

# Impact of Oral Health Educational Intervention on Smoking among Male Adolescents

## Abstract

**Objective:** To evaluate the impact of oral health educational intervention on smoking among male Saudi adolescents. **Methods:** This study included participants from male public high schools (10–12-grade students) in Dammam, Dhahran, and Al Khobar, Saudi Arabia, between March 2018 and May 2018. Multistage random sampling was used to recruit the students. The participants received two sessions of oral health educational intervention, which was based on educating the adverse effects of smoking on oral health. A pilot-tested questionnaire was used to collect preintervention and postintervention data. McNemar's test was performed for statistical analysis. **Results:** There were 432 participants in the study with a mean age of  $10.18 \pm 8.44$  years. The prevalence of smoking was 31.7% in the preintervention stage. Over half the participants (60.6%) had family history of smoking. There was no reduction in smoking prevalence after the educational intervention. A significant improvement in the awareness about the effects of smoking on oral health was observed after the intervention ( $P < 0.05$ ). The proportion of smokers willing to quit smoking significantly increased from 34.3% in the preintervention stage to 55.5% in postintervention stage ( $P = 0.021$ ). Similarly, the percentage of smokers willing to join smoking cessation program increased after the intervention. **Conclusion:** There was a significant improvement in the awareness about the effects of smoking on oral health. The study found significantly higher percentage of adolescents willing to quit smoking after oral health educational interventions. The smoking cessation campaigns should include the education of adverse effects of smoking on oral health.

**Keywords:** Educational intervention, oral health, smoking cessation

## Introduction

Tobacco use is a major public health problem as over 1.1 billion people smoke around the globe.<sup>[1]</sup> Although the prevalence of daily smoking decreased worldwide, the number of smokers increased because of global population growth.<sup>[2]</sup> Smoking causes multiple diseases such as chronic obstructive pulmonary disease, lung cancer, and heart diseases. Recent evidence shows that smoking also causes some common diseases such as rheumatoid arthritis, diabetes mellitus, and colorectal cancer.<sup>[3]</sup> The effect of smoking on oral health includes caries, dryness of mouth, inflammation of gums, halitosis (oral malodor), calculus deposits, and tooth mobility. Smoking also promotes oral candidiasis as a result of overgrowth of *Candida* organisms.<sup>[4]</sup> Moreover, tobacco consumption is one of the major risk factors of oral cancers.<sup>[5]</sup>

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One of the health promotion measures to control smoking includes delivering interventions to individuals by peer education in small groups or one-on-one approach where there is sharing of experiences and information or applying motivational interviewing to motivate positive change in the behavior.<sup>[6]</sup> A previous study compared two smoking cessation interventions based on motivational interviewing and brief advice among adolescents. Within 1 month of baseline, the participants only in motivational interviewing group significantly reduced the consumption of cigarettes per day. However, after 6 months of follow-up, a significant reduction in the number of cigarettes smoked per day was observed among both motivational interviewing and brief advice groups.<sup>[7]</sup>

In Saudi Arabia, 23.7% of males and 1.5% of females were smokers in 2016.<sup>[8]</sup> There is a high prevalence of smoking (20.2%) among male adolescents in Dammam, Saudi Arabia.<sup>[9]</sup> In a previous cross-sectional

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study, an association between the awareness about the adverse effects of tobacco consumption on oral health and low probability of smoking was observed among male schoolchildren. It was reported that the children who were aware of the adverse effects of smoking on oral health were 22%–47% less likely to smoke.<sup>[10]</sup> However, it is not known whether an educational intervention based on educating the complications of smoking on oral health can help reduce smoking and encourage quitting among schoolchildren. The objective of this study was to evaluate the impact of an educational intervention on smoking among adolescents. In addition, the study evaluated the improvement in the awareness about the effects of smoking on oral health.

## Methods

This observational study was conducted between March 2018 and May 2018. The study participants were selected from male public high schools (10–12-grade students) in Dammam, Al Khobar and Dhahran cities in the eastern province of Saudi Arabia. Sample calculations were based on population size (20,000), anticipated %frequency (30%), confidence limit ( $\pm 4$ ), and design effect (1). These calculations yielded a sample of 492. Multistage random sampling was used, and five schools were randomly selected from the list of schools in these cities using a lottery method. Then, a random selection of students was carried out from these selected schools using MS Excel (2010) random number generator. About 86 students were recruited from each school. These study participants received an educational intervention that was based on educating adverse effects of smoking on oral health.

