



Upscaling a behavioural intervention program for tobacco use cessation – A randomised controlled study

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ABSTRACT

A randomised control trial was conducted among school teachers in Bihar, India for upscaling a tested, evidence-based tobacco intervention using train-the-trainer model. Six blocks in three districts were selected and randomised into intervention and control blocks. Cluster coordinators in intervention blocks were given training in the details of intervention. Cluster coordinators routinely train headmasters and they were asked to include intervention training in their routine. Except for the training material, no additional resources were provided to cluster coordinators and headmasters. Headmasters implemented the intervention along with the teachers in the school. Post-intervention random sample of 70 schools out of 219 schools from intervention blocks and 70 schools out of 224 schools in control blocks were surveyed. The survey was self-administered among 429 school teachers in intervention schools and 331 among control schools. For all 140 headmasters, the survey was interviewer administered. Almost all headmasters in intervention schools had attended the training and had involved teachers in the intervention program. Odds ratios for carrying out the recommended activities in intervention schools compared to control schools were very high and significant. In addition, intervention schools also conducted activities such as including intervention messages in classroom teaching and conveying them to parents, activities that were not directly recommended in intervention program. Thus, this train-the-trainer model demonstrated that it is possible to upscale the intervention programs successfully with the resources within the system.

1. Introduction

School teachers in India are considered role models not just for their students but also by the community. Indeed, teachers themselves take this role rather seriously (Sorensen et al., 2005). One implication for public health is that teachers can provide a positive role model for students and their communities by not using tobacco or helping others quit.

In India, education is a state responsibility. Schools are run by the education department of the state government. The curricula and the text books are specified by the education department and therefore may differ from state to state. Additionally, there is a country-wide school system, much smaller in size, run by the Central Government and functioning independently from schools managed by the states. In this

school system, curricula and text books are same all over the country. Those schools are primarily meant for the children of the central government employees who may be transferred from one state to another.

In a survey of school teachers in a random sample of schools in the State of Bihar conducted during April-May 2000, a very high prevalence of tobacco use, 77 %, was noted (D. N. Sinha, Gupta, Pednekar, Jones, & Warren, 2002). In the same state, a random sample of the schools run by the Central Government was also surveyed using the same methods during February 2001. These schools were surveyed independently, and the prevalence among school teachers was found to be much less: daily smoking, 2.4 % vs. 14.5 %, and daily smokeless tobacco use 14.1 % vs. 41.7 %. In a detailed analysis, the major reason was the existence and awareness of tobacco control policy in the Central schools and compliance with it (Dhirendra N. Sinha, Gupta, Warren, & Asma, 2004a). At

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the same time, 13–15 year old students were also surveyed. The difference in the prevalence of tobacco use among State schools and Central schools was quite striking, 5–6 times higher prevalence in State schools compared to Central schools (Dhirendra N. Sinha, Gupta, Warren, & Asma, 2004b).

Taking a cue from these results, a randomised controlled intervention trial was conducted in schools in Bihar to encourage tobacco use cessation among school teachers and support the adoption of tobacco-free school policies. Based on extensive formative research, an appropriate intervention model was developed for school teachers in Bihar and administered using a randomised control design (Nagler et al., 2013). A survey conducted immediately post-intervention showed that the intervention was effective in helping with cessation among school teachers with 50 % quitting in the intervention group compared to 15 % in the control group (Sorensen et al., 2013). In addition, intervention schools were more likely to implement tobacco control policies (Pawar et al., 2014).

The current study tested a large-scale dissemination of this intervention by implementing it through the Bihar State Department of Education using a train-the-trainer (TOT) model in a randomised controlled trial design (Nagler et al., 2023). This paper compares the effectiveness of the training using this TOT model through findings from the post-intervention surveys of teachers and headmasters in intervention and control schools. Specifically, we assessed between-group differences in headmasters' and teachers' reports of tobacco control policies in their schools; participation in headmaster and teacher trainings and discussions; implementation of components of the intervention within schools; and other related tobacco control activities not directly recommended in the intervention package.

