

REVIEW ARTICLE

A Scoping Review of Health Education Interventions to Improve Sexual and Reproductive Health Literacy Among Adolescents

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ABSTRACT

Sexual and reproductive health (SRH) literacy is essential for adolescent wellbeing, yet evidence on effective educational approaches across different contexts remains fragmented. **Aims:** Identifying approaches to improve adolescent SRH knowledge. **Design:** Scoping review. **Data Sources:** Systematic search across multiple databases for studies published between 2019-2025. Most recent search executed on January 27, 2025. Ten studies using randomized controlled trials, quasi-experimental, and observational designs from low- and middle-income countries were analyzed, focusing on adolescents aged 10-24 years. Ten studies from seven countries were included, comprising quasi-experimental (n=6), cross-sectional (n=3), and experimental designs (n=1). Mobile-based interventions showed significant knowledge improvements (26.1% increase in Bangladesh, $p<0.001$). School-based programs demonstrated effectiveness across knowledge domains (e.g., puberty health knowledge in Iran increased from 2.02 to 7.51 on measurement scale). Video-based education showed greater improvements in attitudes and behaviors compared to e-leaflets ($p<0.001$). Sociodemographic factors (age, education level, parental education) were consistent predictors of SRH knowledge across studies. Digital and school-based SRH education interventions effectively improved adolescents' knowledge, attitudes, and behaviors. The review emphasizes the need for equitable program delivery and research on long-term impacts and scalability.

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INTRODUCTION

Adolescence, as defined by the World Health Organization, encompasses the age range of 10–24 years and is a critical period of physical, psychological, and social development. In Indonesia, adolescents constitute a significant portion of the population, representing almost 20% of the total population. This demographic segment plays a pivotal role in the country's future development, making it essential to ensure their health and well-being, including sexual and reproductive health (SRH). Globally, adolescents face numerous SRH challenges, with an estimated 1.5 million adolescents aged 10–24 years dying annually, and nearly 5,000 deaths occurring each day (1). In developing countries, 12 million girls aged 15–19 years give birth annually, with an additional 777,000 births

occurring among girls under 15 years of age. Moreover, 1.7 million adolescents aged 10–19 years live with HIV, with 90% of cases concentrated in developing countries. In Indonesia show that 63 million of the country's 238 million population are adolescents. However, only 9.9% of adolescent girls and 10.6% of adolescent boys aged 15–19 years possess comprehensive knowledge about HIV/AIDS. Furthermore, 0.7% of adolescent girls and 4.5% of adolescent boys have engaged in premarital sexual activity.

The lack of comprehensive SRH education among adolescents contributes to high rates of risky behaviors, early pregnancies, sexually transmitted infections, and unsafe abortions, particularly affecting young women. Education on SRH is essential to equip adolescents with knowledge about their reproductive health, empowering them to make informed decisions and reduce risky behaviors (2). Comprehensive SRH education encompasses physical, psychological, and social aspects, emphasizing the importance of maintaining a healthy reproductive system for future well-being (2,3).

Health education is a key strategy for promoting SRH literacy and encouraging healthy behaviors among adolescents (4,5). Effective health education can be delivered through various methods, such as counseling, advocacy, and information dissemination, tailored to meet the unique needs of adolescents. However, limited access to accurate and timely information remains a significant barrier to improving SRH outcomes (6,7).

Despite various initiatives, gaps remain in the delivery and effectiveness of SRH education, particularly in low-resource settings where cultural and social norms often hinder open discussions about reproductive health. The integration of innovative and evidence-based educational approaches is necessary to bridge these gaps and enhance adolescents' understanding of SRH. Digital health interventions, school-based programs, and peer education have shown promise in improving SRH knowledge, but their effectiveness varies depending on the target population and implementation context. Therefore, a comprehensive review of existing health education interventions is essential to determine best practices and optimize strategies that can be adapted to different sociocultural settings.

Objectives

This review aims to address the following objectives: Identifying approaches to improve adolescent SRH knowledge. To analyze the types of methods that are most effective in delivering health education on SRH to adolescents.

The review focuses on adolescents aged 10–24 years and considers diverse health education methods, including digital platforms, school-based programs, peer education, and community-based approaches. This review seeks to provide actionable insights for educators, policymakers, and healthcare providers to improve SRH literacy and outcomes among adolescents.

