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Original Research Article

Which school-based model produces adolescent advocates for tobacco prevention in rural Maharashtra? A quasi-experimental study

Rajashree Kadam[1], Manasi Bawdekar[2], Nilesh Chatterjee[1]*, Kalpana Pillai[1], Kirti Gaur[2]

[1]Salaam Mumbai Foundation, Nirmal Building, 1st Floor, Nariman Point, Mumbai 400021, Maharashtra, India
[2]Research, Monitoring and Evaluation, Salaam Bombay Foundation, Nirmal Building, 237, Barrister Rajni Patel Marg, Nariman Point, Mumbai, Maharashtra

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***Correspondence:**
Dr. Nilesh Chatterjee,
E-mail: nileshchatterjee100@gmail.com

ABSTRACT

Background: India's rising non-communicable disease (NCD) burden has prompted school-based health programmes that aim to build student health and students as advocates for healthy behaviours in communities. We compared two tobacco-prevention delivery models in government schools: teacher-only tobacco-free school (TFS) training versus TFS training plus an external facilitator to examine which one encouraged more student advocates.
Methods: Post-test-only quasi-experimental study conducted in four rural districts of Maharashtra. Teachers in two districts received TFS training, while two other districts received teacher training plus an external facilitator assigned for classroom delivery of health and hygiene sessions. Grade-8 students (n=1,348) from 50 schools (24 teacher-only, 26 teacher+facilitator) were surveyed. The primary outcome, "consistent commitment to advocacy," required reporting "always" for awareness-raising with both family and community. Bivariate tests and logistic regression examined associations with knowledge, perceived TFS implementation, participation in activities, and self-efficacy (refusal, persuasion).
Results: Consistent advocacy was higher in teacher-only schools [49% (293/596)] than in teacher+facilitator schools [40% (302/752)]. In adjusted analyses, being in a teacher-only school, awareness of tobacco initiatives, higher perceived fulfilment of TFS criteria, and greater refusal and persuasion self-efficacy were independently associated with consistent advocacy (all $p \leq 0.05$). Sex and knowledge scores were not significant.
Conclusions: Teacher-led delivery of the TFS programme produced more consistently committed adolescent advocates. Training teachers to create health advocates/ambassadors may be a scalable approach for student-led tobacco and NCD prevention in the large-scale Ayushman Bharat government school-health program. Future research should explore mechanisms and assess impacts on actual tobacco use.

Keywords: Adolescents, Schools, School health program, Students, Student tobacco-prevention advocates, Teacher-training intervention, Tobacco-free school environment

INTRODUCTION

India bears a heavy burden of non-communicable diseases (NCDs) and their risk factors. Tobacco use alone accounts for roughly 27 % of all cancers in the country, causing about one million preventable deaths each year.[1,2] Unhealthy behaviours continue to increase the incidence of diabetes, cardiovascular disease, dementia and cancer. India currently has 23% of the world's diabetes cases and the third-highest share of people with obesity. The present estimate of 180 million individuals with obesity is projected to reach 450 million by 2025, making India the world's most affected nation.[3,4] In 2019 obesity-related costs were estimated at US$ 28.95 billion (1% of India's

GDP). By 2060 these costs are expected to rise nearly 29-fold to US$ 838.6 billion (2.5% of GDP).[5]

Among India's 250 million adolescents, 7.3 million boys and 5.2 million girls were obese in 2022- a dramatic increase from 0.2 million in 1990.[3,4] Indian children, like their peers worldwide, are now exposed to diets high in fat, sugar and salt; sedentary routines; extended screen time; and risky behaviours, including tobacco and alcohol use, substance abuse, unsafe sex, interpersonal violence and self-harm.[6,7] Addressing these risk factors early is critical to averting future NCDs.

Schools reach most school-age children and therefore offer a strategic platform for health promotion.[8] Responding to this opportunity, the Government of India, under the larger Ayushman Bharat initiative, launched the School Health and Wellness Programme- a joint effort of the Ministries of Education and Health and Family Welfare.[9] The programme provides health education and services while creating a supportive environment in which students learn from peers, teachers and other role-models.

Schools are targeted because healthy habits are easier to establish in childhood than to modify in adulthood. However. the programme also recognizes that students could serve as potential health advocates for behaviour change in their families and communities. Personal advocacy here denotes a student's commitment to influence others to avoid harmful risk factors and adopt protective behaviours. Such student advocates could be especially valuable in contexts where public-health resources are limited.[9]

Consequently, the school health programme must achieve two goals: help students adopt healthy behaviours and empower them to advocate these behaviours to others. Key questions remain: Will teacher-led education alone suffice to produce student advocates? What type of school learning strategies most effectively nurture sustained advocacy? To explore this issue, we used tobacco prevention as a test-case, comparing two approaches for delivering anti-tobacco messages to pupils. Specifically, we asked which approach better promoted students' consistent advocacy of tobacco prevention within their families and communities. This test-case could help inform strategies used by the government's school health programme.