2. Methods

2.1. Sample

Three districts of Bihar (Samastipur, Nalanda and Muzaffarpur) were selected for the study. Districts are divided into blocks for administrative purposes. A pair of blocks in each district, geographically as far apart as feasible to minimise the possibility of contamination, was selected for the study. Blocks in the pair were randomised into intervention (Sairanjan, Asthawan and Kudhani) and (Singhia, Hilsa, and Minapur) control blocks. Schools in blocks are categorised by the Education Department in clusters with one cluster coordinator appointed for each cluster. Three selected blocks in the intervention arm contained 46 clusters and in the control arm, 40 clusters. The cluster coordinators routinely train school headmasters for changes in curricula and implementation of government programs on a periodic basis, generally every month. For assessing the implementation of the intervention activities, among a total of 219 schools in the intervention block, 70 schools were selected by random sampling. Similarly, among 224 schools in the control blocks, 70 control schools were randomly selected. This provided us with a sample size of 429 teachers in intervention schools and 331 teachers in control schools.

2.2. Intervention

Cluster coordinators in the three intervention blocks were trained in the school-based intervention program emphasizing tobacco use cessation among school teachers and school tobacco control policies. The training was conducted by one of the authors (Dhirendra N. Sinha) who was a locally based oncosurgeon and tobacco control expert. He served as the lead trainer of Cluster Coordinators and liaison to state-level officials and school leadership. A major focus of the training was on encouraging and helping tobacco users to quit their tobacco use, implementation and dissemination of tobacco control policies in the school, organised group discussions among school teachers and headmasters on tobacco control and reminders in the form of display of

posters. This was based on the intervention program developed and used during the earlier randomised controlled trial among Bihar school teachers (Nagler et al., 2013). Cluster coordinators were provided with sets of resource material, including posters, a program implementation manual, quit booklets, one set for each school in the cluster, and recommended wording and posting of tobacco-free policies. These 46 cluster coordinators, in turn, trained 219 headmasters within their jurisdiction to carry out various activities of the intervention in their schools during September 2018 to March 2019.

2.3. Survey

From April to June 2019, post-intervention surveys of the school teachers and headmasters were carried out in these 140 schools out of total 443 schools to assess the extent of implementation of the recommended intervention activities in schools as a result of the training of cluster coordinators. Teachers present in the school on the day of the survey were distributed questionnaires for self-administration.

The headmasters in 140 selected schools were also surveyed independently with a separate questionnaire focusing on school-level activities and intervention. Unlike the teachers' survey, the headmasters' survey was interviewer-administered.

2.4. Data analysis

Analysis was carried out for selected questions that informed the extent of implementation of the activities related to the intervention program. These questions were related to the training of the cluster coordinators and activities described in the Implementation Manual. One copy of the Implementation Manual was distributed to every headmaster by the cluster coordinator during the training. For data analysis, the activities were divided into two categories: one, activities that were recommended explicitly during the training; and two, activities that were not specifically recommended but may have taken place due to the training.

The adjusted odds ratios were calculated using a logistic regression model. The dependent variable was coded as 0 for control school and 1 for intervention school. Independent variables were all categorical. The multivariate logistic regression model was run to estimate the adjusted odds ratio, including adjustments for gender, age, rural–urban area, block, cluster, and school. We used SPSS software (version 25) to run the analysis.

2.5. Ethical compliance

The Harvard T.H. Chan School of Public Health's Office of Regulatory Affairs and Research Compliance (IRB16-1055) and the Healis-Sekhsaria Institute for Public Health Institutional Ethics Committee (OHRP: IRB00007340; FWA00019699) approved the study. We also obtained consent and permission from Bihar state, district, and block-level Department of education officials for schools to participate in this study.