Methods

This scoping review was conducted in accordance with the methodological framework proposed by Arksey and O'Malley (8), further refined by Levac et al. (9) and the Joanna Briggs Institute (10), and reported following the PRISMA-ScR guidelines (11).

Protocol and Registration

Although protocol registration is recommended for scoping reviews, this review was conducted prior to establishing protocol registration as a standard practice in our research group.

Eligibility Criteria

The inclusion criteria for this review were determined using the PCC (Population, Concept, Context) framework recommended for scoping reviews:

Population: (1) Adolescents aged 10–24 years, as defined by the World Health Organization. (2) Studies with broader age ranges were included only if separate data for the 10–19 age group could be extracted.

Concept: (1) Digital health education interventions focused on sexual and reproductive health (SRH). (2) Digital interventions were defined as any educational content delivered through computers, mobile devices, internet platforms, social media, mobile applications, or other electronic technologies. (3) SRH education encompassed topics including but not limited to: puberty, reproductive anatomy and physiology, contraception, sexually transmitted infections, pregnancy prevention, healthy relationships, and sexual decision-making

Context: (1) Studies published between January 2019 and January 2024. (2) Published in English-language peer-reviewed journals. (3) No geographical limitations were applied to ensure global representation.

Study Designs: (1) Randomized controlled trials (RCTs). (2) Quasi-experimental studies (non-randomized controlled trials, before-after studies). (3) Observational studies (cohort studies, case-control studies, cross-sectional studies). (4) Mixed-methods studies (where quantitative outcomes related to knowledge could be extracted).

Studies were excluded if they:

1. Did not report outcomes specifically related to knowledge acquisition/change
2. Focused exclusively on populations outside the defined adolescent age range
3. Described interventions that were not explicitly focused on digital health education (e.g., clinical interventions only)
4. Did not include a digital component in the educational intervention
5. Were conference abstracts, editorials, commentaries, reviews, or protocols without original data
6. Full text could not be retrieved despite contacting authors

The rationale for these criteria was to ensure comprehensive mapping of contemporary evidence (past five years) on digital education interventions specifically designed for adolescent SRH knowledge improvement, while maintaining methodological rigor through focus on peer-reviewed publications.

Information Sources

A comprehensive search was conducted across the following electronic databases: PubMed, ProQuest, ScienceDirect, Web of Science, and Scopus. The search did not include grey literature, conference proceedings, but did manual searches of reference lists from relevant articles. The initial search was conducted on 5 December 2024, and an updated search was performed on January

27, 2025, to capture recently published studies. All identified references were imported into Mendeley for deduplication and screening.

Search Strategy

The search strategy was developed using a combination of Medical Subject Headings (MeSH) and free-text terms, including: "adolescent reproductive health", "health education", and "knowledge". Boolean operators (AND/OR) were applied to combine terms, and filters were used to limit studies to the specified date range and languages. A detailed search strategy for PubMed is included in Appendix A.

Selection of Sources of Evidence

The selection process involved two stages:

Stage 1: Title and Abstract Screening

Two independent reviewers (initials: RH and AM) screened all titles and abstracts against the inclusion criteria. Studies clearly not meeting inclusion criteria were excluded. A conservative approach was adopted at this stage, whereby titles/abstracts with insufficient information were included for full-text review.

Stage 2: Full-Text Review

The full texts of potentially relevant studies were retrieved and independently assessed by the same two reviewers against the detailed inclusion/exclusion criteria. Specific reasons for exclusion at this stage were documented for each excluded study. Any disagreements between reviewers were resolved through discussion or, when consensus could not be reached, consultation with a third (initials: YA).

Weekly team meetings were held throughout the screening process to discuss challenges in applying the inclusion/exclusion criteria and to ensure consistency. A PRISMA flow diagram was created to document the complete selection process, including the number of studies identified, screened, assessed for eligibility, and included in the review, along with reasons for exclusions.

Data Items & Charting Process

Data were charted using a standardized form developed and pre-tested by the review team. Key variables were extracted independently by two reviewers, and discrepancies were resolved by consensus. The following data items were extracted from included studies: Author(s), year, and country, Study design, Sample characteristics, Health education intervention details (e.g., type, duration, delivery method), Outcome measures, and Key findings

Critical appraisal of included studies was not conducted, as this scoping review aimed to map the evidence rather than assess the quality of individual studies. However, methodological limitations of included studies were noted where applicable.

