

## REPRODUCTIVE HEALTH EDUCATION AND ADOLESCENT KNOWLEDGE: A BIBLIOMETRIC PERSPECTIVE ON INTERVENTION TRENDS

*Pendidikan Kesehatan Reproduksi dan Pengetahuan Remaja: Perspektif  
Bibliometrik tentang Tren Intervensi*

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### ABSTRAK

Permasalahan rendahnya pengetahuan remaja tentang kesehatan reproduksi mendorong perlunya pemetaan tren literatur dan intervensi yang terarah. Penelitian ini menggunakan desain bibliometrik sistematis dengan pendekatan PRISMA. Sebanyak 856 artikel dipilih dari 3.020 publikasi (2019–2024) yang diambil melalui perangkat lunak Publish or Perish. Variabel yang dikaji meliputi pendidikan kesehatan reproduksi, pengetahuan remaja, dan jenis intervensi. Data dianalisis menggunakan VOSviewer untuk memvisualisasikan pola sitasi, kolaborasi penulis, dan klaster tematik. Temuan menunjukkan tiga tema utama: pendekatan metodologis (misalnya systematic review, evidence), konteks demografis (misalnya woman, child, Nigeria, Ethiopia), dan intervensi pendidikan (misalnya student, questionnaire, health education). Tema-tema ini menggambarkan fokus penelitian pada program berbasis sekolah, keterlibatan komunitas, dan penggunaan media digital untuk meningkatkan pengetahuan kesehatan reproduksi remaja. Studi ini menyimpulkan bahwa riset tentang pendidikan kesehatan reproduksi remaja semakin menekankan pada intervensi yang berbasis bukti, terstruktur, dan sensitif gender. Namun, isu-isu seperti hambatan budaya, remaja usia muda, dan ketimpangan regional masih kurang mendapat perhatian. Oleh karena itu, penelitian selanjutnya disarankan untuk menutup kesenjangan ini melalui pendekatan yang inklusif, kontekstual, dan kolaboratif, dengan mengintegrasikan aspek kesehatan mental serta keterlibatan keluarga.

**Kata kunci:** intervensi, pendidikan kesehatan reproduksi, pengetahuan remaja

### ABSTRACT

The low level of adolescent knowledge about reproductive health highlights the need for mapping literature trends and targeted interventions. This study employed a systematic bibliometric design using the PRISMA approach. A total of 856 articles were selected from 3,020 publications (2019–2024) retrieved through the Publish or Perish software. The variables analyzed included reproductive health education, adolescent knowledge, and types of interventions. Data were analyzed using VOSviewer to visualize citation patterns, author collaboration, and thematic clusters. The findings revealed three main themes: methodological approaches (e.g., systematic review, evidence), demographic contexts (e.g., women, children, Nigeria, Ethiopia), and educational interventions (e.g., students, questionnaires, health education). These themes indicate a research focus on school-based programs, community engagement, and the use of digital media to enhance adolescents' reproductive health knowledge. This study concludes that

research on adolescent reproductive health education increasingly emphasizes evidence-based, structured, and gender-sensitive interventions. However, issues such as cultural barriers, early adolescence, and regional disparities remain underexplored. Therefore, future studies are recommended to address these gaps through inclusive, contextual, and collaborative approaches, integrating aspects of mental health and family involvement.

**Keywords:** intervention, reproductive health education, adolescent knowledge

## INTRODUCTION

Adolescent reproductive health remains a global challenge in efforts to improve youth well-being. The World Health Organization reports that the lack of adequate sexual education can lead to serious consequences, including early pregnancy, sexually transmitted infections, and gender-based violence.[1]

In Indonesia, similar issues arise due to limited access to comprehensive information, low awareness of reproductive rights, and the prevailing taboo surrounding reproductive health topics in families and schools[2]. Reproductive health education plays a critical role in enhancing adolescents' knowledge and awareness through comprehensive, accessible, and community-based approaches. Rochmayani and Zulaekha highlight that educational materials tailored for junior high school students cover a broad range of reproductive health topics [3].

Likewise, other studies show a strong correlation between the intensity of interventions and increased knowledge among elementary school children, underscoring the importance of early education [4]. Mikhail et al. emphasize that youth desire more open communication and easier access to resources such as condoms [5], and Djunaedi and Sulistyorini further support the need for early education to prevent risky behaviors [6]. Technological innovations, such as digital pocketbooks, have also been shown to increase engagement and accessibility to reproductive health information[7]. Parental and community involvement is also crucial. Kusumaningtyas et al. find that parental support is particularly essential for adolescents with disabilities [8].

