

Original Article

Tobacco Smoking: Knowledge of Primary School Children and Impact of Educational Intervention in Alexandria Governorate, Egypt

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Abstract

Background: Schools are a channel to better inform, and health educate children and adolescents about the hazards of tobacco smoking increasing their chance of stopping smoking, or even prevent its sporadic or regular use.

Objective(s): To assess primary public school children's knowledge regarding smoking, its associated factors, and to evaluate the impact of an educational session about tobacco smoking on the knowledge of school children in Alexandria Governorate, Egypt.

Methods: A one- group pretest-posttest design was conducted targeting a total number of 565 primary public-school children by using a pre-designed self-administered questionnaire, as a tool for assessment of their knowledge before and after applying an educational session for them.

Results: Current smokers among the participant students accounted for 6.1% (6.2% of girls vs. 5.9% of boys), while 7.1% were ever smokers. Students with good knowledge constituted 9.7%, while those with poor knowledge represented 37.7%. Five items showed less than 50% correct response before the intervention and improved significantly ($p = 0.000$) after the intervention, namely "Nicotine is the substance that gives the distinctive flavor of cigarettes and is also used as an insecticide", "Cigarettes contain toxic substances such as arsenic and cyanide", "Tobacco kills nearly half of its users", "Drinking waterpipe (Shisha) is less harmful than cigarettes", and "Electronic cigarettes have no harm and help in quitting smoking". Education of the mother ($\beta = 0.139$, $p = 0.017$), information on packets ($\beta = 0.135$, $p = 0.015$), having a friend who is smoker ($\beta = -0.135$, $p = 0.005$), having a working mother ($\beta = 0.131$, $p = 0.006$), gender ($\beta = 0.128$, $p = 0.007$), and smoking status ($\beta = -0.119$, $p = 0.012$) were the most important predictors of the baseline knowledge score. The total knowledge of the participating students improved significantly after intervention, there was a highly statistically significant difference in the median score before and after the intervention (9 vs. 13, $p = 0.000$).

Conclusion: The lower incidence of smoking among the children having better knowledge combined with the revealed result of the effectiveness of the educational intervention in improving the knowledge of school children especially at that young age mandate the integration of such education among the school curricula.

Keywords: Tobacco smoking, school children, educational intervention

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INTRODUCTION

Smoking, which is the leading cause of preventable death as a whole and the leading cause of cancer-related death, remains a major public health problem, especially among adolescents ⁽¹⁾. Smoking causes cancer, heart disease, stroke, lung disease, diabetes, and chronic obstructive pulmonary disease (COPD), including emphysema and chronic bronchitis. Smoking also increases the risk of immune system problems, including tuberculosis, certain eye diseases, and rheumatoid arthritis ⁽²⁾.

Egypt is a young population; adolescents aged 10-19 years old are around 17 million, representing

approximately 19 percent of the total population. Together with youth in the age group 20-24 years, an additional 9 million, adolescents and youth represent almost one third of the Egyptian population. Youths and adolescents face issues similar to that of all Egyptian citizens, in addition to some youth-specific issues related to their lives and roles in society ⁽³⁾. World Health Organization (WHO) estimated the prevalence of cigarette smoking in Egypt among those aged 15 years or more in both sexes in the year 2015 to be 18.9%, and 4.8% among youth aged 13-15 years ⁽⁴⁾.

Nicotine is a highly addictive drug. Adolescents, who are still at an important stage of growth and

development, are particularly vulnerable to their effects. Smoking and other tobacco use can have many immediate and sometimes irreversible health effects and can seriously harm a child's health before graduating from school or becoming an adult. Smokers younger than 18 years old are estimated to die prematurely from a smoking-related illness, which makes tobacco control measures a public health priority among youth ⁽²⁾.

Most smokers start using tobacco products well before the age of 18 ⁽⁵⁾. If smoking is not started in adolescence, smoking is unlikely to occur, and the likelihood of smoking cessation in adults is inversely proportional to the age at which smoking was started. ⁽⁶⁾

Several factors play role in smoking initiation among children and adolescents including social and physical environments mainly smoking advertising, peer and parental smoking, youth's mental health problems, personal beliefs and attitudes towards smoking, low income and education, peer-pressure, accessibility and availability of tobacco products, low scholastic achievement, low self-image and self-esteem ⁽⁵⁾, and not well-informed about the harmful effects of smoking ⁽⁷⁾, thus the implementation of smoking prevention interventions in primary schools may prevent smoking among children.