Synthesis of Results

Data were synthesized descriptively to map the range of health education interventions and their reported outcomes. Thematic analysis was conducted to identify patterns and factors associated with the effectiveness of interventions. Results are presented in tabular and narrative formats to facilitate understanding.

Results

Selection of Sources of Evidence

The database search identified a total of 158 records (4 from PubMed, 127 from ProQuest, 18 from ScienceDirect, and 9 from Scopus). After checking for duplicates, 132 unique records remained. These were screened based on titles and abstracts, and 24 full-text articles were assessed for eligibility. Of these, 10 studies met the inclusion criteria, all of which employed a randomized controlled trial (RCT) or quasi-experimental study design. The primary reasons for exclusion during the full-text review were: Studies not employing RCT or quasi-experimental designs (n=8). Interventions not health education for reproductive health (n=6). A detailed breakdown of the selection process is provided in the PRISMA flow diagram (Figure 1).

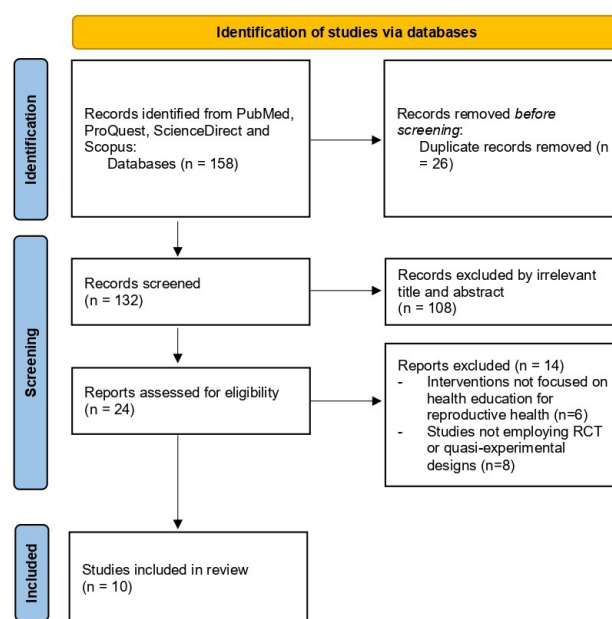


Figure 1: PRISMA flow diagram

Characteristics of Sources of Evidence

The included studies were published between 2019 and 2025, with the majority (n=6) published between 2020 and 2021. The included studies comprised a mix of quasi-experimental (6 studies) (12–17), cross-sectional (3 studies) (18–20), and experimental (1 study) (21) designs. Geographically, studies were conducted in diverse low- and middle-income countries, including India (20), Indonesia (15,16,21), Thailand (17), Bangladesh (12), Iran (13), Egypt (18), and Ethiopia (19).

Table 1: Included Studies (N=10)

