



A Web-Based Education Program to Empower Family in Smoking Prevention among Adolescents in Indonesia: A Randomized Controlled Trial

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Abstract

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BACKGROUND: Stronger family connections, communications, and parental respect reduce smoking initiation. Web-based computer-tailored smoking prevention programs may help decrease smoking initiation rates among adolescents. However, there is currently no conclusive evidence regarding the efficacy of a web-based, computer-tailored smoking prevention program to empower families in adolescent smoking prevention.

AIM: This study aimed to investigate the effects of web-based education program to empower family, improve skill to refuse, and prevent smoking initiation among adolescent in Indonesia.

METHODS: A randomized controlled trial was employed on family members in Bogor, West Java, Indonesia. The following criteria were the mother or legal guardian of children aged 10 to 14 years who are not currently smoking. Data were collected 3 times: One week before the start of the training (baseline), immediately after intervention (T1), and three months after the training concluded (T2).

RESULTS: 77 participants completed the study, 37 in the intervention group and 40 in the control group. The average age in this sample of the family (mother) was 37.34 (SD:7.51) years in the intervention group and 11.75 (SD:6.81) for the control group. From baseline to follow-up, family empowerment, smoking refusal skill, and smoking intention increased 38%, 24%, and 33%, respectively.

CONCLUSIONS: A web-based education program appears to be a suitable catalyst for empowering family and smoking prevention among adolescents. It should be regarded as a valuable and supportive addition to existing and future programs.

Introduction

Smoking continues to be a public health problem among children and adolescents [1], [2], [3], with the risk of developing these diseases common as well [chronic, premature] later in life [1 or longer if they begin to smoke regularly] [3], [4]. The prevalence of smoking among Indonesian primary school children at 12 was 7.2% [5]. In comparison, the prevalence of smoking in secondary school continues to rise rapidly (9.1% of children are monthly smokers at 14 years of age) [5]. Considering smoking prevention in adolescents, a randomized controlled trial [6] found that an extensive social impact program with a decision-making element was effective for children aged 13–15. Following the World Health Organization's recommendation, more than 20 countries worldwide school-based smoking programs were initiated from 1997 to 2009 implemented a school-school competition like the Smoke-Free Class competition. As a further incentive to quit smoking, the winner received a prize and did not sign the contract. Randomized controlled trials in many countries tested the program, and a meta-analysis [7] concluded that it

appeared to be successful in reducing smoking. Schools are essential for reaching children and supporting a healthy lifestyle in previous studies [8], [9]. Therefore, there have been several smoking prevention programs designed to prevent children and teenagers from taking up or continuing their smoking in schools [9], [10]. The majority of the previously mentioned preventive initiatives were implemented in schools; however, schools are considered insufficient [9], and teachers are often untrained in health promotion activities [8], [10].

Some parental approaches may protect against smoking initiation in different racial/ethnic groups [11]. Stronger family connections, communications, and parental respect reduce smoking initiation [12]. Family empowerment is described as a process through which persons get more control of their lives. Empowerment emphasizes the education of the entire family and reflects on their strengths and capabilities, educational needs, increased awareness, and increased involvement in this phase [13]. Family empowerment aids families in adapting to change by assisting them in discovering their strengths, developing and exercising their abilities, exploring their options, augmenting their resources, and ensuring they have

the assistance they need to deal with health challenges. The evaluation of program effectiveness has been hindered by insufficient evidence identified or a lack of rigor in program implementation. Four of nine studies evaluating a family intervention against a control group had substantial positive outcomes, while one study had significant adverse effects [9]. A study published in 2011 assessed 16 research involving significant parental participation, such as school pamphlets, sessions that parents and children would attend, as well as incentives for quitting smoking, and both working in communities and groups [14], [15].

The increase in internet penetration and availability of resources may lead to high costs and increase the number of people reached in Indonesia, making web-tailored smoking prevention programs an advantageous approach for reducing the numbers of young people who start to smoke. Furthermore, web-based programs can be customized to include information based on gender, community, and stage of tobacco initiation, and they provide better access to tobacco prevention resources [16], [17]. This example illustrates the benefit of an online intervention called a web-based experience (ASPIRE). The curriculum consists of a series of videos and events that encourage a tobacco-free lifestyle [18], and after an 18-month follow-up, it has shown significant effectiveness in reducing tobacco consumption [19]. A few recent Internet-based studies have revealed several favorable program effects that have also been observed regarding computer-tailored cessation programs [20]. However, there is currently no conclusive evidence regarding the efficacy of a web-based, computer-tailored smoking prevention program to empower families in adolescent smoking prevention.

This paper will contribute to closing this gap by investigating the effects of a web-based education program to empower families, improve skills to refuse, and prevent smoking initiation among adolescents in Indonesia.

