline (This is true for males and Totals).

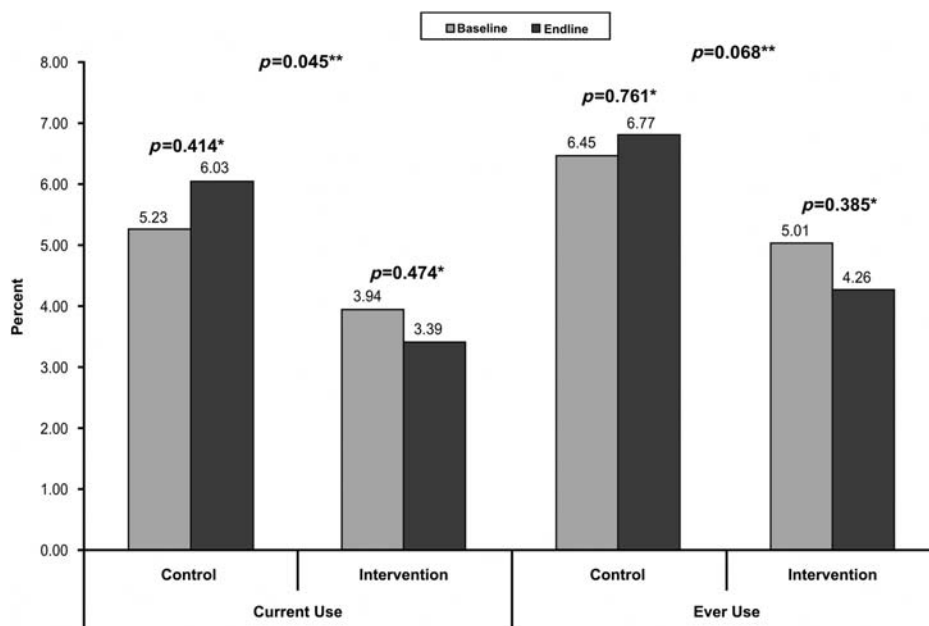


Fig. 1: Current use and ever use among the control and intervention community at baseline and endline. * p -Value for the difference between baseline and endline based on χ^2 test; ** p -Value for interaction effect between community and year in a repeated measure logistic regression.

and control communities. Out of 1055 never users at baseline in the intervention community, only 3 (0.28%) reported experimenting with tobacco products during the intervention period.

In contrast, among the control community, 16 (1.67%) out of 958 never users at baseline reported experimenting with tobacco at endline. Of these experimenters, 15 were boys. The odds

Table 2: Salivary cotinine level and self-reported tobacco use in the two communities at baseline and endline

Tobacco use based on salivary cotinine level	Control						Intervention			<i>p</i> -value ^a
	Reported current use						Reported current use			
	No	Yes	Total	No	Yes	Total	No	Yes	Total	
Baseline	No	169 (85.79%)	0 (0.00%)	169 (66.27%)	140 (82.84%)	4 (9.76%)	144 (68.57%)	0.551		
	Yes	28 (14.21%)	58 (100.00%)	86 (33.73%)	29 (17.16%)	37 (90.24%)	66 (31.43%)			
	Total	197	58	255	169	41	210			
Endline	No	143 (86.67%)	13 (20.97%)	156 (68.72%)	121 (87.05%)	6 (16.22%)	127 (72.16%)	0.354		
	Yes	22 (13.33%)	49 (79.03%)	71 (31.28%)	18 (12.95%)	31 (83.78%)	49 (27.84%)			
	Total	165	62	227	139	37	176			
Cotinine levels	Tobacco use status						Tobacco use status (binary)			
Cotinine level undetected (0 ng/ml)	Non-user; absence of passive and active tobacco use						Non-user			
<10 ng/ml	Exposure to tobacco smoking; workout active use						Non-user			
10–100 ng/ml	Infrequent active smoking/tobacco use or heavy exposure to passive smoking						Tobacco user			
>100 ng/ml	Active user						Tobacco user			

^aComparing false negative reporting between control and intervention using χ^2 test.

Bold values are false negative reporting rate between the intervention and control groups at baseline and endline.