Author(s), Year, Country	Study Design	Sample Characteristics	Health Education Intervention	Outcome Measures	Key Findings
Premyuda Nararat, Surasak Taneepanichskul, Ramesh Kumar, Ratana Somrongthong (2021), Thailand (9)	Comparative cross-sectional study with pre-post design	128 female secondary school students from two rural schools in Thailand, selected via simple random sampling	Mobile messages on sexual and reproductive health literacy, delivered over 24 weeks to one group; the other group received routine care	Baseline and endline sexual health literacy scores (four domains)	Mobile messages significantly improved sexual health literacy ($p<0.05$) across all four domains in the intervention group, while no significant changes were observed in the control group ($p=0.521$).
Tanima Ahmed (2020), Bangladesh (10)	Before-after quasi-experimental study	400 adolescent girls aged 14–19 years, selected randomly from 8 schools in Dhaka North City Corporation	SMS-based intervention on reproductive health delivered through mobile phones for 8 weeks	Pre- and post-intervention knowledge scores on reproductive health; SMS response rates; linear regression analysis	Post-intervention knowledge score (mean $70.8\pm9.7\%$) was significantly higher than pre-intervention (mean $44.71\pm9.13\%$, $p<0.001$). SMS response rate positively correlated with knowledge gain ($+0.636$, $p<0.001$).
Roza Bahari, Farkhondeh Amin Shokravi, Monireh Anoshah, Maryam Moridi (2021), Iran (11)	Quasi-experimental study	100 visually impaired female students aged 10–19 years, recruited via convenience sampling from Narjes educational center in Tehran	Health education program designed based on an educational needs assessment survey, focused on puberty health, delivered with suitable strategies for visually impaired students	Knowledge about puberty health (baseline and 1-month follow-up); domains include onset of puberty changes and personal hygiene	Knowledge about puberty health significantly increased in all domains after the intervention ($p<0.05$). Highest increase was in knowledge about the onset of puberty changes (from 2.02 to 7.51). Minimal change in personal hygiene (6.67 to 8.23).
Wenny Artanty Nisman et al. (2020), Indonesia (12)	Quasi-experimental study with nonequivalent control group design	135 students (boys and girls) selected purposively from two schools in Indonesia, ages not specified	Reproductive health education based on gender equality, provided as a school-based intervention	Knowledge, attitudes, and self-efficacy of adolescent boys and girls (pre- and post-intervention scores)	Intervention significantly improved knowledge in girls ($p=0.006$) but not attitudes or self-efficacy. Boys showed no improvement in knowledge, attitudes, or self-efficacy compared to the control group.
Nesreen Mohamed Kamal Elden et al. (2019), Egypt (13)	Descriptive cross-sectional study	412 schoolgirls from 3 randomly selected public schools in a rural district in Fayoum Governorate, aged 10–19 years	None (assessment only)	Reproductive health knowledge score (categorized as high or low); perception of violence	Over two-thirds of participants had low reproductive health knowledge (mean score: 12.5/28). Age (AOR=1.6) and fathers' education (AOR=1.4) predicted high knowledge. Approximately 31% of participants accepted physical punishment from parents.
Cecep Eli Kosasih et al. (2024), Indonesia (14)	Quasi-experimental study	154 senior high school students from two public schools in Bandung Regency, West Java, Indonesia, randomly recruited	Educational messages on Triad ARH delivered via LINE for Group A (78 students) and WhatsApp for Group B (76 students), with pre-test and post-test assessments	Knowledge, attitudes, and behavior scores (pre- and post-intervention)	Significant improvement in knowledge, attitudes, and behaviors in both LINE and WhatsApp groups ($p=0.001$). LINE group showed slightly higher improvement in knowledge and attitudes, while WhatsApp group had higher improvement in behavior. No statistically significant difference between the two platforms ($p>0.05$).
Nebiyou Fasil et al. (2022), Ethiopia (15)	Community-based cross-sectional study	3290 adolescent girls aged 13–17 years, recruited from West Hararghe, rural Ethiopia	Peer-group discussions on SRH topics (intervention targeted girls aged 10–14 years)	Comprehensive knowledge of HIV (assessed using a tool adapted from demographic and health survey questionnaires)	Comprehensive knowledge of HIV was very low overall (14.84%). Girls receiving SRH education had higher odds of comprehensive HIV knowledge (AOR=1.36, $p<0.05$). Older age (AOR=1.73) and attending secondary school (AOR=3.89) were also associated with increased comprehensive HIV knowledge.

CONTINUE

Table I. Included Studies (N=10)(cont.)

Author(s), Year, Country	Study Design	Sample Characteristics	Health Education Intervention	Outcome Measures	Key Findings
Neneng Dewi Yuliasih et al. (2025), Indonesia (16)	Quasi-experimental study	166 female first-year university students divided into two groups: video intervention (n=83) and e-leaflet control (n=83)	Reproductive health education through videos (study group) and e-leaflets (control group), conducted in Jatinangor District	Knowledge, attitude, and behavior scores before and after the intervention	Both groups showed significant improvement in knowledge, attitudes, and behaviors after the intervention ($p<0.001$). No significant difference in knowledge improvement between groups ($p>0.001$). Attitude and behavior improvement were significantly better in the video group ($p<0.001$).
Murdiningsih et al. (2020), Indonesia (17)	Experimental study with pre-post intervention	192 students in Palembang, Indonesia, meeting inclusion criteria	Adolescent reproductive health education to improve knowledge, attitudes, and control of premarital sexual behavior	Premarital sexual behavior, knowledge, and attitudes assessed pre- and post-intervention	Significant relationship between knowledge, reproductive health attitudes, and control behaviors with premarital sexual behavior ($p=0.00$). Knowledge was the dominant factor influencing premarital sexual behavior ($p=0.00$). Recommended inclusion of reproductive health education in school curricula.
Niharika Tripathi (2021), India (18)	Cross-sectional study with logistic regression analysis	160,551 unmarried young women aged 15–24 years from the District Level Reproductive and Child Health Survey (DLHS: 2007–2008)	Access to family life/sex education (FLE) and its relationship with attitudes towards sexual and reproductive health matters	Attitudes towards reproductive processes, contraceptive methods, and RTI/STI and HIV/AIDS transmission pathways	Women with access to FLE were significantly more likely to hold favorable attitudes towards sexual and reproductive health matters, including precise knowledge of transmission pathways of RTIs/STIs and HIV/AIDS. Access to FLE was lower among women from disadvantaged socioeconomic backgrounds.

