



# Effects of a randomized controlled trial to assess the six-months effects of a school based smoking prevention program in Saudi Arabia



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## ABSTRACT

**Objective.** To examine the efficacy of a smoking prevention program which aimed to address smoking related cognitions and smoking behavior among Saudi adolescents age 13 to 15.

**Method.** A randomized controlled trial was used. Respondents in the experimental group ( $N = 698$ ) received five in-school sessions, while those in the control group ( $N = 683$ ) received no smoking prevention information (usual curriculum). Post-intervention data was collected six months after baseline. Logistic regression analysis was applied to assess effects on smoking initiation, and linear regression analysis was applied to assess changes in beliefs and analysis of covariance (ANCOVA) was used to assess intervention effects. All analyses were adjusted for the nested structure of students within schools.

**Results.** At post-intervention respondents from the experimental group reported in comparison with those from the control group a significantly more negative attitude towards smoking, stronger social norms against smoking, higher self-efficacy towards non-smoking, more action planning to remain a non-smoker, and lower intentions to smoke in the future. Smoking initiation was 3.2% in the experimental group and 8.8% in the control group ( $p < 0.01$ ).

**Conclusion.** The prevention program reinforced non-smoking cognitions and non-smoking behavior. Therefore it is recommended to implement the program at a national level in Saudi-Arabia. Future studies are recommended to assess long term program effects and the conditions favoring national implementation of the program.

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## 1. Introduction

Richard Evans provided a new impetus in the previous century to smoking prevention by outlining that adolescents often start smoking due to social influences exerted by others, such as peers, parents and the mass-media (Evans et al., 1978). This resulted in a wide array of studies on smoking prevention in the United States (Flay, 1985; Vartiainen et al., 1986; Sussman et al., 1988; USDHHS, 2012) and Europe (De Vries et al., 2006; Davis et al., 2009; Faggiano et al., 2010; Lotrean et al., 2010; Luna-Adame et al., 2013). Reviews clearly provided support for the effect of this approach (Hansen, 1992; Dusenbury et al., 2003; Wiehe et al., 2005; Isensee and Hanewinkel, 2012), but also concluded that mostly short term effects up to a couple of years were realized, unless using a broader community approach (Perry et al., 1992; de Vries, 2007). Yet, school based programs may still have potential if certain conditions were met, such as using an interactive delivery method,

social and life skills training and involvement of the adolescents as groups' leaders (Sussman et al., 2010).

Smoking behavior of adolescents has only recently received attention in Arab countries (Behbehani et al., 2004; Maziak et al., 2004; Akl et al., 2011). Various studies reported smoking prevalence rates among male adolescents. An early study among male secondary junior high school students (12–13 years old) in Riyadh reported a prevalence of 3.2% (Jarallah et al., 1996). A later study by Bassiony (2009) estimated a much higher smoking prevalence, between 12 and 29.8% (Bassiony, 2009). Finally, a recent study (Mohammed et al., 2014) reported a prevalence of 39.6%. In short, estimates concerning the smoking prevalence among adolescents in Saudi Arabia vary widely. Moreover, it has been shown by many studies that tobacco use is rapidly increasing in Saudi Arabia and in Arab countries (Islam and Johnson, 2005; Amin et al., 2011; Park et al., 2012). As morbidity and mortality are clearly linked to smoking uptake (USDHHS, 2014), this increase reveals a clear need for effective and evidence-based smoking prevention programs in Saudi Arabia.

In Saudi Arabia, as in many other Arab countries, no momentum exists yet to promote smoking prevention, despite the mandate within the Framework Convention on Tobacco Control (FCTC) that was also signed by Saudi Arabia (WHO, 2015). The FCTC clearly stipulates the need for

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the utilization of evidence based smoking prevention methods to protect present and future generation from the devastating health, social, environmental and economic consequences of tobacco consumption and exposure to tobacco smoke by providing a framework for tobacco control measures to be implemented by the parties at the national, regional and international levels (WHO, 2005). Consequently, there is a clear lack in evidence based smoking prevention programs in Saudi-Arabia. Therefore a new smoking prevention program was developed, based on the results of an analysis of smoking prevalence and its determinants (Mohammed et al., 2014), revealing that a smoking prevention program for boys was indicated but not for girls as smoking prevalence among this group was found to be almost nil (Al-Turki, 2006).

The goal of this paper is to describe the effects of a school-based smoking prevention program after six months on smoking initiation concerning regular smoking behavior, defined as smoking at least one cigarette per week and smoking-related cognitions such as attitudes, social influence beliefs, self-efficacy and intentions.

## 2. Method

### 2.1. Sample and design

The design of this project was based on the European Smoking Prevention Framework Approach (ESFA). The project applied an integrative social cognitive model, the I-Change Model, to study smoking prevention in six European countries (De Vries et al., 2003; Holm et al., 2003; Hoving et al., 2007; Ariza et al., 2008; Lotrean et al., 2010), targeting attitudes, social influence beliefs and self-efficacy. Our program was based on these studies and used a randomized controlled trial to test the effects of the smoking prevention program. Schools were blindly randomized by the research team to the experimental and control group. Experimental schools received the intervention, while control schools received usual care with no anti-smoking content. In December 2008, 19 out of the 25 secondary schools approached in Taif province accepted to participate in the project. Power analysis (power = 0.95,  $p < 0.05$ ) revealed that 350 participants in each group were needed in order to be able to detect a 10% difference between the conditions in smoking prevalence. Taking into account an estimated smoking prevalence rate of 15% at follow-up and an expected dropout rate of 15%, the required sample was estimated to be at least 455 participants in each group. The estimated smoking prevalence of 15% was based on the median of previous smoking prevalence studies in Saudi Arabia (Jarallah et al., 1996; Bassiony, 2009; Mohammed et al., 2014). The intervention was subsequently implemented in 24 classes of grade 8th, distributed over 10 randomly selected schools, while 9 schools were allocated to the control group. The target group consisted of male students only because the Saudis school structure entails gender specific education, and no approval for this study among female students could be obtained due to low smoking prevalence among this group. At baseline (T1), 1416 participants filled in the questionnaire, of which 50.1% (709) were in the experimental group.