3. Results

All 140 schools selected in the intervention and control cohorts were successfully surveyed, resulting in a school response rate and headmaster response rate of 100 %. School teachers who were present in the school on the day of the survey were eligible to be surveyed. The teacher response rate was 86.6 % (439 out of 507) in intervention schools and 74.7 % (340 out of 455) in control schools. There were no refusals.

The results are categorised in two headings – direct effect of training; and, spillover effects. Direct effects of training were those program components addressed directly by the training for Headmasters. Spillover effects were activities that the headmaster and teachers conceived and implemented themselves but were clearly influenced by the

intervention training.

Compared to headmasters in the control group, headmasters of the intervention group schools were significantly more likely to report having organized discussions of tobacco control in their schools, having a tobacco policy displayed in their schools, and having a ban on the use of smokeless tobacco (Table 1).

Some activities that were not a part of the intervention training but were clearly inspired by it such as cardboard paintings or pencil drawings related to tobacco control displayed in the school, sharing tobacco information in school morning meetings, parent-teachers meetings and in extra-curricular activities were much higher in intervention schools than in control schools (Table 1).

There were minor differences in the characteristics of teachers in the intervention group compared to the control group. For example, there were slightly more females in the intervention group, teachers were slightly older, and in poorer health (Table 2).

Compared to teachers in the control group, intervention group teachers were significantly more likely to report having received training on tobacco control, organized group discussions of tobacco control in their schools with teachers, having a tobacco policy displayed in their schools, and having a ban on the use of smokeless tobacco

Table 1

Post-intervention survey of Head Masters in 70 Intervention and 70 control schools, 2019, Bihar, India.

	School type Intervention (70) n (%)	Control (70) n (%)	*Adjusted Odds Ratio (95 %CI)
Directly related to training			
Training received from Cluster Coordinator	64 (91.4)	4 (5.7)	411.2 (61.0, 2770.8)
Tobacco control policy exists in the school	66 (94.3)	50 (71.4)	6.38 (1.94, 20.98)
Posted wall paintings related to tobacco control	41 (58.6)	18 (25.7)	4.23 (1.99, 8.99)
Group discussions conducted with teachers about the hazards and quitting tobacco use	70 (100)	27 (42.2)	NA
Group discussions facilitated by the HM or a teacher	70 (100)	24 (38.7)	NA
Disseminated the booklet about quitting	59 (84.3)	2 (2.9)	197.6 (39.6, 986.8)
Conveyed information about quitting	55 (78.6)	14 (20.0)	22.9 (8.5, 61.9)
Informed about Government quit line	16 (22.9)	9 (12.9)	2.34 (0.90, 6.05)
Median number of training sessions from cluster coordinator	3.6	1.6	NA
Median number of group discussions with teachers about tobacco control	3.9	1.7	NA
Spill over effect of training			
Display of other tobacco signage such as cardboard paintings	19 (27.1)	1 (1.4)	27.3 (3.4, 217.0)
Teachers were encouraged to quit	54 (77.1)	22 (31.4)	9.78 (4.26, 22.41)
Provided tobacco control information to following:			
a) School morning meetings	58 (82.9)	35 (50)	6.01 (2.59, 13.93)
b) Community events	25 (35.7)	6 (8.6)	5.49 (1.90, 15.88)
c) Parent teacher meetings	55 (78.6)	31 (44.3)	4.97 (2.31, 10.70)
d) Extra-curricular activities	21 (30.0)	9 (12.9)	2.72 (1.02, 7.22)
e) Integration into lesson plans	34 (48.6)	27 (38.6)	1.62 (0.61, 4.28)

Note:* Adjusted for block, cluster and region (Urban, Rural), NA = Not applicable.

Table 2

Sample characteristics of teachers, 2019, Bihar, India.