Methods

Study design and intervention

A randomized controlled trial was used in this study. The family in the intervention group received the program in its complete format. The benefit of web-based learning programs is interactivity and entertainment presented with education materials and presentation of the course content on a website. The intervention was divided into four sections, all of which revolved around a central internet program: (1) The smoking zone information, (2) family as a role in preventing smoking, (3) accompanying paper

journal, (4) small-group motivational interview, and (5) tailored follow-up through social media. Participants used a unique, assigned username and password to access the web-based course education, allowing us to monitor use while maintaining a safe online environment limited to registered users only. The impact of individual components was not assessed because this intervention was intended to be a comprehensive program. The first three components were delivered in a single 60-min class session once a week for 5 weeks, with follow-up messages sent through social media once a month following the initial class. The family in the control group received the same health information presented in a web-based education program via a leaflet.

Participants

The following criteria were used to determine eligibility: (1) Mother or legal guardian of children aged 10–14 years, (2) children who are not currently smoking according to the WHO smoking definition, and (3) willingness to participate in this study. Exclusion criteria included women who were both mentally and physically challenged or who were pregnant. This study aimed to recruit a minimum of 72 (12 × 6) participants to represent typical group sizes for digital media use. At the same time, maintain participants of more than 30 in the intervention and control groups for statistical robustness and account for dropouts. We recruited $n = 80$ participants, to begin with, but needed 80 more to reach our desired sample size. This randomization is then applied to the running number for the assignment of the intervention group (IG) ($n = 40$) and control group CG ($n = 40$), which means that the two groups had 40 cards total, but the result was completely randomized. There were three dropouts in the intervention group before the program started, leaving a representative group of 77 mothers.

Measure

The data collection instrument was a self-administered questionnaire that gathered the basic personal information about age, gender, family's monthly income, education, and family smoking status.

The Family Empowerment Scale (FES) [21], [22] was used to assess family empowerment. Participants rate items on a five-point Likert scale ranging from 1 (never) to 5 (always/very often). The responses are added together to generate a total score, which ranges from 12 to 60. Higher scores reflect good empowerment. The instrument was translated backward and forwards into Bahasa Indonesia. The content validity index (CVI) was 0.87 as measured using Aiken Formula, and the Cronbach's Alpha was 0.91.

Children could indicate which of seven statements best describes their intention to begin smoking when asked. The following statements were

made: "I think I will never begin to smoke," "I think I will begin to smoke in the future," "I think I will begin to smoke within one month," "I think I will begin to smoke within six months," "I think I will begin to smoke within one year," and "I think I will begin to smoke within five years." Five responses were graded on a 5-point scale ranging from 1 (extremely unsure) to 5 (extremely certain) (strongly certainly). The content validity index (CVI) was 0.82, and The Cronbach's Alpha was 0.69.

The probability of refusing to smoke was assessed by presenting participants with a scenario in which they were offered a cigarette and giving them five possible responses. "I declined," "I say: I am not smoking right now," "I am leaving the area," "I am not going to smoke," and "I'm changing the subject of the conversation." Five responses were scored on a five-point scale ranging from one (strongly agreed) to five (strongly disagreed) (strongly disagree). Five experts reviewed and approved the content validity, with a CVI ranging from 0.78 to 0.82. Internal data reliability was determined to be 0.75.

Procedure

The online education program was promoted to family members in Bogor, West Java, Indonesia. In a prior study, it was explained that participants would be expected to complete a series of questionnaires at different times throughout the study in exchange for cost-free participation. Concerning ethical guidelines, participants were fully compensated, receiving refunds based on a formula. Participation was entirely voluntary, and no one's personal information was kept, so nobody's identity could be tracked. Ethical Committee approved this study at the affiliated university. The intervention was given via the internet to all participants in randomly assigned conditions in one of the two groups. Data on family empowerment and smoking initiation were collected 3 times: One week before starting the training (baseline) and immediately after intervention (T1). Three months after the training concluded (T2).

Data analysis

Intention-to-treat analyses were conducted to determine whether a web-based education program is more effective than a control group at empowering families, developing smoking refusal skills, and preventing adolescent smoking. The regression models used were implemented both in the intervention and control groups, with baseline levels of the dependent variable taken into account. Linear regressions with fixed effects were used to calculate the results. In comparing DI Differences (DID), the variances between baseline and T2 for intervention versus control groups were calculated (DID). All analyses were conducted using SPSS version 23.

Results

Sample characteristics

The average age in this sample of the family (mother) was 37.34 (Standard Deviation (SD):7.51) years in the intervention group and 11.75 (SD:6.81) for the control group. Most participants have education levels above senior high school with household income also above minimum regional basic salary. About 45.9% of participants in the intervention group reported that father currently smoking and 40% in the control group. There were no significant differences between the intervention and control groups on the sample characteristics at baseline (Table 1).

