



International Approaches to Tobacco Prevention and Cessation Programming and Policy among Adolescents in India

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Abstract

Purpose of the Review India is not only one of the largest producers of tobacco in the world, but is also one of the largest consumers of tobacco products. Adolescents and young adults are the most vulnerable to tobacco addiction as early initiation is predictive of long-term use and health risks. This review seeks to provide an overview of policies and programs for tobacco prevention and cessation among adolescents. The research over the last few years is highlighted and recommendations for future programming and policy are proposed.

Recent Findings Tobacco control programs for adolescents in India have mostly been developed for school-based settings. The focus is largely on increasing knowledge and awareness of tobacco harm. However, evidence-based prevention and cessation programming are lacking. Policies regarding advertising and marketing to youth are regulated by national legislation and informed by WHO's global tobacco control treaty. Stricter implementation and consistent evaluation of these policies are integral to creating an environment for reducing tobacco use and improving health outcomes.

Summary With the tobacco industry now marketing heavily to the most vulnerable groups, especially in low and middle-income countries, it is vital to develop programs and enforce policies for adolescents that are effective for prevention as well as cessation.

Keywords Tobacco control · Policy · Prevention · Cessation · Adolescents

Introduction

The tobacco epidemic is a major public health concern and is shifting from high-income countries (HICs), in part due to successful tobacco control programs in HICs, to low and middle-income countries (LMICs) [1, 2]. This

disproportionate impact will translate into 70% of tobacco deaths occurring in LMICs by 2020 [2]. The anticipated death toll attributable to tobacco is 10 million in 2030, with 7 million of these deaths occurring in LMIC like China and India. India is the second largest tobacco consuming and third largest tobacco growing country. The cigarette market is controlled by

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four Indian companies and they spent \$48.8 million on tobacco advertising in 1998 [3]. In 2003, the Indian government enacted the Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act (COTPA). The provisions under this Act include prohibition of smoking in public places, advertisement bans, mandatory display of pictorial health warnings on tobacco packages, and prohibition of sale to and by minors [4]. The tobacco advertising efforts and spending have grown tremendously since the legislation and now focus on advertising at events and points-of-sale (promotional display where tobacco products are sold) [3, 5].

Adolescents and young adults are a highly vulnerable group in a LMIC such as India [6]. They are offered free cigarettes by tobacco companies despite regulations, and tobacco marketing is effectively targeted towards them leading to increased tobacco use [7, 8, 9, 10]. Tobacco initiation is mostly reported in adolescence and could emerge as a major risk factor for non-communicable diseases during adulthood, therefore making it an important group for focus on prevention and cessation efforts [1, 6, 11]. Estimates are that approximately 5500 adolescents start tobacco use every day in India adding to the 4 million children under the age of 15 who consume tobacco regularly [1, 12, 13]. Estimates from the Global Youth Tobacco Survey (GYTS) (a school-based cross-sectional survey conducted in multiple countries as a part of WHO's Tobacco Free Initiative (TFI) to gather a nationally representative sample of 13–15 year old students) in India suggest that in 2006, 13.7% of 13–15 year old students used any tobacco product, 3.8% were current smokers, and 11.9% used other tobacco products [14, 15]. In 2009, these percentages increased to 14.6% used any tobacco product, 4.4% were current smokers, and 12.5% used other tobacco products. In 2006 as well as 2009, about 15% never smokers were likely to initiate smoking in the following year (see Table 1) [16].

A meta-analysis on studies published between 1991 and 2007 examined prevalence of tobacco use among high school children in India (grades 6th–12th) and found the median prevalence of ever-users of tobacco to be 18.15% (14.0% males and 6.43% females) with wide inter-regional variations [1]. A cross-sectional study in six tribal villages in

Maharashtra found the prevalence of smokeless tobacco use as 53% and smoking as 23% among 240 adolescents. Among the tribal adolescents, bidi was most commonly used for smoking, and gutka and pan masala, for smokeless tobacco [10]. These numbers reflect a stark contrast in tobacco use patterns in school-attending adolescents compared to the ones in tribal areas with limited access to educational resources.

In addition to the prevalence rates in this group, the age of initiation is quite worrisome. Tobacco use initiation in India starts among persons as young as 6 years [6, 17], most during the teen years, and a majority starting before the age of 18 [18]. A significant percentage of young tobacco users (65–80%) is likely to have made at least one quit attempt and failed, which suggests the need for tobacco use cessation efforts [19, 20]. As such, this literature review seeks to examine what is known about tobacco use cessation efforts, including providing an overview of the policies, programs, and approaches to prevention and cessation among adolescents and young adults in India.

Methods

Studies were identified through a literature search online using PubMed, Cochrane Library, and Google Scholar. The tobacco control programs and policy articles for the review were selected via PubMed and Cochrane Library searches; Google Scholar was used to locate any additional studies. The key search terms used for PubMed were: “India” “tobacco” “adolesce*” “youth” “cessation” “prevention” “program*” and “policy” in various combinations. The search terms for Cochrane Library trials were “India” “adolesce*” and “tobacco”. The keywords could appear anywhere in the article. The searches were limited to articles written in English language only. No limits on year of publication were included; the majority of articles were published in the last 10 years. The PubMed search yielded a total of 232 studies and the Cochrane Library search found 30 studies. The studies found in Cochrane Library were also indexed in PubMed; therefore, the final studies were shortlisted from PubMed. Out of 232 studies, 191 were eliminated. The studies were eliminated if they focused on another country, included multiple countries, focused on adult tobacco use prevalence and programs, or

Table 1 Prevalence rate^a among adolescents (ages 13–15) from Global Youth Tobacco Survey (GYTS) India

	2006			2009		
	Overall	Boys	Girls	Overall	Boys	Girls
Ever smoked cigarettes	12	14.4	8.7	6.1	7.7	4
Currently use any tobacco product	13.7	16.8	9.4	14.6	19	8.3
Currently smoke cigarettes	3.8	5.4	1.6	4.4	5.8	2.4
Currently use other tobacco products	11.9	14.3	8.5	12.5	16.2	7.2

^a Prevalence rates (%) reported from India GYTS Factsheets 2006 and 2009

focused on a broad adolescent issue such as non-communicable diseases. The studies focusing on university, dental, or medical students were not included. The abstracts of the remaining 41 studies were reviewed to select eligible studies and references from these studies were also screened for relevance. The inclusion criteria were [1] the study must discuss or evaluate a tobacco prevention/cessation program or policy [2] it must focus on adolescents (person under the age of 18). If a program had multiple publications, the one discussing final outcomes was selected. Overall, ten studies were finally selected to review adolescent tobacco control programs and four were selected to review the impact of tobacco control policies for adolescents.

