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Tobacco Use Prevention by Integrating Inside and Outside of School Based Programs: A Systematic Review Article

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ABSTRACT

Background: Experience of tobacco use in early ages will increase probability of addiction to nicotine therefore, efficient tobacco control programs for teenagers are crucial. This study was conducted to recognize elements of successful integrated inside and outside of school based smoking prevention programs.
Methods: MeSH terms and related keywords were used to search PubMed, Cochrane, Medline, EMBASE, ERIC, SID databases from inception to 29th October 2013. Trials with random and non-random designs, systematic reviews and cohort studies that assessed or reported application of integrated tobacco control programs were included. Quality of the retrieved publications was checked independently by the authors and any disagreement was resolved by consensus.
Result: Among the 745 identified publications, only 15 studies had the inclusion criteria with a considerable methodological heterogeneity. While, precise outcome of integrated out of school/school-based interventions were not perceptible but this study's findings implied that outside of school intervention could strengthen school-based tobacco prevention programs. No study was found to examine school-based interventions integrated with primary health care such as anti-tobacco consultations, high-risk students screening and their referral to special centers.
Conclusion: Integration of outside and inside of school-based programs may boost probability of obtaining favorable outcomes and success rate in practice.

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Introduction

Tobacco use epidemic is one of the prominent public health threats that cause about 6 million deaths around the world each year. About 50% of the tobacco users may die due to the medical conditions associated with or aggravated by smoking.[1] Smoking in young people might have short-term health consequences including disorders in respiratory tract and other body functions, in addition to the nicotine addiction or fascination to test other drugs. Smoking was also related with other

high-risk behaviors such as physical violence and unprotected sex.[2]

The earlier age of smoking initiation, could increase probability of addiction to nicotine.[3] Despite the existing evidence about the detrimental effects of smoking on health, number of smokers especially among children and teenagers is increasing. The overall global estimate of smoking among students is 9.5%.[4] The prevalence of tobacco smoking was 14% for the Indian students in one study[5] and 24.8% in the sixth-grade students and 9.3% in the eighth-grade students in other study.[6] In 5 European countries (France, Italy, Republic of Ireland, the Czech Republic, and Sweden) mean age of smoker women was 18.2 and more than 80% of them had started smoking before the age of 20.[7] In Tabriz, Iran, in a period of 12 months, 14.3% of students had moved from non-smoking stage to experimenter smoking, 2.8% to regular smoking; and 16.5% from experimental smoking to regular smoking.[8] In a report of the Iranian institute of anti-tobacco it was suggested that regular smoking pattern is rampant in very low ages as 12 years old in Iran.[9]

According to the recommendation given by the American Cancer Society (ACS) the earlier age of smoking initiation will enhance the lifetime risk of related cancers. The ACS also stated that out of every 10 daily smokers, 9 people smoked their first cigarette before the age of 18 and has become addicted in their teenage years.[3] Therefore, where most smokers start tobacco use before finishing their high school; prevention of smoking initiation in high schools might hinder smoking in later life.[10]

Regarding the overall reduction in the age of smoking in youth populations[3, 6, 7, 9, 10] and considering the fact that most smokers were addicted in their teenage years, it is wise to focus on behavioral strategies to hamper smoking adoption amongst children and teenagers.[11, 12]

School based tobacco prevention programs may potentially be effective for most related consequences of smoking.[13] In Germany for instance, comparison of the costs and advantages of a school-based smoking prevention program have shown that competition of "classes without smoking" was effective.[14]

As the report of the American Medicine Institute was revealed in 2007 many successful tobacco use prevention programs have been conducted in schools and therefore, school-based programs were advised to be the core element of tobacco prevention activities.[15] Apparently, schools are the best places to get access to teenagers, train them, and affect their thoughts, attitudes, and behaviors. However, school-based programs alone have little or short-term effects.[16, 17] In 2013, a study on the Indian teenagers showed that a general school-based tobacco control program could change patterns of tobacco use considerably but those school based programs that included frequent follow ups and multiple interventions were more effective than the single intervention programs.[18]

In spite of a large number of studies on prevention or control of tobacco use, there have been fewer studies on tobacco prevention programs that simultaneously have integrated interventions inside and outside of school environments. The present study was aimed at examining the effectiveness of integrated school-community based tobacco prevention programs and finding effective elements of outside-of-school programs to enhance the inside-school programs.

