



Effectiveness of Sexual and Reproductive Health Education Interventions among Adolescents: A Systematic Review

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Abstract. *Background:* Adolescents remain vulnerable to adverse sexual and reproductive health (SRH) outcomes, including unintended pregnancy, sexually transmitted infections (STIs), HIV exposure, unsafe abortion, and limited access to youth-friendly services. Comprehensive sexuality education is recommended as a core public health strategy to improve knowledge, attitudes, skills, and protective behaviors. *Objective:* This systematic review synthesized intervention evidence on the effectiveness of SRH education among adolescents and young adults. *Methods:* The review followed PRISMA 2020 guidance. Scopus, PubMed, and Dimensions were searched for English-language studies published from 2016 to 2025. Eligible studies included adolescents or young adults exposed to school- or community-based SRH education interventions and reported measurable knowledge, attitudinal, self-efficacy, service use, or behavioral outcomes. The risk of bias was assessed using the Cochrane RoB 2 tool. Due to heterogeneity in interventions and outcome measures, findings were synthesized narratively. *Results:* From 394 records, 18 duplicates were removed, and 376 records were screened. Five full-text reports were assessed, two were excluded after methodological appraisal, and three studies were included. The included studies were conducted in Colombia, India, and Liberia and collectively showed positive effects of SRH education on reproductive-health knowledge, HIV/STI knowledge, self-efficacy, condom-related attitudes, contraceptive use, condom use, and HIV testing. Participatory approaches, including group discussion, peer learning, role-play, and service-linked education, appeared particularly promising. *Conclusion:* SRH education interventions can improve adolescents' SRH knowledge and selected protective behaviors, especially when interactive, culturally responsive, and linked to accessible services. However, the small number of included studies, self-reported outcomes, and heterogeneity of measures limit certainty. Future trials should use standardized outcomes, longer follow-up periods, implementation fidelity assessment, and equity-sensitive analyses.

Keywords: *Adolescents; Comprehensive Sexuality Education; HIV Prevention; Reproductive Health; School-Based Intervention*

1. Introduction

Adolescence is a developmental period marked by rapid biological, psychological, social, and relational transitions. These transitions create opportunities for health promotion, but they may also increase vulnerability to sexual and reproductive health (SRH) risks when adolescents have limited access to accurate information, confidential services, and supportive social environments. Globally, adolescent pregnancy, STIs, HIV exposure, gender-based violence, and unsafe sexual practices remain major public health priorities (World Health Organization, 2024a, 2025).

Comprehensive sexuality education (CSE) is an evidence-informed approach that aims to equip young people with knowledge, skills, attitudes, and values needed to make

informed decisions, develop respectful relationships, protect their health, and understand their rights (UNESCO, 2018; WHO, 2018). Unlike one-time didactic health talks, effective SRH education should be age-appropriate, culturally responsive, gender-transformative, participatory, and connected to youth-friendly services.

Previous reviews have shown that school-based sex education and HIV-prevention programs in low and middle-income countries may improve knowledge and selected behavioral outcomes, although effects vary according to intervention content, intensity, implementation fidelity, and access to services (Denford et al., 2017; Fonner et al., 2014; Haberland & Rogow, 2015). Evidence remains heterogeneous because SRH interventions differ in curriculum content, duration, facilitator training, theoretical foundation, target population, and outcome measurement.

The original draft of this systematic review identified promising evidence from intervention studies but required strengthening in several areas: explicit PICOS criteria, a reproducible search strategy, PRISMA-consistent reporting, clearer risk-of-bias interpretation, and a more analytical synthesis. The present revised manuscript addresses those gaps and synthesizes current intervention evidence on the effectiveness of SRH education among adolescents and young adults. SRH education interventions can improve adolescents' SRH knowledge and selected protective behaviors, especially when interactive, culturally responsive, and linked to accessible services; this study is relevant to SDGs 3 and 5.

2. Methods

Methods from this review align with the PRISMA 2020 guidelines, ensuring a rigorous approach to identifying, selecting, and synthesizing relevant literature (Denford et al., 2016; Fernández et al., 2021). The search strategy used a structured query string across databases to capture both published academic articles and grey literature, ensuring comprehensive coverage of school-based and community-led pedagogical models (Kabelka et al., 2025; Vaikla et al., 2025). The search string was constructed using controlled vocabulary and free-text terms tailored to the study's specific population, intervention, comparison, and outcome parameters.