Results

Results of the literature search are organized below according to the following categories: [1] Adolescent Tobacco Control Policies in India and [2] Adolescent Tobacco Control in India: Programs and Outcomes, including various sub-categories within each.

Adolescent Tobacco Control Policies in India

Key Policies

The provisions under the national tobacco control legislation COTPA pertaining specifically to tobacco control among adolescents are prohibition of sale of tobacco products to and by minors (persons below 18 years of age) and ban on the sale of tobacco products within 100 yards of all educational institutions (Section 6) [4]. In addition to that, it prescribes the display of a sign board mentioning no sale to minors at the point-of-sale. Section 5 of COTPA prohibits any kind of advertisement, brand promotion, and sponsorship of tobacco products and, therefore, aims to protect youth from the tobacco industry influence. India's specific ban on tobacco use exposure in Indian movies under Section 5 is principally to protect minors.

In addition, India was an active participant in the negotiations under working groups of the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) and ratified the treaty in 2004. Article 16 of FCTC requires parties to prohibit sales of tobacco products to and by minors. Article 14 of FCTC requires member states to take measures for cessation. Soon after FCTC ratification, the Indian Government created a National Tobacco Control Programme (NTCP) in 2007 to assist in achieving the provisions under the treaty. The program sought to establish tobacco cessation centers (TCCs), training programs for teachers, health workers, and educational interventions for schools and the general population, among other policy enforcement monitoring activities

[4, 8••]. Continuous advocacy and research evidence from randomized controlled intervention trials led to inclusion of school-based interventions under NTCP [21]. The NTCP was piloted in 2007–2008 and implemented in 42 districts of 21 states in the country [4]. Unfortunately, NTCP does not address a cessation component in schools [22••]. The focus under NTCP lately has been to expand cessation services and clinics, but none that specifically cater to adolescents and their needs.

Policy Implementation

In school settings, policy implementation has been strengthened by the *Tobacco-Free Teachers/Tobacco-Free Schools* TFT/TFS program. TFS are required to implement eleven criteria which create an environment for prevention and control of tobacco use among school students. These criteria include changing organizational environment of the school, enforcing tobacco control laws, and addressing informational needs of the students. Five hundred seven schools in the state of Maharashtra were observed and their adherence to the 11-point TFS criteria was recorded. The study found that only 11% of schools adhered to all 11 TFS criteria, 9% adhered to none, and 80% complied with one to ten criteria. In regard to the organizational criteria, only 31% had a tobacco control committee, 28% reported having stationery with anti-tobacco messages and 22% had given out awards for tobacco control initiatives. For enforcement criteria, 72% prohibited sale of tobacco within 100 yards and 59% banned tobacco use inside the school. For the information criteria, 63% of schools displayed posters restricting smoking in and around the premises, 52% had a copy of the TFS school directives, 45% displayed posters showing harmful effects of tobacco use, and 31% displayed “tobacco-free school” sign near the entrance. The least followed criteria were consulting with state tobacco control officers, followed by only 18% of the schools [23].

A study of TFT/TFS programs in 36 intervention schools in the state of Bihar found that 100% of the schools adopted a tobacco control policy by recording it on their letterhead, painting the policy on the wall, and posting at least one “No Tobacco” sign in the school premises. The implementation of policies was higher among intervention versus control schools; 64% of intervention and 28% control schools showed “improvement” in policy implementation. There was a higher enforcement of policy at post-intervention as compared to baseline scores in intervention schools (OR = 3.26; CI 2.35, 4.54) [24]. Another study in Bihar analyzed the impact of policies on school personnel in federal schools in comparison with state schools that have no tobacco control policies. The study found that federal schools have regulations regarding tobacco use ban on school premises for students, school personnel, parents and visitors, and have also implemented the

ban on sale of tobacco products within 100 yards of the school boundary, but the enforcement is not stringent [25].

COTPA prohibits youth access to tobacco products at the point-of-sale (PoS) and requires signage stating restrictions, and bans outdoor tobacco advertisements and sale of tobacco near educational institutions. These bans have the potential of curbing the tobacco use risk for adolescents by reducing access, intent to use, and by de-normalizing tobacco use [26]. An observational two-wave study of 25 urban and rural areas in five states (Bihar, Karnataka, Kerala, Maharashtra, and Rajasthan) assessed the compliance of educational institutions, neighborhoods, and points-of-sale with provisions to restrict youth access and exposure to tobacco products and advertising. The proportion of point-of-sale establishments compliant with prohibition of easy access to tobacco products by youth reduced from about 40 to 31% ($p < 0.001$) from wave 1 to wave 2. In contrast, the proportion compliant with the signage requirement doubled from about 5 to 10% ($p < 0.001$). The results suggest that educational institutions had significant increases over a 1-year period with compliance: (1) of the ban on sale within 100 yards of a school (35 vs 45%, $p < 0.05$) and (2) with the signage requirement (7 vs 13%, $p = 0.010$). Change in compliance differed by city size and stratified analysis shows that compliance increased in small cities ($\beta = 0.25$, $p = 0.001$) and decreased in rural towns ($\beta = -0.16$, $p < 0.05$) and mid-sized cities ($\beta = -0.2$, $p < 0.05$). The change in compliance for large cities did not increase significantly ($\beta = 0.03$, $p = 0.68$) [27].