	Intervention (n = 429)		Control (n = 331)	
	Count	%	Count	%
Gender				
Female	201	46.9	113	34.1
Male	213	49.7	209	63.1
Missing	15	3.5	9	2.7
Age group				
Up to 30	48	11.2	41	12.4
31 to 45	246	57.3	215	65
45+	119	27.7	60	18.1
Missing	16	3.7	15	4.5
Area				
Urban	9	2.1	19	5.7
Rural	420	97.9	312	94.3
Education				
Up to Higher Secondary School	75	17.5	69	20.8
College	241	56.2	166	50.2
Graduate and above	101	23.5	75	22.7
Missing	12	2.8	21	6.3
Overall health				
Excellent	57	13.3	50	15.1
Good	202	47.1	191	57.7
Fair	137	31.9	65	19.6
Poor	10	2.3	3	0.9
Missing	23	5.4	22	6.6

Table 3

Post-intervention survey of teachers in 70 Intervention and 70 control schools, 2019, Bihar, India.

Questions	School Type Intervention (n = 429) n (%)	Control (n = 331) n (%)	*Adjusted Odds Ratio (95 %CI)
Direct effect of training			
Program about tobacco conducted for teachers in school	355 (82.8)	115 (34.7)	9.67 (6.59, 14.20)
Organized discussions about tobacco among teachers	369 (86.0)	153 (46.2)	7.24 (4.88, 10.75)
Tobacco control wall paintings displayed	347 (80.9)	173 (52.3)	3.60 (2.51, 5.17)
Tobacco policy displayed	357 (83.2)	209 (63.1)	3.57 (2.41, 5.28)
Shared information about tobacco with others	395 (92.1)	278 (84.0)	2.52 (1.49, 4.27)
Policy specifically prohibiting smokeless tobacco use inside school exists	391 (91.1)	263 (79.5)	2.89 (1.79, 4.67)
Policy specifically prohibiting smoking inside school exists	396 (92.3)	275 (83.1)	2.79 (1.65, 4.69)
Sought help for quitting	18 (52.9)	3 (33.3)	1.41 (0.03, 75.67)
Spill over effect of training			
Program about tobacco conducted for students	354 (82.5)	134 (40.5)	6.96 (4.17, 10.14)
Information about tobacco incorporated for students	288 (67.1)	160 (48.3)	2.65 (1.89, 3.70)

Note: * Adjusted for age, gender, block, cluster, school and region (Urban, Rural).

(Table 3).

The intervention training did not include any tobacco-control related activities for students or instruction for teachers to include tobacco control material in their lesson plans. Despite that, a much higher number of intervention schools reported conducting a program for students and including tobacco information in lesson plans.

4. Discussion

In India, the ToT model has been used in many different areas of public health. For example, it has been used for prevention of diabetes (Ravindranath et al., 2018), HIV and complications in delivery (Chhabra, Ave, & Building, 2010). Generally they have been single-arm trials, sometimes with before-after comparison for evaluation.

This study was a randomised controlled trial of a tested intervention undertaken to investigate whether a train-the-trainer model would be effective in upscaling and delivering an evidence-based tobacco control intervention to school teachers in the state of Bihar, India. The trainer in this study were the cluster coordinators, trained by a co-author. Cluster coordinators, in turn, trained headmasters of schools in the clusters of each block for carrying out recommended intervention activities as a part of their routine interaction. The model's effectiveness was assessed by comparing the activities included in the tobacco control program in the intervention and control schools at two levels: school level and individual teachers.

Looking at the delivery of the training, over 90 % of headmasters in intervention schools responded that they received training in tobacco control from their cluster coordinators compared to just about 6 % in the control group. For most other parameters like the display of a tobacco control policy, display of posters, and receiving information on quitting, the odds ratios were high and significant. Detailed implementation results for each component for the intervention cohort are reported separately (Nagler et al., 2023).

At the individual teachers' level, differences in responses for intervention-related parameters - like having a tobacco control program in the school and having organised discussions in the intervention and control schools were highly significant.

