

Online and Offline Interventions to Improve Adolescent Reproductive Health Knowledge and Attitudes: A Scoping Review

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Abstract

Objective: This scoping review aims to identify and classify online and offline interventions to improve adolescent reproductive health knowledge and attitudes, and evaluate their effectiveness.

Method: The study employs a scoping review methodology, following the Arksey and O'Malley framework and PRISMA guidelines. Articles published between 2019 and 2024 were retrieved from PubMed, CINAHL, and Scopus using comprehensive search strategies. Inclusion criteria focused on quantitative studies involving adolescents aged 10-19 years that assessed interventions targeting knowledge or attitudes about reproductive health. Data were extracted systematically and critically appraised using the Joanna Briggs Institute (JBI) tool, with articles scoring above 75% considered high quality.

Results: Fifteen studies met the inclusion criteria, comprising six online interventions (web-based programs, mobile applications, text messaging) and nine offline interventions (school-based programs, family-oriented initiatives, games, and health education). Sample sizes ranged from 64 to 1,210 participants, predominantly adolescents aged 10-24 years. Both online and offline interventions significantly improved knowledge and attitudes toward reproductive health, with all studies achieving JBI critical appraisal scores above 75%.

Conclusion: Both online and offline interventions are effective in enhancing adolescents' reproductive health knowledge and attitudes. The choice of intervention should align with the target population's characteristics. This review highlights the importance of integrating diverse approaches into reproductive health education to address varying needs and contexts effectively

Keywords: Adolescent, Attitude, Intervention, Knowledge, Reproductive health, Online, Offline

INTRODUCTION

There are various types of interventions to improve reproductive health knowledge and attitudes in adolescents. Reproductive health education interventions can be conducted online and offline. This intervention is useful to prevent the risk of the Adolescent Reproductive Health (KRR) triad, namely sexuality, HIV/AIDS, and drugs (BKKBN, 2023).

In the risk of sexuality, there are several problems faced by adolescents such as

exposure to pornography, unwanted pregnancy, sexually transmitted infections, abortion, and early marriage (Chakole et al., 2022; Laksono et al., 2023; WHO, 2023). Therefore, the issue of sexuality risk is something that really needs attention because it will have an impact on the physical or mental development of adolescents (Guttmacher Institute, 2022; Pathmendra et al., 2023; Santos et al., 2022).

In a study conducted by Meilani et al., (2023) said that as many as 57.5% of 80 adolescents

in one of the high schools in Yogyakarta had access to pornography through movies, short videos, and also images through social media. Early marriage in adolescents aged 10-14 years in Indonesia is 93,350 people (Badan Pusat Statistik, 2022). A total of 1,220,900 women were married before the age of 18, so it can be said that one in nine girls is married in Indonesia (Badan Pusat Statistik, 2022; UNICEF, 2020). Globally, by 2021, there will be 42 births for every 1,000 girls aged 15-19 years (WHO, 2024a). Survey results in West Java according to the Age Specific Fertility Rate in 2020 showed that among 1,000 adolescent girls aged 15-19 years, around 24.5 of them gave birth (BPS, 2020). This illustrates the issue in one aspect of the KRR Triad, namely sexuality or reproductive health in adolescents (Kartini & Masruchi, 2021). Exuality problems in RH can have a negative impact on the physical and psychological well-being of adolescents. Sexuality problems in RH can have adverse physical and psychological impacts on adolescents. Some of them, in the case of teenage pregnancy, cause pregnancy complications and even death (Chakole et al., 2022). On the psychological aspect, research results show more symptoms of anxiety and somatization in adolescents than women who give birth at an older age, and those who marry at less than 25 years of age show higher levels of depressive symptoms than those who marry at an older age (Chakole et al., 2022; Sezgin & Punamäki, 2020). In addition, marriage at a young age can violate children's fundamental rights, such as the right to childhood, access to education, adequate health, and the freedom to determine the direction of their own lives (Paul, 2019). These impacts can be prevented through early reproductive health education. The Triad of Adolescent Reproductive Health Problems (Triad KRR) often arises due to a lack of information about reproductive health (Kosasih et al., 2021). A study by Solehati et al. (2022) showed that 81.4% of 668 adolescents in Bandung Regency had poor reproductive health knowledge. The perception of the topic

as taboo causes embarrassment among adolescents, making them hesitant to seek information on reproductive health (Mohd. Tohit & Haque, 2024). Low levels of knowledge may lead adolescents to develop poor attitudes and behaviors regarding reproductive health (Karatana et al., 2023). Adequate reproductive health knowledge is a key factor in shaping adolescents' attitudes to avoid issues related to the Triad KRR (Salehin et al., 2021).

