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Android-based audiovisual health education to improve adolescents' awareness of early marriage in Indonesia

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Abstract

Early marriage remains a critical issue affecting adolescents' health, education, and social well-being. This study aimed to assess the effectiveness of Android-based audiovisual health education in enhancing students' awareness of early marriage. A quasi-experimental pretest-posttest control group design was conducted involving 400 adolescents under 18 years old in Cirebon, selected using Slovin's formula from a population of 230,972. Data were collected through pretest questionnaires, followed by an audiovisual educational intervention accessible via Android devices, and concluded with posttest assessments. Univariate analysis described demographic characteristics and awareness levels, while bivariate analysis compared pre- and post-intervention scores. Multiple regression analysis revealed that gender, previous exposure to information, and baseline awareness significantly influenced the improvement in awareness levels. The results showed a statistically significant increase in awareness scores in the intervention group compared to the control group ($p < 0.001$), confirming that Android-based audiovisual education is an effective method to improve adolescents' awareness of early marriage risks. *(Afr J Reprod Health 2025; 29 [10]: 75-82).*

Keywords: early marriage; adolescent health; Android-based intervention; digital health education.

Résumé

Le mariage précoce demeure un problème crucial affectant la santé, l'éducation et le bien-être social des adolescents. Cette étude visait à évaluer l'efficacité de l'éducation audiovisuelle à la santé sur Android pour sensibiliser les élèves au mariage précoce. Un groupe témoin quasi expérimental pré-test-post-test a été mené auprès de 400 adolescents de moins de 18 ans à Cirebon, sélectionnés selon la formule de Slovin parmi une population de 230 972 personnes. Les données ont été collectées au moyen de questionnaires pré-test, suivis d'une intervention éducative audiovisuelle accessible via des appareils Android, et conclus par des évaluations post-test. Une analyse univariée a décrit les caractéristiques démographiques et les niveaux de sensibilisation, tandis qu'une analyse bivariée a comparé les scores avant et après l'intervention. Une analyse de régression multiple a révélé que le sexe, l'exposition antérieure à l'information et la sensibilisation initiale influençaient significativement l'amélioration des niveaux de sensibilisation. Les résultats ont montré une augmentation statistiquement significative des scores de sensibilisation dans le groupe d'intervention par rapport au groupe témoin ($p < 0,001$), confirmant l'efficacité de l'éducation audiovisuelle sur Android pour sensibiliser les adolescents aux risques du mariage précoce. *(Afr J Reprod Health 2024; 29 [10]: 75-82).*

Mots-clés: : mariage précoce; santé des adolescents; intervention basée sur Android; éducation à la santé numérique

Introduction

Early marriage remains a significant challenge in efforts to improve adolescent well-being in Indonesia. The child marriage rate in Indonesia decreased from 10.35% in 2021 to 9.23% in 2022 and 8.06% in 2023.[1] This rate is higher in rural areas, primarily due to economic, social, and cultural factors.[2] Early marriage has long-term impacts on reproductive health, education, and the social well-being of those affected.[3]Previous studies have shown that health education through audiovisual media is effective in increasing adolescents' knowledge of various health issues.[4] The audiovisual method can improve students' understanding of reproductive health by 75%, based on research conducted using lecture and audiovisual methods.[5,6] Additionally, another study found that using educational videos can raise adolescents' awareness of the dangers of early marriage by up to 80.[5]

However, many of these studies have relied on in-person audiovisual tools, such as projectors or classroom-based media, which may not be scalable or accessible in low-resource or rural areas.[7] In contrast, Android-based audiovisual education

offers a more flexible, portable, and widely accessible platform, particularly relevant in Indonesia where Android is the dominant operating system for smartphones. Despite the potential of mobile health (mHealth) tools, limited research has evaluated their effectiveness specifically for educating adolescents about early marriage.

