

Effectiveness of Digital Reproductive Health Education Interventions for Adolescent Girls: A Literature Review

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Abstract. Reproductive health education is a critical need for adolescent girls who face various sexual and reproductive health risks, while access to comprehensive education remains limited. Advances in digital technology offer new opportunities through digital-based educational interventions that are more flexible and accessible. This study aims to evaluate the effectiveness of digital reproductive health education interventions for adolescent girls and to identify factors influencing their effectiveness. The method used was a literature review of studies employing randomized controlled trial designs that assessed various digital interventions, including mobile applications, text messaging, educational games, and entertainment-based videos. The findings indicate that digital interventions consistently improve adolescent girls' knowledge and attitudes toward reproductive health and enhance their confidence in accessing health services. However, changes in risky sexual behaviors and long-term contraceptive use remain limited. The implications of this study suggest that digital interventions should be integrated with supportive approaches, such as family involvement and continuous follow-up, to achieve more effective and sustainable behavioral change.

Keywords : Reproductive Health; Digital Health Education; Adolescent Girls; Technology; Sexual Health

1. INTRODUCTION

Reproductive health education is an essential component of global health development, particularly for adolescents who are undergoing complex biological, psychological, and social transitions. Adolescent girls, as a group with specific vulnerabilities related to reproductive functions and social norms, face significant health risks, including unintended pregnancy, sexually transmitted infections (STIs), and psychosocial consequences resulting from inadequate knowledge and decision-making skills. Access to accurate, comprehensive, and age-appropriate reproductive health information is therefore a key factor in promoting safe and responsible health behaviors (Arisjulyanto & Suweni, 2023).

Globally, the provision of high-quality reproductive health education has become a major concern within the sustainable development agenda. The World Health Commission and various international studies emphasize that access to appropriate reproductive health information is an integral part of achieving the Sustainable Development Goals (SDGs), particularly Goal 3, which focuses on adolescent health and well-being (Ackah et al., 2024). Empirical evidence indicates that adequate reproductive health knowledge plays a crucial role in reducing the risks of unintended pregnancy, STIs, and risky sexual behaviors among

adolescents (Papayungan et al., 2024). Nevertheless, in practice, the implementation of reproductive health education continues to face multiple challenges (Rosamali & Arisjulyanto, 2020).

Globally, approximately 1 million adolescents aged 10–19 years are living with HIV, and in 2024 there were around 370,000 new infections among individuals aged 15–24 years, including 145,000 cases among adolescents aged 15–19 years. Of these new infections, more than two-thirds (71%) occurred among adolescent girls, while only about 64% of adolescents living with HIV received antiretroviral therapy (ART), which is essential to suppress the virus and reduce the risk of transmission and mortality. In Indonesia, as of March 2025, approximately 2,700 adolescents aged 15–19 years were reported to be living with HIV, and it is estimated that around 564,000 people nationwide are living with HIV. The transmission trend has expanded across several provinces, and the prevalence among adolescents aged 15–24 years reaches approximately 3% in certain regions such as Papua, underscoring the need for more intensive reproductive health and HIV prevention interventions targeting adolescents (Kemenkes RI, 2024; World Health Organization., 2025)

Social and structural barriers such as stigma surrounding sexuality, limitations within formal education curricula, and cultural norms that restrict open discussions on reproductive health often prevent adolescents, especially girls, from accessing sufficient and safe information (Alhassan et al., 2025). These conditions contribute to gaps in knowledge and attitudes that may ultimately lead to suboptimal health behaviors. Consequently, alternative approaches are needed to reach adolescents in a broader, more flexible, and contextually relevant manner (Legiati et al., 2019).

Along with the rapid advancement of information and communication technologies, digital-based educational interventions have emerged as innovative strategies for delivering reproductive health education. These interventions include mobile applications, web-based platforms, social media, and other interactive digital tools that enable the delivery of multimedia and personalized health information (Yana et al., 2024). Digital media not only serve as channels for information dissemination but also offer interactive and adaptive learning experiences that align with adolescents' dynamic digital environments (Guo et al., 2025).

