

# Smoking Habit Prevention in Schools: Report of a Pediatric Educational Intervention Held in Pisa

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**Abstract:** *Introduction:* Smoking is the leading preventable cause of death in the world and the detrimental effects of tobacco on health have been described across the full life span. There is no safe level of tobacco exposure and childhood is the more vulnerable period of life. Current estimates show that 10% of children aged 13-15 years are active smokers and most of them started smoking at  $\geq 11$  years of age, due to peer and/or family influence. Moreover, recently, e-cigarette use has spread, particularly among youth. Many school-based smoking prevention interventions have been carried out around the world, the efficacy of which has yet to be established.

*Materials and methods:* In February 2018 we planned an educational program on smoking habit within the Italian Society of Pediatric Respiratory Diseases (SIMRI) ("Dai un calcio al fumo" program). In May 2018 we held 8 interventions at the Fibonacci School (Pisa, Italy), meeting 365 children aged 9 to 13 years and involving a pediatrician and a pediatric resident in a 2-hour lesson focusing on the importance of a healthy lifestyle and smoking habit effects. The children were invited to ask questions and talk about their experiences, with a subsequent 30-minutes collegial discussion. The most frequent questions were collected, as well as students', physicians' and teachers' opinions on each meeting.

*Results:* During our educational interventions the most frequently asked questions were about the discrepancy related to the fact that a dangerous product is legally sold and the potential harmful effects of e-cigarettes. All the children stated that they knew that combustible cigarette smoking was dangerous. Most of them admitted that they feel that smoking habits start from emulating friends and relatives. Almost 70% of the children reported to have at least one smoker relative. Teachers, physicians and students proposed to replicate the meetings the following year.

*Conclusions:* The considerable interest shown by the students, together with the low cost and potential effectiveness of school-based educational measures, suggest that in our country a national educational program should be introduced in schools. Too many children are still exposed to tobacco smoke in the household environment.

**Keywords:** Adolescents, Children, Cigarettes, E-cigarettes, School-based smoking prevention, School tobacco polices, Nicotine addiction, Tobacco control.

## INTRODUCTION

Tobacco smoke continues to represent the leading preventable cause of death and morbidity worldwide, causing more than 7 million deaths per year [1] due to the harmful effects of its components (such as toxins, heavy metals, irritants) on cardiovascular and respiratory systems, as well as its well-known role in cancer pathogenesis [2]. Most of the smallest particles inhaled through smoking reach blood circulation and all bodily sites by passing through the alveolar-capillary membrane. Nicotine is the primary addictive agent in tobacco products, often causing smokers to become

lifelong tobacco consumers: as a matter of fact, nicotine binds brain nicotinic cholinergic receptors (nAChRs) resulting in the release of dopamine and other neurotransmitters responsible for dependence [3]. Binding to nAChRs in other bodily sites causes sympathomimetic effects such as the increase of heart rate and contractility, increase in blood pressure and insulin sensitivity reduction. Sudden nicotine withdrawal causes a syndrome characterized by irritability, depression, restlessness, anxiety, increased hunger, insomnia and craving, leading to relapse in smoking [3]. The detrimental effects of tobacco on health have been described across the full life span, starting even before conception. In children, tobacco smoke exposure has been found to be involved in intrauterine growth restriction, sudden infant death syndrome, decreased pulmonary function, increased risk for recurrent respiratory tract infections, asthma and neurobehavioral disorders [4-6]; moreover, fetal and