Another study explored the association of presence of tobacco vendors and advertisements near high schools with student's tobacco use outcomes in the city of Mumbai. The current tobacco use of students was positively associated with density of tobacco vendors and advertisements within 100 and 500 m of schools. The study also found a substantial lack of adherence to COTPA policies on sale and advertising of tobacco near educational institutions [26].

NTCP has made efforts to create educational programs for schools and the institutions are adopting tobacco policies to create tobacco-free environments. A major obstacle, though, is inadequate implementation of tobacco supply policies where signs with age requirements are displayed but youth are still able to purchase these products.

Adolescent Tobacco Control in India: Programs and Outcomes

School-based smoking prevention programs are known to be effective and have demonstrated reduction in smoking intentions, uptake, and experimental use. They have been particularly effective in increasing awareness and influencing short-term outcomes [28]. In this section, we review school and community-based programs for tobacco control among

adolescents. Ten intervention programs related to tobacco control among adolescents were identified (see Table 2). Eight of these interventions are in school-based settings: Project EX [22••], MYTRI [29], HRIDAY-CATCH [21], Kerala School Study [30], Salaam Bombay Foundation Intervention [31], school-based intervention in rural North India [32] a tobacco prevention program in Bangalore [13], and an ASSIST-like peer-led intervention for prevention of tobacco consumption in Rural Gandhinagar [33]. Two interventions, Project ACTIVITY [34] and a community-based intervention model [6], are based in a community setting.

School-Based Interventions

While there was a prevention and awareness component in almost all the programs, only five out of eight school-based programs had a cessation component or effect. Evidence from these school-based programs is discussed below and the details are also included in Table 2.

The classroom-based prevention and cessation version of Project EX, an evidence-based program developed in the USA, was implemented in schools in Delhi [20, 22••]. The program was adapted to the local context by translating to the local language, making scenarios in the curriculum culturally relevant and including forms of tobacco used by the specific group. The program had a significant prevention effect but no significant cessation effect. Overall, alternate medicine activities such as yoga and meditation were rated as most likable [22••]. A Stop Smoking in School Trial (ASSIST)-like peer-led intervention was able to demonstrate a significant reduction in smoking as well as smokeless tobacco consumption in the intervention group. Overall tobacco (any form) consumption reduced from 48.8% at baseline to 38.9 and 36.9% after 6 months and 1 year, respectively [33].

A comprehensive tobacco control and prevention program in government and aided schools in Kerala saw a decrease in overall tobacco prevalence from 9.85 to 4.68%. The study used a multi-pronged approach using awareness classes, school visits, monitoring activities, ensuring participation in tobacco-related events, supplying educational materials, and training junior public health nurses in tobacco control [30]. To address tobacco control among economically disadvantaged youth, the Salaam Bombay Foundation (SBF) created a tobacco use prevention program in Mumbai in 2002 which focused on improving students' life skills and self-efficacy. The program engaged youth in various ways at multiple levels such as individual, organizational, and community level. Even though the program was not focused on cessation efforts, the students in SBF schools were half as likely to use tobacco in last 30 days as students in control condition schools [31].

A multi-component intervention for middle school children in rural Ballabgarh was able to reduce smoking as well as smokeless tobacco use significantly between baseline and

Table 2 Description of tobacco prevention and cessation interventions included in the review

Author and year	Program/ intervention	Aim	Setting	Sample	Theoretical approach	Components	Outcome measured	Follow-up interval	Design	Results
(Sidhu et al. 2016)	Project EX	Classroom-based tobacco prevention/cessation program	School	16–18 year old students from 4 schools in Delhi	Motivation enhancement, coping skills, and personal commitment model	<ul style="list-style-type: none"> - Eight 40–45 min tobacco cessation/prevention sessions for tobacco users as well as non-users - Activities included <i>game shows</i> and <i>talk shows</i> - Complementary and alternative medicine (CAM) activities such as meditation and yoga 	Measures of tobacco use, quit intention, quitting, and program receptivity	Immediate post-test and 3-month follow-up	Quasi-experimental design	<ul style="list-style-type: none"> - Quit rates favored the control condition but no significant cessation effect was observed - The program had a significant prevention impact - Alternates medicine activities were rated as most likable
(Perry et al. 2009)	MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India)	Multi-component intervention aimed at preventing tobacco use among adolescents	School	6th and 8th grade students (followed-up till 8th and 10th grade) from 16 schools in Delhi and 16 in Chennai	<p>Conceptual model guided by social cognitive theory. The intervention targeted:</p> <ul style="list-style-type: none"> • Environmental factors: <ul style="list-style-type: none"> -social norms -role models -social support opportunities • Intrapersonal Factors <ul style="list-style-type: none"> -knowledge -values -meanings -beliefs -skills 	<ul style="list-style-type: none"> - Behavioral classroom curricula consisting of 6–7 peer-led classroom activities - School posters corresponding with classroom activity - Parental involvement component, 6 postcards sent to parents - Peer-led activism included competitions between classrooms and schools; facilitated group activities 	Self-reported use of cigarettes, bids, and chewing tobacco. Future intentions to smoke or use chewing tobacco.	1-year and 2-year follow-up	Group-randomized trial	<ul style="list-style-type: none"> - Tobacco use increased by 68% in control group and decreased by 17% in the intervention group over 2 years -Intention to smoke increased by 5% in the control group and decreased by 11% in the intervention group -Intentions to chew tobacco decreased by 12% in the control group and by 28% in the intervention group
(Arora, Stigler, and Reddy 2011)	HRIDAY-CATCH (Child and Adolescent Trial for Cardiovascular Health)	Cardiovascular disease prevention intervention	School	7th grade students from 30 schools in Delhi	Educational and lifestyle-related health intervention	<ul style="list-style-type: none"> -School-based curriculum consisting of awareness and advocacy package delivered by 	Intentions to use tobacco	1-year follow-up	Randomized control intervention trial	<ul style="list-style-type: none"> - Students in the intervention were less likely than controls to have been offered, received,

Table 2 (continued)

