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Effect of Reproductive and Sexual Health Education School Based Program for Adolescents: Systematic Review

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ABSTRACT

Background: adolescent sexual and reproductive health remains a major global challenge, reflected in high rates of sexually transmitted infections, HIV, and unintended pregnancy. School-based sexual and reproductive health education is considered a key strategy to promote healthy knowledge, attitudes, and behaviors among adolescents.

Purpose: to assess the effectiveness of school-based sexual and reproductive health education programs in improving adolescents' knowledge, attitudes, and sexual behaviors.

Methods: this study employed a systematic review design following Cochrane guidelines and reported according to PRISMA 2020. Literature searches were conducted in PubMed, ScienceDirect, Wiley, Taylor & Francis for studies published between 2015 and 2025. Eligible studies involved students aged 10-19 years and evaluated school-based interventions. Of 518 records identified, nine studies met the inclusion criteria. The reviewed studies included cluster randomized controlled trials, quasi-experimental designs, cross-sectional surveys, and pilot studies. Assessment of reviewed articles using JBI Critical Appraisal Tools. Data were collected using validated questionnaires assessing knowledge, attitudes, and sexual behaviors.

Results: all included studies reported significant improvements in adolescents' knowledge of sexual and reproductive health following the interventions. Most studies also demonstrated positive changes in attitudes, particularly regarding contraception and prevention of sexually transmitted infections. Effects on sexual behavior were more heterogeneous, with stronger and more consistent outcomes observed in multi-session and skills-based programs.

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Conclusion: school-based sexual and reproductive health education is effective in enhancing adolescents' knowledge and often improving attitudes. However, achieving sustained behavioral change requires more intensive, participatory, and multi-component interventions that are integrated with health services and supported by school policies.

Keywords: sexual and reproductive health education; school-based programs; adolescents; sexual behavior; systematic review

BACKGROUND

Reproductive and sexual health issues among adolescents remain a significant global challenge. Adolescents aged 10-19 years are the population group most vulnerable to various sexual health risks, such as sexually transmitted infections (STIs), HIV/AIDS, and unplanned pregnancies. Data from the World Health Organization (2025) states that every day more than one million new cases of STIs occur worldwide, and nearly half of these cases are experienced by adolescents and young adults. This high vulnerability is closely related to limited information, social pressure, and suboptimal access to accurate and comprehensive sexual education (WHO, 2025).

In response to this situation, many countries have adopted school-based reproductive and sexual health education programs as one of the main strategies to promote healthy and responsible sexual behavior among adolescents. School-based education is considered effective because it is able to reach adolescents in a structured and formal context. A systematic review by Myat (2024) shows that these programs can significantly improve knowledge, positive attitudes, and healthy decision-making skills related to sexuality. Juyani (2024) report that the implementation of comprehensive sexuality education in schools can reduce risky sexual behavior by up to 25% within one year after the intervention.

In developing countries, the effectiveness of these programs is greatly influenced by the social, cultural, and economic context. For example, a study Alekhya (2023) in India found that reproductive education in urban schools was able to increase understanding and skills in preventing pregnancy and STIs among adolescent girls. Meanwhile, in Nigeria, a participatory approach in sexual education programs has shown positive effects in increasing awareness and reducing risky sexual behavior among high school students (Osadolor et al., 2022).

In Indonesia itself, the implementation of sexual education programs in schools still faces many obstacles. The curriculum does not yet fully accommodate sexual health issues, and its implementation is still partial and depends on the initiative of each school (Adikusuma et al., 2025). Cultural factors that consider sexuality a taboo issue, lack of

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training for teaching staff, and minimal policy support exacerbate the situation (Adikusuma et al., 2025; David & Situmorang, 2024). Based on population projections for 2025, it is estimated that there will be approximately 66.83 million young people, or 23.50 per cent of Indonesia's total population. The composition of young men and women has a fairly small difference, only 2.77 percentage points, with a sex ratio of 105.70. This sex ratio indicates that for every 100 young women, there are approximately 106 young men. In the younger age group, especially young men, reproductive health issues are a major concern because at this stage individuals experience various biological, psychological and social changes that can influence behaviour and decision-making related to reproduction and sexual health (BPS, 2025). Premarital sexual activity among adolescents is rising at a concerning pace, posing potential long-term risks to women's reproductive health. Early sexual initiation during adolescence heightens vulnerability to sexually transmitted infections, including HIV/AIDS, as well as unintended pregnancies and adolescent fatherhood (Mediawati & Yosep, 2022; Unigwe et al., 2022). Based on the latest data, Indonesia ranks 14th in the world in terms of the number of people living with HIV (PLHIV) and 9th in terms of new HIV infections. Over the past three years, the HIV positivity rate has remained stagnant, but STI cases have increased, including among young people (Muhawarman, 2025). The absence of formal education encourages adolescents to seek information from social media or peers, which may not be accurate and can increase the risk of unsafe sexual behavior (Karima et al., 2023). Empirical evidence shows that school-based sexuality education programmes play an important role in increasing knowledge, shaping healthier attitudes, and guiding adolescent practices towards safer sexual behaviour (Unesco, 2023).

On the other hand, some schools have independently initiated reproductive health education programs, but the results vary greatly. A comprehensive evaluation of the effectiveness and efficiency of these programs is still very limited. Most studies are descriptive in nature and do not systematically assess behavioral changes or resource optimization (costs, teaching staff, and time). Therefore, a systematic review is necessary because there is a need for comprehensive evidence synthesis to support evidence-based policies. Without a systematic summary, policymakers risk adopting curricula that are ineffective or inappropriate for the context. Second, systematic reviews enable the assessment of the methodological quality of studies and the detection of potential biases, so that the resulting recommendations are more reliable. Thirdly, systematic reviews serve to identify research gaps that still need to be addressed. This gap is the reason behind this research in the form of a systematic review.