METHODS

Study setting and design

This study was conducted in four rural districts of Maharashtra, India's second-most populous state, where 16.7% of agricultural land is devoted to tobacco cultivation. Adult tobacco-use in Maharashtra declined from 31.4% in 2009-2010 to 26.6% in 2016-2017, yet youth tobacco-use rose by 3% during the same period.[10] Among Maharashtra's 100,000 schools, roughly two-thirds are government-managed, enrolling 13 million students, mainly from lower-socio-economic, rural backgrounds. All government schools are required to comply with national tobacco-control legislation and tobacco-free school (TFS) guidelines.[11]

We used a post-test-only quasi-experimental design to assess whether adding an external health-education facilitator to the usual TFS training of an assigned school teacher affected student advocacy for tobacco prevention in the family and community. Four districts were purposively selected: two were assigned to the intervention condition (teacher training + external facilitator) and two to the comparison condition (teacher training only). Districts for intervention were determined by state authorities. Data were collected once, after the intervention, from 1348 grade-8 students in randomly chosen government schools in these four districts. The post-intervention student survey was administered between April and May, 2023.

In order to be eligible for the post-only survey, students had to be grade 8 students enrolled in government-managed schools in the four districts, able to complete the Marathi questionnaire, present on the survey day, bring parental consent and provide student assent. Non-grade 8 students; students absent on the survey day; lacking parental consent or assent; or from schools outside the sampling frame were not eligible.

Intervention procedures

The department of education instructed principals in all four districts to nominate at least one non-tobacco-using teacher involved in health education. Nominated teachers were trained to implement tobacco-prevention activities in their schools.[11] They attended a one-day session covering tobacco harms, legal regulations, practical steps for enforcing TFS policies, how to conduct classroom lessons, awareness campaigns and village rallies with students.

In the two intervention districts, each school also received support from a paid facilitator recruited by an NGO. Facilitators- recent graduates with strong communication skills- completed a five-day course on health education, tobacco prevention and hygiene activities. These external facilitators visited the intervention schools to conduct additional classroom-based sessions for students on tobacco prevention, health and hygiene.

Random assignment of districts was not feasible, as the state administration selected the districts. Thus, all four districts received TFS training, but only the two intervention districts had the added resource of a trained external facilitator. Both interventions were completed in the academic year between September 2022 and March 2023.

Sampling and data collection

Lists of government schools were compiled for two blocks per district. Within each list, schools were selected by random-number draw until the target sample was reached: 596 students from 24 schools in the comparison districts and 752 students from 26 schools in the intervention districts. Two trained research facilitators administered a structured Marathi-language questionnaire during class time. Teachers were absent to ensure privacy and reduce any bias in responses by students. Facilitators read each question aloud while students marked paper questionnaires. Training of facilitators covered rapport-building, standardized delivery, confidentiality and accuracy. Approvals were taken from Salaam Mumbai Foundation's internal committee, district education officers and school principals. Parents provided written consent and students assented.

Study instrument

The questionnaire captured age; gender; awareness of six ill-effects of tobacco (yes/no); knowledge of seven tobacco-related diseases (yes/no); awareness of the nine TFS criteria and of the 2003 Cigarettes and Other Tobacco Products Act (COTPA); perception of TFS implementation (nine yes/no items); participation in four school tobacco-prevention activities (yes/no); and four items scored as never (0)/sometimes (1)/always (2) assessed student's ability to refuse tobacco offered by friends; ability to persuade a family member to stop using tobacco; active efforts to spread awareness of tobacco harms to family members; active efforts to spread awareness in locality/community (Table 1).

Data analysis

Data were entered in Microsoft Excel and analysed with SPSS v16.0. Descriptive analysis was generated for all variables. A dependent variable- commitment to personal advocacy- was created by summing two items: active efforts to raise awareness among family and active efforts to raise awareness in the community. Students scoring 4 (always + always) were classified as consistently committed; all others were categorized as inconsistently committed.

Chi-square tests examined associations between commitment to personal advocacy and dichotomous predictors. Independent-samples t-tests compared continuous predictors.