Despite this potential, the effectiveness of reproductive health education particularly digital-based interventions in comprehensively reaching and influencing adolescent girls remains an unresolved issue. Numerous studies report that adolescent girls continue to exhibit limited knowledge, attitudes, and healthy behaviors related to reproductive health, even after educational programs have been implemented (Mukhtar et al., 2025). Furthermore, challenges

such as low digital literacy, unequal access to technology, and variations in social and cultural contexts further complicate the successful implementation of digital interventions (Papayungan et al., 2024).

Recent studies suggest that digital interventions, including mobile applications and web-based education, have the potential to improve reproductive health literacy through interactive features such as educational videos, quiz modules, and chatbots designed to enhance adolescent engagement (Alhassan et al., 2025). However, research findings remain inconsistent across studies. While some interventions demonstrate significant improvements in knowledge and attitudes, their impact on long-term behavioral change and the sustainability of healthy practices remains limited (Guo et al., 2025).

This study is therefore important, as adolescent girls represent a vulnerable population at heightened risk of reproductive health problems, including early pregnancy, STIs, and associated psychosocial consequences. Optimizing reproductive health education through digital media has the potential to significantly reduce the burden of reproductive health issues, support the achievement of global public health goals, and inform policy-making as well as the development of more effective and sustainable educational programs.

The objective of this literature review is to evaluate the effectiveness of digital-based reproductive health education interventions for adolescent girls based on the most recent scientific evidence from 2020 to 2025. In addition, this study aims to identify factors influencing the effectiveness of these interventions and to formulate recommendations for the development of digital reproductive health education programs that are more responsive to the specific needs of adolescent girls.

2. METODE PENELITIAN

Penelitian ini melakukan tinjauan terhadap berbagai studi yang mengkaji efektivitas intervensi digital dalam pendidikan kesehatan reproduksi (KSR) untuk remaja putri. Studi yang dievaluasi menggunakan desain randomized controlled trial (RCT) dengan berbagai pendekatan digital, seperti pesan teks, aplikasi mobile, permainan digital, dan video hiburan, untuk meningkatkan pengetahuan, sikap, dan perilaku terkait kesehatan reproduksi di kalangan remaja putri. Peserta penelitian adalah remaja putri yang terlibat dalam program mHealth di beberapa lokasi, termasuk Ghana, India, dan Nigeria. Data dikumpulkan melalui pre- dan post-test untuk mengukur pengetahuan, sikap, dan perilaku terkait KSR di kalangan peserta.

3. RESULT AND DISCUSSION

Table 1. Literatur Review

No	Title	Author	Aim	Key Findings
1	Assessing the reach and effectiveness of mHealth: evidence from a reproductive health program for adolescent girls in Ghana	Rokicki & Fink (2017)	To assess the effectiveness of an SMS-based mHealth program in improving sexual and reproductive health (SRH) knowledge among adolescent girls in Ghana.	The mHealth program significantly improved SRH knowledge, with 81% participant engagement. Knowledge gains were observed both in the short term (3 months) and long term (15 months), particularly among highly engaged participants.
2	Crush: A Randomized Trial to Evaluate the Impact of a Mobile Health App on Adolescent Sexual Health	Martínez-García et al. (2023)	To evaluate the effectiveness of the <i>Crush</i> mobile app in improving SRH knowledge, attitudes, and contraceptive use among adolescent girls.	<i>Crush</i> users showed increased confidence in accessing SRH services (aOR = 1.6) and more positive attitudes toward contraceptive use (aOR = 2.3). However, no significant differences were found in hormonal or IUD contraceptive use or clinic visits.
3	Engaging parents in digital sexual and reproductive health education: evidence from the JACK trial	Aventin et al. (2020)	To explore parental engagement in digital sexual and reproductive health education and evaluate the acceptability and feasibility of school-based digital materials.	Approximately 27% of parents accessed the digital materials, and 9% watched the animated film. Among users, 87% rated the materials positively, and 67% reported improved confidence in discussing SRH topics with their children.
4	Impact of a Text-Messaging Program on Adolescent Reproductive Health: A Cluster-	Rokicki et al. (2017)	To examine whether a text-messaging program could improve reproductive	Text-messaging interventions improved reproductive health knowledge (11% in