Author and year	Program/ intervention	Aim	Setting	Sample	Theoretical approach	Components	Outcome measured	Follow-up interval	Design	Results
(Philip et al. 2013)	Kerala School Study	Comprehensive tobacco control and prevention program	School	13-17 year old students (grades 8–12) from 13 schools in Kannur district of Kerala	—	<p>teachers and peer leaders</p> <ul style="list-style-type: none"> - Home-based activities including activity booklets which the students complete with their families -Anti-tobacco awareness classes -Formation of anti-tobacco task forces -Inter-school competitions Supplying IEC (information, education and communication) -Providing a handbook on tobacco control for school personnel 	Current tobacco use, ever tobacco use, parental use, tobacco--related health awareness, and ability to transform their parents	1-year follow-up	Quasi-experimental design	<p>- The evaluation of the program found a significant reduction in the number of current tobacco users (more than half users became non-users) during the final evaluation of the study</p> <p>- 34% of participants positively influence their parents and relatives to quit</p>
(Saraf et al. 2015)	School-based intervention for prevention of non-communicable disease in school children of rural North India	Multi-component intervention to improve knowledge and behavioral practices regarding diet, physical activity, and tobacco use	School	Middle school children (6th and 7th grades) from 40 middle schools in Rural Ballabgarh, North India	—	<ul style="list-style-type: none"> -School component (policies) -Classroom component (activities) -Family component (Information Education and Communication (IEC) material) 	-Measures of knowledge and behavioral change in physical activity, diet, and tobacco	1-year follow-up	Cluster randomized controlled trial	<p>-Pre-post decrease in the prevalence of current smoking was significantly more in intervention group as compared to control group (7.7%; $p < 0.01$)</p> <p>- Post intervention a significant number of intervention schools adopted the tobacco policy (16/19)</p> <p>-Knowledge about tobacco improved significantly in the intervention group</p>
(Sorensen et al. 2012)	Salaam Bombay Foundation	Aim of the program is to reduce tobacco use initiation and	School	8th and 9th grade students from 147	Holistic approach focusing on developing life	-10 1 h classroom sessions per year. Out-of-classroom	Primary outcome, tobacco use	1-year and 2-year follow-up	Quasi-experimental design	<p>-Students in intervention schools were significantly</p>

Table 2 (continued)

Author and year	Program/ intervention	Aim	Setting	Sample	Theoretical approach	Components	Outcome measured	Follow-up interval	Design	Results
(SBF) Intervention	prevalence among youth from low socio-economic backgrounds.	government-run schools in Mumbai	skills (refusal skills, dealing with peer-pressure, and low self-esteem), advocacy development, and awareness of tobacco hazards	activities 2–3 times a week created peer leaders	Secondary outcomes, knowledge of tobacco products and of tobacco control legislation; life skills and attitudes	in the last 30 days	6-month follow-up	Cluster randomized trial	less likely to report using some form of tobacco (3.6 and 4.1% in intervention students as compared to 8.7% in control schools)	
(Verma et al. 2015)	Tobacco prevention programme for Indian adolescents	Short-term educational intervention on adolescent's knowledge, attitude, intentions, and behaviors	School	Grade 10 students (ages 15–16 years) in Bangalore	Social influence theoretical framework	-Two 25–30 min interactive sessions held 6 months apart -Educational material included PowerPoint presentations and interview videos of teenagers and physicians	Tobacco-related knowledge, attitudes, intentions, and behaviors	6-month follow-up	-	-Indicators of knowledge, life skills, and self-efficacy were higher among students in SBF schools -Significant difference in knowledge and attitudes ($p < 0.0001$)
(Mall and Bhagyalaxmi 2017)	Peer-led intervention for prevention of tobacco consumption in adolescence	A Stop Smoking in School Trial (ASSIST)-like peer-led intervention aimed to sustain new norms of preventing tobacco consumption through social networking in schools	School	Grades 6th to 9th from 20 schools in Rural Gandhinagar	-	-Two peer supporters were selected from each class in intervention schools and given a 1-day training regarding the health hazards of tobacco use (smoking and smokeless tobacco)	Current tobacco use (all forms)	6-month and 1-year follow-up	Cluster randomized controlled trial	-A significant reduction in tobacco consumption of any form in intervention group. It reduced from 48.8 to 38.9% (at 6-month follow-up) and 36.9% (at 1-year follow-up)
(Harrell et al. 2016)	Project ACTIVITY	Multi-component intervention to	Community	10–19 years old youth from 14 low SES	Conceptual model guided by social	- Training workshops for project staff,		Cluster randomized trial		-No significant differences in

Table 2 (continued)

Author and year	Program/ intervention	Aim	Setting	Sample	Theoretical approach	Components	Outcome measured	Follow-up interval	Design	Results
(Advancing Cessation of Tobacco in Vulnerable Indian Tobacco Consuming Youth)	prevent the onset of initiation as well as provide support for smoking cessation and prevention	Communities (slums) in Delhi. Each community had a cluster of roughly built shelters (Jhuggi-Jhopri) and houses made of permanent materials (resettlement colony)	cognitive theory. The intervention targeted: • Socio-environmental factors -opportunities -barriers -role models -social support -norms • Intra-personal factors -knowledge -values -skills -motivation	partner NGOs, youth peer leaders, and adult community leaders -Community-based interactive activities and outreach programs - Community-based tobacco cessation camps -Enforcement of key provisions of COTPA (tobacco-free public places and prohibiting youth access to tobacco products)	-Current tobacco use (past 30 days) -Intention to smoke and use smokeless tobacco	1-year and 2-year follow-up		tobacco use were noted between conditions at baseline or over time overall -In resettlement colonies, any current tobacco use significantly decreased in the intervention n (slope = - 0.69) and increased in control group (slope = 0.24, $p < 0.001$) - Knowledge about the harmful effects of tobacco increased significantly in the intervention		
(Arora et al. 2010)	Multi-component community-based intervention To explore etiology of tobacco use in adolescents from low SES and to evaluate the efficacy of the intervention for prevention of uptake and cessation of tobacco use	Community 10–19 year olds at two low-SES communities in Delhi. Each community had a cluster of roughly built shelters (Jhuggi-Jhopri) and houses made of permanent materials (resettlement colony)	Socio-environmental and intra-personal factors	-Interactive activities 3–7 sessions of 4 activities -Pre-tested posters -Audio and video films -Lectures -Street plays -Educational material distribution by peer and community leaders -Awareness rally	-Self-reported “Ever use” and “Current use” (past 1 week) of tobacco at baseline and endline - Salivary cotinine levels of a sub-sample were also measured	1-year follow-up	Cluster sampling and random sampling design	-Odds of tobacco uptake in the control community (OR = 5.96, $p = 0.005$) was significant compared with intervention community -Quit rate was higher in the intervention community but not significantly different from the control community ($p = 0.282$) -Of those who self-reported as non-users, 13–17% were classified as users based on salivary cotinine levels		