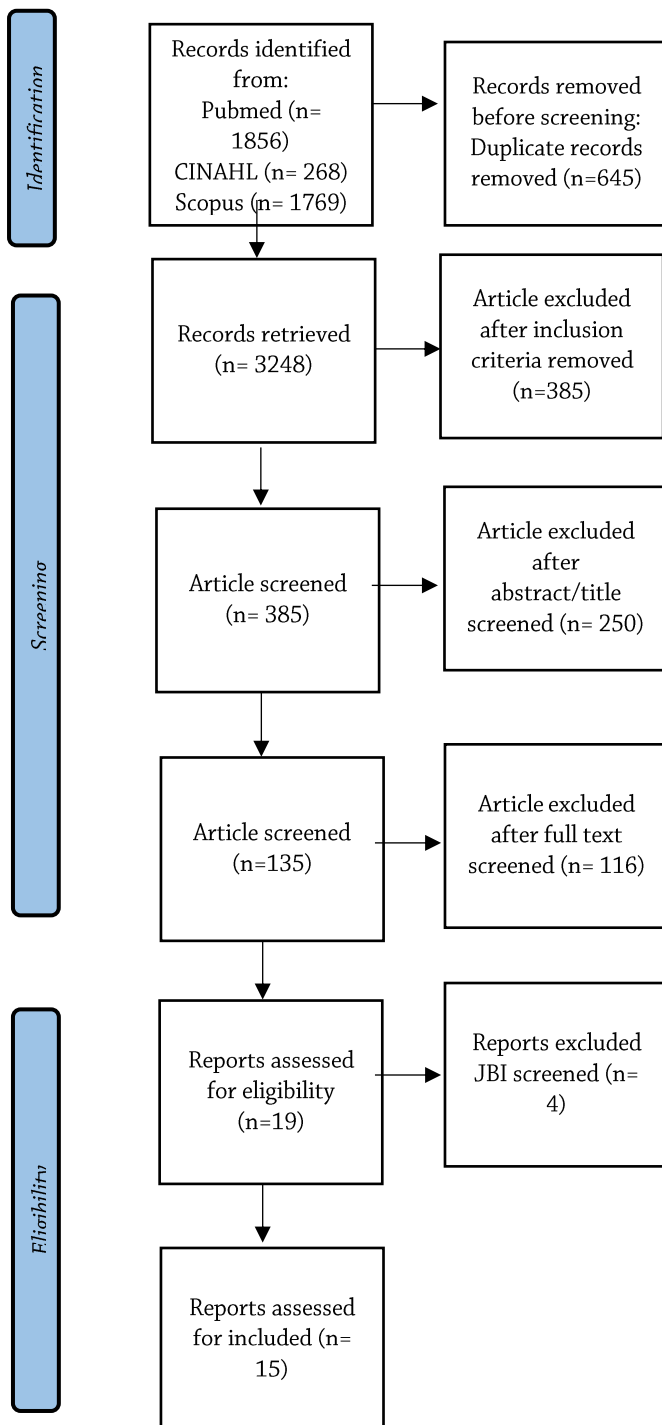
In determining, reproductive health education interventions are important to prevent and reduce the adolescent reproductive health triad. Adolescents, who are currently the dominating population of Indonesia, are certainly expected to be a superior generation in the future. Prevention of the KRR triad, especially in sexuality, is one way to make Indonesian adolescents a superior generation. Therefore, a scoping review is needed to describe online and offline reproductive health education interventions to improve adolescent reproductive health knowledge and attitudes.