### 2.2. Procedure

Baseline data was collected in December 2008; the five-week program was implemented in December 2008 and January 2009. Follow-up data was collected six months later in August 2009 (Fig. 1). Participants were informed about the project, and were told that they had the right not to participate and to stop at any time they wanted. Questions were read one after one by the data collector in the absence of teachers to assure confidentiality of the response. Filled-out questionnaires were sealed in an envelope and collected by the research team for data management. Approval to conduct the study and to implement the intervention was gained from all relevant bodies within the school health program in Taif province in Saudi Arabia.

### 2.3. The questionnaire

For this study a translated version of the ESFA questionnaire was used with some culture-specific adaptations to make it fit with Saudi norms. Consequently, the questions assessing smoking behavior, social norms, modeling and pressure from a girlfriend or boyfriend were omitted (Mohammed et al., 2014).

**Demographic factors** assessed included age, grade, area, family monthly income, pocket money and academic achievement.

**Socio-cognitive factors** assessed included attitude, self-efficacy and social influences. A seven point scale (+3 = agree) to -3 = disagree) was used to measure: Attitude, using nine items (Cronbach's  $\alpha = 0.89$ ); Self-efficacy, using 12 items asking the respondent if he is able not to smoke in various situations ( $\alpha = 0.98$ ); Intention using two items, intention to smoke in the future and in the next year ( $r = 0.65$ ); Social norms using eight items ( $\alpha = 0.92$ ); Social pressure was assessed by eight items on a five point scale and measured whether the participants had ever felt pressure from others to smoke (mother, father, brother(s), sister(s), best friend, friends, classmates, and teachers: +4 = very often; 3 = often, 2 = sometimes, 1 = few times and 0 = never) ( $\alpha = 0.73$ ); Social modelling was assessed: 0 = non-smoking; 1 = smoking for the same eight reference persons ( $\alpha = 0.68$ ).

**Smoking behavior** was categorized based on an algorithm used by earlier international studies on smoking prevention (Ausems et al., 2002; De Vries et al., 2006; Ariza et al., 2008; Lotrean et al., 2013). A respondent was categorized as: (1) a nonsmoker when the respondent indicated to have never smoked not even one puff; had tried smoking once in a while but did not smoke anymore; had quit smoking; smoked less than once a week; or as (2) a smoker when the respondent indicated to smoke at least once a week; smoked daily; and when having reported to smoked 100 cigarettes or more in his life unless reporting to have quit smoking (De Vries et al., 2006; Lotrean et al., 2013). An algorithm consisting of four additional concepts (smoked in the past 24 h, last seven days, last month and life time smoking) was used to correct any inconsistencies in answers for the self-reported smoking which were resolved by coding the response into the most unfavorable response (Holm et al., 2003; De Vries et al., 2006; Hoving et al., 2007). More details about the questionnaire are described elsewhere (Mohammed et al., 2014).

### 2.4. Intervention

The program was derived from a Dutch smoking prevention program (De Vries et al., 1994), translated and adapted to Saudi local culture and norms. For instance, a training session about teamwork and team leading was conducted since school children in Saudi Arabia are not accustomed to a peer-led approach of the program. Additionally, scenes with girls were not used since these scenes were not in consistence with the local culture and norms.

The program used a video peer led approach implying that the main theme was introduced on video by youngsters, followed by group work and active learning. Since active learning in groups and using peers as leaders were novel elements for Saudi schools, an introduction on how to work in groups was given. The intervention consisted of five lessons; each lesson took 45 min to be implemented (the normal time for one teaching session in Saudi-Arabia). Trained school health care workers guided the intervention program, while peer leaders who were selected by group members were trained on how to lead the discussion and how to make and present a summary. These leaders worked as chair persons for each group and were assigned to summarize their group work following each activity. For more details about the program see Table 1.

## 3. Analysis

Data entry and analysis was performed in SPSS 20.0. Chi-square tests and *t*-tests were used to assess baseline differences between the experimental and control group on demographic factors, socio-cognitive factors and behavior. Dropout analysis was carried out using logistic regression, with all demographic and socio-cognitive factors included as covariates. At T2, 1383 participants filled in the questionnaire (97.7%) of which 2 cases were deleted due to duplication of identification numbers. The dropout rate was 1.3% for the control group and 1% for the experimental group. Analysis of covariance (ANCOVA) was used to assess intervention effects on the socio-cognitive factors using the complex samples approach available in SPSS to simulate the multi-level structure of students nested within schools (i.e. clustering). Logistic regression analysis was used to assess intervention effects on smoking initiation using the complex samples approach to adjust for clustering.

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