In addition to the components of the training, we also assessed some activities that were not components of the intervention training. It was interesting to note these spillover effects, like the innovative display of tobacco control information through hand-drawn posters, inclusion of tobacco control information in the school morning sessions, community events, parent-teacher meetings, and in extra-curricular activities. Even at the individual teacher level, many more teachers in intervention schools compared to control schools reported incorporating tobacco control information in their teaching. These spillover effects show that the intervention contributed towards an increased attention to a broader array of tobacco control activities among school teachers. These spillover effects also highlight that teachers took their role to heart and served as beacons of tobacco information - both inside and outside the school.

Although the differences between the intervention and control schools were significant, it was interesting to note that in the control schools also, there was substantial knowledge and activities related to tobacco control. During the period of the project, the Government of India strengthened its tobacco control activities substantially. It formulated Tobacco Free Education Institutions (TOFEI) guidelines (Ministry of Health and Family Welfare, Government of India: Guidelines for Tobacco Free Educational Institution (Revised), 2017) and disseminated those to States. Control schools were exposed to those activities and guidelines, and some effects are seen in the results as responses from control schools. Clearly, the intervention in the intervention group further added to the government guidelines and activities as shown by significant differences in the intervention and control groups.

Also, the government efforts for tobacco control in Bihar seem to be succeeding well. The reduction in tobacco use in Bihar from the first round of the Global Adult Tobacco Survey (GATS) conducted during 2009–10 to the second round of GATS conducted in 2016–17 was one of the highest in India. These surveys were conducted among probability samples of the general population age 15 years and over. From the first round of GATS to the second round of GATS, the prevalence of smoking in Bihar decreased by 64.2 % (from 14.2 % to 5.1 %), the highest decrease among all States, and smokeless tobacco use by 51.7 % (from

48.7 % to 23.5 %), the second highest decrease among all States of India (Tata Institute of Social Sciences (TISS), Mumbai and Ministry of Health and Family Welfare, Government of India. Global Adult Tobacco Survey GATS 2 India 2016-17, 2017).

The intervention training encouraged schools to display anti-tobacco messages or wall paintings although no funds or resources were provided by the project for that purpose. Still, many schools were able to get them done. Additionally, they displayed cardboard paintings or pencil drawings to promote tobacco control efforts.

The study has several strengths. First, it was designed as a randomised control trial to test the applicability of the train-the-trainer model in the context of tobacco use cessation among school teachers. It was conducted in collaboration with the Education Department officials and is scalable, in that beyond intervention material and training to the trainers, no other resources were provided. The possibility of contamination due to interaction among school personnel in intervention and control groups was minimised by selecting the intervention and control blocks geographically as far apart in the district as feasible. The possibility of headmasters and teachers getting transferred from one school to another was minimised by confining the intervention to single school year as such transfers generally take place during the end or the beginning of the school year.

There are some shortcomings as well. Since the assessments were based on self-reports, the possibility of social desirability bias cannot be ruled out. Unlike for school teachers, it was not possible to compare demographic characteristics of headmasters. Since the headmasters' survey was interviewer administered, in the interest of confidentiality, no personal information was asked. The headmasters groups are expected to be similar as they are not recruited directly but are promoted from existing school teachers; promotions are based on the experience, qualifications and work reports.

Future intervention research should explore the use of additional technology such as smartphones to scale and implement the Tobacco Free Teachers – Tobacco Free Society program in all districts of states directly through headmasters and tracking the program implementation.

In conclusion, this study assessed the effectiveness of a train-the-trainer model used to train headmasters to implement a school-based tobacco control program for teachers by comparing reports from headmasters and teachers in intervention and control schools. The findings indicate that the training contributed to implementation of the intervention within schools as well as to unplanned benefits such as increased introduction of tobacco control messages in curricula for students and inclusion of tobacco control information for parents and the community. This study provides a model for using the existing training infrastructure within the education system to provide tobacco control supports for teachers and ultimately for their students and surrounding community.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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