Materials and Methods

This study is part of a research project aimed to pinpoint major and successful in and out of school based integrated programs to prevent tobacco use. We assessed random and non-random trials, reviews, and meta-analyses that reported combined programs of tobacco prevention inside and outside of schools. Studies that were only inside or outside of school, or only included tobacco cessation programs, or contained tobacco prevention and control programs for adults were excluded.

Searches were carried out for published literature in 6 databases of PubMed, Cochrane, Medline, EMBASE, ERIC, SID. Keywords included (smoke OR smoking OR cigarette OR tobacco OR hookah) AND (control OR prevent*) AND (community based or population based OR com-

munity wide OR population wide) AND ("school based" OR class* based) AND (teen* or youth or young people or child* or girl or boy or adolescent) in both Persian and English. No time or language limit was considered, though all the included studies were in English. The search was conducted from inception until 29th of October 2013 and the results were saved in the Reference Manager Software version10.

The titles and abstracts of the 745 retrieved articles were checked primarily for relevancy that lead to exclusion of 559 and retaining of 186 documents. In the next stage, 83 articles were removed due to the overlap among databases, and 103 publications were remained for further scrutiny. In the next phase, quality of the selected articles was checked according to the quality criteria explained in the Cochrane's Handbook for Systematic Reviews of Interventions.[19] These criteria for trials included random selection of the study target group, concealed allocation of groups, and for review articles clear study question or statement of purpose, use of different databases, precise inclusion and exclusion criteria and interpretation of results. These criteria were applied by two of the reviewers independently to assess the quality of identified publications. Finally, out of these articles, 15 had the target quality characteristics (containing 5 systematic reviews) that were remained for analysis in this study. Different tobacco prevention methods and anti-tobacco programs, educational curricula, training through teachers or peers and educational facilities were considered as school-based interventions. Out-of-school prevention and control interventions included programs such as knowledge mobilization, community organizing and smoking ban in public places, adopting sale prohibition rules, increase in tobacco tax (price) and media activities. Out of school measures that where applied simultaneously with in-school tobacco prevention programs were also focused for analysis.

Ethical Considerations

We did our best to avoid including of redundant publications and include those publications that were methodologically as transparent as possible and therefore, their accuracy of findings was more probable.

Results

Among the 745 retrieved articles, 15 were finally selected based on the inclusion criteria (Figure 1). Types of interventions were considered based on the intervention setting i.e. inside or outside of schools as discussed above. Although there were a number of methodological considerations in the included articles, they have reported a set of effective integrated inside and outside of school programs to prevent smoking. Quality considerations were for example non-random selection of the study participants[20], unclear follow up of the study respondents[21] and in some studies[21-24] due to the nature of the study, infeasibility of blinding or concealed allocation of cases and controls.

Out of these 15 articles, 10 were primary studies (Table 1) and 5 were systematic reviews,[11, 25-28] 4 were exclusively focused on the cigarette smoking prevention[23, 29-31], 5 on the use of alcohol and marijuana in addition to cigarette smoking[20,21,24,32,33] and one on the prevention of violence and other risky behaviors in addition to tobacco use among the youths.[22]

All of the selected studies were conducted in developed countries (the U.S., Canada, Finland, Spain, England, Netherlands and Germany). Studied samples in the included studies were identical e.g. youths, the indigenous White students of both sexes except for one study that included students of the Black African origin .[29]

Despite the observed heterogeneity in the studied samples and inherent methodological diversity, simultaneous inside and outside of school interventions were conducted to prevent or control tobacco smoking in these studies.

Types of the most schools based interventions were educational and adverse effects of tobacco on health, resistance against social pressure and influence, life skills and decision-making were pinpointed. Variety of community interventions including media activities[21-23,32] and cooperation of parents and family members[20-22,30,33] were also observed.