Sample sizes ranged widely from 100 to 160,551 participants, with a median sample size of 161 participants (excluding the outlier study with 160,551 participants). Eight studies focused exclusively on female adolescents, while two included both male and female participants. The age range of participants across studies was 10-24 years, with most studies focusing on the 10-19 age group, aligning with the WHO definition of adolescence.

Critical Appraisal within Sources of Evidence

The methodological quality of included studies varied. All quasi-experimental and experimental studies (n=8) utilized pre-post intervention assessments to measure changes in outcomes. However, only one study (17) employed a comparative design with a control group receiving routine care, which strengthens the validity of the findings. The remaining studies either used non-equivalent control groups or had no control groups, limiting causal inferences.

Sample selection strategies also varied in rigor, with four studies using random sampling methods, while others employed convenience or purposive sampling, potentially introducing selection bias. Additionally,

follow-up periods were generally short (1-8 weeks post-intervention), limiting assessment of long-term intervention effects.

Results of Individual Sources of Evidence

Mobile-based interventions

Three studies evaluated mobile-based reproductive health education interventions. Narkarat et al. (2021) (17) found that mobile messages delivered over 24 weeks significantly improved sexual health literacy across all four domains among female secondary school students in Thailand ($p<0.05$), while no significant changes were observed in the control group. Similarly, Ahmed (2020) (12) demonstrated that an 8-week SMS-based intervention in Bangladesh significantly increased reproductive health knowledge among adolescent girls (from $44.71\%\pm 9.13\%$ to $70.8\%\pm 9.7\%$, $p<0.001$), with SMS response rates positively correlating with knowledge gain ($+0.636$, $p<0.001$).

Kosasih et al. (2024) (15) compared two mobile messaging platforms (LINE and WhatsApp) for delivering educational messages on the Adolescent Reproductive Health Triad in Indonesia, finding significant

improvements in knowledge, attitudes, and behaviors in both groups ($p=0.001$). The LINE platform showed slightly better results for knowledge and attitudes, while WhatsApp yielded greater improvement in behavior, though differences between platforms were not statistically significant ($p>0.05$).

School-based interventions

Four studies examined school-based reproductive health education interventions. Bahari et al. (2021) (13) implemented a specialized education program for visually impaired female students in Iran, resulting in significant knowledge increases across all domains of puberty health ($p<0.05$), with the greatest improvement in knowledge about the onset of puberty changes (from 2.02 to 7.51 on the measurement scale).

Nisman et al. (2020) (14) evaluated a gender-equality-based reproductive health education program in Indonesia, finding significant knowledge improvement among female students ($p=0.006$) but not among male students, with neither group showing significant changes in attitudes or self-efficacy.

Murdiningsih et al. (2020) (21) demonstrated that reproductive health education significantly improved knowledge, attitudes, and control of premarital sexual behavior among Indonesian students ($p=0.00$), with knowledge identified as the dominant factor influencing premarital sexual behavior.

Yuliasih et al. (2025) (16) compared video-based versus e-leaflet reproductive health education among female university students in Indonesia. Both interventions significantly improved knowledge, attitudes, and behaviors ($p<0.001$), with the video intervention showing significantly better results for attitude and behavior change ($p<0.001$), though knowledge improvement was similar between groups.

Assessment-only and community-based studies

Two studies did not implement interventions but assessed reproductive health knowledge and associated factors. Elden et al. (2019) (18) found that over two-thirds of rural Egyptian schoolgirls had low reproductive health knowledge (mean score: 12.5/28), with age ($AOR=1.6$) and fathers' education ($AOR=1.4$) predicting higher knowledge levels.