While Netshikweta et al. note that community-based programs involving teachers and parents significantly enhance adolescents' reproductive health knowledge[9]. This aligns with Rhodes et al., who stress the need to build community capacity to address health disparities effectively [10]. Previous studies on adolescent reproductive health education have mostly been descriptive and context-specific, without systematically mapping research trends, citation patterns, or thematic linkages using bibliometric methods. To date, no bibliometric study has identified dominant themes, research gaps, and evidence-based practices in this field. Such an approach is crucial for building a stronger foundation for effective interventions. Therefore, this study aims to systematically map and analyze trends in adolescent reproductive health education from a bibliometric perspective to identify key themes, gaps, and practices that can inform future programs.

## METHODS

### Data Sources

This study employed a scoping review design with a bibliometric approach guided by the five-step framework proposed by Tricco et al [11], [12]. Including: (1) identifying the research question, (2) conducting a structured search using *Publish or Perish* software to access Google Scholar, (3) selecting studies through iterative team-based screening, (4) charting data through quantitative summaries and thematic mapping, and (5) synthesizing and reporting findings. The search was conducted between September and November 2024, resulting in 3,020 initial records. After duplicate removal and applying eligibility criteria, 856 articles were retained for analysis. A purposive sampling technique was applied to select articles relevant to adolescent reproductive health education. Inclusion criteria: Peer-reviewed articles published between 2019 and 2024,

written in English, focused on reproductive health education, adolescent knowledge, or educational interventions, and articles based on empirical research or systematic reviews. Exclusion Criteria: Opinion articles, editorials, or non-peer-reviewed materials, Inaccessible full texts, Studies not involving adolescents or lacking an educational/intervention focus. Screening Process: Title and abstract screening was conducted by a single reviewer using predefined inclusion and exclusion criteria to ensure consistency and transparency. In cases of uncertainty, decisions were guided by consultation with academic supervisors and the review protocol.

The study focused on three main variables: (1) intervention types, including school-based, community-based, and digital reproductive health programs; (2) outcomes, referring to the level of adolescent reproductive health knowledge and awareness; and (3) contextual factors, such as delivery methods, educational content, and characteristics of the target population. To support the analysis, *Publish or Perish* software was used to retrieve relevant peer-reviewed literature from Google Scholar, while *VOSviewer* facilitated the bibliometric visualization of keyword co-occurrence, author collaborations, and citation patterns. Quantitative summaries were employed to capture publication trends and intervention types, while thematic mapping was conducted to identify recurring topics and research gaps within the included studies.

### Selecting Data

The data selection process for this bibliometric analysis followed three stages: identification, screening, and inclusion, as illustrated in the PRISMA flowchart. Using *Publish or Perish*, 3,020 articles were retrieved from Google Scholar (1,000), PubMed (1,000), and Scopus (1,020) based on the keywords reproductive health education, adolescent knowledge, and intervention. After screening, 2,651 articles were deemed relevant, while 369 were excluded. In the eligibility phase, 1,966 articles were assessed by title, leading to the exclusion of 1,122 for irrelevance, duplication, or other criteria. Finally, 844 articles were included in the synthesis, ensuring a rigorous and unbiased selection of high-quality, relevant studies.

### Data Analysis

Data were analysed using *VOSviewer*. *VOSviewer* is a software designed to create and visualize bibliometric networks. These networks can include journals, researchers, or individual publications, and are built on citations, bibliographic coupling, co-citation, or co-authorship [13], [14]. The article selection process followed a simplified PRISMA approach, which includes identification, screening, and inclusion stages. The detailed flow of article selection is illustrated in Figure 1.