OBJECTIVE

This study aims to identify the effect of school-based reproductive and sexual health education interventions, and assess existing implementation weaknesses.

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METHODS

This study is a systematic review or literature study conducted in accordance with the Cochrane Guidelines (Cumpston et al., 2024) and compiled based on PRISMA 2020 (Page et al., 2022) and the protocol is not registered. A systematic review aims to collect evidence that meets predetermined eligibility criteria in order to answer specific research questions (Cumpston et al., 2024). This literature study used secondary data from international articles or journals with the following databases: Pubmed, ScienceDirect, Wiley, and Taylor and Francis. Articles or journals were searched using keywords and Boolean operators (AND, and OR) to broaden or narrow the search, thereby facilitating the selection of articles or journals to be used. The keywords in this systematic review were adjusted to Medical Subject Headings (MeSH) and consisted of main keywords and Boolean operators used in the search, including: (effect*) AND ((reproductive health) OR (sexual) AND (education*) OR (promotion*) AND (teen*) OR (adolescen*) OR (youth*) OR (student*) AND (school)).

The strategy used to search for articles used the PICO framework, which consists of inclusion and exclusion criteria, with a focus on: Is school-based reproductive and sexual health education effective in improving knowledge, attitudes, and behavior among adolescents? Assessment of reviewed articles using JBI Critical Appraisal Tools.

Table 1. PICO Systematic Review Format

P (Population)	Student (aged 10-19 years)
I (Intervention)	Reproductive Health and Sexual education School-based program
C (Comparison)	Without Reproductive and Sexual Education
O (Outcome)	Effects

Inclusion Criteria:

1. Studies discussing school-based reproductive and sexual health education programs.
2. Studies conducted on school-aged adolescents (10-19 years old).
3. Original articles published in the last 10 years (2015-2025).
4. Articles in Indonesian or English.
5. Full-text articles.

Exclusion Criteria:

1. Articles that are reviews, editorials, opinions, or letters to the editor.
2. Articles that are not available in full text or cannot be accessed online.

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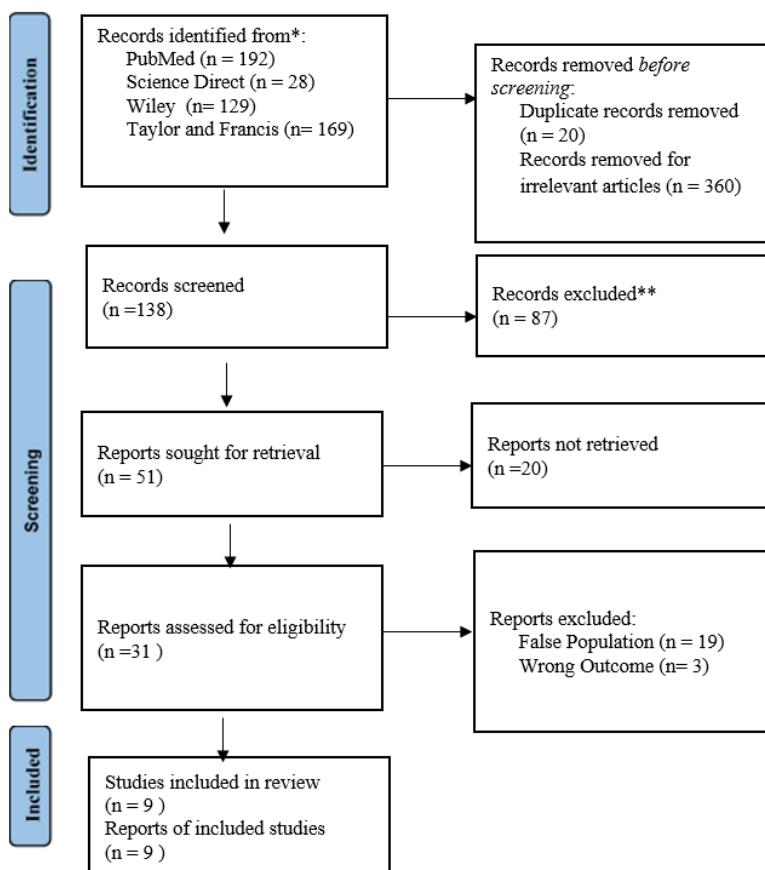
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RESULTS

Study Selection

Based on the results of a literature search through publications in the Pubmed, ScienceDirect, Wiley, and Taylor and Francis databases using keywords adjusted to MeSH, researchers found 518 articles that matched the keywords. A search of articles through the 4 databases found 518 articles consisting of 192 articles from PubMed, 28 articles from ScienceDirect, 129 articles from Wiley, and 169 articles from Taylor and Francis. Initial screening was performed using Rayyan that involving 4 (four) reviewers, which yielded 138 articles, which were then screened based on title, resulting in 360 irrelevant articles and 20 duplicate articles. Then, 31 articles were screened based on inclusion criteria. Nineteen articles did not match the population, and three articles had inaccurate results, so they were excluded. The screening results yielded nine articles relevant to this systematic review.



Picture 1. PRISMA ScR Flow Diagram

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Characteristics of the Studies

Reviewed there were 9 articles discussed, written in English and published between 2015 and 2023. These nine articles shared several characteristics, such as year of publication, country of origin, and research methods used. More details are presented in tables below.

Table 2. Year Classification

No	Year of Publication	Number of Articles
1	2015	1
2	2016	1
3	2018	1
4	2022	3
5	2023	3
	Total	9

Based on the table above, the articles reviewed were published between 2015 and 2023. The details are as follows: 1 article in 2015, 1 article in 2016, 1 article in 2018, 3 articles in 2022, and 3 articles in 2023.