One study examined community-based interventions. Fasil et al. (2022) (19) evaluated the impact of peer-group discussions on comprehensive HIV knowledge among rural Ethiopian adolescent girls, finding very low overall knowledge levels (14.84%). Girls who received sexual and reproductive health education had significantly higher odds of comprehensive HIV knowledge ($AOR=1.36$, $p<0.05$), as did older girls ($AOR=1.73$) and those attending secondary school ($AOR=3.89$).

Finally, Tripathi (2021) (20) analyzed data from 160,551

unmarried young women in India, finding that access to family life/sex education was significantly associated with favorable attitudes toward sexual and reproductive health matters, including better knowledge of RTI/STI and HIV/AIDS transmission. The study also highlighted lower access to such education among women from disadvantaged socioeconomic backgrounds.

Synthesis of Results

This scoping review identified several key trends across the included studies. First, multiple delivery methods for reproductive health education were evaluated, including mobile-based approaches, school-based interventions, and peer-group discussions, with mobile-based interventions consistently showing significant positive outcomes across knowledge, attitudes, and behaviors.

Second, interventions targeting specific populations (e.g., visually impaired students, females only) showed promising results when tailored to participant needs. However, gender differences were observed in some interventions' effectiveness, with one study finding significant knowledge improvements among female but not male participants.

Third, while knowledge improvements were consistently reported across interventions, changes in attitudes and behaviors were more variable, suggesting that knowledge acquisition may not always translate to behavioral change without additional supportive components.

Fourth, sociodemographic factors including age, education level, and parental education were significant predictors of reproductive health knowledge across multiple studies, highlighting the importance of considering social determinants when designing interventions.

Finally, the evidence suggests that both traditional educational approaches and technology-enhanced methods can be effective for reproductive health education, though their comparative effectiveness may depend on cultural context, resource availability, and target population characteristics.

Discussion

This scoping review evaluated the effectiveness of health education interventions in improving adolescent sexual and reproductive health (SRH) literacy and behaviors while identifying implementation challenges. The evidence gathered revealed diverse intervention designs, target populations, and delivery methods, demonstrating the evolving landscape of SRH education approaches. Digital interventions emerged as a promising strategy for SRH education.. Similarly, Fowler et al. (2022)(22) demonstrated TikTok's potential in addressing gaps in traditional sex education, with topics like female anatomy and sexual pleasure gaining significant traction

among adolescents.

The importance of contextual and culturally sensitive interventions was underscored by multiple studies. Morales et al. (2019)(23) emphasized the need for culturally adapted interventions, particularly in low-resource settings, highlighting the significance of addressing local cultural nuances such as challenging machismo in Colombian sexual health education. Okeke et al. (2022)(24) further noted that SRH needs vary significantly based on gender, schooling, and marital status, calling for nuanced, gender-responsive approaches.

Emerging research also highlighted the critical role of digital health in addressing comprehensive SRH needs. Huang et al. (2022)(25) suggested that digital health strategies offer potential for overcoming multiple barriers in sexual and reproductive health services, particularly in low- and middle-income countries. Contextual challenges were significant. Millanzi et al. (2023)(26) found that in Tanzania, 69.7% of adolescents were sexually active, with 44.8% engaging in voluntary sexual behaviors. Factors such as exposure to drug abuse, media, and social groups significantly influenced early sexual debut. This underscores the complexity of adolescent sexual behaviors and the need for comprehensive, nuanced interventions. Mulubawa et al. (2020)(27) proposed that successful SRH interventions are more likely to be effective when supported by contextual factors, including existing policies, socio-cultural norms, and community health system structures. The study suggested that interventions triggering individual and collective mechanisms could transform community-based health systems to be more responsive to adolescent SRH needs.

Limitations

This scoping review has several limitations that should be acknowledged. First, the included studies exhibited considerable heterogeneity in terms of study design, sample size, intervention type, and outcome measures, which may have affected the consistency of findings. Second, most studies relied on self-reported data, which is prone to biases such as social desirability and recall errors. Third, the geographic focus of the studies was predominantly in Asia and Africa, potentially limiting the generalizability of findings to other regions with differing cultural or socioeconomic contexts. Additionally, publication bias may have influenced the results, as studies with positive outcomes are more likely to be published than those with null or negative findings. Lastly, the scoping review did not systematically assess the methodological quality of the included studies, which could have provided a more robust evaluation of the evidence.

