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Short Report

# Effect of Video and Leaflet based Health Education on the Knowledge of Smoking Hazards among Senior High School Students in Gowa, Indonesia

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## ABSTRACT

**Background**: Most adult smokers start smoking during adolescence, and the prevalence of tobacco use among school students is high in Indonesia. School-based education is a common preventive approach; however, evidence on combined video and leaflet media in Indonesian senior high schools is limited. **Objective:** This study evaluated the effects of video- and leaflet-based health education on students' knowledge of smoking hazards at SMA Negeri 9 Gowa. **Methods**: A one-group pretest–posttest quasi-experimental study was conducted in January and February 2024 among 93 students in grades X and XI. The intervention consisted of an educational video and a leaflet on the hazards of smoking. Knowledge was measured using a 19-item questionnaire before and one week after the intervention, and the scores were compared using the Wilcoxon signed-rank test. **Results**: The mean knowledge score increased from 14.39 (SD 1.33) before the intervention to 18.04 (SD 0.75) after the intervention, a mean increase of 3.65 points ($p < 0.001$; Cohen's $d_{av}$ = 3.51). The percentage of students with good knowledge increased from 23.7% to 100%. **Conclusion**: Video- and leaflet-based health education led to a large, short-term increase in knowledge of smoking hazards. Because the study had no control group and did not measure behavior, controlled studies with longer follow-ups are needed before the approach is adopted as a school-based prevention strategy.

## KEYWORDS

Adolescent, health education, knowledge, smoking prevention, students, Indonesia

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## INTRODUCTION

Smoking is a major public health problem because it is a leading risk factor for chronic noncommunicable diseases. In 2019, tobacco was the second leading risk factor for death worldwide, after high systolic blood pressure, accounting for an estimated 8.71 million deaths [1]. Although the World Health Organization (WHO) has developed control strategies to address smoking-related problems, many people continue to smoke [2]. In 2020, an estimated 1.30 billion people used tobacco, and 22.3% of the global population aged ≥ 15 years were tobacco users [3].

Indonesia faces a significant burden among young people. According to the 2019 Global Youth Tobacco Survey, 19.2% of Indonesian students aged 13–15 years currently use tobacco products, including 35.6% of boys and 3.5% of girls [4]. Qualitative evidence indicates that smoking is socially internalized in Indonesia and is linked to the development of masculinity among teenage boys [5]. Smoking is often viewed as a normal social behavior, with initiation occurring at a very young age in some areas [2]. The determinants of adolescent smoking reported in Indonesian studies include peer influence, family factors, and the wider social environment [6–9].

Adult smokers generally begin their habits during their teenage years, when they are still too young to fully understand the long-term consequences of smoking [10]. Adolescence is a transitional period during which curiosity and the search for identity make adolescents more susceptible to the influence of their surrounding environment [11]. If not addressed, smoking behavior in adolescents can lead to disrupted concentration, decreased academic performance, and health problems [12]. Senior high school students are therefore an important target group for prevention. Knowledge is considered a precursor to attitudes and behavior, and an adolescent's understanding of the dangers of smoking may influence whether they choose to smoke [13]. However, school programs that rely on information alone have shown limited effects on smoking onset, whereas programs that combine social competence and social influence components have been more effective [14]. Multimedia learning theory proposes that compared with words alone, combining verbal and visual materials can improve understanding [15], which provides a rationale for pairing videos with printed leaflets.

During a preliminary survey at SMA Negeri 9 Gowa, a teacher reported that several students had tried smoking in secret, and the students interviewed cited peer influence, limited awareness of the dangers of smoking, and curiosity as reasons for smoking. No anti-smoking media, such as post-ers, banners, or wall magazines, were observed in the school. Evidence of combined video and leaflet education in senior high schools in South Sulawesi is limited. Therefore, this study evaluated the effects of video- and leaflet-based health education on knowledge of smoking hazards among students at SMA Negeri 9 Gowa.

## MATERIALS AND METHODS

### *Study design and setting*

This study used a one-group pretest–posttest quasiexperimental design and was reported with reference to the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement [16]. This study was conducted at SMA Negeri 9 Gowa, Gowa Regency, South Sulawesi, Indonesia, from January to February 2024.