METHODS

Study Design

This study uses a literature review with a scoping review design. Scoping review is a systematic method in research conducted to explore and summarize the evidence in the scientific literature related to a particular topic (Arksey & O'Malley, 2005). The main purpose of a scoping review is to provide a comprehensive understanding of the scope of the research topic by identifying and collating a wide range of relevant literature. The present scoping review follows a five-stage methodological framework that includes (1) identifying research questions and (2) relevant studies, (3) selecting studies based on inclusion criteria, (4) mapping and interpreting data, and (5) summarizing and reporting results. In addition, we adapted the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement accordingly (Moher et al., 2009).

Searching Methods



Trough literature search will be carried out using the following electronic databases: PubMed, CINAHL, and Scopus. PubMed was selected for its extensive access to a wide range of references and abstract databases in the natural sciences and biomedical fields. CINAHL was chosen for its focus on nursing-related topics, while Scopus is an excellent

resource for interdisciplinary research, covering areas such as social sciences, natural sciences, and health.

For all retrieved articles, a detailed analysis will be performed on the titles, abstracts, and index terms to develop a comprehensive search strategy. A second search will then be conducted using the identified keywords and index terms across the entire database. The third step will involve reviewing the reference lists of all selected studies for additional relevant sources. The search strategy will encompass studies from 2019 to the present. All references will be imported into the reference management software, Mendeley. Searching strategy includes a series of combinations of relevant keywords: (Online OR social media OR application OR web OR smartphone OR internet OR offline) AND (sexual health) OR (reproductive health)) OR (sex education)) OR (sexual behaviour)) OR (contraception)) OR (contraceptive agents)) OR (condoms)) OR (pregnancy)) OR (abortion)) OR (termination of pregnancy)) OR (sexually transmitted infections)) OR (venereal diseases) AND (Adolescent) OR (youth)) OR (young people)) OR (teenager) AND (knowledge) AND (Attitude) AND (Intervention). The research question used is: What online and offline interventions can improve adolescents' knowledge and attitudes towards reproductive health?

Inclusion and exclusion criteria

The inclusion criteria for this study were that articles were included if they met the following criteria: (a) quantitative intervention studies, quasi experiments or randomized controlled trials; (b) involved adolescents aged 10 to 19 years; (c) described at least one of the intervention items to improve knowledge or attitudes; (d) described one of the following: condom use, sexual partners, sexual debut, contraceptive prevalence, sexually transmitted infections, unintended pregnancy, abortion, or sexual/reproductive health knowledge. Only articles in English are included. Published in 2019-2024.

Data extraction

The authors utilized tables that included details such as the author's name, publication year, country, study objectives, population or sample size, research methods, intervention type, and results to extract data. This method is intended to facilitate the analysis of articles that have undergone the screening process.

Quality Appraisal

The journals were evaluated using the Joanna Briggs Institute (JBI) critical appraisal tool, with articles deemed high quality if they scored above 75% based on topic relevance and assessment criteria. Each criterion was rated as "yes" (1 point), "no," "unclear," or "not applicable" (0 points). The total score determined article eligibility, ensuring the selected studies met minimum standards of quality, reliability, and relevance for inclusion in the review.

| Author, Published Year | JBI Critical Appraisal Tool | Study Design |
|---------------------------------------|-----------------------------|--------------------|
| Scull, et al (2022). | 84,6% (11/13) | RCT |
| Alekhy, et al (2023). | 76,9%(10/13) | RCT |
| Martínez-García, et al (2023). | 76,9%(10/13) | RCT |
| Wendt, el at (2022) | 84,6% (11/13) | RCT |
| Perez-Lu, et al. (2022) | 76,9% (10/13) | RCT |
| Millanzi, et al. (2022). | 92,3% (12/13) | RCT |
| Guilamo-Ramos, et al. (2020) | 84,6% (11/13) | RCT |
| Wirsy, et al. (2022) | 84,6% (11/13) | RCT |
| Yakubu, et al (2019) | 84,6% (11/13) | RCT |
| Manlove et al., (2021) | 76,9% (10/13) | RCT |
| Morgan, et al (2020). | 88,9% (8/9) | Quasy Experimental |
| Pakarinen, et al (2023). | 77,8% (7/9) | Quasy Experimental |
| Sidamo, et al (2023). | 88,9% (8/9) | Quasy Experimental |
| Carvalho, et al (2023) | 100% (9/9) | Quasy Experimental |
| Pinandari et al., (2023) | 92,3% | Quasy Experimental |