Conclusions

The results of this scoping review highlight the critical

role of health education interventions in improving adolescent SRH literacy and behaviors, with digital tools emerging as particularly promising. These interventions, when designed to be interactive, culturally sensitive, and inclusive, can significantly enhance knowledge and promote healthier attitudes and behaviors. Key implications include the need for policymakers to prioritize the integration of digital education into existing SRH programs, particularly in low-resource settings. Educators should focus on developing gender-sensitive strategies to address disparities in intervention effectiveness. Future research should aim to explore long-term outcomes of these interventions, examine their scalability, and assess their cost-effectiveness in diverse contexts. Addressing the limitations of current evidence, such as ensuring methodological rigor and expanding geographic representation, will be essential for advancing the field. Overall, this review provides valuable insights for the development and implementation of effective SRH education strategies, contributing to improved adolescent health outcomes globally.

REFERENCE

1. WHO. Adolescent and young adult health [Internet]. World Health Organization. 2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions>
2. Utami DRRB, Nurwati I, Lestari A. School-based sexual and reproductive health education among adolescents in developing countries. *Int J Public Heal Sci.* 2024;13(1). <https://doi.org/10.11591/ijphs.v13i1.23267>
3. Akande OW, Muzigaba M, Igumbor EU, Elimian K, Bolarinwa OA, Musa OI, et al. The effectiveness of an m-Health intervention on the sexual and reproductive health of in-school adolescents: a cluster randomized controlled trial in Nigeria. *Reprod Health.* 2024;21(1). <https://doi.org/10.1186/s12978-023-01735-4>
4. Atari DO, Tariquzzaman SK, Nancy A. Knowledge and Perceptions on Menstrual Hygiene Management Among School-Going Adolescent Girls in South Sudan. *J Adolesc Res.* 2024;39(2). <https://doi.org/10.1177/07435584211043293>
5. Achigibah AD, AmdjadFar M, Krugu JK, Ruitter RAC, Mevissen FEF. The end point of it is abstinence: a qualitative analysis of underlying factors influencing Christian leaders' adoption and implementation of sex and sexuality education in Bolgatanga, Ghana. *Cult Heal Sex.* 2024; <https://doi.org/10.1080/13691058.2024.2311138>
6. Klu D, Gyapong M, Agordoh PD, Azagba C, Acquah E, Doegah P, et al. Adolescent perception of sexual and reproductive health rights and access to reproductive health information and services