Table 1: Summary data about the specifications of the included primary studies in this systematic review

Reference	Purpose of the study	Study design	Target group	Type of interventions	Outcomes
[20]	Evaluation of a preventive initiative of tobacco use	Non-randomized community trial (NRCT) with cross sectional evaluations	8th to 12thgrademostly white teenagers	School's curriculum revision / community based environmental strategies	Decrease in the prevalence of tobacco use
[21]	Evaluation of a drug use prevention program	Quasi-experimental and randomized experimental trial	6th and 7th grade mostly white (79%) students	School training program/ community support for changing social / Media coverage	Remarkable reduction in the prevalence and onset of drug use within 1-2 years of follow up
[22]	Evaluation of an intervention on prevention of tobacco/ other drugs use/ problematic behaviors	Randomized controlled trial (RCT)	7th and 9th grade male and female, mostly white (85%)	School based program/ community program/ media programs	Improvement in the preventive effect of school-based programs
[23]	Evaluation of the long term effects of a smoking prevention program	A 15-year controlled trial	7th grade 12-13 years old male and female high school teenagers	School/ community based programs	Reduction of smoking rate until 2 years and decline of the preventive effect after that
[24]	Evaluation ofa community based (CTC: Community That Care) program on the risk level of drug consumption and problematic behaviors	Community Randomized Trial (CRT)	5th-9th grade 10-14 year-old mostly white (67%) students	School/family/community program	Reduction of current incidence and prevalence of cigarette use
[29]	Cigarette smoking control	Quasi-experimental	6th and 7th grade students	School's curriculum revision/ multimedia intervention	Tobacco use reduction in 6 months follow up
[30]	Evaluation of a cigarette prevention program	Quasi-experimental	Middle-school 12-13 years old male and female teenagers	School's curriculum revision /in and out of school activities	Decrease of the number of new smokers and regular smokers
[31]	To identify the most effective combination of school-based/ local environments programs to reduce smoking rate	Longitudinal cohort study with cross-sectional evaluations	10th and 11th grade15 -19 years old male and female students	school-based/ local environments interventions	Reduction of cigarette smoking through integrated programs
[32]	Marijuana, cigarette and alcohol use control	Randomized Community Trial (RCT)	Middle school teenagers	School's curriculum revision/ school and community based media attempts	Reduction of cigarette uptake
[33]	Evaluation of an intervention program on the onset of drugs	Randomized block design	7thgrademale and female mostly white (96%) students	School/family based intervention	The onset index score was the lowest in the school/family based intervention group

In a number of studies[21-23,30,32], other methods were used such as: giving revenge to retailers who do not sell tobacco to young people, supporting the environment to change social norms of tobacco consumption, planning social support campaigns, voluntary and youth activities, reducing young people's access to tobacco, analyzing access points, engaging coaches and sport organizations, social organizations and provision of smoking cessation services to teachers and adults.

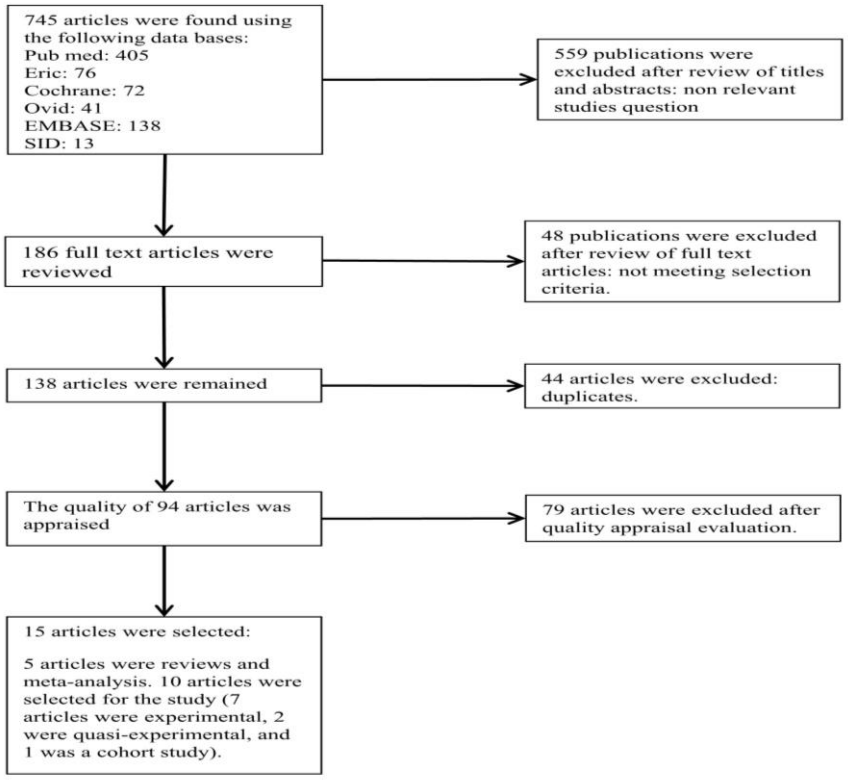

Fig.1: flow diagram of literature search for this review

School and media integrated programs were also investigated in the 2 included studies.[29, 32] Findings of the retrieved publications were indicative that the educational interventional programs could reduce the level of smoking. However, in one study [29] no significant difference between smoking level in the experimental and control groups was reported, but after a six months follow up in both groups, a sharp decline in the consumption level was observed. In general, integration of school and media programs seems to have had a positive impact on reduction of cigarette consumption.