	Randomized Trial in Ghana		health knowledge among adolescent girls in Ghana.	unidirectional and 24% in interactive programs). Both interventions reduced self-reported pregnancy among sexually active adolescents, though no significant behavioral changes were observed.
5	In the Know: A Cluster Randomized Trial of an In-Person Sexual Health Education Program Integrating Digital Technologies for Adolescents	Yarger et al. (2024)	To evaluate the effectiveness of the <i>In the Know</i> sexual health education program integrating digital technologies to improve clinical service use and SRH knowledge among adolescents.	Participants were more likely to use clinical services (42.7% vs 33.2%, $p = 0.009$) and had higher SRH knowledge scores (57.6% vs 50.7%, $p = 0.001$). No significant differences were found in unprotected sex.
6	Enhancing Reproductive Health Among Adolescent Girls in India: Results of an Individualized RCT to Study the Efficacy of the Go Nisha Go Mobile Game	Raj et al. (2025)	To assess the effectiveness of the <i>Go Nisha Go</i> mobile game in improving reproductive health knowledge, menstrual health management, and agency among adolescent girls in India.	The intervention group showed significant improvements in menstrual health knowledge, hygiene practices, and contraceptive awareness. Confidence in negotiating contraceptive use and refusing sex increased. Satisfaction was high, with 74% discussing and 66% recommending the game.
7	Randomized Trial of a Sexual Health Video Intervention for Black and Hispanic Adolescent Females	Jenner et al. (2023)	To evaluate the effectiveness of an entertainment-based sexual health video intervention for Black and Hispanic adolescent girls in improving contraceptive	Participants demonstrated improved contraceptive knowledge, increased STI testing, and higher HIV/STI risk perception. No significant changes were observed in long-acting contraceptive use or condomless sex, except

			knowledge, STI testing, and HIV/STI risk perception.	among first-time service users.	SRH
8	The effectiveness of an m-Health intervention on the sexual and reproductive health of in-school adolescents: a cluster randomized controlled trial in Nigeria	Akande et al. (2024)	To assess the effectiveness of an mHealth intervention in improving SRH knowledge, attitudes, and sexual behaviors among in-school adolescents in Nigeria.	The intervention group showed significantly higher SRH knowledge and attitude scores than the control group. However, no significant reduction in risky sexual behaviors was observed in either group.	

Based on Table 1, this study reviews eight scientific journal articles focusing on digital-based reproductive health education interventions for adolescent girls. Each article is systematically analyzed according to seven main components: research title, researchers, publication year, journal name, research objectives, research design, and key findings. This approach allows for a comprehensive understanding of the effectiveness of various digital interventions in improving reproductive health among adolescent girls.

Digital-based reproductive health education interventions have emerged as a potential solution to overcome the limitations of accessibility and effectiveness associated with conventional sexual health education. Various digital media, such as mobile applications, text messages (mHealth), educational videos, and digital games, have been proven effective in improving knowledge and attitudes of adolescent girls regarding sexual and reproductive health. The studies by Rokicki and Fink (2017) and Yarger et al. (2024) demonstrate that technology-based interventions can enhance knowledge of sexual and reproductive health and the utilization of health services, particularly when accompanied by high levels of participation and interactivity.

However, increased knowledge does not always correspond to sustained behavioral change. Martínez-García et al. (2023) found that although mobile applications can improve positive attitudes toward contraception and confidence in accessing reproductive health services, actual behavioral changes—such as increased use of hormonal contraception or higher visits to health services—did not show significant differences. These findings highlight that changes in sexual behavior require more intensive and long-term interventions.

