

A Framework to Prevent and Control Tobacco among Adolescents and Children: Introducing the IMPACT Model

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Abstract The objective of this paper is to provide a comprehensive evidence based model aimed at addressing multi-level risk factors influencing tobacco use among children and adolescents with multi-level policy and programmatic approaches in India. Evidences around effectiveness of policy and program interventions from developed and developing countries were reviewed using Pubmed, Scopus, Google Scholar and Ovid databases. This evidence was then categorized under three broad approaches: Policy level approaches (increased taxation on tobacco products, smoke-free laws in public places and work places, effective health warnings, prohibiting tobacco advertising, promotions and sponsorships, and restricting access to minors); Community level approaches (school health programs, mass media campaigns, community based interventions, promoting tobacco free norms) and Individual level approaches (promoting cessation in various settings). This review of literature around determinants and interventions was organized into developing the IMPACT framework. The paper further presents a comparative analysis of tobacco control interventions in India vis a vis the proposed approaches. Mixed results were found for prevention and control efforts targeting youth. However, this article suggests a number of intervention strategies that have shown to be effective. Implementing these interventions in a coordinated way will provide potential synergies across interventions. Pediatricians have

prominent role in advocating and implementing the IMPACT framework in countries aiming to prevent and control tobacco use among adolescents and children.

Keywords Adolescent tobacco prevention · Adolescent smoking · Socio-ecological model · Cessation programs · Framework

Introduction

Tobacco is the single largest preventable cause of death and disease in the world today [1]. Recent estimates reveal that 6 million people die due to tobacco every year and this figure will increase to 8.3 million deaths by 2030 [2]. Worldwide about 90 % of adult tobacco users begin before the age of 18 y and some as young as 10 y and 6 y as reported in India [3–5]. A striking 80,000–100,000 adolescents initiate smoking every day; thus posing a huge public health threat. Tobacco burden in low and middle income countries (LMICs), especially India is unique due to rampant consumption of both smoking and smokeless forms of tobacco [6, 7]. Myriad varieties of smoking and smokeless tobacco products available in South Asian countries like India make tobacco a very versatile product for consumption among adolescents. These myriad varieties add to easy availability (due to cottage industry production of many tobacco products) and affordability of tobacco products for children and adolescents [8].

An increase in tobacco use has been documented in LMICs, especially among girls [9, 10]. It was estimated in 2009 that about 15 % school going adolescents between 13–15 y use a tobacco product and another 15.5 % adolescents are likely to initiate tobacco use in the future in India [9–11]. Tobacco using adolescents face health burden such as sub-mucous fibrosis (pre-cancerous lesions), cancers, respiratory diseases, cardiovascular

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diseases, stroke *etc.* during early adulthood [10, 11]. Children are exposed to second hand smoke (SHS) at homes through parental smoking and this involuntary exposure poses health risk in the form of middle ear infections, reduced rate of lung growth, many cancers, heart diseases and other respiratory conditions [12]. Moreover, almost half of the adolescents, who initiate tobacco use, are likely to die either in their middle-age or old-age with causes related to tobacco use [13].

This paper aims to provide a comprehensive framework that can be implemented to prevent and control tobacco use among this vulnerable group. This multi-level intervention framework has been termed—IMPACT *i.e.*, Intervention Model for Protecting Adolescents and Children against Tobacco. This framework provides a cogent summary of main policy and program interventions, which policy makers, program managers, schools, principals, teachers and Pediatricians can adopt at various levels to protect adolescents and children, especially in developing countries like India. The role of Pediatricians, as important stakeholders in implementing IMPACT has also been discussed and highlighted in this paper.

The authors searched Pubmed, Scopus, Google Scholar, Ovid databases and books for this review. They conducted extensive literature review and synthesis of published research addressing interventions to reduce smoking and smokeless tobacco use among children and adolescents. The review is limited to adolescents and children oriented tobacco and smoking prevention and control strategies. All the information from the literature review has been organized into developing ‘The IMPACT Framework’.

Intervention Model to Protect Adolescents and Children from Tobacco (IMPACT)

Tobacco use is a social and public health problem. It is not restricted to an individual’s behavior but is a multi-faceted process influenced by wide ranging contextual factors. These multi-level influences determining tobacco use initiation or uptake by a child, also interact across different levels [14]. Identifying these determinants is essential to develop a comprehensive policy and program response. Also behavior change is sustainable when environments and policies support no-tobacco use, when social norms and social support are in favor of tobacco control and when adolescents are motivated and educated to make a quit attempt to give up tobacco use. These determinants are to be addressed as individual factors, socio-environmental factors and public policy factors, to bring about substantial changes in tobacco use behavior.