Pentz et al.[21] have studied integration of school programs, doing homework with family, media activities and community based drug prevention activities with community and school policies. The result of this integration was reported to be the reduction of last month smoking (report of last month smoking was 3.4% in the experimental group and 13.1% in the control group) and last week smoking (4.3% in the experimental group and 10.5% user in the control group). The study findings have revealed that after 2 years, increasing of smoking rate in the control schools was 1.5 times higher than the observed rate in the experimental schools.

In another study[22] integration of school based programs (displaying videos about effects of smoking on health, resistance against social pressure, peer discussion), media programs (knowledge provision, advertising around sport fields, radio announcements) and community pro-

grams (anti-tobacco activities for youth, family relationships' enhancement, voluntary activities, and limiting youth access to tobacco) was investigated. Based on the findings, compared to the control schools in which programs were only school-based, the integrated programs had significant effect on prevalence of weekly cigarette use. It was also evident that these programs could improve school-based tobacco prevention programs through prevention of increase in the smoking prevalence. After 1 year, smoking prevalence rate was significantly lower in the communities where community-based programs had been conducted compared to the communities that only school-based programs had been administered. It was also reported that during 5 years, attitude toward tobacco and intention to its use in the experimental communities were significantly more negative than to the solely school-based programs.

Integrated school programs in a study[33]were boosted by the family programs for parents and children. In this study 3 groups were examined: group A that experienced life skills training in the school along with family programs for parents and children, group B in which only life skills training was performed and group C as the control group with no intervention. The output onset index score in the group A was the lowest and in the control group was the highest. The observed difference between group A and group B was not significant but it was significantly different from the control group. The lifetime smoking prevalence in the group A was 12.1%, in the group B was 13.9% and in the control group was 16.7%.According to the results in the groups A and B lowest level of alcohol and marijuana usage was observed however, for smoking the results were not statistically significant.

In a study [20], school programs were integrated with prevention programs for youth and their families with the coordination of different organizations and societies. The program was followed up for 3 years. The results showed an enormous smoking reduction particularly in the last 30 days (2.4, $P<0.05$). The reduction of lifetime smoking rate was also statistically significant according to the study results. These effects were reported in all of the classes, so supported the effectiveness of interventions in community and public scopes.

Ariza et al.[30] conducted a number of interventional programs in which school programs were integrated with programs for parents, students' free time activities, sport coaches and organizations, control of illegal sale of tobacco to young and children and stop smoking programs for teachers. In a period of 12 months, 4.5% ofboys and 5.6% of girls reported to be new smokers in the experimental group, while in the control group these figures were 6.7% and 11.7% ($P<0.001$) respectively. There was also a significant difference between the number of new smokers in the experimental and control group within the 24 and 36 months of study in both sexes. Onset of smoking in the experimental group was 46.9% less than the control group and at the end of the experiment; it was 15.3% less than the control group. These results all have proved the effectiveness of multifaceted programs' that considered strategies for influencing teens by adults. Based on the findings in a 36 months period, major contributing factors of becoming regular smokers were being female and study at public schools.

A study[23] that lasted for a relatively longer time, integrated school programs with community-based programs, education through media and tobacco quit programs for adults through organizing community and group communications. Two experimental groups were guided by teachers and health educators in this study and a control group that received no intervention. The immediate results indicated that in the experimental groups, students reported in a lesser degree once-a-month cigarette smoking. After 6 months and 2 years, the results were very similar. The preventive effect of the interventional program was paramount even after 8 years, in the schools that guided by teachers. After 15 years however; there was no significant difference between the experimental and control schools.Those who were non-smoker from the beginning were also followed by the age of 21 and compared to the control groups and the result indicated significantly fewer experimental smokers in this group of students. At the age of 28, the difference was also significant (30% vs.