follow-up, pre-post decrease in current smoking was 110% in the intervention group and 2.3% in the control group ($p < 0.01$). It also led to adoption of tobacco policy by 16 out of 19 intervention schools. Therefore, this intervention succeeded in improving the school environment as well as knowledge and behavior of students regarding tobacco use (in addition to diet and physical activity). [32]. A short-term educational intervention on adolescent's knowledge, attitudes, intentions, and behaviors in Bangalore found a significant increase in tobacco-related knowledge and attitudes after 6 months. This study might be the first one to examine effectiveness of a short-term educational intervention in India [13].

MYTRI (Mobilizing Youth for Tobacco Related Initiatives in India) 2002–2007 and *HRIDAY-CATCH* (Child and Adolescent Trial for Cardiovascular Health) 1996–2002 were randomized controlled prevention interventions conducted with support from the Fogarty International Center (FIC) at National Institutes of Health (NIH). They were conducted in collaboration between researchers at a non-profit in India (HRIDAY) and Universities of Minnesota and Texas [21]. An evaluation of MYTRI reported that overall, current tobacco use increased by 68% in the control group and decreased by 17% in the intervention group. Intentions to smoke increased by 5% in the control group and decreased by 11% in the intervention group; intentions to chew tobacco decreased by 12% in the control group and by 28% in the intervention group [29].

Community-Based Interventions

Both community-based interventions included in this review had a cessation component. The first study to demonstrate the effects of a community-based, multi-component, and peer-led tobacco prevention intervention was implemented for disadvantaged adolescents in a low-income community in Delhi. The quit rate was higher in the intervention community but not significantly different from the control community ($p = 0.28$), providing no significant cessation effect. The study was able to highlight several factors causing early initiation of tobacco use in adolescents in lower SES such as acceptance of tobacco use by elders and limited knowledge of negative consequences of use [6].

Project *ACTIVITY* (Advancing Cessation of Tobacco in Vulnerable Indian Tobacco Consuming Youth) was a cluster-randomized community-based trial to evaluate a multi-component tobacco reduction intervention in 10–19 years old low SES communities in Delhi (2009–2011). There was no significant change in tobacco use between intervention and control conditions. When stratified by residence type, a significant decrease was observed in youth in resettlement colonies in the intervention group for overall tobacco use and cigarette/bidi smoking ($p < 0.0001$). No changes in smokeless tobacco were observed [34].

Theoretical Approaches and Frameworks

Project MYTRI, Project *ACTIVITY*, and the community-based intervention model were guided by the social cognitive theory (SCT). They targeted socio-environmental factors such as social norms, role models, social support and opportunities, and intra-personal (individual) factors such as knowledge, values, meanings, beliefs, and skills. The projects also used active youth engagement and peer-led health activism as a strategy. It was an attempt to translate successful models from the West to India [6, 21, 34, 36]. The community-based model employed interactive activities, films, lectures, street plays, and informational materials given out by peer leaders [6].

Project EX focused on motivation enhancement and cognitive-behavioral skills to encourage quit attempts among youth. Motivation enhancement provides multiple reasons to quit tobacco through use of talk shows and games. Cognitive-behavioral skills provide a quit strategy and plan to deal with withdrawal. The alternative medicine elements of the program, including yoga, meditation, and deep breathing, allow the youth to sustain a quit attempt. [20]. The randomized controlled trial of a cessation program in degree colleges in Bangalore used cognitive-behavioral strategies, motivational strategies, and social influence strategies [37].

Arora, Mathur, and Singh [35•] proposed a multi-level intervention framework *IMPACT* (Intervention Model for Protecting Adolescents and Children against Tobacco) which approaches tobacco use from a socio-ecological perspective. This framework points to evidence from the *SIM SMOKE* model which simulates the effect of multiple tobacco control policies on smoking initiation and cessation [35•, 38]. Substance abuse interventions have employed various treatment approaches including social influence, motivational, and cognitive-behavioral strategies. Meta-analysis and systematic reviews of school-based prevention programs have found that materials using a social influence approach, including practicing resistance skills and normative education, are more effective than curricula adopting education and information-only approaches [37, 39, 40].

The interventions have mostly employed classroom-based strategies with some peer-led activities, and family and community engagement. The interventions reviewed were lacking clinic-based modalities geared towards adolescents. Overall, the focus on and resources dedicated to tobacco cessation among adolescents appear to be few and far between. A review in 2013 concluded that no study from India has reported the effectiveness of any cessation program (school or facility-based) for adolescents in India [35•]. A few studies indicated some evidence of cessation but there are no evidence-based programs that have been replicated and known to have long-term results among Indian adolescents.

Discussion

Based on the results of the literature search and the broader set of evidence on tobacco cessation, some key recommendations and implications for practice become clear and are proposed below.

A majority of the interventions included in this review focused on enhancing knowledge and altering norms at an individual level and used SCT constructs. However, these school-based interventions have been mostly successful with prevention rather than cessation. They need to engage and motivate tobacco users to quit and provide sustainable resources for these adolescents. Lack of cessation facilities has been a detriment to quitting and may lead to swapping out one product for another [6]. An analysis of GYTS data found that receiving counseling by a professional (physician, dentist, other health professionals, school health program educators) or a tobacco cessation program was associated with higher odds of quitting [15]. School-based tobacco control clinics, counselors, and medical professionals can be involved in tobacco cessation intervention for adolescents.