Schools are in a uniquely powerful position to play a major role in alleviating the serious problem of smoking and other tobacco use by kids because they can provide an efficient means of reaching large numbers of students who can receive instructions and guidance through their educational experience ⁽⁸⁾, and provide an opportunity to 'set' healthy and enduring patterns of behavior through school-based interventions ^(9,10).

Hence, this study was conducted to assess primary public school children's knowledge regarding smoking, to determine associated factors, and to evaluate the impact of an educational session about tobacco smoking on the knowledge of school children in Alexandria Governorate, Egypt.

METHODS

Study design, setting and participants

A cross-sectional design was used to assess school children's knowledge regarding smoking, and associated factors, while a one- group pretest-posttest design was used to assess the impact of an educational session about tobacco smoking on the knowledge of primary public school children of both genders.

Inclusion criteria

Only children in the fifth and sixth grades.

Sample size and sampling

The sample size was calculated using G. power 3.1.9.4

software. Based on assumption that the expected effect size of intervention is small (0.2), alpha error of 0.05, 90% power and a design effect of 2 ⁽¹¹⁾. The minimum required sample size was 530 subjects which then was increased to 565 to compensate for non-response.

A multistage stratified random sampling technique was used to recruit the required sample size. One mixed primary school was chosen at random from the primary public schools present in the eight educational districts in Alexandria Governorate. Each educational district was represented by one school. Two classes from the selected eight mixed primary schools were chosen at random: one class from the fifth grade and one from the sixth grade. Each school was visited once to collect data and to conduct the educational session.

Data collection tools and techniques

A pre-designed structured self-report questionnaire was used to collect the following data:

- Socio-demographic data: age, gender, father's education and occupation, and mother's education and working status.
- Data about smoking: presence of smokers at home, frequency of exposure to cigarette/waterpipe smoking at home, exposure to smoking in closed places, sources of information and receiving advice about hazards of smoking, having smoker friends, ever/current cigarette/waterpipe smoking, and age of initiation.

Children's smoking-related knowledge questionnaire:

This questionnaire included 16 items measuring children's knowledge about smoking cigarettes and waterpipe, including composition (5 items), hazards of smoking (8 items), types and forms of smoking including passive smoking, waterpipe smoking, and the electronic cigarette/waterpipe (3 items).

Each item had three responses: "Yes", "No", or "do not know". The correct answers were given score one, while both wrong answers and "do not know" scored as zero. The total score was calculated and converted to a percent score. A percent score below 50% was considered as "poor knowledge", from 50% to 75% was categorized as "moderate knowledge", and more than 75% reflected "good knowledge".

This questionnaire was designed by the first author after an extensive literature review. Face validity was confirmed by the rest of the research team. Content validity of the designed questions was then ensured after being judged by a panel of public health experts. The questions were assessed for relevance and clarity, some modifications were conducted accordingly based on the feedback of the experts, until agreement on the final form of the questions was confirmed. Reliability of the questionnaire was assessed using the internal consistency of individual items and it was satisfactory

(Cronbach's $\alpha = 0.715$). Also test-retest reliability was assessed, and it was good (interclass correlation coefficient = 0.709)

The educational intervention

An educational session was designed with the aim of improving students' knowledge about smoking cigarettes/ waterpipe (Shisha). The content of the educational session included: the composition of cigarettes, the harmful substances in the cigarettes and their effects on the body, the addictive nature of nicotine, the harmful impact of smoking cigarettes on physical health as well as the mental health, the harmful effect of waterpipe (Shisha) smoking and the electronic cigarettes/Shisha, passive smoking, advertising traps for youth, myths and facts about cigarettes smoking, and finally some important statistics about morbidity and mortality.

Each class received one educational session. Each session took 60 minutes. The session was conducted through a collaborative approach using illustrations, brainstorming, group discussion, and audio-visual aids. The session was prepared and implemented by the principal investigator (first author).

Evaluation of the impact of the educational session on students' knowledge was conducted immediately after session completion using the same knowledge questionnaire.

Statistical analysis

The categorical data were described as frequency and percent. The normality of quantitative data was assessed using Shapiro-Wilk test. Skewed data were described as median and interquartile range. The McNemar test was used to determine whether there was a significant difference between the correct responses related to knowledge before and after the intervention. The difference between the median knowledge score before and after intervention was tested using Wilcoxon signed rank test. The difference in levels of knowledge before and after intervention were tested using Stuart-Maxwell test. All significant variables were included in multiple linear regression analysis models where the dependent variable was baseline knowledge score. Multiple linear regression analysis was conducted after testing of its assumptions to determine the significant predictors of baseline knowledge score. Analysis was performed using SPSS 25.0 (SPSS Inc. Chicago, IL. 2020). The p-values were considered significant if it was < 0.05 .