A socio-ecological perspective thus, provides an appropriate approach to bring about population level changes in preventing and controlling tobacco use. This would translate into implementing a comprehensive framework including

multiple approaches promoting no tobacco use rather than a single ‘Magic-Bullet’ intervention [14]. The proposed IMPACT framework presents an overlap of social cognitive theory and socio-ecological model of health behavior. It is a behavior specific model for preventing and controlling tobacco use among children and adolescents (Fig. 1). The multi-level structure of this model on left side represents multiple levels of determinants that influence children and adolescents to experiment and continue using tobacco, while the layers on the right side represent the policy and program interventions that can be implemented at individual level, community level and at policy level to prevent initiation and promote cessation among children and adolescents.

At individual level, genetic factors, addiction to nicotine, self image, reasons to use or not to use tobacco, contribute to continued tobacco use [15]. Lack of knowledge about health effects and fewer refusal skills make them vulnerable to peer-pressure [16]. At the social environment level, parents and peer smoking are strong predictors of adolescent tobacco use behavior along with normative beliefs and expectations and social norms. At the broader National level, tobacco industry is increasingly targeting adolescents, which is contributing to escalating prevalence of tobacco use among adolescents [17, 18]. A recent longitudinal analysis in India substantiated that adolescents are receptive towards tobacco advertising and promotions and are more likely to initiate tobacco use under influence of such advertisement strategies [19].

In addition, the age of initiation of tobacco use is decreasing due to easy access, affordability of tobacco products and poor implementation of policies protecting minors in LMICs [16, 20]. Studies have demonstrated that the degree of nicotine-addiction is more pronounced in adults who initiate tobacco use at an early age [21]. Lack of health warning on tobacco product packages in LMICs adds to lack of knowledge about health consequences of tobacco use [2]. Ineffective warnings seen in India clearly make the case of introducing field tested warnings that adolescents and children can understand [22, 23].

IMPACT framework further explains how influences on tobacco use behavior are addressed by multi-level interventions. Interventions combining school, parents and communities have shown to be effective in lowering smoking rates among adolescents attributing success to achieve involvement of students and their parents [24]. There is evidence that the policy and program intervention approaches as proposed in the IMPACT framework show greater effectiveness, when used in combination, as has been shown in SIM SMOKE model that analyzed the role of public policies in reducing smoking prevalence by looking at four types of policies (taxes, mass media, clean air laws and youth access policies) [25]. These policies and legislations are the cornerstones of National Tobacco Control Programs and are strongly recommended through Framework Convention for Tobacco Control (FCTC) and MPOWER strategies [26, 27].