41.2%). While; the number of regular smokers was higher in the control group but the difference was not significant. These results confirmed the effectiveness of simultaneously integrated school-based tobacco prevention with community-based cessation programs.

Hawkins et al.'s study[24] was on schools, teenagers, their families and the community staff in order to build Communalities That Care (CTC).The achieved experience could be guidance for communities to select, create, and monitor interventions and preventive factors for the youth. It focuses on the mobilization of the community stockholders to develop and conduct evidence-based prevention programs. The provided recommendations are expected to make changes in communities and in the performance of prevention systems through adopting an evidence-based approach and selection of the tested and effective prevention strategies to tackle with the important risk factors within the communities. Multilevel discrete time survival analysis results in the experimental communities and students who had not started smoking until the fifth grade showed that such programs had a significant effect on reduction of smoking incidence up to the tenth grade (95% CI: 0.36-0.81, t=3.36, df= 11, *P*=0.06, AOR 0.54).[24] The results also indicated that chance of smoking initiation in the tenth grade within the experiment communities was about half of that of the control group. The last month's cigarette smoking for the tenth grade students of the experimental groups was reported to be less than of the rate observed in the control group (t=-2.38, df= 11, *P*=0.04, AOR=0.79). The last month's cigarette smoking in the experimental group was 21% less than that of the control group (95% CI: 0.64-0.99, AOR=0.79), *P*<0.05, (16.3% vs. 13.4%). The achievements in this program have shown major advantages compared to its expenses.[24]

One of the included studies[31] was a longitudinal cohort research conducted in different times and contained an extensive set of data related to students, schools and communities that were collected from a national cohort study. The results indicated that mean of the smoking prevalence rate in the cohort schools reduced from 13.3% to 10.7% during 2004–2007 period. During this period, in the studied 51 schools the observed increase of smoking prevalence rate was maximum by 31% (mean of increase was 3%) while; the observed reduction rate was maximum by 69% (mean of decrease was 5%). Predictors of lower smoking prevalence rate in the studied schools were school characteristics, implementation of the prevention programs, community characteristics such as higher cigarette prices at schools' adjacent shops, presence of more immigrants, higher level of education and lower average level of family income. According to the final model, focus of schools on prevention programs can reduce prevalence of cigarette consumption. The overall conclusion based on the study findings was that cigarette-smoking control in the youth population requires programs that focus on multifaceted factors.

The results of 5 reviews, included in this study, are consistent with the findings of the above mentioned studies. A systematic review of school-based smoking prevention programs that targeted long-term effects of interventions have shown that such interventions can reduce smoking onset by 25-30%, but school plus community based programs can reduce it by 35-40% until the end of high school study. In the real world situations however, two factors reported to negatively affect even the best interventional programs. They were firstly, the adaptation rate of the programs by schools and societies and secondly quality of programs' implementation.[26]

The authors of another review study on smoking prevention and control recommended that the policy makers have to focus on synergistic effects of different strategies, particularly school and community programs.[11]For expanding school-based interventions' achievements, it was also suggested that they should be integrated by those community-based programs that use social influence and aims family environment and community socio-political context. Due to higher probability of computer based anti-smoking strategies' success in teenager populations, adaptation of computer based educational programs was also recommended.[11]

Muller-Riemenschneider et al.[25] evaluated long-term effectiveness of behavioral interventions to prevent smoking among children and youth along with effectiveness of different strategies of school based and multifactor community based programs. They have concluded that despite the observed considerable heterogeneity, most of the studies have shown long-term positive impacts. They showed multi-factorial and community-based interventions' effectiveness in reduction of smoking rates compared to the only school based programs that their effectiveness was uncertain. This implies that school based interventions must be facilitated by family and community interventions. Continuity and expansion of smoking prevention programs in populations seems to be fundamental in control of smoking in children and young people.[25]

A meta-analysis of smoking prevention programs in the US (including publications from 1978-1997) showed inconsistent results from implementation of school and community based programs. Community programs had loweffectiveness in short term but higher effectiveness in long term rather than school only programs. The best results were achieved using school and community bases programs simultaneously.[27]