### *Participants, sampling and intervention*

The school population consisted of 1,307 students. The inclusion criteria were students in grades X and XI who were willing to participate in the study. Students in grade XII and those who declined to participate were excluded. A total of 93 students participated in the study. The minimum sample size was estimated for a paired comparison with a medium effect size ($d_z$ = 0.5), a two-sided α of 0.05, and 80% power. This resulted in 34 participants or 36 after adjustment for the asymptotic relative efficiency of the Wilcoxon signed-rank test (0.955). The final sample of 93 participants exceeded the minimum. After the pretest, the students received health education on the hazards of smoking through an educational video and a printed leaflet, without follow-up interpersonal counseling. The posttest was administered one week after the intervention.

### Instrument and outcome measures

Knowledge of smoking hazards was measured using a 19-item questionnaire on the dangers of smoking administered before and after the intervention. Knowledge was categorized as good when the score exceeded 75% of the maximum score and as less good when it was 75% or lower, following Budiman and Riyanto [17]. Age and sex were recorded as respondent characteristics.

### Statistical analysis

The data were analyzed using IBM SPSS Statistics version 22 (IBM Corp., Armonk, NY, USA). The respondent characteristics and knowledge categories were summarized as frequencies and percentages, and the knowledge scores were summarized as the means and standard deviations. Because the posttest scores clustered at the upper end of the scale, the paired differences could not be assumed to be normally distributed. The Wilcoxon signed-rank test was therefore used instead of the planned paired-sample $t$ test. Effect size was expressed as Cohen's $d_{av}$, which was calculated from the pretest and posttest means and standard deviations [18]. Statistical significance was set at a two-sided $p < 0.05$.

### Ethical considerations and data management

This study was conducted in accordance with the Declaration of Helsinki [19]. Permission to conduct the study was obtained from the school principal and local education authority. Prior to data collection, all participants were given a clear explanation of the study's objectives, procedures, and rights. Informed consent was obtained from each participant, and for students under the age of 18, consent was also obtained from their parents or legal guardians. Participation was entirely voluntary, and the students were informed that they could withdraw at any time without any academic or personal consequences. All personal data were anonymized, and the data were coded using participant numbers to maintain confidentiality.

## RESULTS

### Characteristics of the respondents

Among the 93 students, 42 (45.2%) were 15 years old, 33 (35.5%) were 16 years old, and 18 (19.4%) were 17 years old. Most respondents were female (n = 58, 62.4%) (Table 1).

**Table 1.** Characteristics of the respondents at SMA Negeri 9 Gowa (n = 93)

| Characteristics | n | % |
|---|---|---|
| **Age (years)** | | |
| 15 | 42 | 45.2 |
| 16 | 33 | 35.5 |
| 17 | 18 | 19.4 |
| **Sex** | | |
| Male | 35 | 37.6 |
| Female | 58 | 62.4 |
| **Total** | **93** | **100.0** |

### Pre and post intervention study

Before the intervention, 22 students (23.7%) had good knowledge, and 71 (76.3%) had poor knowledge. After the intervention, all 93 students (100%) had good knowledge (Table 2). The mean knowledge score increased from 14.39 (SD 1.33) at pretest to 18.04 (SD 0.75) at posttest, a mean increase of 3.65 points. The difference was statistically significant (Wilcoxon signed-rank test, $p<0.001$), and the effect size was large (Cohen's $d_{av}$ = 3.51) (Table 3). The posttest standard deviation was smaller than the pretest standard deviation, indicating that the scores clustered at the upper end of the scale after the intervention.

**Table 2.** Knowledge categories of the respondents before and after the intervention (n = 93)

| Knowledge category | Pretest | | Posttest | |
|---|---|---|---|---|
| | n | % | n | % |
| Good | 22 | 23.7 | 93 | 100.0 |
| Less good | 71 | 76.3 | 0 | 0.0 |
| **Total** | 93 | 100.0 | 93 | 100.0 |

Good: score >75% of the maximum score. Less good, with a score ≤75% of the maximum score [17].