A study documenting inequities in elementary education suggests that about 13.5 million Indian children of elementary age were not enrolled in school in 2006. The proportions of those not in school were higher for various disadvantaged groups: the scheduled castes, the scheduled tribes, and the Muslim community [41]. Even the most effective school-based programs would therefore exclude disadvantaged adolescents not enrolled in school. For example, tribal adolescents have been excluded from these interventions as only 55% of the sample from the study on tobacco use among tribal adolescents attended school. None of those participants had ever participated in a tobacco prevention program or training at school or in the community. The schools in these areas accommodated up to 4th grade only which might be too young for the tobacco prevention programs [10]. Studies have also pointed to the need for exploring the causes and patterns of tobacco use among adolescents living in urban slums in India to inform prevention and cessation [6]. Further interventions and studies are needed to inform community-level initiatives targeted at these under privileged youth.

There exists a disparity in type of tobacco use in rural and urban areas, and tobacco programs should be adapted for schools in these areas accordingly [42]. The programs discussed earlier were not successful at dealing with smokeless tobacco (SLT) use effectively. Both Project ACTIVITY and MYTRI did not have much effect on smokeless tobacco use which highlights the need for policy and program strategies specific to SLT [34]. A possible reason for this might be due to low prices and lax taxation of SLT products making them more accessible to youth [43]. Bidis tend to have the highest price elasticity, followed by gutka and cigarettes, which indicate that fiscal policy could significantly reduce

youth tobacco use [44]. The diversity of tobacco use suggests a need for prevention and cessation programs to target various forms of use [22••].

Mobile phones, especially smartphones, are widely available for users in low and middle-income countries due to drastic reduction in costs. In India, the total number of wireless telephone subscribers as of October 2017 was 1178.2 million with 677.5 million urban and 500.7 million rural subscribers. It is also the second largest population using internet with 429 million users at the end of September 2017 with about 300 million urban and 129 million rural internet subscribers [45–47]. Studies have recommended use of smartphone apps to offer support to young adults trying to quit smokeless tobacco as well [48•, 49]. Technology-driven interventions such as mobile and web technologies are becoming increasingly popular [28]. Most of these studies do not take into consideration the multitude of online influences on adolescents and young adults. The Government of India has recently set up a national quit line and m-cessation program and media reports have shown positive results of these interventions. However, age-disaggregated data would show whether these services are being used by young people in India. Health applications and online customized messaging should be developed and tapped into to create accessible and tailored interventions.

A tobacco advertising, promotion, and sponsorship ban should be accompanied by anti-tobacco messaging adapted for youth. Counter-advertising has been used as a cessation aid with a greater protective effect on past smokers than current smokers [50]. It can be used in spaces frequented by young adults to consistently reinforce the harms of tobacco use in smoking as well as smokeless forms. Studies also vouch for comprehensive school policies to help reduce adolescent tobacco use [51, 52]. It is crucial to implement as well as monitor the impact of tobacco control policies in schools consistently.