Four composite independent variables were constructed: 1) Ill-effects awareness score (0-6): sum of yes (1) and no (0) responses to 6 items on tobacco-related harms (e.g., bad breath, teeth and lip discoloration, tooth decay, risk of addiction, COVID-19 or respiratory infections, and hunger suppression). Scores ranged from 0 to 6. 2) Disease-knowledge score (0-7): sum of yes (1) and no (0) responses to 7 items on diseases linked to tobacco use (e.g., tuberculosis, obesity, cancers, sinusitis, diabetes, heart disease, asthma). 3) Perceived TFS-implementation score (0-9): sum of yes (1) and no (0) responses to 9 dichotomous items related to TFS criteria implementation in the school. 4) Participation score in tobacco-prevention activities (0-4): sum of yes (1) and no (0) responses to 4 items.

Predictors significant at $p \leq 0.05$ in bivariate tests were entered into a logistic-regression model with commitment as the outcome.

RESULTS

A total of 1348 students completed the survey, including 596 from comparison condition (schools that received the universal teacher training for TFS) and 752 from intervention condition (schools that received the teacher training for TFS and an additional external facilitator). Male and female proportions were roughly the same. The average age of participants was 14.4 years, with a median of 14 years. Over 80% of the participants knew that tobacco use caused cancers and understood the ill-effects of tobacco (e.g., bad breath, tooth decay, discoloration of teeth and lips, and risk of addiction). Nearly 49% (293) of 596 students who received TFS-only as compared to 40% (302) of 752 students who received teacher plus external facilitator reported consistent commitment to tobacco-prevention advocacy.

Table 1 compares consistently and inconsistently committed students. There was no age difference. Consistent advocates were more likely to be male (55%) and demonstrated higher scores for ill-effects awareness (mean 4.87/6) and disease knowledge (mean 4.75/7).

Two-thirds (67%) of consistent advocates knew of COTPA compared with 36 % of inconsistent advocates. Consistent advocates also perceived greater fulfilment of TFS criteria in their schools (mean 6.55/9) versus the inconsistent group (mean 5.03/9). The consistent group more frequently reported the presence of shops selling tobacco within 100 yards.

Participation in tobacco-prevention activities was higher among consistent advocates (mean 2.89/4) versus the inconsistent group (mean 2.61/4). The consistent advocates also scored higher on refusal self-efficacy (mean 1.71/2) versus the inconsistent group (1.31/2) and persuasion self-efficacy (mean 1.86/2) as compared to inconsistent (mean 1.24/2).

Table 2 presents the logistic-regression results. After adjustment, factors positively associated with consistent advocacy were: being in the teacher-only condition; awareness of COTPA; higher perceived fulfilment of TFS criteria; stronger refusal self-efficacy; and stronger persuasion self-efficacy.

Table 1: Comparison of students with consistent and inconsistent commitment to personal advocacy for tobacco-use prevention on condition, gender and other independent variables.