**Table 3.** Comparison of knowledge scores before and after the intervention (n = 93)

| Measurement | Mean (SD) | Mean difference | *p* value[a] | Cohen's $d_{av}$ |
|---|---|---|---|---|
| Pretest | 14.39 (1.33) | 3.65 | <0.001 | 3.51 |
| Posttest | 18.04 (0.75) | | | |

SD, standard deviation. [a]Wilcoxon signed-rank test. $d_{av}$, Cohen's *d* based on the average of the pretest and posttest standard deviations.

## DISCUSSIONS

This study revealed a large increase in knowledge of smoking hazards one week after video- and leaflet-based health education. Before the intervention, three-quarters of the students had poor knowledge, which confirms a knowledge gap in this population. After the intervention, all the students reached the good category. The magnitude of this change should be interpreted with caution because the posttest scores clustered at the upper end of the scale, and the design had no comparison group. Several mechanisms may explain this improvement. The use of leaflets and video media can clarify the dangers that arise when teenagers start smoking because students not only listen but also see these consequences directly [20].

According to multimedia learning theory, presenting information through both visual and verbal channels can support understanding [15], and the leaflet allows students to revisit the material after the session. The increase in knowledge may also reflect the absorption of new information, given that a broad understanding of the health risks of smoking is expected to help nonsmokers remain smoke-free [20]. Because the same questionnaire was used twice within one week, part of the improvement may have been due to testing effects and familiarity with the items [21].

These findings are consistent with Indonesian studies on adolescents. Agustian reported that flipchart media improved the knowledge and attitudes of grade VII students regarding the dangers of smoking at SMPN 15 Bengkulu City (Wilcoxon $p < 0.05$) [22], and Amanda reported a significant difference in adolescents' knowledge about the dangers of smoking in Dusun Jetis Moyudan, Sleman, Yogyakarta, before and after health education ($p = 0.001$) [23]. International evidence supports the value of school-based programs. A recent meta-analysis of randomized trials revealed that school-based educational programs reduced smoking initiation at six months, although the effect diminished at 12–36 months [24], and a review of programs for children revealed more consistent knowledge gains with interactive and skills-based programs than with information-focused approaches [25]. However, not all evidence is favorable. A Cochrane review of 134 trials revealed that information-only curricula did not prevent smoking onset, whereas combined social competence and social influence curricula did [14]. A more recent meta-analysis revealed that universal school-based interventions had little or no short-term benefits for tobacco use [26]. Taken together, these findings suggest that the knowledge gain observed here is a necessary first step but is unlikely to change smoking behavior alone.

The sample was predominantly female and aged 15 years, which reflects the composition of the participating grades. Sex differences in knowledge were not analyzed in this study. Because the prevalence of smoking among Indonesian adolescents is much higher among boys than among girls [4] and smoking is closely tied to masculine identity [5], future programs may benefit from gender-sensitive content, and the predominance of female respondents may limit generalizability to boys, who are at higher risk.

### *Implications for practice*

The findings suggest that brief video- and leaflet-based education can efficiently address knowledge gaps regarding smoking hazards among senior high school students. Schools may integrate such materials into health education and pair them with skill-based components, such as refusal skills and peer-led activities, which have been shown to have greater effects on smoking behavior [14,24]. Introducing visible anti-smoking media into the school environment may reinforce these messages.

### *Limitations*

This study has several limitations. First, the absence of a control group means that history, maturation, and testing effects cannot be excluded [21]. Second, the postintervention test was conducted only one week after the intervention, which limits the ability to assess long-term retention of knowledge or actual behavioral change. Third, this study focused only on knowledge, not on attitudes, beliefs, or smoking behavior, and increased knowledge does not always lead directly to behavioral change. Fourth, posttest scores clustered at the upper end of the scale, and this ceiling effect may have limited the ability to detect differences among students. Fifth, self-reported responses may be subject to social desirability bias [27]. Sixth, participants were drawn from a single school without random selection, and most were female, which limits generalizability. Finally, the validity and reliability of the questionnaire were not reported, and the item-level results were not analyzed; thus, the specific aspects of knowledge that improved the most could not be identified.