Table 3. Country Classification

No	Country	Number of articles
1	India	2
2	Colombia	1
3	South Africa	2
4	Ghana	1
5	United States	2
6	Uganda	1
	Total	9

Based on the table above, the reviewed articles originated from six countries. The details are as follows: one article from India, one article from Colombia, two articles from South Africa, one article from Ghana, two articles from the United States, and one article from Uganda.

Table 4. Classification of Research Design

No	Design	Number of Article
1	Randomized Controlled Cluster Trial (RCT)	4
2	Quasi-Experimental	2
3	Cross-Sectional Survey	2

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4	Pilot Study (Pre-test and Post-test)	1
	Total	9

Based on the table above, the reviewed articles consisted of four types of research methods. The details are as follows: four randomized controlled trials (RCTs), two quasi-experimental studies, two cross-sectional surveys, and one pilot study (pre-test and post-test).

Critical Appraisal Classification of Articles

Assessment of reviewed articles using JBI Critical Appraisal Tools.

1. Critical Assessment of Randomized Controlled Trials (RCT) Studies

Three studies using the RCT design were analyzed, namely A1, A3, and A5. All three used valid randomization methods and showed equivalence of characteristics in the treatment groups at the start of the intervention. However, there were differences in the blinding aspect:

- a. A1 has weaknesses in concealing allocation and is not optimal in blinding participants and outcome assessors.
- b. A3 shows further limitations in terms of blinding and allocation mechanisms.
- c. A5 stands out as the study with the best methodological quality, obtaining the highest score (38/A), which reflects the high precision of the RCT implementation.

Overall, the three articles demonstrated good methodological quality, with scores ranging from 29 to 38, and all were classified in Category A (high).

2. Critical Appraisal of Quasi-Experimental Studies

The three quasi-experimental articles evaluated were A7, A8, and A9. All three generally succeeded in demonstrating a clear relationship between intervention and outcome, with relatively comparable participants across groups and consistency in variable measurement.

- a. A7 received the highest score (27/A), indicating a robust study design and data analysis
- b. A8 and A9 received a score of (25/A), with minor shortcomings such as imperfections in the comparison group or a limited number of outcome measurements.

Overall, all studies demonstrated high methodological quality and reliable results in terms of internal validity.

3. Critical Appraisal for Cross-Sectional studies

Two studies with cross-sectional approach, namely A4 and A6. The result of critical appraisal showed:

- a. Inclusion criteria for participants is declared clearly

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- b. Exposure and outcome measurements were valid and reliable.
- c. Confounding factors were identified and controlled appropriately.
- d. Statistical analysis techniques were used appropriately.

Both studies had perfect score (24/A), it shows that the methodological approach that used was really good for cross sectional study.

4. Critical Appraisal for Prevalence Study

One of the study with prevalence design is A2. The score was 27/A. It shows that the methodology approach that used was good.

- a. The sampling frame and participant selection process are appropriate for the target population.
- b. Data collection and condition measurements are carried out in a valid and consistent manner.
- c. The level of participant response is adequate or has been handled appropriately if there are any shortcomings.

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Table 5. Data Extraction

Author	Location	Research Objective	Study Design	Sampling	Intervention/Educational	Main Results
(Alekhya et al., 2023)	Urban Areas, Odisha, India (Bhubaneswar)	Assessing the effectiveness of sexual reproductive health (SRH) education in schools for adolescent girls to improve knowledge, attitudes, and practices related to reproductive health.	Cluster Randomized Trial.	Metode Recruitment: Eight high schools in Bhubaneswar were randomly assigned through randomization (4 intervention, 4 control). Written consent from parents and adolescent girls were obtained. Details: Ninth and tenth grade researchers. After 3 months, of 790 students (469 intervention, 321 control). Average age 14.4 years. No significant differences in baseline characteristics between groups.	The intervention was delivered in schools to all-girls intervention group using a handbook developed by the authors. Topics included puberty, menstrual health, restrictive pregnancy, contraception, and STIs/STDs. It was delivered in three interactive sessions (PowerPoint presentations, brainstorming, scenario of contraceptive methods discussions) of 2 hours each, over 3 consecutive days. It was delivered by the researchers. After 3 months, the same intervention was also delivered to the control group. Awareness of HIV/AIDS increased to 95.6% (p<0.01).	Significant improvement in the knowledge (e.g., awareness of normal physical changes during puberty increased from 60.1% to 94.8% in the intervention group; absorbents decreased to zero in the intervention group (p<0.05). Awareness of contraceptive methods increased from 10.9% to 87.1% (p<0.001). Awareness of STIs/STDs increased from 38.2% to 96.1% (p<0.001).
(Gómez et al., 2022)	11 cities in Columbia	Evaluating the effectiveness of the COMPAS program (Colombian version) in the short term and 6 months after its application to adolescents, reduce sexual risk behavior	Cluster-randomized control trial, in which schools are randomly assigned to either an intervention or control group	Recruitment Method: Schools participated voluntarily. Participants were students in grades 8–11 who obtained consent from their guardians/parents and themselves. Participant Details: 2,047 adolescents aged	Program Name: Short-Term Competencies for Adolescents (Posttest): with a Healthy Sexuality (COMPAS). Theoretical Basis: Based on Social Learning Theory (SLT) and the Information-Motivation-Behavior (IMB) Model. Duration and Structure: Lasts five hours, delivered in five	Effects: The experimental group showed significant improvements in knowledge about HIV and other STDs, sexual assertiveness (initiation, refusal, protection negotiation), self-efficacy (condom use), behavioral intention (seeking, using, requesting condoms), and