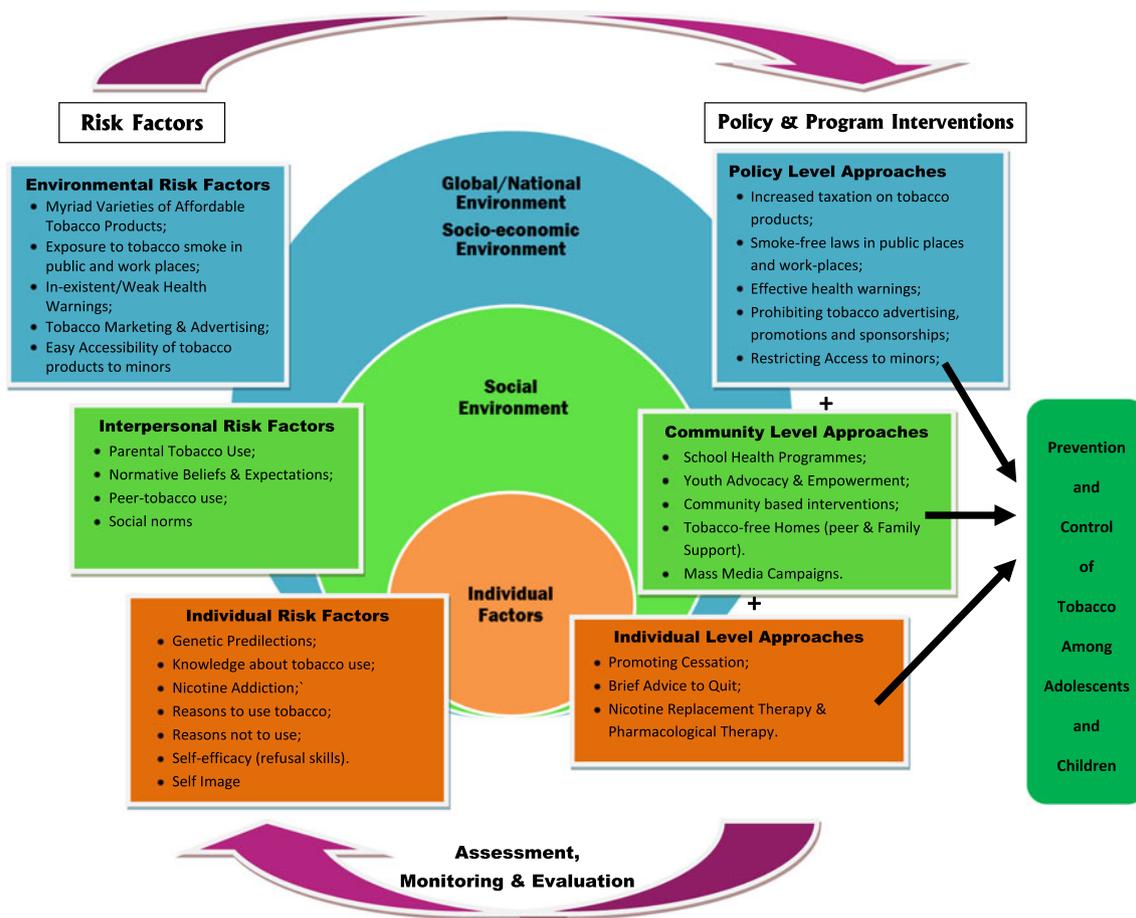


Fig. 1 Intervention model for protecting adolescents and children against tobacco: The IMPACT framework

Policy and Program Interventions for Tobacco Control: The Evidence

A review of existing policies and interventions aimed at preventing and controlling the use of tobacco among adolescents was undertaken to assess effectiveness of each proposed measure in the IMPACT model. The paper further presents a comparative analysis of tobacco control interventions in India vis a vis the proposed IMPACT model.

Policy Level Approaches

Increase Taxation on Tobacco Products

Evidence establishes tobacco taxation as one of the most effective strategy at the population level to deter tobacco use among adolescents. Studies have highlighted that the impact of price increase of tobacco products is more pronounced in not just decreasing consumption, but also in preventing initiation among adolescents [28]. Evidence indicates that

if tobacco products prices are increased by 10 %, the demand for tobacco products would decrease by 4 % – 9 % in India [29, 30]. Since 2004, state governments have been raising taxes on tobacco products including gutkha and cigarettes but bidis have largely been exempted [29]. However this differential treatment of tobacco products can lead to product switching and will not have the desired effect of reducing demand in India [31].

Protection from Second Hand Smoke (SHS)

Research suggests that smoking restriction laws also aid in protecting adolescents and children by preventing initiation of smoking as well as encouraging smokers to quit by creating a smoke free environment at their places of study and work [32]. Jarvis et al., highlighted that a significantly higher number of children with smoking parents lived in smoke free homes in 2008 (48.1 %) after the British smoke free legislation was enforced in comparison to 2007 (30.1 %) and 2006 (35.5 %) [33]. The Cigarettes and Other

Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003 (COTPA), prohibits smoking at public places in India [34]. However, recent evidence highlights high level of air nicotine around places of entertainment followed by hospitals and schools [35]. This substantiates lack of implementation of the smoke-free laws and also cautions against the health hazards of exposure to SHS in adolescents and children [35].

Health Warnings on Tobacco Products

Health warnings on tobacco products were identified as another important population level public health intervention for tobacco control [36, 37]. Hammond concluded that health warnings can augment smoking cessation and discourage youth initiation of tobacco products corroborating evidences from Canada, Australia, UK, Mexico and also from LMICs [36]. India introduced its first pictorial health warnings on tobacco product packages in 2009, which were largely ineffective [22, 23]. Raute et al. in their study on 712 individuals, above 15 y of age conducted in Mumbai and Thane found that most (88.5 %) of people were in favor of stronger pictorial warnings and almost one third of never smokers (33.1 %) stated that they will “think twice before starting smoking” [38].