2.1. Design and Reporting Standard

This systematic review was prepared in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement, which provides reporting guidance for systematic reviews evaluating health interventions (Page et al., 2021a, 2021b). A meta-analysis was not conducted because the included studies varied substantially in intervention design, outcome definitions, measurement tools, and follow-up periods.

2.2. Review Question and PICOS Framework

The review question was: Among adolescents and young adults, how effective are SRH education interventions at improving reproductive health knowledge, attitudes, self-efficacy, service use, and protective sexual behaviors? The research parameters were defined by the population (adolescents and young adults aged 10–24), intervention (school- or community-based SRH education), comparison (alternative or no intervention), outcome (knowledge, attitudes, and behaviors), and study design (randomized and non-randomized controlled trials). Specifically, the inclusion criteria focused on quantitative and mixed-methods research targeting youth aged 10–19 years within school or community settings.

Table 1. Research question and framework

PICOS element	Operational definition
Population	Adolescents and young adults participating in school-based, community-based, or alternative education programmes.
Intervention	Any structured SRH education intervention, including CSE, HIV/STI prevention education, reproductive-health counselling, peer education, group learning, role-play, educational handbook use, or service-linked SRH education.
Comparator	No intervention, standard curriculum, delayed intervention, alternative education site, or usual practice.
Outcomes	SRH knowledge, HIV/STI knowledge, reproductive-health attitudes, self-efficacy, condom attitudes, condom use, contraceptive use, HIV testing, and other protective SRH behaviours.
Study design	Randomized controlled trials, cluster-randomized trials, randomized evaluations, and quasi-experimental intervention studies.

2.3. Information Sources and Search Strategy

Scopus, PubMed, and Dimensions were searched for English-language articles published from 2016 to 2025. The search combined controlled vocabulary and free-text terms related to adolescents, SRH, education, interventions, and reproductive health outcomes. The search was intentionally limited to peer-reviewed articles to support manuscript suitability for international journal submission.

Table 2. Search strategy

Database	Search concept used
PubMed	(adolescent* OR youth OR young people OR young adult*) AND (sexual and reproductive health OR reproductive health OR sexuality education OR comprehensive sexuality education OR HIV prevention OR STI prevention) AND (education OR intervention OR program* OR school-based OR community-based) AND (knowledge OR attitude* OR self-efficacy OR condom use OR contraceptive use OR HIV testing)
Scopus	TITLE-ABS-KEY(adolescent* OR youth OR young people OR young adult*) AND TITLE-ABS-KEY("sexual and reproductive health" OR "reproductive health" OR "sexuality education" OR "comprehensive sexuality education" OR "HIV prevention" OR "STI prevention") AND TITLE-ABS-KEY(education OR intervention OR program* OR school-based OR community-based)
Dimensions	adolescent sexual reproductive health education intervention knowledge attitude condom contraceptive HIV testing

2.4. Eligibility Criteria

Studies were included if they: (a) enrolled adolescents or young adults; (b) evaluated a structured SRH education intervention; (c) used an experimental, cluster-randomized, randomized evaluation, or quasi-experimental design; (d) reported measurable SRH outcomes; and (e) were available as full-text English-language journal articles. Studies were <https://journal.scitechgrup.com/index.php/jsi>

excluded if they were reviews, protocols, conference proceedings, opinion papers, non-intervention studies, studies outside the target population, or studies that did not report SRH-related outcomes. Reports judged to have serious methodological concerns during the full-text appraisal were excluded from the final synthesis and documented accordingly. Furthermore, the literature search and screening process, including the evaluation of grey literature and hand-searching of reference lists, was visualized using a PRISMA flow diagram to ensure full transparency. Two independent reviewers performed title and abstract screening, with conflicts resolved through consensus or consultation with a third author (Utami et al., 2023). Additionally, the methodological quality and risk of bias for each selected study were appraised using standardized JBI critical appraisal tools to ensure the reliability of the evidence synthesis.

2.5. Study Selection and Data Extraction

After duplicate removal, titles and abstracts were screened against eligibility criteria. Full texts of potentially eligible reports were assessed for final inclusion. A standardized extraction form captured author, year, country, design, sample size, intervention characteristics, comparator, follow-up, and primary outcomes. Extracted findings were checked for consistency before synthesis. Data management was facilitated by specialized citation software to organize records exported from electronic databases and to ensure systematic tracking of the review process (Feroz et al., 2021). To manage this workflow, EndNote was used for deduplication and source management. Discrepancies during screening were resolved through discussion between the two reviewers, with an independent third author consulted if consensus could not be reached. Following the initial screening, a random 10% subset of the excluded citations was cross-validated by a third researcher to ensure the robustness of the selection process and minimize potential selection bias.