Conclusion

This review highlights the research and limitations in the current tobacco control programming, especially the lack of cessation programs for adolescents, and policy implementation issues for adolescents in India. In addition to shifting the focus from prevention to cessation, the programs should adapt educational materials for multiple forms of tobacco use and provide professional resources to aid cessation support among adolescents. Tobacco cessation programs in schools, low-income communities as well as in virtual spaces frequented by adolescents and young adults, in conjunction with strictly enforced policies can create an environment conducive to making quitting process easier to initiate and maintain. Further interventions and research in this area are strongly warranted.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Pal R, Tsering D. Tobacco use in Indian high-school students. *Int J Green Pharm IJGP* [Internet]. 2009 [cited 2017 31];3(4). **Available from:** <http://www.greenpharmacy.info/index.php/ijgp/article/view/109>
2. Wipfli H. The FCTC turns 10: lessons from the first decade. *J Epidemiol.* 2016;26(6):279–83. <https://doi.org/10.2188/jea.JE20160080>.
3. Shimkhada R, Peabody JW. Tobacco control in India. *Bull World Health Organ.* 2003;81(1):48–52.
4. Kaur J, Jain DC. Tobacco control policies in India: implementation and challenges. *Indian J Public Health.* 2011;55(3):220–7. <https://doi.org/10.4103/0019-557X.89941>.
5. Report on Tobacco Control in India. 2004 [cited 2018 Dec 1]. **Available from:** http://www.who.int/fctc/reporting/Annex6_Report_on_Tobacco_Control_in_India_2004.pdf?ua=1
6. Arora M, Tewari A, Tripathy V, Nazar GP, Juneja NS, Ramakrishnan L, et al. Community-based model for preventing tobacco use among disadvantaged adolescents in urban slums of India. *Health Promot Int.* 2010;25(2):143–52. <https://doi.org/10.1093/heapro/daq008>.
7. Arora M, Reddy KS, Stigler MH, Perry CL. Associations between tobacco marketing and use among urban youth in India. *Am J Health Behav.* 2008;32(3):283–94. <https://doi.org/10.5555/ajhb.2008.32.3.283>.
- 8.•• McKay AJ, Patel RKK, Majeed A. Strategies for tobacco control in India: a systematic review. *PloS One.* 2015;10(4):e0122610. **This review provides a good overview of tobacco control efforts and outcomes of interventions in India. It summarizes evidence from studies, of any population resident of India consuming any form of tobacco, using the WHO treaty Framework Convention on Tobacco Control (FCTC) as the underlying framework for synthesis.** <https://doi.org/10.1371/journal.pone.0122610>.
9. Sinha DN, Gupta PC, Reddy KS, Prasad VM, Rahman K, Warren CW, et al. Linking Global Youth Tobacco Survey 2003 and 2006 data to tobacco control policy in India. *J Sch Health.* 2008;78(7):368–73. <https://doi.org/10.1111/j.1746-1561.2008.00316.x>.
10. Zahiruddin QS, Gaidhane A, Bawankule S, Nazli K, Zodpey S. Prevalence and pattern of tobacco use among tribal adolescents: are tobacco prevention messages reaching the tribal people in India? *Ann Trop Med Public Health.* 2011;4(2):74.
11. Jayakrishnan R, Geetha S, Mohanan Nair JK, Thomas G, Sebastian P. Tobacco and alcohol use and the impact of school based antitobacco education for knowledge enhancement among adolescent students of Rural Kerala, India. *J Addict.* 2016;2016:9570517.
12. Sinha DN, Gupta PC, Pednekar M. Tobacco use among students in Bihar (India). *Indian J Public Health.* 2004;48(3):111–7.
13. Verma A, Muddaiah P, Krishna Murthy A, Sanga R. Exploring an effective tobacco prevention programme for Indian adolescents. *Public Health.* 2015;129(1):23–8. <https://doi.org/10.1016/j.puhe.2014.11.010>.
14. World Health Organization. World Health Organization. India (Ages 13–15), Global Youth Tobacco Survey (GYTS). FACT SHEET 2006. [cited 2017 Dec 5]. **Available from:** <https://nccd.cdc.gov/GTSSDataSurveyResources/Ancillary/DownloadAttachment.aspx?ID=257>
15. Chandrupatla SG, Tavares M, Natto ZS. Tobacco use and effects of professional advice on smoking cessation among youth in India. *Asian Pac J Cancer Prev APJCP.* 2017;27;18(7):1861–7.
16. World Health Organization. World Health Organization. India (Ages 13–15), Global Youth Tobacco Survey (GYTS). FACT SHEET 2009. 2011 [cited 2017 Oct 31]. **Available from:** <http://www.who.int/libproxy1.usc.edu/fctc/reporting/Annexoneindia.pdf>.
17. Patel DR. Smoking and children. *Indian J Pediatr.* 1999;66(6):817–24. <https://doi.org/10.1007/BF02723844>.
18. Singh RK, Singh S. Help to quit. *Bdj.* 2009;207(11):518–9. <https://doi.org/10.1038/sj.bdj.2009.1089>.
19. Sussman S, Black D. Advancing youth tobacco use cessation in developing countries: practical considerations. *Int Public Health J.* 2009;1:119–28.
20. Sussman S. International translation of Project EX: a teen tobacco use cessation program. *Sucht.* 2012;58(5):317–25. <https://doi.org/10.1024/0939-5911.a000205>.
21. Arora M, Stigler MH, Reddy KS. Effectiveness of health promotion in preventing tobacco use among adolescents in India: research evidence informs the National Tobacco Control Programme in India. *Glob Health Promot.* 2011;18(1):9–12. <https://doi.org/10.1177/1757975910393163>.
- 22.•• Sidhu AK, Sussman S, Tewari A, Bassi S, Arora M. Project EX-India: a classroom-based tobacco use prevention and cessation intervention program. *Addict Behav.* 2016;53:53–7. **This study was the only school-based tobacco control intervention in India to utilize complementary alternative medicine (CAM) activities.** <https://doi.org/10.1016/j.addbeh.2015.09.005>.
23. Chatterjee N, Kadam R, Patil D, Todankar P. Adherence to the tobacco-free school policy in rural India. *Asian Pac J Cancer Prev APJCP.* 2017;18(9):2367–73. <https://doi.org/10.22034/APJCP.2017.18.9.2367>.
24. Mathur N, Pednekar M, Sorensen G, Nagler E, Stoddard A, Lando H, et al. Adoption and implementation of tobacco control policies in schools in India: results of the Bihar school teachers study. *Asian Pac J Cancer Prev APJCP.* 2016;17(6):2821–6.
25. Sinha DN, Gupta PC, Warren CW, Asma S. Effect of school policy on tobacco use by school personnel in Bihar, India. *J Sch Health.* 2004;74(1):3–5.
26. Mistry R, Pednekar M, Pimple S, Gupta PC, McCarthy WJ, Raute LJ, et al. Banning tobacco sales and advertisements near educational institutions may reduce students' tobacco use risk: evidence from Mumbai, India. *Tob Control.* 2015;24(e1):e100–7. <https://doi.org/10.1136/tobaccocontrol-2012-050819>.
27. Mead EL, Rimal RN, Cohen JE, Turner MM, Lumby EC, Feighery EC, et al. A two-wave observational study of compliance with youth access and tobacco advertising provisions of the Cigarettes and Other Tobacco Products Act in India. *Nicotine Tob Res Off J Soc Res Nicotine Tob.* 2016;18(5):1363–70. <https://doi.org/10.1093/ntr/ntv263>.
28. Murthy P, Subodh BN. Current developments in behavioral interventions for tobacco cessation. *Curr Opin Psychiatry.* 2010;23(2):151–6. <https://doi.org/10.1097/YCO.0b013e328336653f>.