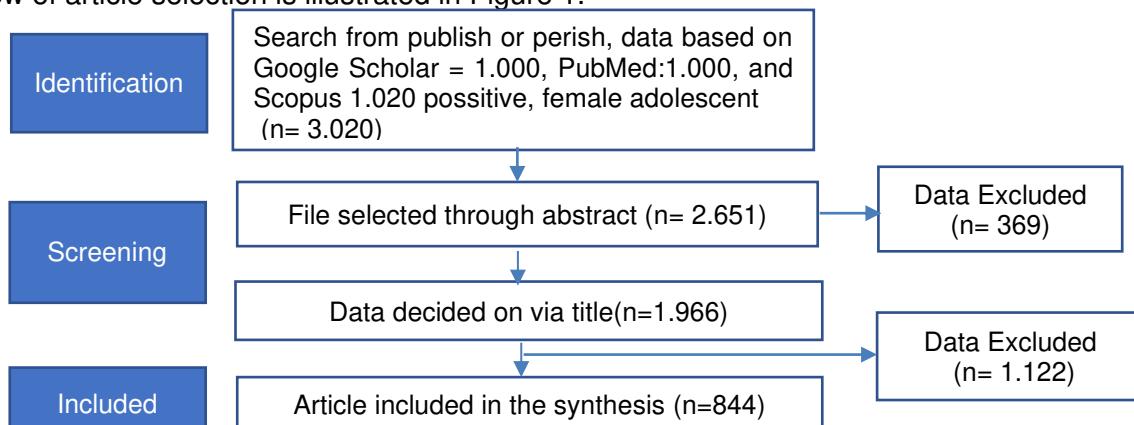
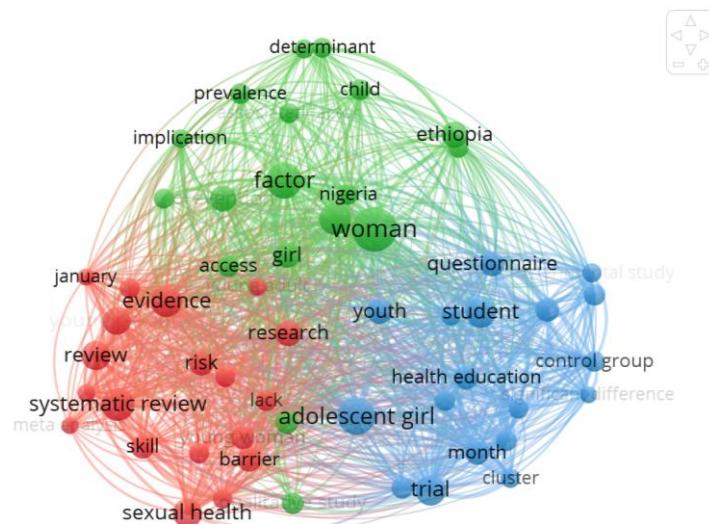


Figure 1. PRISMA Flowchart

## RESULT

During the identification and screening stages, several exclusion criteria were applied to ensure the relevance and quality of the included studies. Articles were excluded if they

met one or more of the following: (1) not published in peer-reviewed journals; (2) not written in English; (3) published outside the defined period of 2019–2024; (4) lacking a focus on adolescent reproductive health education or interventions; (5) presenting only opinion-based content such as editorials or letters; or (6) lacking accessible full-text versions. These considerations were made to maintain the methodological rigor and thematic focus of the scoping review. The VOSviewer network visualization at Figure 2 presents a bibliometric network visualization, likely generated using a tool like VOSviewer, illustrating clusters of keywords related to reproductive health, adolescent girls, and intervention studies. The network is divided into three clusters, each represented by distinct colors. The red cluster focuses on research methodologies and outcomes, with keywords like “systematic review”, “evidence”, “risk”, and “sexual health”, highlighting the analytical and outcome-driven aspects of the studies. The green cluster emphasizes demographic and geographical factors, featuring terms such as “woman”, “child”, “Nigeria”, and “Ethiopia”, suggesting the importance of population-based and contextual analyses. The blue cluster centers on education and intervention methods, including terms like “student”, “questionnaire”, “trial”, and “control group”, reflecting a focus on experimental and educational approaches. The size of the nodes represents the frequency or significance of the keywords in the literature, with larger nodes like “woman” and “adolescent girl” indicating central themes. The connections between nodes (edges) denote co-occurrences or relationships, with denser connections highlighting stronger thematic links. This visualization provides insights into the key trends, focus areas, and potential research gaps in the field, demonstrating the interdisciplinary nature of the topic, spanning health education, demographic analysis, and research methodologies.



**Figure 2. Network Visualization**

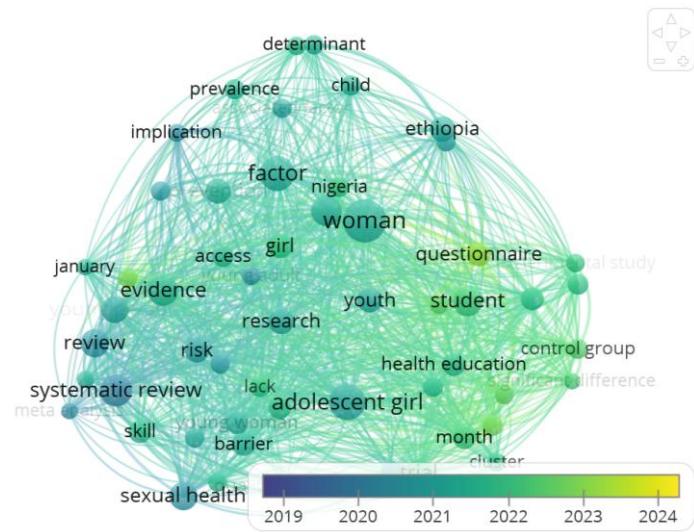
To complement the visual output in Figure 2, the table below summarizes the themes identified in each cluster of the VOSviewer bibliometric network. Each color-coded cluster reflects a distinct thematic focus based on co-occurring keywords, providing insight into methodological trends, demographic emphasis, and educational strategies across the reviewed literature.