2.6. Risk of Bias Assessment

Risk of bias was assessed using the revised Cochrane Risk of Bias tool for randomized trials (RoB 2), which evaluates bias arising from the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selection of the reported result (Sterne et al., 2019; The Cochrane Collaboration, 2024). Cluster-randomized trials were interpreted with attention to baseline balance and cluster-level allocation. Overall judgments were categorized as low risk, some concerns, or high risk. For non-randomized and quasi-experimental studies, the Joanna Briggs Institute critical appraisal checklists were used to assess methodological robustness and potential confounding variables (Alanazi et al., 2024; Banharak et al., 2023). Two reviewers independently conducted these appraisals to ensure consistency, with any disagreements resolved through discussion or by consulting a third reviewer. This rigorous appraisal process ensured that only studies meeting a minimum threshold of methodological quality were retained for the subsequent narrative. Data synthesis involved summarizing key intervention characteristics and pooling effect sizes where study heterogeneity permitted.

2.7. Data Synthesis

A narrative synthesis was performed because the intervention content, educational intensity, outcome measures, and follow-up periods varied too widely to be comparable for quantitative pooling. Findings were grouped by outcome domain: knowledge, attitudes and

self-efficacy, service use, and protective behaviors. comparable for quantitative pooling. Findings were grouped by outcome domain: knowledge, attitudes and self-efficacy, service use, and protective behaviors. To ensure analytical consistency, we summarized overarching themes and assessed the direction of outcomes for interventions that shared common characteristics (Diamond-Smith et al., 2018). Beyond this narrative synthesis, integrating implementation science perspectives offers critical insights into understanding how intervention delivery fidelity interacts with contextual dynamics such as prevailing cultural norms and local health system readiness to influence program effectiveness. By examining the interplay between implementation processes and environmental constraints, this analysis elucidates how specific contextual factors, frequently neglected in traditional quantitative data syntheses, actively shape intervention outcomes. Such a nuanced perspective is essential for identifying actionable mechanisms of change, ultimately providing a more robust foundation for developing adaptive and reliable adolescent sexual and reproductive health policies tailored to diverse socio-economic environments.

3. Results and Discussion

3.1. Results

The following section outlines the findings of this systematic review, beginning with the PRISMA-guided study selection process and the characteristics of the included interventions. Following this, the methodological quality of the selected studies is appraised, leading to a narrative synthesis of intervention outcomes, including improvements in knowledge, attitudes, self-efficacy, and sexual and reproductive health practices. In alignment with the Context and Implementation of Complex Interventions framework, these results are organized to distinguish between the implementation strategies employed and the mechanisms through which interventions successfully achieve their intended outcomes. Specifically, the search strategy yielded a comprehensive corpus of studies, which were rigorously screened to identify those most relevant to adolescent reproductive health outcomes.