Ethical considerations

The study was approved by the Ethics Committee at the High Institute of Public Health (HIPH), Alexandria University. Approvals of the Undersecretary of Education for school children in Alexandria Governorate were obtained before starting the study. Research objectives were explained to the participants and confidentiality of the information was confirmed.

Parents were informed through the school administrative staff by sending them notification about the educational session, the objectives, and the date.

RESULTS

Table (1): Smoking characteristics of primary public school children in Alexandria

Characteristics	School children (n=565)	
	Frequency	Percent
Smoking status (n=560)^a		
Never smoker	486	86.8
Ever smoker	40	7.1
Current smoker (n=34)	34	6.1
• Cigarette	9	26.5
• Waterpipe (Shisha)	18	52.9
• Both	7	20.6
Age at smoking initiation (Mean \pmSD)	10.8 \pm 1.5	
Prevalence of smoking status by gender		
Boys (n= 221)		
Never	184	83.3
Ever	24	10.9
Current	13	5.9
Girls (n= 339)		
Never	302	89.1
Ever	16	4.7
Current	21	6.2
Presence of a smoker at home		
No	188	33.6
Yes	371	66.4
Frequency of exposure to smoking at home per week		
No exposure	134	33.3
1-2 Days/week	55	13.6
Most of days	64	15.9
Daily	150	37.2
Exposure to smoking in closed places		
No/rarely	246	46.9
Sometimes	203	38.6
Often	76	14.5
Having a friend who is a smoker		
No	464	86.5
Yes	72	13.5
Sources of information about hazards of smoking		
None	106	19.2
TV	137	24.9
Social media	63	11.5
On cigarette packets	233	42.4
Others	11	2.0
Getting advice about hazards of smoking		
Never	125	23.3
From parents	320	59.7
From brothers	11	2.0
From friends	18	3.4
From teachers	32	6.0
Others	30	5.6

a: Total less than 565 due to missing responses

The age of the participant students ranged from 10 to 14 years, with a mean value of 11.3 ± 0.8 years. The highest percent of students aged 11 years old (35.9%) followed by those aged 12 years old (35.6%), while the minority aged 14 years old (2.1%). More than half of them (60.7%) were girls. The highest percent of

students' fathers and mothers were illiterate or could just read and write (27.7%, 31.9%, respectively) followed by those who had secondary education (27.5%, 24.4%, respectively). Meanwhile, university graduate fathers and mothers represented 15.9% and 12.5% respectively. The majority of students' fathers (91.5%) had an occupation, the highest percent of them worked as laborers (31.5%), followed by employees (18.5%), then those who worked as drivers (13.3%). The majority of students' mothers were housewives (78.2%).

Table 1 demonstrates the smoking characteristics among participants. About 37% of them were exposed daily to smoking at their homes, and 14.5% of them were often exposed in closed places. Most of them (66%) reported living with a smoker in the family, while 13.5% have a smoker friend. Interestingly, 42.4% of children got their information about smoking hazards from what is written on the cigarette packets, while almost one fourth on them got the information from TV. More than half of them (59.7%) got advice from their parents about smoking hazards. Regarding smoking status, 6.1% were current smokers (6.2% of girls vs. 5.9% of boys), while 7.1% were ever smokers.

More than half (52.9%) of current smokers smoked shisha. The mean age at smoking initiation was 10.8 ± 1.5 years.

The percent of correct answers before and after intervention for the individual items in the knowledge questionnaire were presented in table 2. The number of students answered correctly increased for all 16 items. Of these 16 items, only 3 were not statistically significant ($p > 0.05$), "Smoking does not cause addiction" (63.6% vs. 65%; $p = 0.758$), "Smoking does not cause heart diseases or strokes" (53% vs. 57.1%; $p = 0.154$) and "Second-hand smoking does not cause any health hazards except for smokers" (51.3% vs. 54.5%; $p = 0.224$). Five items showed less than 50% correct response before the intervention and improved significantly ($p = 0.000$) after the intervention, "Nicotine is the substance that gives the distinctive flavor of cigarettes and is also used as an insecticide" (44.1% vs. 78.9%), "Cigarettes contain toxic substances such as arsenic and cyanide" (45.4% vs. 77.3%), "Tobacco kills nearly half of its users" (33.3% vs. 66.9%), "Drinking waterpipe (Shisha) is less harmful than cigarettes" (39.1% vs. 60.4%), "Electronic cigarettes have no harm and help in quitting smoking" (44.6% vs. 60.4%).