Prohibiting Tobacco Advertising, Promotions and Sponsorship (TAPS)

Prohibiting tobacco advertisement, promotion and sponsorships (TAPS) has been validated as an effective tobacco control policy intervention [39]. Hanewinkel et al. reported that high exposure of cigarette advertisements is a significant predictor of adolescent smoking initiation after controlling for baseline covariates (adjusted relative risk: 1.46 [95 % CI: 1.08–1.97]; $P < .05$) [39]. COTPA, Section 5, prohibits all forms of tobacco advertising except on-pack, in-pack and point-of-sale in India [34]. Evidence points to lack of implementation of Section 5 by utilizing the channels for surrogate advertising [20]. Article 13 guidelines under FCTC clearly highlight that comprehensive prohibition of tobacco advertisement, promotion and sponsorship (TAPS) is the only protection of children and adolescents from advertising and promotions and partial bans are not at all effective [26]. Arora et al., highlighted that risk of progression to tobacco use was almost double for adolescent boys who were highly receptive to tobacco advertisements in comparison to non receptive boys (95 % CI 1.28 to 4.32; $P < 0.05$) [40].

Restricting Access to Minors

Restricting access to minors has been identified as a population policy intervention with limited benefits [41]. Evidence substantiate that prevalence of current smoking among youth is significantly associated with tobacco outlet density [42]. Government of India prohibited the sale of tobacco products in an area within 100 yards of any educational institution in 2004 and made it mandatory for the school administration to display warning boards at conspicuous places [34]. COTPA also prohibits sale of tobacco products to and by minors [34]. Research has demonstrated that this prevents initiation of tobacco use by adolescents and restricts adults through a decrease in the total tobacco sale outlets [43]. Indian Government has recently added a pictorial health warning on the board at point of sale, along with warning prohibiting sale of tobacco to minors [44].

Community Level Approaches

School-Based Health Programs

Schools and educational institutions provide an ideal setting to impart tobacco cessation programs to adolescents. School based cessation interventions provide an opportunity to prevent tobacco use initiation, and helping people to avoid difficulties that can arise due to withdrawal symptoms when they are trying to quit tobacco. School-based multi-component prevention intervention designs such as Project MYTRI (Mobilizing Youth against Tobacco Related Initiatives) were highly effective in controlling the tobacco menace in India [16]. Perry et al., reported that the overall tobacco use among school going adolescents decreased by 17 % after intervention; however, in the control group it increased by 68 % [24]. Goenka et al., highlighted that peer-led approach together with increased peer-student discussion and participation provide better outcome than teacher-led instructions alone ($r = 0.70$, $P < 0.005$) [45].

Youth Advocacy and Empowerment

Youth engagement has been identified as imperative for developing an effective and comprehensive tobacco control program. Global Youth Action on Tobacco (GYAT) Network was established to provide an experience sharing platform for youth-based advocacy globally *via* e-groups. [46]. Youth advocacy platforms such as Youth for Health (Y4H) model aiming at formulation of a global alliance for tobacco control and other common youth concerns were reported to be successful strategies for engaging youth in India and globally [45]. Corroborating this evidence at the community level, Arora et al., proposed that youth peer-leaders and NGO volunteers can be utilized as important

intervention implementation units for addressing out-of-school adolescents [47].

Mass Media Campaigns

It has been established that meticulously designed mass-media intervention designs are instrumental in altering the tobacco use behavior among the youth [48]. Moreover, such interventions can reach a larger population within less time [49]. Also, the uneducated youth especially in developing countries can be engaged through such intervention strategies [48, 49]. Evidence also suggests that media strategies focused upon revealing industry tactics which maneuver young adolescents to initiate tobacco use and those demonstrating harms of SHS exposure to children and significant others; have been more effective than those providing educational health messages alone [49]. Media strategies were found to be equally important in targeting tobacco users in India [50]. The impact of the national mass media campaign in India was assessed by several researchers and they reported that a high percentage of smokeless-only users (75 %) and dual users (77 %) were alarmed about their tobacco use habit after being exposed to the campaign [50]. The campaign also impacted upon orientation towards cessation as 72 % of smokeless and dual tobacco users contemplated quitting their habit and 41 % tried to convince other people to quit tobacco use [50].