3.1.1. Study Selection

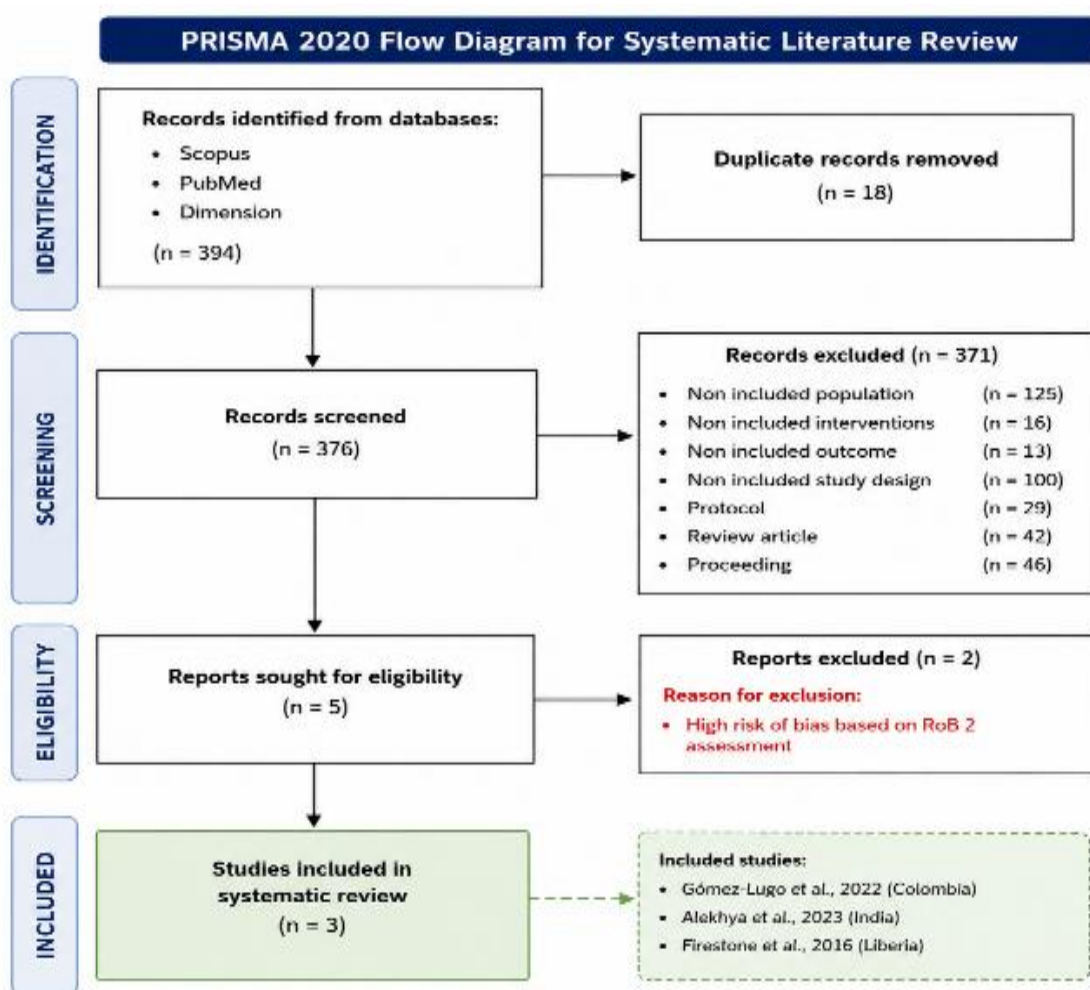
The search identified 394 records. After removing 18 duplicates, 376 records were screened. A total of 371 records were excluded during title and abstract screening because they did not meet the population, intervention, outcome, or design criteria, or because they were protocols, reviews, or conference proceedings. Five full-text reports were assessed for eligibility. Two reports were excluded after methodological appraisal. Three studies were included in the final systematic review: Gómez-Lugo et al. (2022), Alekhya et al. (2023), and Firestone et al. (2016).

Table 3. Study selection

PRISMA stage	Number of records/reports
Records identified through databases	394
Duplicates removed	18
Records screened	376
Records excluded after title/abstract screening	371
Full-text reports assessed for eligibility	5

PRISMA stage	Number of records/reports
Reports excluded after risk-of-bias/ full-text appraisal	2
Studies included in the narrative synthesis	3

Figure 1 shows the PRISMA Flow diagram of this study, illustrating the progression from initial database identification through to the final inclusion of the three selected studies. This systematic review process highlights the necessity of rigorous screening to ensure that only high-quality interventions are synthesized, addressing the existing gap in the literature on how sex education program content affects multifaceted health outcomes. Furthermore, this selection criterion ensures that the evaluated programs possess the requisite internal validity to support evidence-based conclusions regarding the structural and behavioral mechanisms of impact.



Note. PRISMA 2020 Flow Diagram adapted from Page MJ, et al. *BMJ* 2021;372:n71.
RoB 2 = Risk of Bias 2 (Cochrane Collaboration tool).

Figure 1. PRISMA Flowchart: Effectiveness of Sexual and Reproductive Health Education Interventions among Adolescents

Table 4. Characteristics of included studies

Study	Country	Design	Sample	Intervention	Comparator	Main outcomes
Gómez-Lugo et al. (2022)	Colombia	Cluster-randomized controlled trial	2,047 adolescents	School-based COMPAS sexual risk-reduction education	Control group without the intervention	Improved HIV/STI knowledge, condom attitudes, self-efficacy, and protective sexual behaviour.
Alekhya et al. (2023)	India	Cluster-randomized trial	790 female students	School-based SRH education using educational handbooks and structured sessions	Control group without SRH education	Improved SRH knowledge, attitudes, and practices related to menstruation, hygiene, contraception, and reproductive health.
Firestone et al. (2016)	Liberia	Randomized evaluation	1,157 at baseline; 1,052 at endline	HealthyActions: intensive group learning combined with onsite SRH services	Alternative education sites/control condition	Increased contraceptive use, condom use, HIV testing, and SRH awareness.