- in Adaklu district of the Volta Region, Ghana. *BMC Health Serv Res.* 2023;23(1). <https://doi.org/10.1186/s12913-023-10447-1>
7. Vongxay V, Albers F, Thongmixay S, Thongsombath M, Broerse JEW, Sychareun V, et al. Sexual and reproductive health literacy of school adolescents in Lao PDR. *PLoS One.* 2019;14(1). <https://doi.org/10.1371/journal.pone.0209675>
8. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* [Internet]. 2005 Feb;8(1):19–32. <https://doi.org/10.1080/1364557032000119616>
9. Levac D, Colquhoun H, O'Brien KK. Scoping studies: Advancing the methodology. *Implement Sci.* 2010;5(1). <https://doi.org/10.1186/1748-5908-5-69>
10. Tricco AC, Lillie E, Zarin W, O'Brien K, Colquhoun H, Kastner M, et al. A scoping review on the conduct and reporting of scoping reviews. Vol. 16, *BMC Medical Research Methodology.* 2016. <https://doi.org/10.1186/s12874-016-0116-4>
11. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med* [Internet]. 2018 Oct 2;169(7):467–73. <https://doi.org/10.7326/M18-0850>
12. Ahmed T. Effect of mHealth tool on knowledge regarding reproductive health of school going adolescent girls: a before-after quasi-experimental study. *BMJ Open.* 2020;10(10). <https://doi.org/10.1136/bmjopen-2019-036656>
13. Bahari R, Shokravi FA, Anosheh M, Moridi M. Effect of a health education program on puberty knowledge among visually impaired female adolescent students. *Med J Islam Repub Iran.* 2021;35(June):74. <https://doi.org/10.47176/mjiri.35.74>
14. Nisman WA, Parmawati I, Setyoharsih TW, Gita RVF, Annisa R. How does health reproduction education based on gender equality influence knowledge, attitudes, and self-efficacy in adolescents? *Enfermeria Clínica.* 2020;30(7):11–5. <https://doi.org/10.1016/j.enfcli.2020.09.002>
15. Kosasih CE, Solehati T, Maryati I. Comparing the effect of LINE-based and WhatsApp-based educational interventions on reproductive health knowledge, attitudes, and behaviors among Triad adolescents: A quasi-experimental study. *Belitung Nurs J* [Internet]. 2024 Feb 28;10(1):87–95. <https://doi.org/10.33546/bnj.3033>
16. Yuliasih N, Sari P, Bestari A, Martini N, Sujatmiko B. Does Health Education Through Videos and E-Leaflet Have a Good Influence on Improving Students' Reproductive Health Knowledge, Attitudes, and Practices? an Intervention Study in Jatinangor, Indonesia. *Adv Med Educ Pract* [Internet]. 2025 Jan;Volume 16:29–39. <https://doi.org/10.2147/AMEP.S487338>
17. Narkarat P, Taneepanichskul S, Kumar R, Somrongthong R. Effects of mobile health education on sexual and reproductive health information among female school-going adolescents of rural Thailand. *F1000Research.* 2021;10(June). <https://doi.org/10.12688/f1000research.53007.1>
18. Elden NMK, Khairy WA, Elsebaei EH. Knowledge of Reproductive Health and Perception of Violence Among Rural Schoolgirls in Egypt. *J Pediatr Adolesc Gynecol* [Internet]. 2019 Aug;32(4):368–76. <https://doi.org/10.1016/j.jpag.2019.01.004>
19. Fasil N, Worku A, Oljira L, Tadesse AW, Berhane Y. Association between sexual and reproductive health education in peer group and comprehensive knowledge of HIV among adolescent girls in rural eastern Ethiopia: a community-based cross-sectional study. *BMJ Open* [Internet]. 2022 Oct 3;12(10):e063292. <https://doi.org/10.1136/bmjopen-2022-063292>
20. Tripathi N. Does family life education influence attitudes towards sexual and reproductive health matters among unmarried young women in India? *PLoS One* [Internet]. 2021 Jan;16(1). <https://doi.org/10.1371/journal.pone.0245883>
21. Murdiningsih M, Rohaya R, Hindun S, Ocktariyana O. The effect of adolescent reproductive health education on premarital sexual behavior. *Int J Public Heal Sci* [Internet]. 2020 Dec 1;9(4):327. <https://doi.org/10.11591/ijphs.v9i4.20444>
22. Cohen LP, Gefen A, Peko Cohen L, Gefen A. Phantom testing of the sensitivity and precision of a sub-epidermal moisture scanner. *Int Wound J* [Internet]. 2019;16(4):979–88. <https://doi.org/10.1111/iwj.13132>
23. Morales A, Garcia-Montaco E, Barrios-Ortega C, Niebles-Charris J, Garcia-Roncallo P, Abello-Luque D, et al. Adaptation of an effective school-based sexual health promotion program for youth in Colombia. *Soc Sci Med.* 2019;222. <https://doi.org/10.1016/j.socscimed.2019.01.011>
24. Okeke CC, Mbachu CO, Agu IC, Ezenwaka U, Arize I, Agu C, et al. Stakeholders' perceptions of adolescents' sexual and reproductive health needs in Southeast Nigeria: a qualitative study. *BMJ Open.* 2022;12(6). <https://doi.org/10.1136/bmjopen-2021-051389>
25. Huang KY, Kumar M, Cheng S, Urcuyo AE, Macharia P. Applying technology to promote sexual and reproductive health and prevent gender based violence for adolescents in low and middle-income countries: digital health strategies synthesis from an umbrella review. *BMC Health Serv Res.* 2022;22(1). <https://doi.org/10.1186/s12913-022-08673-0>
26. Millanzi WC, Osaki KM, Kibusi SM. Attitude and

prevalence of early sexual debut and associated risk sexual behavior among adolescents in Tanzania; Evidence from baseline data in a Randomized Controlled Trial. BMC Public Health. 2023;23(1). <https://doi.org/10.1186/s12889-023-16623-6>

27. Mulubwa C, Hurtig AK, Zulu JM, Michelo

C, Sandøy IF, Goicolea I. Can sexual health interventions make community-based health systems more responsive to adolescents? A realist informed study in rural Zambia. Reprod Health. 2020;17(1). <https://doi.org/10.1186/s12978-019-0847-x>