Table (2): Effect of the health education intervention program on the students' knowledge about smoking

Questions	Correct response before intervention No. (%)	Correct response after intervention No. (%)	P-value
Cigarette smoke contains about 250 harmful chemicals and 50 cancer-causing substances	360 (63.8)	456 (85.2)	0.000*
Nicotine is the substance that gives the distinctive flavor of cigarettes and is also used as an insecticide	248 (44.1)	423 (78.9)	0.000*
Cigarettes contain toxic substances such as arsenic and cyanide	255 (45.4)	411 (77.3)	0.000*
Tar enters the composition of cigarettes and causes lung cancer	368 (65.5)	448 (83.7)	0.000*
Cigarettes contain carbon monoxide, which causes a lack of oxygen in the body	327 (58.3)	429 (80.3)	0.000*
Tobacco kills nearly half of its users	186 (33.3)	356 (66.9)	0.000*
Smoking calms nerves and relieves stress	283 (51.0)	322 (60.4)	0.000*
Cigarette smoking is not addictive	353 (63.6)	344 (65.0)	0.758
Smoking increases the incidence of chest diseases such as asthma and tuberculosis.	323 (57.9)	384 (73.3)	0.000*
Smoking causes chronic diseases for the smoker, such as diabetes	288 (51.7)	394 (75.3)	0.000*
Smoking does not cause heart disease or stroke	293 (53.0)	301 (57.1)	0.154
Smoking causes facial wrinkles and yellowing of the teeth and fingers	398 (72.0)	412 (77.9)	0.003*
Cigarette smoking causes oral, laryngeal and gastrointestinal cancers	389 (69.8)	403 (75.8)	0.009*
Drinking waterpipe (Shisha) is less harmful than cigarettes	218 (39.1)	320 (60.4)	0.000*
Inhaling other smokers' cigarette smoke does not cause health damage to non-smokers	287 (51.3)	290 (54.5)	0.224
Electronic cigarettes have no harm and help in quitting smoking	252 (44.6)	341 (60.4)	0.000*

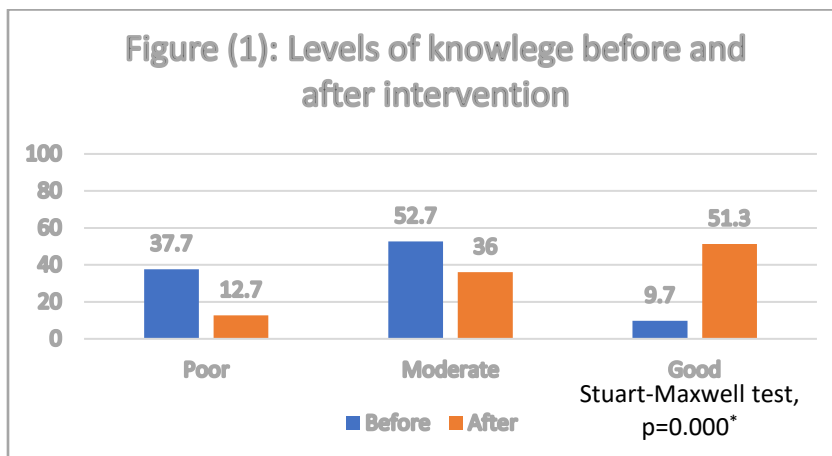
P-value of McNemar Test - * significant ($p\text{-value} < 0.05$)

Regarding the total knowledge score, there was a highly statistically significant difference in the median score before and after the intervention (9 vs. 13, $p =$

0.000). Figure 1 illustrates the levels of knowledge related to smoking before and after the educational intervention program. Before intervention, more than

half (52.7%) of students had moderate level, meanwhile after intervention, nearly half of them (51.3%) had good knowledge. Students with poor level of knowledge decreased significantly

from 37.7% to 12.7%, while those with good knowledge increased significantly from 9.7% to 51.3% following the educational intervention (p=0.000).