The educational intervention comprised teaching material about the effects of smoking on oral health. Lecturing, discussing, showing videos, and using brochures, posters, and models were employed to educate participants about the complications of tobacco consumption on oral health. One session of educational intervention lasted for about 1 h and was delivered twice each after 3 weeks. One researcher delivered educational sessions to study participants to ensure consistency in the delivery of oral health education.

The questionnaire was developed and reviewed by the researchers several times to ensure its face and content validity. The feasibility, consistency, clarity of the wording, layout and style, and readability of the questionnaire were assessed by the research team to ensure its face validity. They evaluated content validity by assessing the appropriateness and relevance of the content of the questionnaire to the study purpose. The extensive literature review was done, and the opinion of the expert faculty was sought. A convenience sample of 30 students from a school was used to conduct piloting of the questionnaire. The reliability of responses related to the effects of smoking on oral health was calculated, and Cronbach's alpha was 0.88. The questionnaire was translated into the Arabic language so that students can easily respond to the questions.

The questionnaire was used to inquire the demographic information including academic grades in the previous year, family income, and parents' education level. The participants were asked to provide information about smoking habit, family history of smoking, and awareness regarding the effects of smoking on oral health. There were 11 questions about the smoking effects on oral health. These questions were related to the effects of tobacco consumption on the health of mouth, on taste, breath, oral ulcers, dental caries, bleeding of gums, dryness of mouth, tooth sensitivity, loosening of teeth, and chewing. The participants were asked to provide their responses on a dichotomous scale (yes/no). The study participants received a questionnaire before the start of the study to provide baseline data. After giving two sessions of oral health education, data were collected to evaluate the impact of the intervention on smoking.

Ethical approval of the study was obtained from the Scientific Research Unit at the College of Dentistry Imam Abdulrahman Bin Faisal University (EA#2018009). The administrators of selected schools were approached to get their approval to conduct the study. The participants received details about the conduct of study, including its purpose and potential benefits. They were encouraged to ask questions if there was any difficulty in understanding the questions or procedures in the study. They were informed about their voluntary participation in the study, including their right to withdrawal from the study without negative consequences. Informed consent was obtained from the study participants. The study was conducted according to the principles of the Declaration of Helsinki.

Data were statistically analyzed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY, USA: IBM Corp). Descriptive statistics were computed for the study variables. McNemar's test was performed to compare the proportions of smokers and nonsmokers before and after the interventions. A  $P < 0.05$  was considered statistically significant.

## Results

The baseline data showed that there were 432 participants in the study, with a mean age of  $10.18 \pm 8.44$  years. The majority of the participants (68.5%) were 11<sup>th</sup>-grade students. There were 31.7% ( $n = 137$ ) of smokers in the study. Of the smokers, about half of them (47.4%) started smoking  $\leq 2$  years ago. Over half of the participants (60.6%) reported having at least one smoker in their families [Table 1].

In the preintervention stage, the prevalence of smoking was 31.7% and the majority (83.2%) used cigarettes followed by shisha (47.4%). Shisha smoking is a type of tobacco smoking that involves the use of a glass-bottomed water pipe. The postintervention data analysis included 403 participants and showed a smoking prevalence of 31.3%.

There were 85.7% cigarette smokers and 37.3% shisha users in the postintervention group. There was a loss of 29 students during the follow-up of the study. Overall, no significant reduction in the prevalence of smoking was observed after two educational interventions [Table 2].

Table 3 shows that there was a significant improvement in the awareness about the effects of smoking on oral health after the interventions. Most items related to the effects of smoking on oral health showed significant improvement. After interventions, significant improvement in the awareness was observed about smoking related to bad

taste ( $P = 0.021$ ), smoking causes oral ulcer ( $P = 0.001$ ), smoking causes oral cancer ( $P = 0.001$ ), and smoking causes dental caries ( $P = 0.001$ ). Similarly, the proportion of students with awareness about the effects of smoking on bleeding gums, dryness of mouth, tooth sensitivity, tooth loosening, and difficulty in chewing increased after interventions ( $P = 0.001$ ).