Table 3: Rate of fresh uptake among the intervention and control communities

	Control		Intervention		χ^2	<i>p</i> -value	*Odds ratio		
	Number of never users at baseline	Ever use of tobacco at endline	Number of never users at baseline	Ever use of tobacco at endline					
	<i>N</i>	%	<i>N</i>	%					
Male	501	15	2.99	529	3	0.57	7.058	0.008	5.411 (1.56–18.81)
Female	457	1	0.22	526	0	0.00	Fisher's exact test <i>p</i> -value = 0.465		
Total	958	16	1.67	1055	3	0.28	8.004	0.005	5.96 (1.73–20.51)

*Odds of fresh uptake in control community with reference to the intervention community.

(OR = 5.96, *p* = 0.005) of fresh uptake in the control community was significant compared with the intervention community.

Out of 32 current users at baseline in the intervention community, 4 (11.11%) reported currently not using tobacco at endline. In the control community, only 2 (4.55%) among the 42 tobacco users at baseline reported not using tobacco at endline. Quit rate was higher in the intervention community but was not significantly different from that of the control community (*p* = 0.282).

Ever users were asked questions on the different forms of tobacco products that they had used from a list of 11 different forms. More than 55% of ever users had used tobacco in

multiple forms (Table 5). Table 6 presents tobacco use in smoking and chewable forms among boys and girls in the two surveys. Girls reported the use of only chewable forms of tobacco products. Boys reported the use of both smoking and chewable forms. Almost 50% of ever user boys had used only chewable products, whereas one-third of the boys reported having used both the products.

DISCUSSION

In both developed and developing countries, tobacco cessation and control have been

Table 4: Quit rate among the intervention and control communities

	Control		Intervention		χ^2	p-value	*Odds ratio		
	Number of current users at baseline	Quit tobacco use at endline	Number of current users at baseline	Quit tobacco use at endline					
		N		%				N	%
Male	41	1	2.44	34	3	8.82	1.317	0.251	0.26 (0.03–2.61)
Female	3	1	33.33	2	1	50	0.137	0.711	0.50 (0.01–19.56)
Total	44	2	4.55	36	4	11.11	1.157	0.282	0.381 (0.07–2.21)

*Odds of quitting in control community with reference to the intervention community.

Table 5: Multiple forms of tobacco use among the ever users of tobacco products

Number of different forms of tobacco products used ^a	Baseline		Endline	
	Frequency	Per cent	Frequency	Per cent
1	73	54.07	65	53.28
2	25	18.52	21	17.21
3	14	10.37	17	13.93
4	13	9.63	10	8.20
5	6	4.44	5	4.10
6	1	0.74	2	1.64
7	2	1.48		
8			1	0.82
9	1	0.74	1	0.82
Total	135		122	

^aTotal of 11 forms of tobacco products were listed on the survey. These included cigarette, bidi, chilum, hukka, zarda, khaini, gutkha, paan with tobacco and snuff. A maximum of 9 out of 11 were reported to be used by ever users.

identified as areas on which public health policy should focus to bring down the huge burden of diseases that tobacco causes globally. It is important to focus efforts on both tobacco prevention and cessation among adolescents, since this is the age when tobacco initiation has mostly been reported.

Successful community-based, peer-led, multi-component tobacco intervention programmes have been undertaken with adolescents in developed countries (Pentz *et al.*, 1989; Perry *et al.*, 1989). In India, a community-based, multi-component, peer-led, tobacco prevention intervention has been implemented for the first time in this demonstration study. School-based group randomized trials such as the MYTRI in India have reduced tobacco use in school students receiving the intervention, compared with increased use in control school students (Perry *et al.*, 2009).

Table 6: Use of smoking and chewable forms of tobacco among boys and girls

		Boys		Girls	
		N	%	N	%
Baseline	Chewable and smoking	44	34.38	0	0.00
	Chewing forms only	67	52.34	7	100.00
	Smoking forms only	17	13.28	0	0.00
Endline	Chewable and smoking	43	37.39	0	0.00
	Chewing forms only	56	48.70	7	100.00
	Smoking forms only	16	13.91	0	0.00

The qualitative research in phase I of this study revealed a high usage of tobacco products in multiple forms among adolescents in the two study communities, which is in line with the Indian component of the GYTS (http://www.cdc.gov/tobacco/global/gyts/factsheets/sear/2006/India_factsheet.htm).