Characteristics of included studies are shown in Table 4. The diverse geographical contexts and varied delivery modalities represented across these investigations, ranging from curriculum-based school interventions to integrated clinical service models, provide a multidimensional view of pedagogical efficacy. This variation in study design underscores the need to analyze how localized implementation barriers, such as instructor training levels and community support, modulate the translation of standardized educational content into measurable behavioral shifts. Furthermore, the inclusion of both school-based and integrated service models highlights how the synergy between formal pedagogical strategies and broader health infrastructure influences the sustainability of reproductive health outcomes. By systematically evaluating these heterogeneous delivery mechanisms, this review elucidates the critical role of institutional integration in overcoming barriers to access to comprehensive sexual health services. These findings suggest that while school-based education is foundational for knowledge acquisition, the incorporation of clinical linkage pathways is essential to translate such awareness into increased utilization of contraceptive and diagnostic services.

Table 5. Risk of bias in included studies

Study	Randomization	Deviations	Missing data	Outcome measurement	Selective reporting	Overall
Gómez-Lugo et al. (2022)	Low risk	Some concerns	Low risk	Low risk	Low risk	Low risk
Alekhya et al. (2023)	Low risk	Some concerns	Low risk	Low risk	Low risk	Low risk
Firestone et al. (2016)	Low risk	Some concerns	Some concerns	Low risk	Low risk	Some concerns

Two full-text reports identified during the eligibility assessment were not included in the final synthesis because their methodological limitations introduced substantial uncertainty regarding causal interpretation. They were therefore reported as excluded full-text reports rather than included studies. This appraisal of methodological quality aligns with established frameworks, such as the Effective Public Health Practice Project tool, which prioritizes the rigor of study design and data reporting to minimize potential bias. Such assessments are vital for characterizing the reliability of evidence in sexual and reproductive health research, as demonstrated in similar high-quality systematic reviews that categorize studies by risk of bias to clarify the robustness of reported outcomes. By addressing these methodological risks, the present analysis enhances the thematic synthesis of intervention efficacy, ensuring that conclusions are derived from consistently rigorous evaluation standards.

3.1.2. Narrative synthesis of intervention effects

Knowledge outcomes. All included studies reported improvements in SRH-related knowledge. The Colombian COMPAS intervention improved HIV/STI and condom-related knowledge, while the Indian school-based intervention improved girls' understanding of menstruation, personal hygiene, contraception, and reproductive-health rights. The Liberian HealthyActions intervention improved awareness of SRH services and HIV prevention.

Attitudes and self-efficacy. Two studies reported favorable changes in attitudes or self-efficacy. Gómez-Lugo et al. (2022) showed improvements in condom-related attitudes and adolescents' confidence in protective sexual decision-making. Alekhya et al. (2023) reported improved attitudes toward reproductive health and menstrual hygiene after the educational intervention. **Service use and protective behaviors.** Firestone et al. (2016) provided the strongest service-linked evidence, showing increased contraceptive use, condom use, and HIV testing when group education was combined with onsite SRH services. This suggests that education may have a greater behavioral impact when adolescents can immediately access confidential, youth-friendly services.

Intervention delivery mechanisms. Across studies, effective components included structured curricula, participatory group learning, peer discussion, role-play, culturally appropriate educational materials, and service linkage. These components are consistent with CSE principles emphasizing interactive learning, skills development, rights-based content, and access to services (UNESCO, 2018; WHO, 2018).

3.2. Discussion

The evidence synthesized herein underscores that while educational interventions are fundamental to improving sexual and reproductive health knowledge, translating them into sustained behavioral change depends heavily on integrating participatory pedagogical approaches. Furthermore, although peer-led models effectively enhance knowledge and self-efficacy, current evidence reveals a persistent gap in achieving measurable behavioral outcomes, suggesting that structural barriers often constrain the impact of purely educational efforts. Consequently, interventions that foster emotional engagement through participant-centered strategies appear uniquely positioned to improve adolescents' assertiveness and self-esteem, thereby bridging the divide between theoretical knowledge and informed decision-making.

3.2.1. Principal findings

This systematic review found that SRH education interventions among adolescents and young adults were associated with improvements in knowledge, attitudes, self-efficacy, and selected protective behaviors. The evidence was strongest for knowledge-related outcomes and moderately supportive for behavioral outcomes such as condom use, contraceptive utilization, and HIV testing. These findings align with prior evidence that school-based and community-based sexuality education can improve adolescent SRH outcomes when programs are structured, interactive, and contextually appropriate (Denford et al., 2017; Fonner et al., 2014; Haberland & Rogow, 2015). However, the synthesis highlights that educational components alone are insufficient for sustained results; gender equity education and structured skills training are necessary to address the root social and power dynamics that influence adolescent behavior.