Independent variables	Univariate analysis	Bivariate analysis		P value
	Total sample (n=1348)	Inconsistently committed (n=753)	Consistently committed- personal advocate (n=595)	
Type of intervention received by school				
Tobacco free school Teachers training only	596 (44.2)	303 (40%) Row (51%)	293 (49%) Row (49%)	P<0.01
TFS + External Facilitator	752 (55.8)	450 (60%) Row (60%)	302 (51%) Row (40%)	
Age in years				
Mean (SD)	14.4 (0.68)	14.05 (0.68)	14.03 (.68)	P=0.5
Median	14	14	14	
Min, Max	12-16	12-16	12-16	
Gender (row percentage)				
Male	670 (49.7)	340 (45%)	330 (55%)	P<0.001
Female	678 (50.3)	413 (55%)	265 (45%)	
Awareness of ill-effects of tobacco (only yes percent displayed)				
Bad breath	1168 (86.6)	645 (86%)	523 (88%)	P=0.23
Tooth decay (display only yes percent)	1229 (91.2)	673 (89)	556 (93)	P<0.01
Risk of COVID-19 infection	793 (58.8)	422 (56)	371 (62)	P<0.05
Addiction (to tobacco)	1114 (83)	607 (81)	507 (85)	P<0.05
Suppresses Hunger	966 (71.7)	537 (71)	429 (72)	P= 0.7
Discoloration of teeth and lips	1121 (83)	612 (81)	509 (86)	P<0.05
Ill-effects Awareness score (summed score of items above)				
Mean (SD)	4.74 (1.57)	4.64 (1.6)	4.87 (1.51)	P<0.01
Median (Min 0 Max 6)	5	5	6	
Tobacco increases risk of this disease (only yes percent displayed)				
TB	776 (57.6)	394 (52)	382 (64)	P<0.001
Obesity	573 (42.5)	282 (37)	291 (49)	P<0.001
Cancers	1088 (81)	594 (79)	494 (83)	p=0.056
Sinusitis	677 (50.2)	317 (42)	360 (61)	P<0.001
Diabetes	750 (55.6)	377 (50)	373 (63)	P<0.001
Heart disease	955 (70.8)	474 (63)	481 (81)	P<0.001
Asthma	924 (68.5)	478 (63)	446 (75)	P<0.001
Knowledge score for tobacco-related diseases (summed score of items above)				
Mean	4.26 (2.18)	3.87 (2.11)	4.75 (2.17)	P<0.001
Median (Max = 7, Min = 0)	4	4	5	
Chemical in tobacco products responsible for addiction?				
Nicotine	1146 (85)	615 (82)	531 (89)	P<0.001
Other chemicals (ammonia, acetone, arsenic)	202 (15)	138 (18)	64 (11)	
Tobacco-free school criteria- knowledge and actions				
How many criteria to be fulfilled for school to be declared Tobacco-free school?				
Correctly answered as 9 criteria	699 (51.9	366 (49)	333 (56)	P<0.01
Are you aware of COTPA Act 2003				
Yes	664 (49.3)	268 (36)	396 (67)	P<0.001
Perception of fulfilment of Tobacco-free School Criteria in the school (only Yes percent displayed)				
'Tobacco free area' banner displayed inside the school	1126 (84)	602 (80)	524 (88)	P<0.001
'Tobacco Free Education Institution' banner displayed at entrance of school	899 (66.7)	430 (57)	469 (79)	P<0.001
Any evidence of use of tobacco products inside the school	833 (61.8)	484 (64)	349 (59)	P<0.05
Posters/awareness material on tobacco ill-effects displayed in school	1040 (77)	517 (69)	523 (88)	P<0.001
At least one tobacco control activity conducted in school in last 6 months	1045 (78)	514 (68)	531 (89)	P<0.001

Continued.

Independent variables	Univariate analysis	Bivariate analysis		P value
	Total sample (n=1348)	Inconsistently committed (n=753)	Consistently committed- personal advocate (n=595)	
Are 'Tobacco monitor' details been displayed on any board in your school?	742 (55)	348 (46)	394 (66)	P<0.001
'No Tobacco Use' been included in code of conduct guideline of school	835 (61.9)	383 (51)	452 (76)	P<0.001
There is 100 yards marking from the wall/fence of school w.r.t tobacco use	576 (42.7)	233 (31)	343 (58)	P<0.001
Any shops selling tobacco products within 100 yards of school premises?	592 (43.9)	279 (37)	313 (53)	P<0.001
Student perception score of fulfilment of TFS criteria by school (sum of above items)				
Mean (SD)	5.7 (2.08)	5.03 (2.09)	6.55 (1.73)	P<0.001
Median (Max 9 and Min 0)	6	5	7	
Student participation in TFS activities conducted in school (only yes percent displayed)				
Tying a sacred thread (rakhi) to shopkeepers wrist for not selling tobacco to minors	693 (51.4)	368 (49)	325 (55)	P<0.05
Creating awareness about tobacco prevention during local festivals	925 (68.6)	508 (67)	417 (70)	P=0.3
Drama, elocution, poem, poster making competitions on tobacco in your school	1009 (75)	532 (71)	477 (80)	P<0.001
Rallies about tobacco conducted in the community around the school	1057 (78)	558 (74)	499 (84)	P<0.001
Student participation score in tobacco-prevention activities				
Mean (SD)	2.73 (1.24)	2.61 (1.29)	2.89 (1.16)	P<0.001
Median (Max = 4 and Min = 0)	3	3	3	
Skills and Behaviors at the personal level (of the student)				
Able to say NO to friends who offer you any form of tobacco	1.49 (SD 0.77) Median 2	1.31 (0.82) 2; 0-2	1.71 (0.65) 2; 0-2	P<0.001
Ability to convince someone in family/ friend circle to not consume tobacco	1.51 (0.68); 2; 0-2	1.24 (0.72) 1; 0-2	1.86 (0.43) 2; 0-2	P<0.001

Table 2: Summary table of the logistic regression analysis.