The age at initiation of tobacco products in this study is reported to be 6 years, which is much lower than the 10 years reported earlier in the Indian literature (Patel, 1999). This is alarming, as starting tobacco use at such an early age would further add to health inequality among the disadvantaged population in India. Chewing of tobacco products is more prevalent among adolescents. Boys reported the use of both smoked and smokeless forms of tobacco products, chewing being more frequently reported both in the qualitative and quantitative phases of this study. Girls self-reported the use of only chewing forms. Chewing tobacco is not overtly visible, and the social stigma attached to smoking, especially among girls, can be avoided if tobacco is chewed. Moreover, in India, chewing forms of tobacco are available in small packs which can be easily hidden from teachers and parents or other adults. Self-reported tobacco use in the survey questionnaire also

highlighted that tobacco is consumed in multiple forms by adolescents. Almost 50% of respondents reported using tobacco in more than one form as noted in phase II of this study. Qualitative data from phase I of this study indicated a very high prevalence of tobacco use (90%), which differed from the results of the survey questionnaire in phase II (self-reported tobacco use 5.7% at the baseline survey). Self-reported tobacco use among these adolescents was validated by salivary cotinine levels, and highlighted high levels of under-reporting among adolescents during the survey. About one in seven self-reported non-users was classified as a user on the basis of the cotinine level. Such under-reporting has been highlighted earlier in a large study conducted in the USA, UK and Poland (West *et al.*, 2007), which forms the basis for the biochemical validation of self-reported smoking status.

The present study highlights the fact that adolescents belonging to low SES are more prone to early initiation of tobacco use because of several social, environmental and personal factors, limited knowledge of the negative consequences of tobacco use, peer pressure and acceptance of tobacco consumption by adults and elders, a finding which is consistent with another study conducted in Delhi and Chennai in India (Mathur *et al.*, 2008). This leads to unchecked tobacco consumption among adolescents residing in low-resource settings, further adding to health inequality. These determinants provide adolescents with an enabling environment that aids conversion of experimentation to regular use of tobacco. As several of these adolescents start working at an early age, easy accessibility and affordability of tobacco products encourages their tobacco habit. Access to disposable income has been found to be a risk factor for tobacco use in other studies in India (Nichter *et al.*, 2004). Lack of cessation facilities was also found to be a determinant that prevented them from quitting. Few of them thought of quitting; some gave up one addiction, but started another one soon, highlighting the vulnerable environment in which these adolescents live.

Comparison of quit rates and rates of fresh uptake between the intervention and control communities clearly underscores the benefits of the intervention in controlling tobacco initiation and enhancing tobacco cessation. Though quit rates did not differ significantly between the two communities, adolescents from both the

communities attempted cessation and a few of them were successful in achieving it. No intervention was administered in the control community but wider influences such as tobacco control policy changes and the mass media cannot be ruled out. These results point towards the need to set up community-based cessation services apart from hospital-based services currently available in India (http://www.whoindia.org/EN/Section20/Section25_952.htm) to facilitate their use by adolescents and the common people. The two hospital-based cessation centres in Delhi are insufficient to cater to the entire population of Delhi.

The limitations of this study included a small number of communities (two) and loss to follow up. For such multi-component interventions to be effective and promote cessation, the period of intervention has to be for a longer duration than the 1 year of intervention in phase II of this study. The results demonstrating the efficacy of this intervention model have been encouraging, considering its short duration. With these experiences and results, a group randomized trial has been planned in the third phase called Project ACTIVITY (Advancing Cessation of Tobacco in Vulnerable Indian Tobacco Consuming Youth), funded by the Fogarty International Center at the National Institutes of Health. This large-scale randomized intervention trial is currently being conducted in 14 low-SES communities of Delhi. Community-based interventions that are sustainable and cost-effective can be a promising approach for the prevention and cessation of tobacco use, particularly for protecting vulnerable adolescents in developing countries such as India.

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