## CONCLUSIONS

Video- and leaflet-based health education was followed by a large, short-term increase in knowledge of smoking hazards among students at SMA Negeri 9 Gowa, with all students reaching the good knowledge category one week after the intervention. These results support the use of combined video and leaflet media to address knowledge gaps in school-based smoking prevention. However, the absence of a control group, short follow-up, and lack of behavioral outcomes mean that the findings do not demonstrate smoking prevention. Future studies should use controlled designs, follow students for at least six months, and measure attitudes and smoking behavior, preferably by combining educational media with skills-based and peer-led components.

## CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## AUTHOR CONTRIBUTIONS

Conceptualization: AUF, NA, DA, and NFI. Methodology: AUF, NA. Software: DA. Validation: NFI, DA, and AUF. Formal analysis: AUF and DA. Investigation: NA and NFI. Resources: AUF, NFI. Data curation: NA, AUF, DA, and NFI. Writing – original draft: AUF, NA, DA, and NFI. Writing – review and editing: AUF, DA, NFI, and NA. Visualization: AUF and NA. Supervision: DA, NFI.

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## DATA AVAILABILITY STATEMENT

The dataset analyzed in the current study is available from the corresponding author upon reasonable request.

## DECLARATION OF ARTIFICIAL INTELLIGENCE USE

In this study, artificial intelligence (AI) tools were used for the following capacity. Manuscript writing support: An AI-based language model (Claude, Anthropic) was employed for language refinement and technical writing assistance during the revision. The final decisions and interpretations presented in this article were solely made by the authors.

## REFERENCES

[1] GBD 2019 Risk Factors Collaborators Global burden of 87 risk factors in 204 countries and territories, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. Lancet 2020;396:1223–49. https://doi.org/10.1016/S0140-6736(20)30752-2.

[2] Chrisman Z. Gambaran pengetahuan siswa tentang bahaya merokok di SMA Negeri 1 Afulu Kecamatan Afulu Kabupaten Nias Utara 2021 [undergraduate thesis]; 2021.

[3] World Health Organization. WHO global report on trends in prevalence of tobacco use 2000–2025. 4th ed. Geneva: World Health Organization; 2021. https://www.who.int/publications/i/item/9789240039322. Accessed: 18 Nov 2026.

[4] Centers for Disease Control and Prevention, World Health Organization. Global youth tobacco survey fact sheet: Indonesia 2019. https://www.tobaccofreekids.org/files/pdfs/en/Indonesia_GYTS_2019.pdf. Accessed: 18 Nov 2026.

[5] Ng N, Weinehall L, Öhman A. 'If I do not smoke, I'm not a real man': Indonesian teenage boys' views about smoking. Health Educ Res 2007;22:794–804. https://doi.org/10.1093/her/cyl104.

[6] Jannah M. Determinan perilaku merokok pada remaja sekolah menengah atas (SMA) di kota Palopo. J Kesehat 2021;14:6–12. https://doi.org/10.32763/juke.v14i1.276

[7] Pratiwi D. Determinan perilaku merokok pada remaja. J Ilmu Kesehat Univ Salakanagara 2022;8:1–12. https://jurnal.unsaka.ac.id/index.php/JIKKBH/article/view/89

[8] Septian, Nurul, Syahrul H. Faktor keluarga yang mempengaruhi perilaku merokok pada siswa sekolah menengah pertama. J Ilmu Keperawatan 2016;4(1). https://jurnal.unsyiah.ac.id/JIK/article/view/6260/5162

[9] Susilaningsih I, Brata FT, S. S. Faktor-faktor penyebab perilaku merokok pada remaja di Tegalrejo. J Keperawatan Karya Bhakti 2022;8:46–56.