**Table 1. Keyword Cluster Themes**

Cluster Color	Focus Area	Sample Keywords	Interpretation Summary
Red	Research design & outcome	Systematic review, evidence, sexual health	Evidence-based studies emphasizing outcomes and risks

Cluster Color	Focus Area	Sample Keywords		Interpretation Summary
Green	Demographics & regional context	Woman, Ethiopia, factor	child, Nigeria,	Contextual studies focused on the population and region
Blue	Educational Interventions & Methods	Student, questionnaire, education	trial, health	School-based trials using structured interventions

Figure 3 presents a bibliometric overlay visualization that displays the evolution of research keywords related to reproductive health and adolescent interventions from 2019 to 2024. The color gradient indicates the average publication year for each keyword, with darker blue representing older studies (2019) and yellow indicating recent publications (2024). Larger nodes, such as “woman” and “adolescent girl”, signify frequently occurring and central themes in the research. Earlier studies, represented by darker nodes, focus on topics like “systematic review”, “sexual health”, and “barrier”, emphasizing foundational and analytical research. In contrast, lighter and more recent nodes highlight emerging topics like “questionnaire”, “control group”, and “health education”, reflecting a shift toward practical and intervention-focused approaches. The dense network of connections (edges) represents the co-occurrence of terms, indicating strong thematic relationships and interdisciplinary research. This visualization offers insights into trends and developments in the field, revealing both established areas of study and new directions for future research.



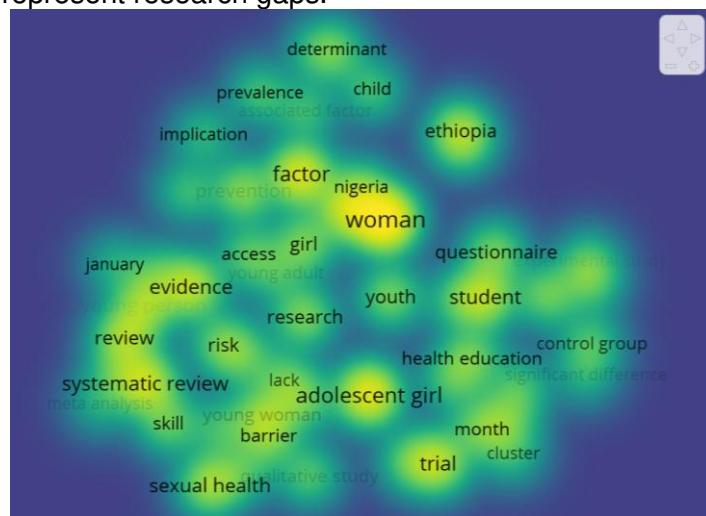
**Figure 3. Overlay Visualization**

To further contextualize the overlay visualization, Table 2 categorizes key themes based on keyword frequency and temporal trends. It helps map how research priorities have evolved, from methodological foundations to more practice-based interventions.

**Table 2. Keyword Themes Across Visualizations**

Table 2: Keyword Themes Across Visualizations			
Theme Category	High-Frequency Keywords	Year Range (from overlay)	Interpretation Summary
Methodological	Systematic review, evidence, trial, risk	2019-2021	Foundational studies focusing on outcomes and methods
Demographics and Region	Woman, adolescent girl, Nigeria, Ethiopia	2020-2023	Population-focused studies, often regional
Intervention and Education	Health education, student, questionnaire, control group	2022-2024	Scholl-based, structured interventions are gaining attention

Figure 4 presents a heatmap visualization that highlights the intensity of keyword occurrences in research related to reproductive health, positive mental health, and female adolescents, with brighter yellow areas indicating higher frequencies of specific terms. Central keywords such as "woman", "adolescent girl", "systematic review", "health education", "student", and "questionnaire" are shown in the most illuminated regions, signifying their prominence and frequent co-occurrence in the literature. Peripheral keywords like "child", "prevalence", "Ethiopia", "barrier", and "sexual health" appear less frequently but remain relevant. The heatmap reveals thematic clusters, including methodological terms (e.g., "systematic review", "trial", "evidence"), demographic and geographical factors (e.g., "woman", "youth", "Nigeria", "Ethiopia"), and intervention-related concepts (e.g., "student", "health education", "questionnaire"). This visualization underscores key areas of focus in the literature, such as the significance of adolescent-targeted interventions, the use of systematic reviews to consolidate knowledge, and the emphasis on education and geographical contexts, while also pointing to less explored topics that may represent research gaps.