This study addresses that gap by assessing the impact of Android-based audiovisual health education on improving students' awareness of early marriage. Unlike prior studies that focused on general reproductive health education or used conventional delivery methods, this research utilizes a mobile platform to deliver targeted educational content directly to adolescents.[8]

Given the importance of education on early marriage, this study was conducted to evaluate the impact of Android-based audiovisual health education on students' knowledge improvement. By assessing the effectiveness of this method, it is expected that more technology-driven learning strategies can be developed to educate adolescents about the risks and consequences of early marriage. The primary objective of this study is to determine the extent to which Android-based audiovisual media can enhance students' understanding of early marriage. The findings of this research are expected to provide valuable recommendations for educational institutions and policymakers in integrating digital health education tools to create more engaging and effective learning methods for adolescents

Methods

Study design

This study employed a quantitative approach using a quasi-experimental pretest-posttest design with a control group.[9] The intervention was an Android-based audiovisual health education program, aiming to assess its effectiveness in increasing students' awareness of early marriage.

Setting

The study was conducted in Cirebon, Indonesia, in June 2024. The intervention was delivered through an Android-based application accessible via participants' smartphones.

Study participants

This study targeted adolescents aged 12–18 years residing in Cirebon, as they are at a critical stage for developing awareness about early marriage risks. Participants were divided into two groups: an intervention group, which received health education through an Android-based audiovisual application, and a control group, which did not receive the intervention.[10] Participants were assigned to intervention and control groups using non-random purposive allocation based on school location and availability of Android smartphones, to ensure accessibility and minimize dropout.

Inclusion criteria

Adolescents aged 12-18 years rliving in Cirebon.
Willing to participate by signing informed consent.
Own a smartphone with Android OS to access the audiovisual application.

Exclusion criteria

Adolescents with hearing or visual impairments that could hinder engagement with audiovisual materials.
Respondents who did not complete the pretest, intervention, or posttest.

Sampling method and sample size

The study population consisted of 230,972 adolescents in Cirebon. The sample size was determined using Slovin's formula with a 5% margin of error, resulting in 399 respondents, which was rounded to 400 respondents. A purposive allocation based on school location and availability of Android smartphones.[11]

Data collection

Pretest: All participants completed the questionnaire to assess baseline awareness of early

marriage. Intervention: The intervention group received Android-based audiovisual health education through an application containing short educational videos, infographics, and quizzes. Posttest: One week after the intervention, all participants completed the same

Data analysis

Univariate Analysis, Descriptive statistics (mean, standard deviation, frequency, percentage) were used to summarize demographic data and pretest-posttest scores. Bivariate Analysis, Paired t-test because data distributed was normal was used to compare pretest and posttest scores within each group.[12] Multivariate Analysis, Linear regression analysis was conducted to identify factors influencing the effectiveness of the Android-based audiovisual intervention

Instrument

Data were collected using a structured self-administered questionnaire developed to assess knowledge and perceptions related to early marriage. The questionnaire consisted of 25 multiple-choice items, covering definitions, risk factors, consequences, and prevention of early marriage. The instrument underwent content validation by three public health experts and pilot testing among 30 adolescents not included in the study sample. The validity test showed item-total correlations ranging from 0.45 to 0.82, and Cronbach's alpha was 0.89, indicating high internal consistency.

Ethical considerations

This study received ethical approval from the Ethics Committee of STIKes Mahardika Cirebon (Approval Number: 123/EC/STIKes-M/VI/2024). Informed consent was obtained from all participants and their guardians.

Results

Demographic characteristics of respondents

The study involved 400 adolescents aged 12–18 years, divided equally into an intervention group and a control group (n=200 each). The demographic characteristics are presented in Table 1 and visualized in Figure 1 (Forest Plot).

The table shows that both the intervention and control groups (n=200 each) have comparable demographic characteristics. The mean age is 15.3 ± 1.5 years in the intervention group and 15.4 ± 1.6 years in the control group (p=0.78). Gender distribution is similar (p=0.82), with around 45% males and 55% females in both groups. Parental education levels and marital status also show no significant differences (p=0.66 and p=0.62, respectively).