Covariate	Odds ratio (OR)	95% confidence interval	P value
Condition			
TFS only	[ref]		
THS + Ext facilitator	0.543	0.402 – 0.734	<0.001
Gender			
Male	[ref]		
Female	0.854	0.653-1.119	0.254
Ill-effects of tobacco score	0.974	0.882-1.076	0.608
Tobacco-induced diseases score	1.013	0.938-1.093	0.33
Aware of COPTA (Cigarettes and Other Tobacco Products Act)			
No	[ref]		
Yes	2.790	2.114-3.680	<0.001
Student perception of fulfilment of TFS criteria score	1.347	1.234-1.470	<0.001
Student participation in tobacco-prevention activities score	0.880	0.771-1.004	0.059
Able to say NO to friends who offer you any form of tobacco	1.261	1.035-1.537	<0.05
Ability to convince someone in family/ friend circle to not consume tobacco	4.638	3.546-6.069	<0.001

DISCUSSION

This quasi-experimental post-test-only, study examined what type of school intervention for tobacco prevention had a greater effect on personal advocacy of tobacco-prevention or consistent commitment to spreading awareness among family and community members about tobacco prevention among students from government

schools in four rural districts in the state of Maharashtra, India. Adolescents either belonged to schools in comparison districts where a universal tobacco-free school (TFS) training intervention was provided to teachers from government schools and the teachers conducted all activities or to schools in intervention districts where in addition to the TFS teacher-training, an external paid and trained facilitator was also deputed to conduct classroom sessions with students.

This post-test-only quasi-experimental study assessed which of two school delivery models better fostered adolescent advocacy for tobacco prevention. Students from teacher-only schools were more likely to be consistent advocates than those exposed to the additional external facilitator. One explanation is that students may respond more strongly to established authority figures within the school hierarchy than to facilitators who are temporary and outsiders- an effect noted in earlier school-based social-programme research.[12,13]

It is also possible that students in teacher-only schools felt implicit pressure to report favourable advocacy behaviour, whereas external facilitators elicited more candid responses.

Prior research has also found that school-based social programs tend to be more effective when implemented by teachers rather than outside professionals, with the established teacher-student relationship playing a key role in fostering better student responsiveness to teacher-led interventions.[12,13]

Further qualitative research is needed to probe the dynamics of whether a teacher-only intervention effectively cultivates consistently committed advocates, and to explore whether teacher-only models also reduce actual student tobacco use- a variable not captured here. Other studies have found that TFS-only intervention is linked with reduced tobacco use in students; however, those students whose family members used tobacco were less likely to give up tobacco.[14] All this information could provide valuable evidence for large-scale government school-health program, including the government's NCD-prevention initiative, that designates teachers as health ambassadors.[9]

Male students were more likely to be consistent advocates, reflecting broader gender norms in India that grant boys greater autonomy and public voice.[15,16] Consistent advocacy was also linked to knowledge (ill-effects, diseases, COTPA) and to self-efficacy in refusing offers and persuading others- findings aligned with previous research.[17] Those who scored higher on ability to refuse when friends offered tobacco and on the ability to persuade family or friends to stop tobacco-use were significantly more likely to be 'consistently committed' to personal advocacy. These two variables most probably reflect greater self-efficacy in assertiveness skills. Studies have shown that youth empowerment programs that include assertiveness and advocacy training lead to increased self-efficacy and proactive engagement in tobacco control activities.[18]

Schools are ideal venues for integrating health and education goals.[9,19] Encouraging students to adopt healthy behaviors and advocate for them within their networks is an effective strategy, particularly in low and middle income countries (LMICs) like India. Advocacy fosters self-awareness, commitment, and motivation, as promoting a behavior often leads to its personal adoption. Publicly endorsing healthy behaviors creates accountability, while social pressure from peers reinforces adherence. Additionally, researching and learning about behaviors during the activity of advocacy can deepen understanding and facilitate personal change.[9] This research highlights the potential of teachers as change agents in schools to influence student health behavior. The absence of baseline data limits causal inference. Exposure to other tobacco-control initiatives in comparison districts cannot be excluded. Self-reported behaviours may be biased by social desirability despite teacher absence during data collection. Finally, the sample- rural, Marathi-medium government schools- may not represent all Indian contexts.

CONCLUSION

Teacher-led implementation of the tobacco-free school programme produced more consistently committed adolescent advocates than a model supplemented by external facilitators. Further research should clarify causal mechanisms and understand why teacher-led interventions were more impactful. However, these findings reinforce the government's strategy of using teachers as school ambassadors for scalable NCD prevention. Multi-component approaches combining school programmes, parental engagement, media and community partnerships remain essential for durable tobacco prevention and broader NCD risk reduction among youth.

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