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childhood exposure to smoke seems to be involved in the early pathogenesis of adult diseases such as chronic obstructive pulmonary diseases (COPD) and cardiovascular diseases [7]. People exposed to tobacco smoke are classically divided into a) active smokers, who inhale the mainstream smoke directly through burning cigarettes, and b) passive smokers, who can be categorized into “second hand smokers”, who inhale the mixture of the side stream smoke (released from the burning tip of the cigarette) and the mainstream smoke breathed out by an active smoker, and “third-hand smokers”, who inhale the residual nicotine and other chemicals in the tobacco smoke deposited on surfaces [8]. Children are at particular risk when exposed to smoke due to higher respiratory rates, developing respiratory and immunological systems, and smaller peripheral airways [9]. There is no safe level of exposure from Second-Hand Smoke (SHS) and the available evidence demonstrates that this is true also for Third-Hand Smoke (THS). Nevertheless, it is estimated that around 40% of children are exposed to tobacco smoke in their home [10] and up to 60% of all children are exposed in the first years of life due to smoking parents [11]. Many studies have shown discrepancies between exposure biomarkers levels and parental reporting, implying that parents may be under-reporting children’s exposure. Evidence shows poor perception of the health risk related to child exposure to environmental tobacco smoke, especially regarding THS [8, 12, 13]. Moreover, living in a not-smoke-free house is a risk factor for smoking initiation in youth. It should be noted that adult smoking usually has its roots in adolescence since adolescents are particularly susceptible to nicotine addiction [14]. Further, once the smoking habit is established, cessation is challenging, and the probability of successful quitting is inversely proportional to the age of tobacco use initiation [15]. Current estimates show that almost 10% of children aged 13-15 years are active smokers: most of them started smoking at  $\geq 11$  years of age, but 4.5% started between 9 and 10 years, due to peer and/or family influence [16]. Notably, in 2014, considering the rate of smoking initiation among youth in the US, it has been calculated that 5.6 million of Americans younger than 18 years of age at that time were expected to die prematurely from a smoking-related illness [17]. It should also be noted that it has been shown how exposure to combustible cigarette (c-cig) smoke in teenagers causes airway inflammation, so that young smokers report chronic cough or phlegm and/or bronchitis more frequently than their non-smoking peers. Moreover, in young smokers with asthma, tobacco smoke may determine poor asthma control as

well as reduce the efficacy of inhaled and oral corticosteroids [18].

Recently, also marketing on the internet started to play a significant role in nicotine addiction, especially regarding electronic cigarettes (e-cig) [19], which have been marketed since the early 2000s, gaining increasing success particularly among youths. In a recent study from the US, 27.5% of e-cig users were high school students and 10.5% were middle school students: such devices are becoming more and more common among adolescents because they are easily concealable, their flavours are attractive and are perceived as a less harmful smoking alternative [20]. However, there is growing evidence demonstrating the presence of potentially harmful compounds in e-cig smoke, as well as their potential detrimental effects on the airways [21]. Moreover, a recent meta-analysis showed that among adolescents who were not cigarette smokers at baseline, those who had ever used e-cig had a 4-fold greater probability of traditional c-cig use initiation [22]. In Italy, global prevalence of smoke habit in pediatric age seems to be stable in time, but a relative reduction in c-cig with an increase in e-cig use has been recently reported [23]. In order to protect the world from the global tobacco epidemic, the World Health Organization promoted the WHO Framework Convention on Tobacco Control (WHO FCTC), which is an international agreement ratified by 181 countries: in 2008, in order to implement the treaty, the WHO introduced a comprehensive set of six highly effective and cost-effective measures that have been shown to reduce smoking, named MPOWER: (M) monitoring tobacco use and prevention policies, (P) protecting people from tobacco smoke, (O) offering help to quit tobacco use, (W) warning about the dangers of tobacco, (E) enforcing bans on tobacco advertising, promotion and sponsorship, and (R) raising taxes on tobacco [24]. Dubray *et al.* assessed the effects of each item in MPOWER on smoking prevalence, showing that M and R measures significantly reduced smoking prevalence [25]. The M measures comprise school tobacco policies (STPs) including banning policies and educational programs: as a matter of fact, schools are a main social environment for youth, where peers and modeling influences are important, especially for smoking initiation. In Italy, several laws aimed at controlling tobacco use have been enacted since 1975 (Table 1). In 2003, Italy was the 4th European country to introduce a smoking ban in closed public places such as restaurants, offices, shops, and public transport (the so-called “Sirchia law”). In 2008 Italy ratified the WHO FCTC [26-28]; thereafter, laws became progressively more stringent, banning smoke also in outdoor areas in

**Table 1: Timeline of the Main Tobacco Control Interventions in Italy**

|      |  |
|------|--|
| 1972 | Ban on advertising products for smokers  |
| 1975 | Smoking ban on public transport (except in areas reserved for smokers), smoking ban in some closed public places (hospitals, cinemas, theaters, museums, universities and libraries).  |
| 1991 | Warnings on the harmfulness of smoking on products for smokers.  |
| 2003 | Sirchia's Law: smoking ban in all closed public places such as restaurants, offices, shops, and public transport.  |
| 2008 | Italy ratified the WHO FCTC.   |
| 2016 | Ban on smoke in outdoor areas in schools, universities and hospitals and in private vehicles when a child or a pregnant woman is present. Increased penalties for those who sell smoking products to minors. Shocking images on tobacco products. Limitations in advertising e-cigarettes. |

schools and hospitals and in private vehicles when a child or a pregnant woman is present. The Italian national strategy has been developed along three lines: 1) support, monitoring and expansion of tobacco control legislation; 2) implementation of cessation interventions; 3) development of prevention programs targeted mainly to young people [23]. Pediatricians have a pivotal role in the latter point, since they can represent an active figure educating children and parents in order to prevent or quit smoking habit. In this paper we will report our experience in organizing and providing an educational intervention in school students in Pisa, Italy, focusing on the main questions that we received from the students.