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Author	Location	Research Objective	Study Design	Sampling	Intervention/Educational	Main Results
				<p>14–19 years from 14 schools in Colombia. Eight schools (891 participants) in the experimental group and six schools (1156 participants) in the control group. The dropout rate at posttest was 19% (experimental group) and 21.4% (control); at 6-month follow-up, 52.6% (experimental) and 39.3% (control).</p> <p>Participant Characteristics (Baseline): Average age was 15.24 years. Approximately 52.1% were female. Most (89%) identified as exclusively heterosexual. 54% of adolescents were sexually active, and only 19% consistently used condoms. The average age of initiation of penetrative sex was 14.43 years for vaginal sex, 14.36 years for anal sex, and 14.28 years for oral sex.</p>	<p>one-hour group sessions per week.</p>	<p>more positive attitudes toward HIV/condom use compared to the control group. Normative perceptions did not change significantly.</p> <p>◦ 6-Month Effects (Follow-up): Most psychological and health variables still showed significant positive changes (e.g., knowledge of HIV/STIs, self-efficacy, sexual assertiveness). There was a significant increase in the percentage of condom use during penetrative sex in the experimental group. However, behavioral intentions to use condoms and attitudes toward condom use when facing barriers showed a decline. There were no significant changes in consistent condom use or condom use during anal and oral sex. The number of lifetime sexual partners increased in both groups.</p>

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Author	Location	Research Objective	Study Design	Sampling	Intervention/Educational	Main Results
(George et al., 2022)	Four DREAMS districts in the Gauteng and KwaZulu-Natal, South Africa. Data collected March 2017 – June 2018.	Estimating the relationship between exposure to Comprehensive Sexuality Education (CSE) and biomedical indicators and key behaviors among adolescent girls.	A representative household-based cross-sectional survey.	Recruitment Method: Multi-stage sampling. Households were randomly selected; all eligible adolescent girls (aged 12-24 years) were enrolled. Analysis was limited to 12-18 years. Characteristics: Total of 9673 adolescent girls. Median age 15 years (IQR 13-17). 89.4% were in school; 59.9% attended CSE classes in the past 12 months. 5.1% were HIV positive; 20.9% had ever had sex; 30.8% had ever been pregnant.	CSE developed by South Africa's Department of Basic Education (DBE) uses “Scripted Lesson Plans in HIV and pregnancy support Schooling itself is designed to improve sexual behavior: lower likelihood of engaging in sexual activity, early sexual debut, transactional sex, and sexual behavior.	South School-going adolescent girls who receive CSE are associated with a reduction in HIV and pregnancy. itself is associated with less risky sexual behavior: lower likelihood of engaging in sexual activity, early sexual debut, transactional sex, inconsistent condom use, having 2+ sexual partners, and ever being pregnant. Exposure to CSE (especially for those not attending school) is associated with a higher likelihood of HIV testing (AOR=1.72) and belief in obtaining condoms (AOR=2.17). For those attending school, exposure to CSE increases HIV testing (AOR=1.48) and belief in obtaining condoms (AOR=1.52).
(Krug et al., 2018)	Bolgatanga Municipality, Ghana (rural West Africa).	Evaluating the SPEEK sex education program, which aims to delay sexual initiation, reduce sexually transmitted infections (STIs),	Cluster Randomized Trial.	Recruitment Method: Twenty-one participating high schools were randomly assigned to the intervention group (11 schools).	The SPEEK comprehensive sex education program, adapted using Mapping (IM). An interactive skills-based program with 11 lessons, each lasting 1 hour. Objectives: to delay sexual activity, use condom	In the immediate post-test, there was a significant increase in knowledge about condom use, pregnancy, and STI testing (P's<0.002). There was also an increase in attitudes toward sexual rights, sexual rights, use condom availability,

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		and prevent pregnancy among junior high school students.		Consent was obtained from parents and students. Details: Junior high school students aged 10-24 years. Characteristics: At baseline: 1822 participants (892 males, 48.95%).	condoms/contraceptives correctly, and get tested for HIV/STIs. Delivered by peer educators..	condom use; perceived behavioral control over sexual delay, condom use, sexual intercourse; and perceived risk of STIs (P's<0.002). At the 6-month follow-up, there were generally no significant intervention effects for the determinants measured, except for positive attitudes toward sex to achieve goals (P=0.000). The study recommends further studies with larger sample sizes and longer follow-up periods.
(Mathews et al., 2016)	42 high schools in South Africa (in the Cape Town area and surrounding areas).	Evaluating the effects of PREPARE, a multi-component school-based HIV prevention intervention, on delaying sexual debut, increasing condom use, and reducing intimate partner violence (IPV) among young adolescents.	Cluster Randomized Controlled Trial	Recruitment Method: PREPARE is a multi- component intervention: (1) Eighth grade students in 42 high schools. Schools were randomly assigned to intervention and control groups. 6,244 eighth grade students were invited to participate. Participant Details: Eighth grade high school students. Characteristics: Average age 13.7 years. Approximately 37.9%-41.5% male. There were no significant differences in baseline characteristics between groups.	Education program (21 sessions, 1-1.5 hours/session, interactive, skills-based). School health services (health checks, SRH education, screening/referral for SRH/psychosocial issues). School safety program (safety audit, photovoice to improve physical, emotional, and sexual safety).	Participants who attended at least 1 session reported better knowledge of condoms and HIV, and more positive attitudes toward delaying sex after 6 months. These effects for persisted for up to 12 months for knowledge of condoms and HIV, and reduced IPV victimization. Participants who attended at least 10 sessions reported better knowledge of condoms and HIV, more positive attitudes toward condom use and delaying sex, and less IPV victimization after 6 months. However, there