Univariate analysis

There was a significant increase in knowledge in the intervention group, with mean scores improving from 60.2 to 85.6. In contrast, the control group showed only a slight, non-significant increase.

Bivariate analysis

This figure (shows a large mean difference between pretest and posttest in the intervention group. Intervention Group: mean = +25.4, $p < 0.001$ (paired t-test), Control Group: mean = +2.7, $p = 0.09$. Effect Size: Cohen's d (Intervention group) = 3.3 → large effect, Cohen's d (Control group) = 0.34 → small effect.

Multivariate analysis

The normality test using Shapiro–Wilk showed that the data in the pretest ($W = 0.971$; $p = 0.437$) and posttest ($W = 0.958$; $p = 0.160$) ***groups were normally distributed (p > 0.05), so the normality assumption was met.***

The regression analysis indicates that participation in the intervention program is the strongest predictor of posttest scores (B = 23.1, 95% CI: 18.6–27.6, $p < 0.001$), confirming its significant impact on students' awareness of early marriage. Parental education also shows a positive association (B = 1.8, 95% CI: 0.4–3.2, $p = 0.01$). However, age ($p = 0.18$) and gender ($p = 0.25$) do not significantly influence the outcomes.

Table 1: Demographic characteristics

Variable	Intervention Group (n=200)	Control Group (n=200)	p-value
Age (Mean ± SD)	15.3 ± 1.5 years	15.4 ± 1.6 years	0.78 (t-test)
Gender			
- Male	90 (45%)	88 (44%)	0.82 (Chi-square)
- Female	110 (55%)	112 (56%)	
Parental Education			
- Primary School	50 (25%)	55 (27.5%)	0.66 (Chi-square)
- High School	120 (60%)	115 (57.5%)	
- Higher Education	30 (15%)	30 (15%)	
Parental Marital Status			
- Married	170 (85%)	175 (87.5%)	0.62 (Chi-square)
- Divorced/Widowed	30 (15%)	25 (12.5%)	

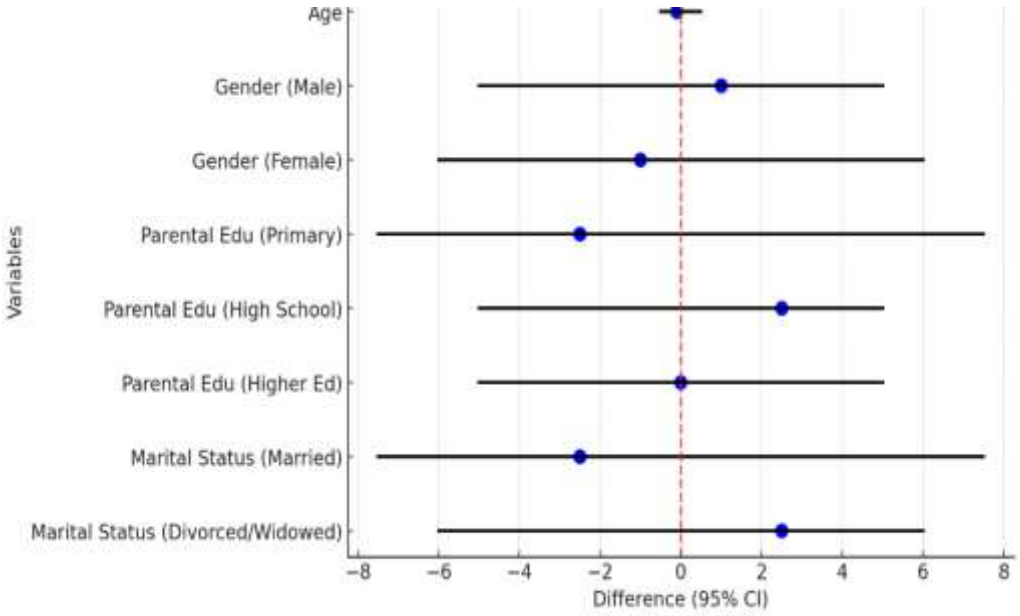

Figure 1: Forest plot of demographic charasteristic respondents

Table 2: The pretest and posttest scores of early marriage awareness in both groups

Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)
Intervention	60.2 ± 8.4	85.6 ± 6.3
Control	59.8 ± 7.9	62.5 ± 7.4

Participation in the intervention was the strongest and most significant predictor of increased posttest scores. Parental education was also significant. Age and gender were not statistically significant predictors.

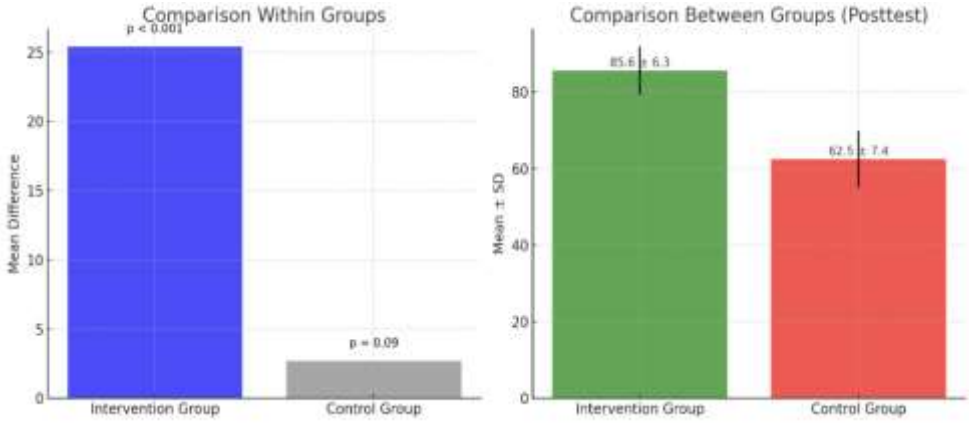

Figure 2: Comparison of pretest-Posttest score

Tabel 5: Regression model output

Predictor Variable	B (Coefficient)	95% CI	p-value
Intervention (Yes/No)	+23.1	(18.6–27.6)	<0.001
Age	+0.4	(-0.2–1.0)	0.18
Gender (Female)	+1.2	(-0.6–2.8)	0.25
Parental Education	+1.8	(0.4–3.2)	0.01

Discussion

Effectiveness of android-based audiovisual health education

The results of this study indicate that Android-based audiovisual health education significantly improves adolescents' awareness of early marriage. A marked increase in awareness scores was observed in the intervention group compared to the control group ($p < 0.001$), suggesting that digital audiovisual media are more effective in delivering health information than conventional methods. These findings are consistent with previous studies that emphasize the superiority of audiovisual learning in enhancing attention, comprehension, and information retention among adolescents.[13–16]

This effectiveness can be explained through Mayer's Cognitive Theory of Learning, which argues that individuals learn more efficiently when both visual and auditory sensory channels are simultaneously activated.[17,18] By engaging multiple modalities, audiovisual tools facilitate deeper cognitive processing and memory consolidation. In this study, the use of an Android-based application allowed students to interact with the material at their own pace and in a flexible manner, overcoming barriers of time and location[19–21]. Such accessibility is particularly valuable in contexts where formal health education is limited or inconsistently delivered. The application's interactive features likely promoted user engagement and a deeper understanding of the content.