Table 1: Sample characteristics of studied participants in both intervention and control group at baseline

Variables	Experimental (n = 37), n (%)	Control (n = 40), n (%)	p
Adolescents characteristics			
Age in a year (mean ± SD)	12.32 ± 5.11	11.75 ± 6.81	0.086
Gender			
Male	25 (67.6)	23 (57.5)	0.254
Female	12 (32.4)	17 (42.5)	
Family characteristics			
Age in a year (mean ± SD)	37.34 ± 7.51	36.21 ± 8.19	0.203
Father current smoking			
Yes	20 (54.1)	24 (60.0)	0.138
No	17 (45.9)	16 (40.0)	
Education level			
Below senior high school	10 (27.1)	16 (40.0)	0.303
Above the senior high school	27 (72.9)	24 (60.0)	
Household income			
Below regional minimum salary	13 (35.1)	18 (45.0)	0.100
Above regional minimum salary	24 (64.9)	22 (55.0)	

SD: Standard deviation.

Family empowerment

The changes in the family empowerment score measure throughout the intervention were compared between the intervention group (IG) and control group (CG). Family empowerment levels increased over time as respondents in the intervention groups scored 4.19 (SD = 2.03), and respondents in the control arm scored 3.01 (SD = 1.57) at T2. Family empowerment increased 38% (95% confident interval (CI) 0.03–1.45) from baseline to follow-up (T2-baseline). At T2, improved outcomes relative to the control are still observed in family empowerment (DID coefficient 0.310, 95% CI 0.02–0.49) (Figure 1).

Smoking refusal skill

The smoking refusal skill score measure changes throughout the intervention were compared between the IG and CG. Smoking refusal skill increased over time as respondents in the intervention groups scored 3.98 (SD = 1.45), and respondents in the control arm scored 2.67 (SD = 1.13) at T2. Smoking refusal skill increased 24% (95% CI 0.17–2.36) from baseline to follow-up (T2-baseline). At T2, improved outcomes relative to the control are still observed in smoking refusal skill (DID coefficient: 0.374, 95% CI 0.13–1.76) (Figure 2).

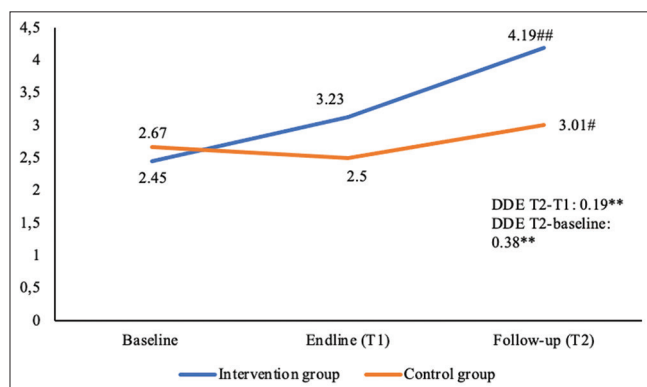


Figure 1: Change of family empowerment after web-based education program both in IG and CG. Note: DDE: Difference-in-difference estimate; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ## Significant change from end line to follow-up: # $p < 0.05$, ## $p < 0.05$.

Adolescent smoking initiation

Adolescent smoking intention increased over time as respondents in the intervention groups scored 25.4 (SD = 13.11), and respondents in the control arm scored 18.7 (SD = 9.93) at T2. Adolescent smoking intention increased 33% (95% CI 0.11–1.95) from baseline to follow-up (T2-baseline). At T2, improved outcomes relative to the control are still observed in adolescent smoking intention (DID coefficient 0.41, 95% CI 0.15–1.37) (Figure 3).

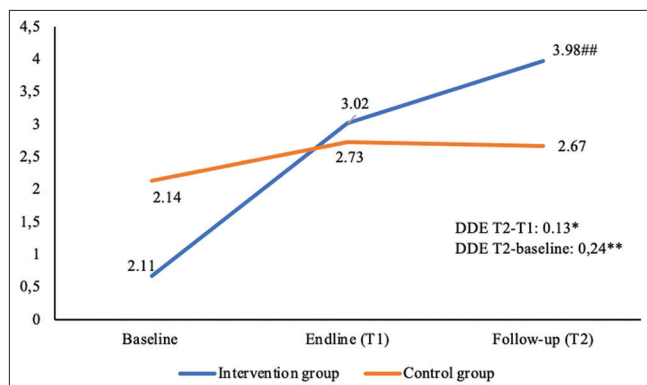


Figure 2: Change of smoking refusal skill after web-based education program both in IG and CG. Note: DDE: Difference-in-difference estimate; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ## Significant change from end line to follow-up: # $p < 0.05$, ## $p < 0.05$.