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(Robbins et al., 2024)	Three cities in the US (Chicago, Illinois; New York City, New York; Philadelphia, Pennsylvania).	Examining the relationship between education in schools and sexual behavior among sexually active minority male adolescents (ASMM).	Cross-sectional. Data from the NHBS-YMSM survey.	Recruitment Method: AIDS or HIV education in schools. (No description of the schools was associated with intervention because this is an observational study of existing and did not plan to return after the holidays were excluded. Participant Details: Sexual minority male adolescents (ASMM) aged 13-18 years. Characteristics: Total of 556 ASMM. 15% aged 13-15 years, 85% aged 16-18 years. 39% Hispanic/Latino, 40% non-Hispanic Black, 16% non-Hispanic White. 63.6% homosexual/gay, 33.5% bisexual. 79.3% sexually active. 84% had received	AIDS or HIV education in schools. (No description of the schools was associated with intervention because this is an observational study of existing and did not plan to return after the holidays were excluded. Participant Details: Sexual minority male adolescents (ASMM) aged 13-18 years. Characteristics: Total of 556 ASMM. 15% aged 13-15 years, 85% aged 16-18 years. 39% Hispanic/Latino, 40% non-Hispanic Black, 16% non-Hispanic White. 63.6% homosexual/gay, 33.5% bisexual. 79.3% sexually active. 84% had received	were more sexual debuts. After 12 months, there was better knowledge of condoms and HIV, as well as more positive attitudes toward condoms and delaying sex. There was no significant impact on primary sexual behavior or IPV in general.

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(Rasberry et al., 2022)	a large urban school district in the southern United States.	Assessing changes in students' health and behavior after the implementation of enhanced support for the delivery of Sexual Health Education (SHE) in one school district.	Quasi-experimental (pre-post design for cross-sectional data for behavior).	Recruitment Method: For high/high school students in 2015-2016 school year. For districts (2015, 2017) and states (2017). Details: Junior high and high school students. August 2014 (high schools), 7555 August 2015 (junior high school, 46.4% high school 9th grade. Mostly Hispanic/Latino (66.6%), low-income (79.9%), "at risk" of dropping out (75.5%). Behavior (district 2015): 2596 students; majority 15-17 years old, 49.62% female, 62-63% Hispanic/multiracial Hispanic. Behavior (district 2017): 3371 students; majority aged 15-17, 49.89% female, 62-63%	Enhanced support for SHE: (1) Systematic curriculum Sub-set of sexual health lessons (10 junior high schools, 13 senior high school professional development for teachers (face-to-face classroom instructional behaviors moved in the August 2014 (high schools), more August 2015 (junior high school, 46.4% high school 9th grade. Mostly Hispanic/Latino (66.6%), low-income (79.9%), "at risk" of dropping out (75.5%). Behavior (district 2015): 2596 students; majority 15-17 years old, 49.62% female, 62-63% Hispanic/multiracial Hispanic. Behavior (district 2017): 3371 students; majority aged 15-17, 49.89% female, 62-63%	Knowledge: Significant improvement in knowledge among students (pre-test average 50.8% correct, post-test 71.8% correct). This improvement was significant for all students, middle school, and high school. Behavior (district 2015-2017): 6 out of 16 desired direction (e.g., more HIV testing, less sexual dating violence, less sex with 4+ partners, less alcohol/drug use before sex). One moved in an undesirable direction (ever being forced into non-consensual physical sex). Behavior (intervention district 2017 vs. non-DASH state 2017): Students in intervention districts were significantly more likely to report condom use during their last sexual encounter (AOR=1.36) and less likely to report having sex with 4+ partners (AOR=.72) or using alcohol/drugs before

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(Yadav & Kumar, 2023)	Andaman and Nicobar Islands, India (Port Blair). Study conducted July–October 2022.	Assessing the knowledge of mid-adolescents before and after sexual and reproductive health (SRH) education interventions. Also assessing socio-demographic factors related to SRH knowledge.	Quasi-experimental.	Hispanic/multiracial Hispanic..	Recruitment Method: SRH awareness education program. Delivered by researchers and third-year MBBS students. Using PowerPoint presentations and videos. Program content is derived from UNICEF sex education guidelines and NCERT textbooks. Written consent was obtained from students and parents/guardians. Participant Details: High school students (grades 9-12) aged 14-17 years, male and female. Characteristics: A total of 252 students (equal numbers of males and females). Most were aged 14-15 years (51.2%). The highest participation was from grade 11 (26.6%).	their last sexual encounter (AOR=.63). The median pre-test knowledge score was 11.05; the median post-test score was 20.87. The change in knowledge scores was statistically significant (p = 0.0001). The percentage of students with good knowledge increased from 43.7% (pre-test) to 97.6% (post-test). The main source of SRH information for students was teachers (61.9%), followed by friends (33.3%). Pre-test knowledge was significantly related to the age, gender, and grade of the students.
(Wolf et al., 2015)	Jinja, Uganda (Pilot study conducted over 2 months starting in March 2010).	(1) To test Ugandan adolescents' basic knowledge of STIs and contraception; (2) To determine whether this knowledge varies	Pilot Study.	Recruitment Method: 129 adolescents (aged 15-19 years) were recruited from 3 secondary schools and 3 NGO community groups. Convenience sampling was used. Participant Details:	The educational program was delivered as an interactive discussion by the research team. It covered reproductive knowledge application and anatomy, the menstrual cycle, pregnancy, STIs (symptoms and protection), and contraceptive methods (oral and significantly after the education session (p <	At baseline, the average scores for contraceptive knowledge were 44%, STI knowledge 72%, and knowledge application 64%. STI and contraceptive knowledge increased significantly after the education session (p <

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Author	Location	Research Objective	Study Design	Sampling	Intervention/Educational	Main Results
		based on demographic factors, sexual experience, or school level; (3) To evaluate the effectiveness of education programs in improving and maintaining knowledge of STIs and contraception.		Adolescents aged 15-19 years. Characteristics: Average age 16.7 years (SD=1.3); 53% female; 100% unmarried; 83.7% currently attending school; 31% sexually active (average age of sexual debut 14.8 years).	pills, Depo-Provera, condoms, withdrawal).	0.001) and knowledge was retained 3 weeks later (p < 0.001). High school education was associated with higher prior STI knowledge (OR=19.6). Previous sexual experience was associated with higher prior contraceptive knowledge (OR=4.62). Older age was associated with better knowledge retention.