In the preintervention stage, 34.3% of the smokers were willing to quit smoking and 36.5% of them were willing to join tobacco cessation program. After the intervention, the proportion of smokers who were willing to quit smoking significantly increased to 55.5% ( $P = 0.021$ ). The proportion of participants willing to join tobacco cessation program also increased from 36.5% before intervention to 42.1% after the intervention, although it was not statistically significant ( $P = 0.826$ ) [Table 4].

## Discussion

Our study found that 31.7% of the students were smokers. This finding is consistent with the results of a study conducted in Tabuk city, Saudi Arabia, that reported a smoking prevalence of 34% among male students.<sup>[11]</sup> Similarly, another study in Riyadh city found that 31.2% of the male students (16–18 years) were smokers.<sup>[12]</sup> The smoking prevalence was 29.8% among male secondary school students in Al-Qassim, Saudi Arabia.<sup>[13]</sup> On the other hand, a study in Alkharj city, Saudi Arabia, reported that 20% of the students were smokers.<sup>[14]</sup> The smoking prevalence in our study was high given that the sale of tobacco products to children under 18 years of age is illegal in addition to high prices of cigarettes in the country. It seems that the restriction on the sale of tobacco and high price of cigarettes may be ineffective in preventing and controlling smoking in schoolchildren in Saudi Arabia.

Among all the participants in the present study, 60.6% mentioned that they had at least one smoker in their families. According to a study by Gilman *et al.*, there was a significant association between the parental smoking and

**Table 1: Frequency distribution of study variables**

Variables	n (%)
School level	
10 <sup>th</sup> grade	112 (25.9)
11 <sup>th</sup> grade	296 (68.5)
12 <sup>th</sup> grade	24 (5.6)
Smokers	137 (31.7)
Nonsmokers	295 (68.3)
Family history of smoking	262 (60.6)
Initiation of smoking (years)	
≤2	64 (47.4)
>2	71 (52.6)
Age, mean (SD)	10.18 (8.44)

SD: Standard deviation

**Table 2: Tobacco consumption among smokers before and after the intervention**

Variables	Preintervention, n (%)	Postintervention, n (%)	P
Prevalence of smoking	137 (31.7)	126 (31.3)	0.604
Use of cigarettes	114 (83.2)	108 (85.7)	0.582
Use of cigar	15 (10.9)	13 (10.3)	0.851
Use of e-cigarettes	8 (5.8)	7 (5.5)	0.99
Use of shisha	65 (47.4)	47 (37.3)	0.18
Use of chewing tobacco	5 (3.6)	8 (6.3)	0.581

**Table 3: Awareness about the effects of smoking on oral health among study participants before and after the intervention**

Variables	Preintervention, n (%)	Postintervention, n (%)	P
Does smoking affect health of mouth?	345 (79.9)	345 (85.6)	0.999
Is smoking related to bad taste?	265 (61.3)	298 (73.9)	0.021*
Does smoking cause bad odor (bad breath)	327 (75.7)	319 (79.2)	0.587
Does smoking cause oral ulcers?	227 (52.5)	282 (70.0)	0.001*
Does smoking cause oral cancer?	269 (62.3)	309 (76.7)	0.002*
Does smoking cause dental caries?	222 (51.4)	278 (69.0)	0.001*
Does smoking cause bleeding of gums?	165 (38.2)	248 (61.5)	0.001*
Does smoking cause dryness of mouth?	205 (47.5)	266 (66.0)	0.001*
Does smoking cause tooth sensitivity?	163 (37.7)	252 (62.5)	0.001*
Does smoking cause tooth loosening?	209 (48.4)	276 (68.5)	0.001*
Does smoking cause painful chewing?	121 (28.0)	179 (44.4)	0.001*