## MATERIALS AND METHODS

The Italian Society of Pediatric Respiratory Diseases (SIMRI) was founded in 1995 and today counts more than 600 members, mainly Italian pediatric pulmonologists. One of its goals is to promote a healthy

lifestyle as well as to educate families and children to prevent the smoking habit. Therefore, since 2015, SIMRI launched the “*Dai un calcio al fumo*” (“Let’s kick smoking”) program, whose title refers to the importance of physical activity to maintain good health together with avoid smoking habit. The program is carried out every year in the city where the annual national SIMRI congress will take place (Turin, Rome, Naples, Pisa, Bari, respectively since 2015) and involves local schools and pediatricians. In 2018, the SIMRI national congress took place in Pisa: as a consequence, from February 2018 we started to plan an educational program on smoking habits to be held in public schools in our city. The following month we made arrangements regarding the timing and location of our interventions with the staff of the Fibonacci School (Via Mario Lalli, 4 Pisa, Italy) and in May 2018 we were able to provide several educational interventions to a sample of children and teachers from that public school (Figure 1). Each intervention involved 2 physicians (a



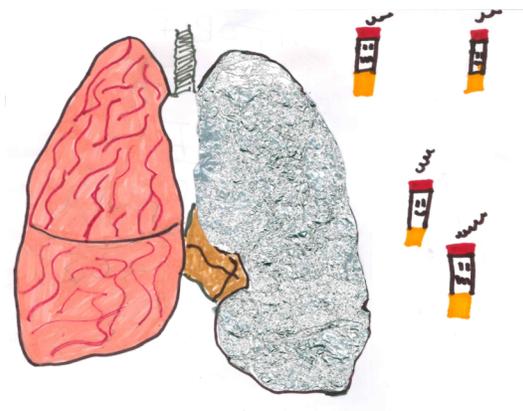
**Figure 1:** Picture taken during one of our educational interventions at the Fibonacci School.

pediatrician and a pediatric resident), in a 2-hour lesson with the aid of PowerPoint slides: almost one hour was dedicated to smoking habits effects on health while the second hour was focused on the importance of a healthy lifestyle. During each lesson, students were invited to ask questions and talk about their experiences, and after the lesson a 30-minutes collegial discussion was held. We asked only the following questions to all the students: "Do you know that cigarette smoking is dangerous?" and "Is at least one of your relatives a smoker?". In order to not let the students feel embarrassed in front of their teachers and peers, we didn't ask them whether they were smokers or if they had ever tried to smoke. Given the age of the students, the economic implications and the role of the tobacco market were not directly addressed in the lessons; however, these aspects emerged through the children's questions. At the end of each lesson, we

collected the questions put forward by the children as well as the students', physicians' and teachers' opinions on each meeting. We also suggested the students to anonymously create drawings on the theme of the fight against smoking habit, without providing instructions on the technique nor on the subject: the drawings were later exhibited in the SIMRI congress venue (Figure 2-5). The overall aim of our study was to provide an effective educational program as well as analyze the children's perception of health risks related to tobacco smoke. Data are presented as n (%) and mean (SD) when appropriate.

## RESULTS

During 8 educational interventions, we met 365 children aged 9 to 13 years ( $11.7 \pm 1.6$  years); 53,4% (195) were males. A thoroughly descriptive analysis of



(2)



(3)



(4)



(5)

**Figure 2-5:** Examples of the numerous drawings created by the students on the theme of the fight against smoking habit.