Discussion

This study aimed to see how a web-based education program affected family empowerment, smoking refusal ability, and smoking intention among Indonesian adolescents. The results showed significant positive effects for family empowerment and preventing adolescent smoking initiation. While the effects on the various outcomes are strongly correlated quantitatively, the qualitative interviews demonstrate that a web-based education program can pave the way for more

sustainable smoking prevention. In addition, we propose the use of qualitative methods is to gain a better understanding of how the conduct of the intervention may vary according to the studied characteristics. The potential benefit derived from using this method for large groups with a known distribution of the studied features would be an additional advantage of such exhaustive knowledge.

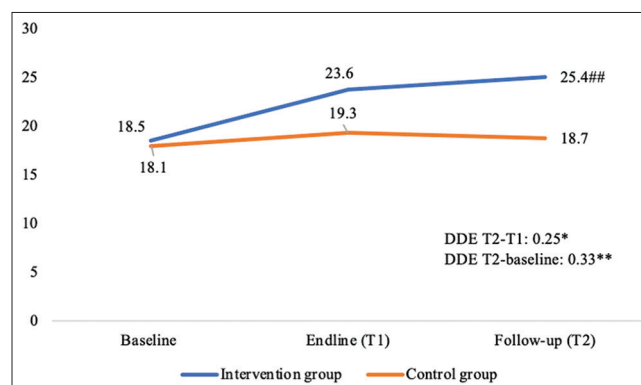


Figure 3: Change of adolescent smoking intention after web-based education program both in IG and CG. Note: DDE: Difference-in-difference estimate; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ## Significant change from end line to follow-up: # $p < 0.05$, ## $p < 0.05$.

The results support the notion that family participation in preventing smoking is essential if we influence adolescent intentions. Family empowerment seems to bridge the information technology, parenting, and smoking goals in many ways on the internet. However, no prior research has identified the role of family empowerment in adolescent smoking [9]. A systematic review showed that parenting programs in children under 18 years old could help prevent tobacco, alcohol, and drug abuse [23], [24]. The common feature of the effective interventions of high intensity was the promotion of authoritative parents (interest in and care for adolescents, often with rule setting). Another study established a Family Resource Center in schools. A consultant used motivational interviewing to ascertain family strengths and weaknesses, motivate parents to improve their parenting and engage in intervention services tailored to each family's unique needs [25].

This study shows how a web-based intervention can be incorporated into the family as an organization to promote smoking prevention in a fun and engaging way. The videos in the web-based learning program can offer strong family support in addition to user activities. These videos tell dramatic stories through testimonials from smokers who have experienced the adverse effects of smoking, humorous stories about social conditions, and smoking consequences, and panic appeal through depictions of oral and maxillofacial cancer resulting from smoking. Regardless of the user experience, entertainment, and interactivity appear to elicit emotions associated with an increase in the ability of adolescents' families to participate in smoking prevention. Future research can build on this work by delving deeper into the psychological processes that

transition families from empowerment to involvement in smoking prevention. This finding reaffirms the critical role of interactivity in determining health outcomes. Multiple channels significantly lower the chances to empower families and involve them in the smoking prevention program. A wide-reaching and efficacious intervention that applies to both family and adolescent alike is simple to implement, and can be tailored to individual needs, provides the most significant potential to change population health [26]. The accessible web-based format is available immediately, at virtually no cost, to public health officials if used separately to support chronic disease, school health, and tobacco control strategies at the population level [27].

Limitations

There are some limitations to this study that should be mentioned. Participants in both groups were required to sit in front of laptop computers and adhere to a strict web-based education software use regimen. They were required to maintain an unchanged sitting position throughout each session without engaging in peer-to-peer interaction. While this protocol did not enable family members to behave as they would in a natural setting, it did provide a consistent Web-based experience that prevents outcomes from being contaminated by disruptions during intervention usage. In addition, a more differentiated model, and thus a more detailed analysis of which specific practice elicits the corresponding effect in participants, will be highly beneficial for future more complex research. Furthermore, the small sample size limits the ability to provide a thorough and systematic review. Future work could examine how long-term smoking initiations in a more significant sample could be prevented by web-based experience.

Conclusions

The results showed significant positive effects for family empowerment and preventing adolescent smoking initiation. The results indicate a diminishing strength of effects, with the most potent and most prevalent changes occurring in family empowerment, smoking refusal skill, and smoking intention. Despite the generally optimistic assessment of the study's findings, it is clear that encouraging long-term smoking reduction through family empowerment training is far from a guarantee of success. At the same time, participants reported fewer effects on sustainability-related intentions. Future research is needed to expand and differentiate the understanding of the initial findings. However, a web-based education program appears to be a suitable catalyst. It should be regarded as a

valuable and supportive addition to existing and future programs.

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Authors' Contributions

Muhammad Hafizurrachman, conceptualized and analyzed data and drafted the paper.

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