Results of multiple linear regression analysis of predictors of the baseline knowledge score are illustrated in table 3. The most important significant predictors were, secondary education of mother (beta = 0.139 , p= 0.017), information on packets (beta = 0.135, p = 0.015), having a friend who is smoker (beta = -0.135, p = 0.005),

working mother (beta = 0.131, p = 0.006), boy gender (beta = 0.128, p = 0.007), exposure to smoking in closed places (beta = 0.125, p = 0.008), smoking status (beta = - 0.119, p = 0.012) where current smoking predicted lower knowledge and receiving advice from teachers, doctors and parent in that magnitude of order.

Table (3): Regression analysis of significant predictors for the baseline knowledge score

Predictors	B	Beta	T	P-value
Age in years	.158	.039	.847	0.397
Gender				
Boy vs. Girl	.859	.128	2.699	0.007*
Father's education				
Primary vs. illiterate/ read & write	.474	.049	.894	0.372
Preparatory vs. illiterate/ read & write	.627	.067	1.191	0.234
Secondary vs. illiterate/ read & write	.672	.093	1.518	0.130
University vs. illiterate/ read & write	.859	.094	1.547	0.123
Mother's education				
Primary vs. illiterate/ read & write	-.201	-.020	-.363	0.717
Preparatory vs. illiterate/ read & write	.526	.064	1.133	0.258
Secondary vs. illiterate/ read & write	1.058	.139	2.406	0.017*
University vs. illiterate/ read & write	.160	.016	.273	0.785
Work of the mother				
Working vs. Housewife	1.099	.131	2.762	0.006*
Presence of smoker at home (yes vs. no)	.600	.087	1.829	0.068
Exposure to smoking at closed places (yes vs. no)	.833	.125	2.649	0.008*
Source of information about smoking				
TV vs. none	.422	.057	1.101	0.272
Social media vs. none	.532	.053	1.085	0.279
Packets vs. none	.868	.135	2.448	0.015*
Others vs. none	.157	.008	.159	0.874
Advice about smoking				
Parents vs. none	.747	.121	2.421	0.016*
Brothers vs. none	-1.086	-.065	-1.102	0.271
Friends vs. none	-.894	-.062	-1.125	0.261
Teachers vs. none	1.745	.149	2.842	0.005*
Doctors vs. none	1.469	.127	2.402	0.017*
Others vs. none	-.691	-.036	-.536	0.592
Having friend who is smoker (Yes vs. no)	-1.375	-.135	-2.849	0.005*
Smoking status				
Ever vs. never smoker	-.734	-.054	-1.153	0.250
Current vs. never smoker	-1.784	-.119	-2.536	0.012*

*Significant (p< 0.05), Model: F= 4.9, p= 0.000

DISCUSSION

This study investigated the impact of school-based educational program on the 5th and 6th grade children's knowledge about smoking and its hazards, and determinants of the baseline knowledge score among them.

In the current study, 6.1% of the 5th and 6th graders were current smokers, while 7.1% of them reported ever smoking. They initiated smoking at a mean age of 10.8±1.5 years. The rate of current smoking according to data from the Global Youth Tobacco Survey targeting school children aged between 13 -15 years in 132 countries (2000-2007) showed a percent of 9.5% ⁽¹²⁾. Similarly, studies from Arab countries showed higher rates among school students for being a current smoker ranging from 10% in Jordan ⁽¹³⁾, to 29.8% in Saudi Arabia ⁽¹⁴⁾. Meanwhile, previous Egyptian studies showed higher rates of current smoking among school students aged 14-19 years that differed according to their age categories starting from 11.6% among 14-15 years old adolescents to 28.6% among those aged 18-19 years ⁽¹⁵⁾. Similarly, rates of ever smoking reported in other studies were higher than current findings. However, nearly similar rate of ever smoking was reported by a study that was conducted among students of similar ages as the current study (10-15 years) in Hong Kong schools, revealing a rate of 8% ⁽¹⁶⁾. These differences in "ever" and "current" smoking rates among school students can be explained in terms of the age at which smoking status was assessed, where rates of "ever" and "current" smoking were higher among the older ages and lower or nearly similar in younger ages as shown from the previously mentioned studies ^(15,16). The age of initiation reported in this work is similar to different findings obtained from previous studies that reported that the peak for smoking initiation occurs around the age of 10 years ^(16,17).