Data Analysis

The author conducted a descriptive analysis of the collected articles using a structured data extraction table. Relevant data were entered according to the predefined columns. An additional table was created to list intervention steps, but it was excluded from the main extraction table due to its length. The findings from the article review were described and compared with previous studies, and the identified interventions were classified based on similarity in approach or content.

RESULT

Based on the search results, 15 articles were obtained that met the inclusion and exclusion criteria. Six studies used Quasi Experiment methodology and eight articles used A randomized controlled trial (table 1). Sample sizes ranged from 64 to 1,210 participants, mostly adolescent boys and girls aged 10-24 years, and one study focused on adolescent boys. The search revealed that studies were conducted in both developing countries (Indonesia, India, and Peru) and developed countries (United States, Finland, and Nigeria). Six articles focused on online interventions, while nine articles addressed offline interventions. The online interventions included web-based platforms, mobile applications, and text messaging. Offline interventions comprised school-based programs, family-based initiatives, games, and health education sessions. All articles underwent critical appraisal and received scores above 75%.

| No. | Author(s) /Year | Country | Purpose | Population/ Sample Size | Method | Intervention | Results |
|----------------|-----------------------------|----------|--|--|-------------------------------|---|---|
| OFFLINE | | | | | | | |
| 1. | Alekhy, et al (2023). | India | This study was to assess the effectiveness of SRH education among adolescent girls in urban Odisha, India. | 790 students in grades 9 and 10. | A randomized controlled trial | Sexual Reproductive Health education. | The results of the study showed significant proportional changes in knowledge, attitudes, and practices related to Sexual and Reproductive Health (p-value <0.001). |
| 2. | Morgan, et al (2020). | Nigeria | This study examines the effectiveness of first-time parents' interventions in increasing voluntary contraceptive use. | 300 First Time Mothers peer group members and 200 male partner group members aged 15-30 years. | a quasi-experimental study | First-time parents (FTPs). | The results of the study showed that there was an increase in the voluntary use of modern contraception (P<0.000). |
| 3. | Pakarinen, et al (2023). | Finland | The purpose of this study was to describe the attitudes, knowledge and sexual behavior of adolescents before and after a sexual health promotion intervention. Intervention. | Teenage students aged 15–19 years. | a quasi-experimental study | Sexual health promotion interventions. | There was a significant difference before and after the intervention regarding better knowledge and more frequent Sexually Transmitted Infection (STI) testing (<i>p</i> - value < 0.05) |
| 4. | Sidamo, et al (2023). | Ethiopia | This study aims to assess the effect of curriculum-based sexual and reproductive health education (CBSRHE) on knowledge and | 832 students aged 19 years. | a quasi-experimental study | Curriculum-based sexual and reproductive health education | There were statistically significant differences between the intervention and control groups in terms of changes in contraceptive |

| No. | Auth or(s) /Year | Cou ntry | Purpose | Populatio n/ Sample Size | Metho d | Interve ntion | Results |
|-----|--------------------------|-------------|--|---|-------------------------------|--|--|
| | | | attitudes about SRH services in order to have safer sexual behavior among first-year students of Arba Minch University. | | | on (CBSRH E). | use, knowledge and attitudes ($p < 0.01$). |
| 5. | Carvalho, et al (2023) | Brazil | The aim of this study was to examine the influence of board games on female prisoners' knowledge of STIs. | 64 women aged 18 years. | a quasi-experimental study | Previna board game. | The results showed that the Previna board game significantly increased players' knowledge about STIs, and this increase in knowledge remained significant throughout the follow-up period. ($p < 0.001$). |
| 6. | Pinandari et al., (2023) | Indonesia | To evaluate the effects of a comprehensive sexual education (CSE) intervention on short-term psychosocial outcomes related to healthy sexuality among very young adolescents in urban Indonesia. | 3,335 teenagers aged 10-14 years | a quasi-experimental study | comprehensive sexuality education (CSE): EQUAL | Students who received the intervention showed significant improvements in competencies, including better knowledge about pregnancy, more gender-equitable attitudes, and communication about sexual and reproductive health and rights, compared to the control group ($p = 0.007$). |
| 7. | Miliani, et al. (2022). | Tanzania | This study designed and tested the effect of integrated reproductive health (RH) | Teenagers aged 10-19 years, a total of 660 teenagers. | A randomized controlled trial | Integrated reproductive health (RH) | The results of the study showed that the soft skill coefficient was significantly higher among adolescents |