29. Perry CL, Stigler MH, Arora M, Reddy KS. Preventing tobacco use among young people in India: Project MYTRI. *Am J Public Health*. 2009;99(5):899–906. <https://doi.org/10.2105/AJPH.2008.145433>.
30. Philip PM, Parambil NA, Bhaskarapillai B, Balasubramanian S. Evaluation of a specially designed tobacco control program to reduce tobacco use among school children in Kerala. *Asian Pac J Cancer Prev APJCP*. 2013;14(6):3455–9. <https://doi.org/10.7314/APJCP.2013.14.6.3455>.
31. Sorensen G, Gupta PC, Nagler E, Viswanath K. Promoting life skills and preventing tobacco use among low-income Mumbai youth: effects of Salaam Bombay Foundation intervention. *PLoS One*. 2012;7(4):e34982. <https://doi.org/10.1371/journal.pone.0034982>.
32. Saraf DS, Gupta SK, Pandav CS, Nongkinrih B, Kapoor SK, Pradhan SK, et al. Effectiveness of a school based intervention for prevention of non-communicable diseases in middle school children of rural North India: a randomized controlled trial. *Indian J Pediatr*. 2015;82(4):354–62. <https://doi.org/10.1007/s12098-014-1562-9>.
33. Mall ASK, Bhagyalaxmi A. An informal school-based, peer-led intervention for prevention of tobacco consumption in adolescence: a cluster randomized trial in rural Gandhinagar. *Indian J Community Med Off Publ Indian Assoc Prev Soc Med*. 2017;42(3):143–6.
34. Harrell MB, Arora M, Bassi S, Gupta VK, Perry CL, Srinath Reddy K. Reducing tobacco use among low socio-economic status youth in Delhi, India: outcomes from project ACTIVITY, a cluster randomized trial. *Health Educ Res*. 2016;31(5):624–38. <https://doi.org/10.1093/her/cyw039>.
35. Arora M, Mathur MR, Singh N. A framework to prevent and control tobacco among adolescents and children: introducing the IMPACT model. *Indian J Pediatr*. 2013;80(1):55–62. **This article presents a comprehensive theoretically informed model that can be useful in designing, implementing and evaluating multi-level tobacco control interventions.** <https://doi.org/10.1007/s12098-012-0768-y>.
36. Stigler MH, Perry CL, Arora M, Shrivastav R, Mathur C, Reddy KS. Intermediate outcomes from Project MYTRI: mobilizing youth for tobacco-related initiatives in India. *Cancer Epidemiol Biomark Prev Publ Am Assoc Cancer Res Cosponsored Am Soc Prev Oncol*. 2007;16(6):1050–6. <https://doi.org/10.1158/1055-9965.EPI-06-0929>.
37. Reddy UK, RKN S, Ul Haque MA, Basavaraja H, BLG A, Divakar DD. Effectiveness of health education and behavioral intervention for tobacco de-addiction among degree students: a clinical trial. *J Int Soc Prev Community Dent*. 2015;5(Suppl 2):S93–100. <https://doi.org/10.4103/2231-0762.172949>.
38. Levy DT, Cho S, Kim Y-M, Park S, Suh M-K, Kam S. SimSmoke model evaluation of the effect of tobacco control policies in Korea: the unknown success story. *Am J Public Health*. 2010;100(7):1267–73. <https://doi.org/10.2105/AJPH.2009.166900>.
39. McDermott L, Stead M, Gordon R, Angus K, Hastings G. A review of the effectiveness of social marketing nutrition interventions. Report prepared for the National Social Marketing Strategy for Health. Stirling: Institute for Social Marketing. 2006. p. 14.
40. Sorensen G, Pednekar MS, Sinha DN, Stoddard AM, Nagler E, Aghi MB, et al. Effects of a tobacco control intervention for teachers in India: results of the Bihar school teachers study. *Am J Public Health*. 2013;103(11):2035–40. <https://doi.org/10.2105/AJPH.2013.301303>.
41. Govinda R, Bandyopadhyay M. Social exclusion and school participation in India: expanding access with equity. *Prospects Paris*. 2010;40(3):337–54. <https://doi.org/10.1007/s11125-010-9160-8>.
42. Sabnis R, Sahu K, Thakur D, Surana S, Mazhar H, Pandey S. Urban and rural disparity in tobacco use and knowledge about oral cancer among adolescents: an epidemiological survey on 12 and 15-year school going students. *J Int Soc Prev Community Dent*. 2016;6(Suppl 3):S226–31. <https://doi.org/10.4103/2231-0762.197200>.
43. Harrell MB, Arora M, Bassi S, Gupta VK, Perry CL, Srinath Reddy K. Reducing tobacco use among low socio-economic status youth in Delhi, India: outcomes from project ACTIVITY, a cluster randomized trial. *Health Educ Res*. 2016;31(5):624–38. <https://doi.org/10.1093/her/cyw039>.
44. Joseph RA, Chaloupka FJ. The influence of prices on youth tobacco use in India. *Nicotine Tob Res Off J Soc Res Nicotine Tob*. 2014;16(Suppl 1):S24–9. <https://doi.org/10.1093/ntr/ntt041>.
45. Telecom Regulatory Authority of India. New Delhi. Press release on telecom subscription data as on 31st October, 2017 [Internet]. 2017 Dec [cited 2018 Jan 6]. **Available from:** http://www.trai.gov.in/sites/default/files/PR_No_104_Eng_12122017_0.pdf
46. Telecom Regulatory Authority of India. New Delhi. Press Release on Indian Telecom Services Performance Indicator Report for the Quarter ending September, 2017 [Internet]. 2017 Dec [cited 2018 Jan 6]. **Available from:** http://www.trai.gov.in/sites/default/files/Press_Release_No109_Eng_28122017.pdf
47. Muralidharan S, Mohan V, Anjana RM, Jena S, Tandon N, Allender S, et al. Mobile health technology (mDiab) for the prevention of type 2 diabetes: protocol for a randomized controlled trial. *JMIR Res Protoc*. 2017;6(12):e242.
48. Ghorai K, Akter S, Khatun F, Ray P. mHealth for smoking cessation programs: a systematic review. *J Pers Med*. 2014;4(3):412–23. **This review provides a good introduction and synthesis of mHealth services for smoking cessation. It provides guidelines for theory-based smart phone interventions for smoking cessation in the future.** <https://doi.org/10.3390/jpm4030412>.
49. Sharma G, Nagpal A. The untapped potential of a low cost evidence based smartphone application for smokeless tobacco cessation. *Rural Remote Health*. 2015;15(3):3479.
50. Shah PB, Pednekar MS, Gupta PC, Sinha DN. The relationship between tobacco advertisements and smoking status of youth in India. *Asian Pac J Cancer Prev APJCP*. 2008;9(4):637–42.
51. Sinha DN, Gupta PC, Dobe M, Prasad VM. Tobacco control in schools of India: review from India global school personnel survey 2006. *Indian J Public Health*. 2007;51(2):101–6.
52. Sinha DN, Gupta PC, Warren CW, Asma S. School policy and tobacco use by students in Bihar, India. *Indian J Public Health*. 2004;48(3):118–22.