In a review by Cochran collaboration[28], to determine the type of successful community based interventions that could prevent young people from smoking, it was suggested that multiple community interventions have a higher capacity to prevent smoking in youngsters. The main approach in the interventions included the coordinated and multi element programs to exam and affect young people. The community members were involved in these programs to identify fit for context interventions and to provide help in the implementation of the programs. The applied interventions included tobacco retailer training, educational programs about the prevention of tobacco related diseases, mass media campaigns and school-family based programs. The review also suggested that single interventions to change the young people's intentions, level of knowledge, attitudes and perception of the negative effects smoking may pose on an individual health are not generally successful in long term.Multi element school interventions with duration of at least12 months and application of social influences and learning theories however; could positively affect the consequences.[28]

Discussion

Multi-facetedcommunity based interventionsthat were integrated with school-based programs reported to be more effective than the distinct interventions. There was heterogeneity in the applied interventions among the included studies. Even interventions inside the schools were conducted differently. The types of community-based interventions were also not homogenous. Thus, summarizing and providing a pooled estimate from the effects these divergent interventions may have on the prevalence of smoking or rate of smoking re-initiation was not possible. It was therefore; not feasible to provide a precise list of advantages and disadvantages every individual intervention might have in different settings and circumstances.

The reported community-based interventions in the included publications were media campaigns, involvement of voluntary groups, adults and families or changes in the environment, regulations and laws that have been suggested to be effective in boosting school-based interventions**.** These findings are supported with the existent research evidence.[25,34-36] Integration of school based initiatives with the extensive tobacco control policies in larger communities was also emphasized in the international mandates.[37]To achieve this goal, new rules and laws are needed to be established in several countries.

Non-effective interventions or unexpected negative results were not represented in the included studies. No study was also found to compare simultaneous in- and out-of-school interventions. Implementation of multifaceted interventional programs could raise the overall expenses. Thus, cost-effectiveness studies are needed to have a clear perspective from the possible constraints in practice.

No study was found on the possible effect of sale point restriction near schools that simultaneously performed with the inside school interven-

tion. Effect of anti-tobacco consultation and tobacco cessation services in primary health care, special services for high-risk students, screening and referring high-risk students to the health system or related centers for further consideration were also not investigated. In addition, probable role of private organizations in supporting school-based programs was not considered in the included studies.

Due to implementation of the identified interventions in the developed countries that inherently have a different economic, social and cultural background, application of the recommended interventions in developing or under developed countries might cause questions that need to be considered.

Limitations

Findings ofthis systematic review need to be interpreted by caution due to the methodological limitations. Firstly, access to some of the relevant databases was not possible. Secondly, it was not possible to search and include unpublished data such as dissertations or thesis due to the lack of a comprehensive national or international thesis databases. Thirdly, since cost-effectiveness of the certain interventions was not discussed in the included publications it was not possible to judge their applicability in real life situations where resources are limited. Non-randomized selection of the studied sub-groups of students also prevents extendibility of the findings to larger communities or students' populations in different socio-cultural settings.Thus; probability of unconscious bias due to all above mentioned concerns and o*ther i*nherent methodological limitations (selection bias e.g. inclusion of publications that were written only in English or Persian language) should not be ruled out completely in this review.

Recommendation for researchers

It is appropriate for the future researches to focus on the cost effectiveness of interventions, because multi elements programs require enormous costs. Conducting studies on the effectiveness of screening programs for high risk students and their referring to consultation can also shed light on the potential achievements that school based interventions might have. Conducting of near the schools sales point studies simultaneous with school-based interventions could also be helpful in deciding the best applicable intervention to control tobacco use in adolescents. Contextual factors might affect tobacco control programs differently in divergent communities though; every pros and cons of such interventions along with community-specific challenges must be studied in the developing and under developed countries that may have different underlying milieu than the developed world.

Suggestions for policy makers

The core research evidence to base tobacco control policies are exists. These evidence need to be scrutinized for selection of best alternatives in different socio-cultural settings. A practical step towards successful control of tobacco use among adolescents is integration of school-based programs with the community-based initiatives. In developing countries revision of current policies and practices are required but a head of these revisions new routes must be invented to bring empirical research evidence into the current sphere of practice.

Conclusion

No gold standard method was recognized to adopt for efficient control of tobacco use in school-aged adolescents worldwide. Local environments do require sensible socio-culturally tailored intervention programs. Findings of this review however; were indicative of synergism; integrated school and community-based initiatives may add to the tobacco control efforts.

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Competing interests

The authors claim no competing financial or person interests with other people or organizations.

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