[10] Asmulsyam A. Edukasi kesehatan bahaya merokok dengan permainan ular tangga dan puzzle dalam meningkatkan pengetahuan serta sikap murid sekolah dasar di Kabupaten Luwu tahun 2020 [thesis]; 2020. https://repository.unhas.ac.id/id/eprint/2105/

[11] Mathijssen JJP, Rozema AD, Hiemstra M, Jansen MWJ, van Oers JAM. Stability of and change in substance use risk personality: Gender differences and smoking cigarettes among early adolescents. Addict Behav Rep 2021;14:100360. https://doi.org/10.1016/j.abrep.2021.100360.

[12] Dinaria, Eva, Candra E, Marita Y. Pengaruh penyuluhan kesehatan terhadap pengetahuan tentang bahaya merokok. Babul Ilmi J Ilm Multi Sci Kesehat 2023;15(2). https://doi.org/10.36729/bi.v15i2.1144

[13] Maidelwita, Yani, Prameswari RA, Arifin Y. Hubungan pengetahuan dan sikap terhadap bahaya merokok pada remaja di SMA Adabiah Padang. J Kesehat Pijar 2023;2:6–14. https://doi.org/10.37287/jppp.v8i2.1801

[14] Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. Cochrane Database Syst Rev 2013;2013:CD001293. https://doi.org/10.1002/14651858.CD001293.pub3.

[15] Mayer RE. Multimedia learning. 2nd ed. New York: Cambridge University Press; 2009.

[16] Des Jarlais DC, Lyles C, Crepaz N, TREND Group. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: The TREND statement. Am J Public Health 2004;94:361–6. https://doi.org/10.2105/ajph.94.3.361.
[17] Budiman, Riyanto A. Kapita selekta kuesioner: Pengetahuan dan sikap dalam penelitian kesehatan. Jakarta: Salemba Medika; 2013.
[18] Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t tests and ANOVAs. Front Psychol 2013;4:863. https://doi.org/10.3389/fpsyg.2013.00863.
[19] World Medical Association. World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human participants. JAMA 2025;333:71–4. https://doi.org/10.1001/jama.2024.21972.
[20] Prabowo Y, Ulfah M, Surahmi F. Pengaruh edukasi melalui media leaflet dan video terhadap pengetahuan dan sikap remaja tentang bahaya merokok di SMA 1 Wiradesa [thesis]; 2020.
[21] Harris AD, McGregor JC, Perencevich EN, Furuno JP, Zhu J, Peterson DE, et al. The use and interpretation of quasiexperimental studies in medical informatics. J Am Med Inform Assoc 2006;13:16–23. https://doi.org/10.1197/jamia.M1749.
[22] Agustian R. Pengaruh penggunaan media lembar balik terhadap pengetahuan dan sikap remaja tentang bahaya merokok di kelas VII SMPN 15 Kota Bengkulu [thesis]; 2020.
[23] Amanda VC. Pengaruh edukasi kesehatan terhadap pengetahuan tentang bahaya merokok pada remaja di Dusun Jetis Moyudan Sleman Yogyakarta [thesis]; 2020.
[24] Alsahli FA, Alruwais NM, Alsultan LS, Abojalid BS, Nughays RO, Humedi AM, et al. Interventions for prevention of tobacco smoking in school-aged children and adolescents: A systematic review and meta-analysis. Cureus 2025;17:e77008. https://doi.org/10.7759/cureus.77008.
[25] Gianfredi V, Barbati C, Sgueglia AC, Bertuccio P, Traverso L, Odone A. Effectiveness of school-based interventions to prevent tobacco initiation and improve smoking-related knowledge in children aged 6–12 years: A systematic review and meta-analysis of randomized trials. J Youth Adolesc 2026. https://doi.org/10.1007/s10964-026-02430-w.
[26] Tinner L, Palmer JC, Lloyd EC, Caldwell DM, MacArthur GJ, Dias K, et al. Individual-, family- and school-based interventions to prevent multiple risk behaviors relating to alcohol, tobacco and drug use in young people aged 8–25 years: A systematic review and meta-analysis. BMC Public Health 2022;22:1111. https://doi.org/10.1186/s12889-022-13072-5.
[27] Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: A critical review of the literature and recommended remedies. J Appl Psychol 2003;88:879–903. https://doi.org/10.1037/0021-9010.88.5.879.