3.2.2. Interpretation in relation to global guidance

The findings support international recommendations for comprehensive sexuality education as a strategy to help young people make informed, safe, and respectful decisions about relationships and reproductive health (UNESCO, 2018; WHO, 2018). Current WHO guidance continues to emphasize prevention of adolescent pregnancy, access to quality adolescent-responsive services, and integrated support across education and health sectors (WHO, 2024a, 2025). Moreover, the observed variability in intervention outcomes necessitates a more nuanced implementation of peer-based models that meaningfully integrate adolescents as experience-based experts to improve the translation of knowledge into healthier behaviors. Furthermore, shifting the analytical lens from individual-level educational outputs to the broader socio-ecological environment reveals that the efficacy of SRH interventions is heavily mediated by the alignment of program content with prevailing community and familial norms. When interventions fail to actively engage caregivers and community gatekeepers, even robust, youth-friendly educational content often encounters latent opposition or contradictory messaging that undermines sustained behavioral change, thereby highlighting the necessity for structural approaches that bridge the gap between individual knowledge acquisition and the supportive social ecosystems required for lasting health improvements.

3.2.3. Why participatory and service-linked approaches may work

Participatory learning may improve outcomes because adolescents are not merely receiving information; they are practicing communication, negotiation, problem solving, and help-seeking skills. Group discussion and peer education may normalize SRH conversations and reduce stigma, while role-play can increase confidence in condom negotiation and service seeking. Service-linked education may be particularly effective because it reduces the gap between intention and action by providing immediate access to contraception, HIV testing, counseling, or referral.

3.2.4. Implications for practice and policy

Schools and community programmes should move beyond one-session reproductive-health talks and adopt structured, age-appropriate, culturally responsive, and rights-based SRH curricula. Program planners should combine knowledge content with skill-building, peer participation, parent/community sensitization, referral pathways, and youth-friendly health services. In low- and middle-income settings, collaboration between schools, primary health care providers, community organizations, and digital health platforms may increase reach and sustainability.

3.2.5. Limitations of the evidence

The certainty of the evidence is limited by the small number of included studies, heterogeneity in intervention design, reliance on self-reported outcomes, and limited follow-up. Because only three studies were synthesized, the findings should not be interpreted as definitive evidence for all adolescent populations or cultural contexts. Publication bias could not be assessed. A GRADE certainty-of-evidence assessment was not conducted, and no protocol registration was reported, which should be addressed in future updates of the review.

3.2.6. Recommendations for future research

Future studies should use adequately powered randomized or cluster-randomized designs, longer follow-up periods, standardized outcome measures, implementation-fidelity assessment, and subgroup analyses by age, sex, gender, schooling status, socioeconomic vulnerability, and urban/rural setting. Researchers should also evaluate digital and hybrid SRH education models, cost-effectiveness, and integration with youth-friendly health services.

Conclusions

This systematic review demonstrates that sexual and reproductive health (SRH) education interventions are effective in improving adolescents' reproductive health knowledge, attitudes, self-efficacy, and health-related behaviors. School-based and community-based educational programs consistently showed positive outcomes, particularly in increasing knowledge regarding sexually transmitted infections (STIs), HIV prevention, contraception, personal hygiene, condom use, and HIV testing behavior. Interactive and participatory educational approaches, such as peer education, group discussions, and role-play activities, appeared to enhance adolescent engagement and encourage positive behavioral changes.

The findings of this review highlight the importance of integrating comprehensive and culturally appropriate SRH education into school curricula and community health programs. Effective reproductive health education may contribute to reducing risky sexual behaviors and improving adolescents' ability to make informed reproductive health decisions. These findings also support existing public health recommendations emphasizing the importance of comprehensive sexuality education as a strategy to promote adolescent health and well-being.

Despite several methodological limitations, including the small number of included studies and variations in intervention characteristics, this review provides meaningful evidence regarding the potential benefits of SRH educational interventions among adolescents and young adults. Future research should involve larger populations, longer intervention periods, and standardized outcome measures to strengthen the evidence base for the long-term effectiveness of SRH education programs across diverse cultural and social settings.

Conflicts of Interest

The authors declare no conflict of interest.

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