Approaches involving the social environment, particularly family involvement, show more promising results. Aventin et al. (2020) found that parental involvement in digital reproductive health education improves parent–child communication regarding sexual and reproductive health topics. The majority of parents felt more prepared and confident to discuss SRH issues, which potentially supports more sustainable behavioral change among adolescents.

Game- and entertainment-based interventions also show significant potential. Raj et al. (2025) on the educational game *Go Nisha Go* and Jenner et al. (2023) on entertainment-based videos reported improvements in knowledge, positive attitudes, self-confidence, and adolescent engagement in reproductive health services. Although risky sexual behavior has not yet fully decreased, these approaches are considered more engaging, acceptable, and effective in reaching diverse adolescent groups.

The effectiveness of digital reproductive health education interventions for adolescent girls is increasingly recognized in the scientific literature, especially in improving knowledge and promoting safer health behaviors. Digital interventions, including mobile applications, social media platforms, and game-based approaches, are consistently reported to enhance adolescents' understanding of reproductive health issues and strengthen their capacity to make more informed and responsible decisions.

The digital intervention strategies employed in various studies show diverse forms and implementation mechanisms. First, mobile applications and games are among the most widely applied methods. For example, the educational game *Go Nisha Go* shows a significant increase in knowledge and menstrual health management, with awareness of menstrual hygiene products increasing from 33% to 92% among participants (Raj et al., 2024). This confirms the potential of games as an interactive, engaging educational tool capable of delivering contextual information.

Second, the use of social media and online platforms also shows promising results. Interventions utilizing social media were reported to successfully improve knowledge and positive attitudes toward reproductive health, with a success rate of 90.4% (Muhlisa et al., 2023). This indicates that digital platforms that are already part of adolescents' daily lives can be utilized as effective educational channels, offering wide reach and rapid message delivery.

The impact of digital interventions is not limited to knowledge but also appears in behavioral and attitudinal changes. Several studies indicate reductions in risky sexual behavior and increased self-efficacy among adolescents after participating in digital programs (Rumdari et al., 2025). Additionally, participant engagement and satisfaction with digital interventions

are reported to be high, evidenced by increased discussions among participants about reproductive health topics. This phenomenon suggests a spillover effect in the dissemination of knowledge and motivation for behavioral change (Raj et al., 2024).

Nevertheless, the variability of results across studies indicates that the effectiveness of digital interventions is not yet fully consistent. Differences in social and cultural contexts, digital literacy levels, and intervention designs lead to varied outcomes. Therefore, further studies are needed to standardize intervention approaches, clarify mechanisms of success, and assess long-term impacts on reproductive health behavior change (Borji-Navan et al., 2024).

Overall, digital reproductive health education interventions have been proven effective in improving knowledge and attitudes among adolescent girls, yet challenges remain in achieving consistent and sustainable behavioral changes. Akande et al. (2024) emphasize that social factors, cultural norms, and access to health services play crucial roles in intervention success. Therefore, a more comprehensive, integrative, and sustainable approach is required, along with further research to identify key supporting factors in optimizing digital reproductive health programs for adolescent girls.

4. CONCLUSION

Digital-based reproductive health education interventions have been proven effective in improving adolescent girls' knowledge and attitudes regarding sexual and reproductive health through various media such as mobile applications, text messaging, digital games, and entertainment videos, which provide wide and flexible access. However, increased knowledge does not always translate into sustained behavioral change, such as contraceptive use or reduced engagement in risky sexual behaviors. Therefore, deeper behavioral change requires a more comprehensive approach, including parental involvement, family and community support, and continuous follow-up. Further research is needed to identify the factors that influence the effectiveness of digital interventions and to develop more holistic, inclusive programs that meet the needs of adolescent girls, especially by ensuring equitable access to technology in resource-limited areas.

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