| No. | Author(s) /Year | Country | Purpose | Population/ Sample Size | Method | Intervention | Results |
|---------------|--------------------------------|------------------|--|---|-------------------------------|---|--|
| | | | subject matter in problem-based pedagogy (PBP) to improve safe sexual behavior soft skills among adolescents in Tanzania. | | | lesson materials in a problem-based pedagogy (PBP). | in PBP compared to the control group ($p < 0.01$). |
| 8. | Guilamo-Ramos, et al. (2020) | African American | To evaluate the efficacy of Families Talking Together (FTT), a triadic abstract intervention to reduce adolescent risky sexual behavior. | 900 families with teenagers aged 11-14 years. | A randomized controlled trial | Families Talking Together (FTT) | This study showed that the FTT triadic intervention was efficacious in delaying sexual debut and reducing risky sexual behavior among adolescents ($p < 0.05$). |
| 9. | Yakubu, et al (2019) | Ghana | This study aimed to assess an abstinence education intervention program based on the Health Belief Model (HBM) among adolescent girls in Northern Ghana. | 363 teenagers aged 13-19 years. | A randomized controlled trial | <i>Sexual abstinence</i> education . | Educational interventions based on HBM significantly increased adolescents' sexual abstinence and knowledge about pregnancy prevention in the intervention group ($P < 0.003$). |
| ONLINE | | | | | | | |
| 10. | Martínez-García, et al (2023). | United States | To test the Crush mobile application which aims to improve sexual health by promoting the use of SRH and contraceptive services among adolescent girls. | 1,210 girls aged 14-18 years. | A randomized controlled trial | Crush: mobile application Sexual and Reproductive Health. | The results showed that the Crush application can improve knowledge, attitudes, and self-efficacy related to key SRH behaviors and may be a strategy to deliver SRH education to adolescent girls. ($p < 0.05$). |
| 11. | Scull, et al | United | To enhance adolescents' | There are 590 | A random | <i>Media Aware</i> is | <i>Media Aware</i> web-based program is |

| No. | Author(s) /Year | Country | Purpose | Population/ Sample Size | Method | Intervention | Results |
|-----|----------------------------|---------------|---|--|--------------------------------|--|--|
| | (2022). | States | critical thinking about media messages and provide medically accurate information and development of skills related to sexual health and communication. | students in grades 9 and 10. | ized controlled trial | a web-based stand-alone program. | effective in positively improving secondary school students' media, sexual health, and sexual health communication outcomes (M = 2.17, SD = 0.08). |
| 12. | Wendt, et al. (2022) | United States | This study examines the impact of Healthy U, a program designed specifically for justice-involved young men. | Male adolescents, ages 14–19 years. | A randomized controlled trial | Healthy U is an application-based program. | The results of the study showed that healthy U significantly and meaningfully increased positive attitudes towards condom use and negative attitudes towards sexual health behavior, as well as increased intentions to use condoms and contraceptives ($p < 0.05$). |
| 13. | Perez-Lu, et al. (2022) | Peru | To examine the effect of the ARMADILLO text message intervention in improving sexual and reproductive health knowledge among adolescents in Peru. | 712 participants aged 13–17 years. | A randomized controlled trial. | ARMADILLO text message intervention. | ARMADILLO SMS content had a significant (but small) influence on participants' contraception knowledge. |
| 14. | Wirsy, et al. (2022) | Africa | This study tested the efficacy of weekly one-way educational text messages to improve adolescent girls' | 398 female adolescent participants aged 10–19 years. | A randomized controlled trial | Mobile-based adolescent sexo-reproductive | The results showed statistical significance so that there was an overall increase in adolescent girls' perceptions after |