**Table 2: Students' Most Frequently Asked Questions**

|   |
|---|
| Why do they sell cigarettes when everybody knows they are dangerous?                                |
| Why isn't the price of cigarettes higher so that nobody could buy them?                             |
| Are e-cigarettes harmless?  |
| Is it harmful to smoke 1-2 cigarettes a day?  |
| What is the difference between smoking cigarettes, pipes, cigars or hookahs?                        |
| Is it true that quitting smoking is very difficult because of nicotine?                             |
| Is heavy smoking the only dangerous smoking habit?  |
| Why did those who sell cigarettes put those awful pictures on the packages?                         |
| Is the habit to chew tobacco harmful?   |
| If you don't inhale deeply, does it hurt anyway?  |
| What is the difference between purchased and self-made cigarettes?                                  |
| Can smoking cigarettes affect growth?   |
| Is it true that children of parents who smoke start smoking much more easily and before the others? |
| Why do people smoke?  |

the study population was beyond the scope of our study. We have reported the most frequent questions received from the students in Table 2. The most asked questions were: "Why do they sell cigarettes when everybody knows they are dangerous?", "Why is the price of cigarettes not higher so that nobody could buy them?" and "Are e-cigarettes harmless?", showing that the children were well aware of the fact that there is a discrepancy related to the fact that a dangerous product is legally sold in their country, while they felt that e-cig were harmless devices. When asked, 100% of the students stated that they knew that c-cig smoking is dangerous and 67,9% (248) stated having at least one smoker relative. Most of them admitted that they feel smoking habits start by emulating friends (peer-pressure) and relatives. During each meeting, many children wanted to share their experiences and concerns. At the end of the educational interventions, the physicians and teachers reported unexpected enthusiasm from the children, and felt that these meetings may be effective and extremely useful. Moreover, this project helped the physicians to take more tobacco-related responsibilities in their role as health educators. The teachers and students proposed to replicate the meetings the following year.

## DISCUSSION

Our brief and limited experience in a local public school shows that educational interventions are an

easy-to-organize instrument to early educate children on smoking habits. However, a recent Cochrane meta-analysis showed that there is still a lack of evidence on the long-term efficacy of STPs, mainly due to the heterogeneity of the available studies [29, 30]. Nevertheless, STPs are inexpensive and relatively easy strategies to prevent smoking initiation in youth, as there is evidence that the school environment can influence young people to smoke. Indeed, some studies show that school-based interventions are effective in preventing the smoking habit and may exert some effects also in reducing the prevalence of smoking in non-participating family members [31, 32]. Several types of school-based smoking prevention interventions have been reported around the world, mainly targeted to secondary schoolers (children aged 11 to 13 years) and teenagers [30]. The Hutchinson Smoking Prevention Project (HSPP), conducted from September 1984 to August 1999, involved 8388 third-grade students, followed up for 2 years after high school: 40 school districts were enrolled in Washington with a program based on teacher-led interventions educating about tobacco prevention and health. Unfortunately, this trial showed no evidence that a teacher-led intervention could be effective in the long-term [33]. An interesting peer-led approach was adopted in the ASSIST (A Stop Smoking in Schools Trial) program in Scotland and England: this program was found to be effective in reducing not only the prevalence of weekly smoking in target students but

also in non-participating family members [30]. In this program, all the students aged 12-13 years had to nominate the most influential students in their peer group and, thereafter, the most nominated were invited to become peer supporters: the supporters were then trained to talk about the risks of smoking and the benefits of being smoke-free during everyday conversations with their peers using language and ideas that they judged would work best with the people they were speaking to [34]. Moreover, in 2012, the Education Against Tobacco (EAT) network was founded in Germany, involving more than 3500 medical students and physicians across 14 countries who volunteer for school-based smoking prevention programs: through this program, medical students learned to take tobacco-related responsibilities in their role as health educators in schools and to discuss tobacco-associated diseases in an understandable way [35]. Standardized EAT intervention consists of two interactive modules: in the first one, medical students and a patient with a tobacco-related disease hold a slide presentation and at the end of the presentation, the patient is interviewed about his reasons for starting to smoke, the influence tobacco consumption had on his life and any other questions by the students. The second part takes place in an interactive classroom setting in which two medical students tutor one class. Both modules focus on strategies of the tobacco industry to influence decisions in a non-objective manner, on peer pressure (social influence), and on decision-making and skills for coping with everyday challenges in a healthy way (social competence) [35]. Another interesting tool used by the same research group is a photoaging smartphone app ("Smokerface"), which alters an image to predict someone's future appearance and take advantage of the broad availability of smartphones and adolescents' interest in appearance [36]: in secondary schools a low cost and widespread poster campaign was carried out to support the use of the app, involving 17-year-old male and female models, perceived as role models by both genders of target groups. The posters included large images of the short-term photoaging effects of smoking (1 pack a day for 1 year) and small images of the long-term effects (1 pack a day for 15 years) [34]. In 2017, a randomized controlled trial showed that the EAT program is effective in preventing smoking, especially in females and students with a low educational background [37]. Our educational intervention was a low-cost pilot project and allowed us to assess the feasibility of similar interventions in our reality. The