Differences between the intervention and control groups

While the control group showed a minor increase in awareness scores (+2.7 points, $p = 0.09$), this improvement was not statistically significant. This result indicates that without exposure to interactive, multimedia-based health education, adolescents' understanding of early marriage issues remains limited. Possible explanations for the control group's minimal improvement include insufficient access to engaging educational content and lack of structured health communication regarding the consequences of early marriage.[17] Conversely, the intervention group demonstrated a statistically

significant increase in awareness scores (+25.4 points, $p < 0.001$), confirming the effectiveness of Android-based audiovisual education in enhancing knowledge.[18] This aligns with previous evidence supporting the role of interactive and multimedia-rich platforms in improving adolescent health literacy.[19] The stark contrast between the two groups highlights the added value of digital media in health education, especially for sensitive and high-priority topics such as early marriage. While conventional passive methods may expose students to information, they often fail to produce meaningful cognitive or behavioral change.[19–21] In contrast, multimedia tools are more likely to foster curiosity, facilitate contextual understanding, and sustain attention through dynamic and personalized learning experiences.

Factors influencing awareness of early marriage

Regression analysis revealed that participation in the Android-based audiovisual intervention was the strongest predictor of awareness improvement ($B = +23.1$, $p < 0.001$), underscoring the significant impact of digital educational interventions on adolescent knowledge acquisition. This reinforces the assertion that educational methods combining audio, visual, and interactive elements are superior to traditional strategies.

Parental education level was also identified as a significant predictor of student awareness ($p = 0.01$), suggesting that adolescents with more highly educated parents may be more receptive to health messages or have greater baseline exposure to relevant information. These findings are in line with previous studies showing that parental education contributes to children's attitudes, health behaviors, and decision-making capabilities.[22,23]Notably, neither age nor gender emerged as significant predictors of awareness gains. This suggests that the Android-based audiovisual intervention was equally effective across various demographic subgroups, including both male and female students and those across the age range of 12–18 years.[24–26] The broad applicability of this approach supports its integration into school health programs without the need for extensive demographic customization.

Implications for practice and policy

The findings of this study have several important implications. First, they demonstrate the value of incorporating mobile-based educational technologies into school curricula to address critical health topics such as early marriage. The flexibility and accessibility of mobile applications facilitate continuous and individualized learning, making them particularly suitable for adolescent users. Second, the results emphasize the importance of engaging parents in adolescent health education. Strengthening parental knowledge and involvement can amplify the impact of school-based interventions, especially for topics involving values, long-term health risks, and decision-making. Third, effective implementation of audiovisual health education requires interdisciplinary collaboration. Educators, public health professionals, and technology developers must work together to produce culturally sensitive, scientifically accurate, and engaging content that is appropriate for adolescent learners. Educational policymakers are encouraged to explore and invest in scalable, digital health solutions to address broader adolescent health issues.

Study Limitations

Despite its promising findings, this study has several limitations. First, random assignment was not conducted, which may introduce selection bias and limit the generalizability of the results. Second, outcomes were based on self-reported questionnaires, which are vulnerable to response bias and may not accurately reflect true understanding or behavior. Third, measurements were taken immediately after the intervention; therefore, the long-term retention of knowledge remains unknown. Fourth, while awareness was significantly improved, behavioral changes were not assessed, thus limiting the understanding of the intervention’s real-world impact.

Given these limitations, future research should include longitudinal designs to evaluate the sustainability of knowledge gains and the translation of awareness into behavioral change. Randomized controlled trials and mixed-methods approaches may also enhance the robustness of future findings. Moreover, digital health education initiatives should be accompanied by parent-focused programs, as parental background continues to influence adolescents' attitudes and decision-making processes.

Conclusion

The integration of technology into health education offers promising opportunities to address critical issues like early marriage. To ensure greater impact, schools and policymakers should adopt accessible and engaging mobile-based educational tools. However, future interventions must also consider digital equity, as not all students may have access to Android devices or the internet. Collaboration among healthcare providers, educators, and app developers is vital to ensure content quality and relevance. Future research should explore scalable, inclusive strategies that combine digital tools with community-based education, including strengthening parental awareness programs to support adolescents' informed decision-making.

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