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Thematic Analysis of Findings

The findings from the nine included studies were synthesized using thematic analysis, grouping outcomes into four major themes: (1) Program Delivery Characteristics (2) The Effect of Intervention on Adolescent Sexual Knowledge, (3) Effect of Intervention on Adolescent Sexual Attitudes and (4) Effect of Intervention on Adolescent Sexual Behaviors.

Theme 1: Program Delivery Characteristics

Method of Delivering Material

Most studies used a school-based face-to-face approach, with various variations in approach. Seven of the nine studies used interactive educational methods, either through discussion, presentations, role-playing, or skills-based approaches (Alekhya et al., 2023; Gómez-Lugo et al., 2022; Krugu et al., 2018; Mathews et al., 2016; Rasberry et al., 2022; Wolf et al., 2015; Yadav & Kumar, 2023). The COMPAS program in Gómez Lugo's (2022) study used a participatory action approach based on cognitive-behavioral intervention, combining activities such as role-playing, brainstorming, game-based learning, cognitive restructuring, and structured training in social skills, problem solving, independent learning, and decision making.

Education is delivered by teachers or school staff as part of formal learning and the official curriculum. (George et al., 2022; Rasberry et al., 2022; Robbins et al., 2024). An approach by a team from outside the school or by trained facilitators was used in the study by (Alekhya et al., 2023; Mathews et al., 2016; Rasberry et al., 2022; Wolf et al., 2015). Meanwhile, the peer-led approach was explicitly applied in research by (Kругu et al., 2018) through the SPEEK program. This peer-led approach emphasizes active student participation. Audiovisual learning media and supporting technologies are increasingly being used to enhance the appeal and understanding of the material. PowerPoint presentations, educational videos, and visual illustrations are used in programs in India and the Andaman & Nicobar Islands by (Alekhya et al., 2023; Yadav & Kumar, 2023).

In addition to classroom learning, some interventions integrate cross-setting delivery methods, including access to school health services and school-based violence prevention programs. The PREPARE program utilizes this approach to expand participants' exposure to reproductive health messages outside the classroom (Mathews et al., 2016).

Duration of Intervention

The duration of education varies greatly between studies and appears to influence the magnitude of the effect achieved.

Intensive short-term interventions were found in Alekhya (2023), namely three sessions of 2 hours each over three consecutive days (total \pm 6 hours), and Wolf (2015)

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with one 1.5 hour session. Both studies still showed significant knowledge improvement, including knowledge retention up to three weeks in the study by Wolf (2015).

In contrast, medium- to long-term interventions such as SPEEK (Krugu et al., 2018) lasted for 11 weeks (11 hours total), while PREPARE Mathews (2016) consisted of 21 weekly sessions lasting 1-1.5 hours per session. These long-term programs tend to have an impact on more complex aspects such as attitudes, behavioral control, and dating violence, although the long-term effects on sexual behavior are not always consistent. Several studies did not report specific durations, such as George (2022) and Robbins (2024), because sex education has been integrated into the formal curriculum for many years. In general, short durations are quite effective for knowledge enhancement, while longer durations are necessary to influence attitudes and behaviors, although the results are not always linear.

Intervention Materials

The educational materials in all studies showed high consistency and can be categorized as comprehensive sexuality education.

Core educational materials that almost always appear include puberty, the reproductive system, pregnancy, contraception, sexually transmitted infections (STIs), and HIV/AIDS, as reported by (Alekhya et al., 2023; Wolf et al., 2015; Yadav & Kumar, 2023). Materials related to pregnancy prevention and contraception are also central components, as in the COMPAS Program in Colombia and SPEEK in Ghana, which convey information about condom use and contraceptive methods as core material, which not only increases knowledge but also intention and self-efficacy in practicing safe sex (Alekhya et al., 2023; Gómez-Lugo et al., 2022; Krugu et al., 2018). More extensive material, including sexual rights, personal boundaries, healthy relationships, and violence prevention, can be found in research by Krugu (2018) and Mathews (2016).

Sources of Material and Theoretical Approaches

Three studies show that educational program materials are sourced from standardized curricula, evidence-based guidelines, structured modules developed by academic institutions, health organizations, or educational authorities, and behavioral theory frameworks (Rasberry et al., 2022; Gómez-Lugo et al., 2022).

Three other studies used educational materials specifically designed for specific research or intervention programs (Alekhya et al., 2023; Krugu et al., 2018; Mathews et al., 2016). In addition, one study by Yadav & Kumar (2023) refers to international guidelines, while the rest of the studies show that education uses common materials and does not originate from specific standard modules (Wolf et al., 2015).



Theme 2: The Effect of Intervention on Adolescent Sexual Knowledge

All studies measuring knowledge in research results show a consistent positive impact after sexual health education interventions are provided. (Alekhya et al., 2023; George et al., 2022; Gómez et al., 2022; Krugu et al., 2018; Mathews et al., 2016; Rasberry et al., 2022; Robbins et al., 2024; Wolf et al., 2015; Yadav & Kumar, 2023). Although two studies by George (2022) and Robbins (2024) showed that knowledge increased or improved in the group exposed to education, this was not measured directly using a pre-post design.

The most significant improvement was demonstrated in controlled intervention studies. Alekhya (2023) reported an increase in sexual and reproductive health knowledge to 94.8% in the intervention group, with awareness of contraception increasing from 10.9% to 87.1% and knowledge of STIs from 38.2% to 96.1%. Similar results were also shown by Yadav & Kumar (2023), where the median knowledge score increased from 11.05 to 20.87, and the proportion of students with good knowledge rose from 43.7% to 97.6% after education.