choice of interactive lessons focused on social competence was driven by the age of our target population, considering the strategies used in the ASSIST and EAT projects more appropriate for older ones. The strong point of our project was the promotion in pediatricians and pediatric residents of their awareness of their role as health educators. Unfortunately, still too few pediatricians discuss the issue of tobacco with the patients and families they care for, and pediatric residency training programs do not prepare them to meet the tobacco challenges. Young people (and their parents) look to pediatricians for guidance and counselling in health-concerning matters, and when pediatricians undergo training in interventions on tobacco, they become effective change-promoting figures [38]. Italy still does not have institutional STPs or a healthcare professionals education program. However, SIMRI has recently launched a series of meetings on the role of pediatricians as an aid to smoking cessation, in order to educate them about these subjects.

Our collection of children's questions demonstrates general poor knowledge and perception about potential health risks related to e-cig as well as passive-smoke, reflecting the lack of health education in families, schools, and health care settings. Moreover, we found a higher prevalence of smoking relatives than what is reported in the literature [10-11]: cigarette smoking is still widespread in Italian families and this is of particular concern considering that living in a not-smoke-free household environment is a risk factor for smoking initiation in youth. Another interesting topic highlighted by the children's questions is the clear contradiction between the legal sale of a harmful product, reflecting tobacco industries' interference in health policy, since they fear a potential negative financial impact. Finally, in Italy smoking is prohibited in every school and this factor is particularly important considering that school-related factors associated with higher smoking prevalence among students include the lack of smoking bans, poor discipline and low teacher involvement (adolescents who reported seeing teachers smoking outdoors are almost twice as likely to be daily smokers) [39]. Schools in which banning policies are rigorous, extended to outdoors and clearly written everywhere, likely have a lower smoking prevalence among students [40, 41].

Our study has several limitations. First of all, we didn't collect detailed information on the student's

household environment nor on their family members and their attitude towards smoking. Moreover, the students', physicians' and teachers' perceptions of our interventions were not scored, but just evaluated qualitatively. Last but not least, our students sample was limited and even if it included subjects aged from 9 to 13 years, our approach was the same for all the students. Actually, older students may have had more experiences related to tobacco smoke, and are also in a particular period of life, requiring specific educational interventions considering age-specific issues and behaviours. Even if our study is focused on Italian school and health care systems, we believe that school-based interventions to prevent nicotine addiction should be improved and implemented worldwide. Interventions like ours, involving children and early adolescents, do not require much time in terms of slides preparation and teaching in class, but may be particularly effective considering the age of the subjects involved. Researchers should continue studying different kinds of approach considering the specific age of the students in order to find the most effective ones.

## CONCLUSIONS

Even if in the last 15 years a great deal has been done in Italy in the fight against tobacco, especially through restrictive laws, much more must be done, particularly to prevent smoking habit in children and adolescents, who are the most vulnerable population. The considerable interest shown on the subject by our students sample, together with the low cost involved and potential effectiveness of school-based educational measures, suggest that in our country a National educational program should be introduced in schools, tailored to age and using different communication strategies for children (such as teacher-led or pediatrician-led interactive lessons) and for adolescents (social-media, smartphone applications, trained influential students). This program is urgently needed, especially in consideration of the increasing diffusion of e-cig among youth, also in our country. Moreover, interventions targeted to children should also involve parents and relatives, as well as pediatricians. Pediatric residency schools should prepare physicians as health educators focusing on the potential effectiveness of their role and providing them with the appropriate communicating tools to meet the challenge.

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## ABBREVIATIONS

|         |   |
|---------|---|
| C-cig:  | combustible cigarettes  |
| E-cig:  | Electronic cigarettes   |
| nAChRs: | Nicotinic cholinergic receptors   |
| SHS:    | Second-Hand-Smoke   |
| SIMRI:  | Società Italiana per le Malattie Respiratorie Infantili (Italian Society of Pediatric Respiratory Diseases) |
| THS:    | Third-Hand-Smoke  |
| STPs:   | School Tobacco Policies   |
| WHO:    | World Health Organization   |

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