Current findings show that the current waterpipe (Shisha) smokers constitute 3.2% of all participants and represent more than half of current smokers (52.9%). Rates of waterpipe smoking among youth aged 13- 15 years according to pooled data from 16 Arab countries in 2016 ⁽¹⁸⁾, revealing that 10.6% of the respondents were current waterpipe tobacco smokers, and the estimates ranged from 0.9% in Oman to 34.2%, in Lebanon. In addition, the overall rate in Egypt was 6.7% and the estimates ranged from 3.7% to 11.9% ⁽¹⁸⁾. Accordingly, current findings are lower than the overall rates and within the estimates globally, while they are almost closer to the lowest Egyptian estimates. The younger ages of school students participated in the current work explain lower rates compared to those obtained from the Global Youth Tobacco Survey ⁽¹²⁾. Similar to current findings, another study from Jordan in 2014 ⁽¹³⁾, revealed that

the rate of waterpipe smoking exceeded that for cigarette smoking. Several factors may explain the high rate of waterpipe use among school children in this study and particularly in the Arab countries. These factors include the misperception that waterpipe smoking is less harmful than cigarettes, being initiated earlier than cigarettes ⁽¹⁹⁻²¹⁾, and being considered as a gateway for cigarettes smoking ⁽²²⁾. In the Arab countries, waterpipe smoking became a socially acceptable practice, especially among youth in social gatherings ⁽¹⁸⁾.

Following the educational program about smoking hazards, students with poor level of knowledge decreased significantly from 37.7% to 12.7%, while those with good knowledge increased significantly from 9.7% to 51.3%. There was a highly statistically significant increase in the median total knowledge score after the intervention ($p = 0.000$). These findings are in line with several other studies where the educational programs in schools improved students' knowledge significantly ⁽²³⁻²⁵⁾.

According to the results of multiple linear regression analysis, predictors of the high baseline knowledge score included having educated and working mothers compared with illiterates or just read/write and housewives. The educated and working mother reflect a good socioeconomic stratum which has been found to be associated with good knowledge level among school students ⁽²⁶⁾. In addition, the educated mothers are able to provide their children with the correct knowledge about smoking, and this explanation is supported by the finding that receiving advice from the parents was a significant predictor of high knowledge score. Moreover, receiving advice from teachers and doctors were significant predictors of high knowledge level among school children, and this finding confirms the role of teachers and health professionals in improving school students' knowledge about smoking and its hazards ⁽²⁷⁾.

In the current study, being a boy predicted high knowledge score compared with girls, which is not in line with other studies that showed the reverse ⁽⁷⁾. The possible explanation in this study comes from a cultural background in which boys are more exposed to environmental factors that may enhance their knowledge about smoking like seeing packets of cigarettes with adults or with other boys who smoke or in environment in which the surrounding adult men are more likely to smoke in contrast to the Egyptian girls whose surrounding environments are more conservative. The findings that getting information from those written on cigarette packets, and exposure to smoking in closed places were found to be significant predictors of high knowledge score support this explanation.

Meanwhile, the finding that having a friend who is smoker, and being a current smoker were associated

independently with low knowledge score were in line with findings of other studies^(7,28), and it draw the attention to the possible bidirectional relationship between knowledge level and being a smoker and vice versa, as well as the possible influence of the smoker peers on their friends' knowledge about smoking hazards.

Limitations of the study

Although this study is distinguished by targeting school children in an age group for which very little data about smoking is collected, however the study findings should be interpreted in light of some limitations. Such limitations include the absence of a control group, and the immediate assessment of knowledge following the end of the educational session, while providing one educational session only could be a limitation as well.

CONCLUSION AND RECOMMENDATIONS

The rate of current smoking among school children enrolled in the 5th and 6th grades was substantial considering these very young age groups, and this rate is compounded by another considerable rate of ever smokers, which means that around 13% of those children have experienced tobacco smoking. Meanwhile, less than 10% of them exhibited good knowledge about tobacco smoking and its hazards, and poor knowledge scores was significantly associated with being a current smoker or having smoker friends. These findings stress the need for further studies to explore the impact of knowledge on school children's attitudes, intentions, and practices towards smoking. The current educational intervention was very effective in improving knowledge of this age. Taking into consideration, the substantial percentage of primary school children who experienced smoking, their poor knowledge about smoking, and the effectiveness of the current intervention, it is highly recommended to conduct such educational programs for children in primary schools and to provide program-specific training for teachers. Further large-scale studies are needed to give a more comprehensive data on children's attitudes towards smoking and the role of educational programs in preventing smoking behavior among school children in the primary education.

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