In the context of brief education, Wolf (2015) showed that a single 1.5-hour education session was sufficient to significantly improve knowledge about STIs and contraception ($p < 0.001$), and that this knowledge persisted after three weeks.

Although two studies by George (2022) and Robbins (2024) showed that knowledge increased or improved in the group exposed to education, this was not measured using a direct pre-post design.

Theme 3: The Effect of Intervention on Adolescent Sexual Attitudes

The impact of education on sexual attitudes is generally positive, but more varied than the impact on knowledge.

Krugu (2018) reported significant changes in psychosocial determinants, including attitudes toward delaying sexual initiation, condom availability, and sexual rights, especially in short-term post-intervention measurements ($p < 0.002$). Alekhya (2023) also noted improvements in attitudes toward menstrual hygiene and reproductive health.

However, in long-term interventions such as PREPARE, Mathews (2016) showed that although there was an increase in certain knowledge and attitudes (e.g., knowledge of condoms), changes in attitudes were not always consistent in the long term. Results that also showed improvements in certain attitudes, but not uniformly, were also shown in a study by Rasberry (2022). The other four studies did not measure attitudes directly (George et al., 2022; (Robbins et al., 2024; Wolf et al., 2015; Yadav & Kumar, 2023).



Theme 4: The Effect of Intervention on Adolescent Sexual Behavior

The effect of education on sexual behaviour is the most heterogeneous finding among all the outcomes studied.

Several large-scale studies have demonstrated the impact of beneficial behaviours. George (2022) reported that exposure to comprehensive sexuality education was associated with a decrease in HIV prevalence and pregnancy, as well as a decrease in engagement in risky sexual behaviours such as transactional sex, age-disparate relationships, and inconsistent condom use. Robbins (2024) also found that HIV/AIDS education in schools was associated with fewer STI diagnoses (aPR = 0.45) and lower rates of condomless anal sex (aPR = 0.71) among sexually minority adolescent males.

At the district level, Rasberry (2022) showed that after the implementation of sexual health education support, 6 of 16 behavioral indicators moved in the desired direction, including increased condom use (AOR = 1.36) and decreased sexual relations with ≥ 4 partners (AOR = 0.72).

The SPEEK program in Ghana showed an increasing tendency to delay sexual activity after the intervention, although actual behavioral changes were not consistent during the follow-up period. These findings indicate that school-based sex education can influence psychological readiness and early decision-making regarding sexual activity, especially among early adolescents (Krugue et al., 2018).

More noticeable behavioral changes were seen in programs targeting the use of sexual protection. The COMPAS study in Colombia reported an increase in condom use during the last sexual intercourse in the intervention group compared to the control group at the six-month follow-up. This effect shows that multi-session interventions that emphasize practical skills, self-efficacy, and sexual communication are more likely to result in protective behavioral changes than purely informative approaches (Gómez et al., 2022).

In contrast, Mathews et al. (2016) found no significant effects on sexual debut or overall condom use, although participants with high exposure (≥ 10 sessions) demonstrated better knowledge and lower rates of intimate partner violence. These findings confirm that changes in sexual behavior require intense, consistent exposure and structural support, and do not always occur immediately after intervention. Meanwhile, the other three studies did not directly measure behavioral changes (Alekhya et al., 2023; Wolf et al., 2015; Yadav & Kumar, 2023).

DISCUSSION

The focus of this systematic review is the impact of school-based sexual and reproductive health education on adolescents' knowledge, attitudes, and sexual behaviour. Nine articles that met the inclusion criteria were found in this study. The school-based sexual and reproductive health education interventions included in this review showed

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the most consistent effect on increasing adolescents' knowledge, were quite effective in shaping attitudes, and showed varying results on changes in adolescents' sexual behaviour. These findings are consistent with recent evidence showing that comprehensive sexuality education or school-based sexual and reproductive health programs, including the use of digital technology or peer-led approaches, consistently improve knowledge, protective attitudes, and several short-term psychosocial indicators.

A quantitative review in 2024 found that school-based sexuality education programs are effective in increasing sexual knowledge, healthier attitudes toward sexuality, and safer sexual behaviors (contraceptive use, STI prevention), and reducing the risk of adolescent pregnancy and sexually transmitted infections, but heterogeneity in design and outcomes limits researchers from drawing definitive conclusions. (Barriuso-Ortega et al., 2024; Kim et al., 2023). A meta-analysis study by Goldfarb (2021) also concluded that comprehensive sexuality education significantly improves adolescents' sexual literacy, especially in the areas of contraception, STIs, and HIV. A global study by Unesco (2023) also confirms that structured comprehensive sexuality education interventions almost always result in increased knowledge, regardless of the cultural context and economic level of the country (Goldfarb et al., 2021; Unesco, 2023).

However, the consistency of evidence regarding changes in sexual behavior (such as delayed sexual debut, increased condom use, and reduced number of partners) and clinical outcomes (STIs/HIV, pregnancy) remains mixed. These heterogeneous results indicate that increased knowledge does not always directly translate into behavioural change. It is also important to acknowledge that the RCT study by Pike (2023), while not included among the nine reviewed articles, as it was identified during discussion synthesis, provides additional context that the school-based sexual health program did not result in significant improvements in HIV or pregnancy incidence, underscoring that program design, implementation fidelity, and contextual factors all mediate effectiveness beyond mere program existence (Pike et al., 2023).

A review of recent primary studies provides additional insight into the factors that mediate the effects of interventions. A modern cluster RCT study by Yarger et al in 2024 showed that the integration of digital technology designed in collaboration with adolescents can increase participant engagement and program accessibility, but the impact on behaviour depends on the duration of the intervention, the quality of implementation, and subsequent access to clinical services (Yarger et al., 2024).