**Figure 4. Density Visualization**

To complement the density heatmap, Table 3 presents a categorized summary of keyword intensity and distribution. It groups keywords by thematic category and describes the brightness and frequency of their occurrence in the visual network, providing a clearer interpretation of their centrality and research prominence.

**Table 3. Summary of Keyword Frequency and Clusters**

Thematic Category	Key Keywords	Frequency Intensity
Methodological	Systematic review; risk; barrier; sexual health	High for systematic review (brightest spot). Medium for Risk, Barrier, Sexual health (moderately bright)
Demographics	Woman, adolescent girl; Nigeria; Ethiopia	High for women and Adolescent girls (very bright, central terms). Medium for Nigeria and Ethiopia (visible, but less intense)
Intervention	Student; Health education; student; questionnaire; control group	High for the student (bright in cluster). Medium for health education, trial, control group (present with moderate intensity)

## DISCUSSION

This bibliometric analysis provides critical insights into the evolving landscape of reproductive health education, adolescent knowledge, and intervention research. High-frequency keywords such as "woman", "adolescent girl", "health education", and "questionnaire" consistently appeared across all visualizations, emphasizing a strong focus on gender-sensitive educational interventions in adolescent health. This aligns with

life course theory, which suggests that adolescence is a pivotal developmental stage influencing long-term health outcomes [15], [16]. Targeted interventions for adolescent girls are crucial not only for individual health but also for broader societal outcomes, including gender equity, delayed marriage, and improved educational retention [17], [18] [19], [20].

Overlay and density maps show a temporal shift from methodological terms to application-focused terms like "health education" and "questionnaire", reflecting the evidence-based practice paradigm [21], [22], [23], [24], [25], [26]. The increasing reliance on structured interventions highlights a positive trend toward institutionalizing adolescent health literacy programs.[27] Meanwhile, underexplored themes such as "barrier", "child", and "Ethiopia" reveal inequities and cultural limitations in access to reproductive health services [28], [29], [30]. Health inequity theory suggests marginalized populations often lack access to education and care due to structural and sociocultural barriers. Author network analysis revealed limited international collaboration, highlighting the need for cross-national partnerships to enhance methodological innovation and contextual relevance. Keywords like "Nigeria" and "Ethiopia" suggest a regional concentration of studies, where cultural, linguistic, and socioeconomic realities shape how adolescents receive and interpret health messages [31], [32], [33], [34].

Experimental designs, evidenced by keywords like "trial" and "control group", are becoming more prominent, reinforcing the need for rigorous, evidence-based policy and programming [35], [36], [37]. Policymakers should invest in high-quality trials and support adolescent access to confidential, culturally competent health services. Integration of mental health into reproductive health programs, family engagement, and competent educator training are also critical [38], [39], [40]. Methodologically, the prominence of "systematic review" and "meta-analysis" indicates the field's reliance on research synthesis for policy relevance [41], [42], [43], [44]. Yet, the study's limitation in relying solely on English-language sources and Google Scholar may underrepresent regionally important findings. Future reviews should incorporate multilingual databases and local collaborations for inclusivity[45]. In conclusion, this study underscores the importance of strengthening equitable, evidence-informed, and context-responsive reproductive health interventions for adolescents, especially in underserved populations.

## CONCLUSION

This bibliometric analysis reveals that adolescent reproductive health research increasingly emphasizes school-based interventions, health education, and gender-sensitive approaches, with "adolescent girl" and "health education" emerging as dominant themes[22], [24], [27], [46], [47]. Despite this, certain topics such as cultural barriers, younger adolescents, and regional disparities remain underrepresented [21], [22], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65]. The field is moving toward more structured, data-driven interventions supported by systematic reviews, meta-analyses, and experimental designs [35], [36], [41]. However, limited international collaboration and the underutilization of non-English and gray literature constrain global applicability. To advance adolescent health outcomes, future efforts should prioritize inclusive, context-specific, and culturally competent educational interventions that address structural inequities and promote cross-disciplinary collaboration [66], [67]. These findings support the need for integrative, policy-driven strategies that empower adolescents with knowledge and autonomy in managing their reproductive health.

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