\*Statistically significant

**Table 4: Willingness to quit smoking and join tobacco cessation program before and after the intervention**

Variables	Preintervention, n (%)	Postintervention, n (%)	P
Willingness to quit smoking	47 (34.3)	70 (55.5)	0.021*
Willingness to join tobacco cessation program	50 (36.5)	53 (42.1)	0.826

\*Statistically significant

the risk of their adolescents becoming smokers.<sup>[15]</sup> In fact, the likelihood of smoking initiation in adolescents with both parents being smokers was four times more than the adolescents with nonsmokers parents.<sup>[16]</sup> It was found that the influence of parents was greater than that of peers on smoking behavior among adolescents.<sup>[17]</sup> The literature also reported the impact of older siblings being smokers on adolescents' smoking initiation.<sup>[18]</sup>

In our study, about half of the smokers (52.6%) started smoking more than 2 years ago. The age of smoking onset is important for the persistence of smoking in later years of life.<sup>[19]</sup> The individuals who started tobacco use below the age of 16 years were twice more likely not to quit smoking than the individuals with smoking initiation at later age.<sup>[19]</sup> Even the duration of smoking plays a greater role than smoking intensity in the causation of lung cancer.<sup>[20]</sup> This calls for the prevention of smoking at an earlier age to avoid negative consequences of smoking.

No significant reduction in the prevalence of smoking among the students was observed in our study. Similar results were reported by Peterson *et al.*, who found no significant improvement in the prevalence of daily smokers in school-based smoking prevention program.<sup>[21]</sup> Likewise, Schofield *et al.* failed to demonstrate improvement in smoking behavior among secondary school children in Australia.<sup>[22]</sup> In contrast, Botvin *et al.* conducted a prevention program with 15 sessions of intervention over 6 years in 56 public schools and showed a 25% reduction in the prevalence of smoking.<sup>[23]</sup>

The awareness about the effect of smoking on oral health significantly improved because of interventions in our study. This finding is in line with the results of a study by Malcon *et al.*, who reported improved knowledge about the risk of smoking at the end of educational interventions provided during the 6-month duration.<sup>[24]</sup> Similarly, Midford *et al.* observed an increase in knowledge in all 3 years of intervention.<sup>[25]</sup> Schofield *et al.* also reported improvement in smoking knowledge in a 2-year posttest survey.<sup>[22]</sup> In our study, awareness increased among adolescents in a shorter duration compared with previous studies.<sup>[22,24,25]</sup> It is possible that the duration may not play a big role in enhancing the awareness, rather it can be the content and effectiveness of delivery of educational sessions.

It was reported that adolescent smokers attempted many times to stop smoking, but the relapse prevalence was high despite some of them quitted smoking for a long period of time.<sup>[26]</sup> Nevertheless, several studies have shown

considerable percentage of adolescents expressing their desire to quit smoking. O'loughlin *et al.* reported that 25% of the study participants were willing to quit smoking.<sup>[27]</sup> Marshal *et al.* revealed that 62.1% of high-school students were willing to stop smoking.<sup>[28]</sup> The present study showed that the proportion of smokers who were willing to quit smoking significantly increased from 34.3% in preintervention stage to 55.5% in postintervention stage. In addition, the proportion of participants who were willing to join tobacco cessation program also increased from 36.5% before the intervention to 42.1% after the intervention.

The limitation in our study could be related to fewer educational interventions that were provided over a shorter duration due to time constraints. In addition, the sample was recruited from three cities in the eastern province of Saudi Arabia, which may compromise generalizability of the study. Moreover, only male students were recruited in the study because cultural norms do not allow male researchers visiting female schools in Saudi Arabia. The future study should provide more sessions of awareness about the adverse effects of smoking on oral health over a considerable period using a randomized controlled trial.

## Conclusion

The study found that most students had family history of smoking. There was a significant improvement in the awareness about the negative effects of smoking on oral health. No significant reduction in the prevalence of smoking and number of cigarettes smoked was observed in the study. The proportion of schoolchildren willing to quit smoking significantly increased after educational interventions. In addition, a greater percentage of schoolchildren were willing to join a smoking cessation program. School-based smoking cessation campaigns should incorporate education of adverse effects of smoking on oral health in their programs. Antismoking programs should also target family members of smokers.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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