From the perspective of behavioural change theory, several studies that included skills training (communication, negotiation, assertiveness), role-play, or school environmental support reported stronger psychological/intentional effects than lecture-based interventions. (Ivanova et al., 2020) This confirms that skills-based and participatory interventions are more likely to build adolescents' capacity to apply knowledge in real-life situations. However, for this capacity to lead to long-term

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behavioural change, access to adolescent sexual and reproductive health services (counselling, condom/contraceptive supply, STI/HIV testing) and school policy support such as youth-friendly policies and teacher training are also necessary (UNESCO, 2024).

All interventions that use structured materials (handbooks, PowerPoint presentations, videos) can rapidly increase knowledge; this increase is an important prerequisite for changes in attitudes and intentions, because understanding the health consequences, prevention mechanisms, and practical skills such as condom use facilitates healthier decisions (Alekhya et al., 2023; Yadav & Kumar, 2023).

Programs involving skills training (role-play, condom demonstrations, assertiveness training) showed a stronger effect on intention and self-efficacy, which are important mediators of actual behavior change (Gómez et al., 2022).

An overview study of peer-led interventions also shows that peer approaches benefit knowledge and attitudes, although evidence of effects on biological and behavioural outcomes is less consistent (Mason-jones et al., 2023). Recent studies also highlight the potential of web-based and digital teaching as an alternative or complement to face-to-face programs, as shown in an article with a meta-analysis comparing web-based sexual and reproductive health education with face-to-face education, which indicates that web-based education has the potential for a positive impact, but further studies are still needed (Guo et al., 2025). In addition, a scoping review article that gathered perspectives from adolescents emphasized the need for content that is relevant, socially safe, and delivered in a high-quality manner so that adolescents do not seek information from unvalidated sources (Kabelka et al., 2025).

Weaknesses and Limitations of the Program that has been implemented

1. Inadequate duration and intensity: Brief interventions often succeed in increasing short-term knowledge but may not be sufficient to change complex habits or social relationships that influence sexual behaviour (Krug et al., 2018; Wolf et al., 2015).
2. Fidelity of implementation and teacher training: Without adequate training for teachers or monitoring of fidelity, even effectively designed materials may be delivered sub optimally, thereby reducing their impact. District support studies emphasize the importance of training and coaching to ensure more consistent results (Rasberry et al., 2022).
3. The influence of contextual factors outside of school: Family factors, gender norms, access to health services, and peer pressure influence adolescent behavior; programs that focus solely on the classroom without addressing these social determinants have limited ability to change biological outcomes (Mason-Jones et al., 2016).
4. Follow-up is too short: Many studies assess outcomes only up to 3-6 months; behavioural changes and biological outcomes often take longer to appear and be measured (Gómez et al., 2022; Krug et al., 2018).

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Policy and Practice Implications

1. Adopt standardized but adaptive comprehensive sexuality education: Structured comprehensive sexuality education curricula (handbooks, modules) have been shown to increase knowledge and should be adapted to be culturally and gender-sensitive for relevance (Alekhya et al., 2023; Gómez et al., 2022).
2. Teacher training and system support: Investment in teacher training, coaching, and district policies increases the likelihood of consistent and sustained effects (Rasberry et al., 2022).
3. Combine health services and social components: Providing access to testing, referrals for contraceptive services, and gender-based violence prevention programs in schools increases the relevance of interventions and can reduce barriers to behavioural change (Mathews et al., 2016).
4. Use a multi-modal approach: A combination of face-to-face, peer-led, and multimedia/digital materials can broaden reach and maintain engagement among adolescents (Mason-jones et al., 2023).

LIMITATIONS

This systematic review has several limitations that should be considered when interpreting the findings. First, the search was restricted to articles published in English or Indonesian, which may have resulted in the exclusion of relevant studies published in other languages, introducing potential language bias. Second, despite following PRISMA 2020 guidelines, this review was not prospectively registered in a systematic review registry (e.g., PROSPERO), which limits transparency regarding the review protocol.

Third, the nine included studies demonstrated considerable heterogeneity in terms of study design, intervention components, outcome measures, follow-up periods, and geographic and cultural contexts. This heterogeneity precluded meta-analytic pooling of results and limited the ability to draw definitive quantitative conclusions about effect sizes. Fourth, the majority of included studies were conducted in sub-Saharan Africa, South Asia, and North America, meaning that the evidence base may not be directly generalizable to the Indonesian context without cultural and contextual adaptation.

Fifth, potential publication bias cannot be excluded, as studies with positive or statistically significant findings are more likely to be published than those with null results. This may have resulted in an overestimation of the effectiveness of school-based SRH education in the current review. Sixth, most studies assessed short-term outcomes (3-6 months), which may not capture the full trajectory of behavioural change. Sustained behavioural outcomes and biological outcomes (such as STI incidence and pregnancy rates) require longer follow-up, which was rarely employed in the included studies. Future

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systematic reviews should prioritize studies with extended follow-up periods and harmonized outcome measurement to enable more robust evidence synthesis.

CONCLUSION

School-based reproductive and sexual education programs consistently improve adolescents' knowledge and often improve attitudes and behavioural intentions in the short term. However, to achieve real and sustained behavioural change, more intensive interventions with multi-dimensional components (including skill-building, service access, and policy support), high fidelity implementation, and long-term evaluation are needed. For the midwifery education context specifically, these results call for the formal integration of SRH education competencies into midwifery training programs, the positioning of midwives as community-level SRH facilitators in schools, and the development of evidence-based, culturally adapted SRH education toolkits. Bridging school-based education with youth-friendly clinical reproductive health services represents a priority action area where midwives can have the greatest impact on adolescent health outcomes.

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