Tobacco Free Homes and Communities

Evidence also highlights that families and communities play a crucial role in preventing uptake of risk behavior and promoting adoption of health promoting behaviors. No-tobacco use norms in families and communities, parental monitoring and expectations have substantial influence on promoting health behaviors among adolescents [51]. Community based tobacco cessation approach has been tested in India through a demonstration project and found to be beneficial [47]. A significant reduction in tobacco use by adolescents was found in intervention group as compared to control group ($P=0.048$). The intervention group also reported significantly lower fresh uptake of tobacco use (0.3 %) in comparison to control group (1.7 %). [47]

Individual Level Approaches

Most of the cessation interventions targeting children and adolescents have been school based. There are however, some other interventions for tobacco cessation among youth and children based at health facilities, worksites and using quitlines [52]. SMART was a teen worksite based behavioral tobacco intervention model for teens 15–18 y of age. Almost 84 % of the adolescents recognized SMART as a

tobacco cessation program at the end of intervention and barring 13 % of the adolescents, everyone participated in either interactive or non interactive activities. The authors concluded that SMART can be an effective program to reduce teen smoking [53]. No study from India, so far has reported the effectiveness of any existing school based or facility based cessation program for adolescents in India.

Discussion

Adolescents and children in LMICs are particularly vulnerable to health effects of tobacco use. Fragmented implementation of tobacco control policies such as prohibition on smoking in public places, add to their vulnerability. During World Health Assembly, 2011, a resolution was endorsed, calling upon member states to protect youth from dangers of Non Communicable Diseases (NCDs) [54]. This article thus suggests a number of intervention strategies that have proven to be substantially effective in addressing the tobacco concerns of adolescents and children. Implementing these interventions in a coordinated way would potentially synergize tobacco control interventions, especially in LMICs.

Policy measures are most cost-effective compared to other interventions proposed in this paper. Increasing taxes on tobacco products is most effective as it is revenue generation for the Government and at the same time a demand reduction strategy proposed under FCTC [26]. Health warning is another effective policy intervention, implemented at expense of tobacco industry. Many developing countries have adopted pictorial warnings from developed countries, but it is essential to understand various interpersonal, cultural, social and environmental factors before conceptualizing and implementing health warnings in developing countries. Further research on health warnings in developing countries should look at ways to increase effectiveness and impact of health warnings on different sub groups like children, adolescent and women.

School based tobacco prevention and cessation programs have been found to be quite effective in increasing quit rate among adolescents. Evidences from developing countries like India also emphasize on the potential of school based tobacco prevention programs in reducing tobacco use prevalence among adolescents [55]. Since school based tobacco prevention effectiveness data is from research studies in India, state governments need to upscale these evidence based interventions under National Tobacco Control Program. Definitive evidence exists to support youth engagement in tobacco control advocacy for a more sustainable change than individual-based interventions. Leroy et al., argued that the youth-advocacy interventions have proven to be more sustainable and highlighted that youth campaigns not only provide

individual empowerment to adolescents involved in the campaign; but, aids in achieving organizational empowerment as well [56]. Also, adolescents and youth play a critical role in constructing a social norm change within the communities as they form a large and important segment of the community populations. This substantiates that school-based intervention accompanied with youth advocacy would provide sustained benefits for tobacco control at community as well as individual level.

Other cessation programs for adolescents and children like the worksite based cessation programs, counseling by health care providers and use of quit lines have been found out to be effective in Western countries. Counseling and information on tobacco cessation can help young people avoid or quit tobacco use behavior. Their effectiveness however is yet to be established in developing countries like India. However, some community based cessation models have been pointing towards potential for this approach in developing countries and may be a likely approach to adopt in comparison to resource intensive health setting based cessation approaches [47, 51–53].

Individual risk factors could be addressed through individual level approaches but would also be influenced by policy and community approaches. Similarly interpersonal risk factors could also be addressed with policy level approaches too. The interventions suggested under IMPACT model would contribute to micro-level gains in reducing and preventing tobacco use among children and adolescents; but, these will translate in significantly reducing morbidity and mortality attributable to tobacco.

Pediatricians have an active role in advocating with governments for such policy reforms and to actively initiate and lead community and individual level approaches to protect children and adolescents from tobacco exposure [57]. In addition, they are an important resource in building capacity of teachers and peer leaders [57]. Moreover, health settings provide an ideal platform as pediatricians are well-positioned to identify risky behaviors; early screening provides early diagnosis of an emerging health problem and prompt adequate access to treatment through such settings [57]. Thus, pediatricians have a prominent role in advocating and implementing the IMPACT framework to prevent and control tobacco use among adolescents and children.

Conclusions

Governments have an obligation to implement policies and programs that respect, protect and fulfill adolescents' and children's rights to health and development, thus a comprehensive framework as the IMPACT framework will need to be adopted by every country, wanting to protect the children and adolescents in their country from the burden of tobacco epidemic.

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