| No. | Auth or(s) /Year | Cou ntry | Purpose | Populatio n/ Sample Size | Metho d | Interve ntion | Results |
|-----|------------------------|-------------|---|-----------------------------------|----------------------------|--------------------------|---|
| | | | perceptions of sexual-reproductive health. | | | health scheme (MASH S). | the intervention and not by chance. |
| 15. | Tu, et al, (2019) | Taiwan | The purpose of this study was to develop messages within a gains framework (benefits of performing the behavior) and a losses framework (costs of not performing the behavior) and to identify the impact of these messages on cervical cancer awareness and vaccination intentions against human papillomavirus (HPV) associated with cervical cancer. | 565 students aged 15-16 years. | a quasi-experimental study | HPV framed message film. | The results showed that both gain-frame and loss-frame messages increased HPV knowledge (d = 2.147-2.112) and attitudes toward HPV vaccination (d = 0.375-0.422). |

DISCUSSION

The results of the scoping review show that there are 15 types of interventions that can improve reproductive health knowledge and attitudes in adolescents, namely online interventions are web-based, applications, and text messages. Offline research is school-based, family-based, game-based, and health education-based.

Online and offline research have their own advantages. In online interventions, adolescents have the opportunity to reach sexual and reproductive health information in a way that is personalized, relevant, and flexible to time (Aventin et al., 2020). Offline research can be conducted in person so that it

can be discussed with educators in various attractive ways (Thongkorn & Chaimongkol, 2023).

Offline, school-based interventions have several advantages, some of which include direct interaction and qualified presenters, so that adolescents can ask questions about their reproductive health problems (Hinson et al., 2023). Various interactive methods such as discussion, quiz games, roleplay, and interactive media materials such as Power Point (Boku et al., 2024; Morenz et al., 2021) Some studies say that in addition to providing material, presenters also provide comfort to adolescents, so that they feel comfortable and more easily open to reproductive health issues (Guo et al., 2023).

From an economic perspective, school-based education is an easy and cheap access for adolescents to obtain reproductive health information (Alekhya et al., 2023). Providing school-based education can make adolescents increase their motivation to learn reproductive health, based on research using the Information-Motivation-Behavioral Skills model (Thongkorn & Chaimongkol, 2023). Good knowledge can influence one's attitude to support positive things and vice versa (Solehati et al., 2022b). The summary of school-based interventions shows that schools can be a cheap, inexpensive, and sustainable source of reproductive health information for adolescents to avoid risky reproductive health behaviors.

Improving reproductive health knowledge and attitudes can be done with games. Like the previous article that used a board game intervention to improve reproductive health knowledge in children with special needs (Masrul et al., 2019). This research uses learning media with the Cone of Experience principle which illustrates that the utilization of "audio-visual" functions can increase understanding by 20%, "demonstration" by 30%, and "doing exercises" by 75% which have been applied to paper doll media and board games (Davis & Summers, 2015). Another study used flashcards to deliver material through games and resulted in increased knowledge of unintended pregnancy (Rohqiyati et al., 2023). This shows that providing reproductive health information through games can improve adolescent reproductive health.

Offline interventions can be done with the closest people, namely the family. One such intervention is Families Talking Together (FTT), a family-oriented program that aims to improve adolescent reproductive health (Guilamo-Ramos et al., 2020; Whitaker & Miller, 2000). Parents have an important role in providing health information to their children. One study, conducted an intervention by training parents to communicate about Parent-Adolescent communication (PAC) about sex and alcohol to their teenagers and the results showed that there was an increase in talk about sex and alcohol higher than the control group (Ford et

al., 2019). Another study, using FTT to support communication about HPV vaccine and sexual health promotion by student nurses to parents of teenagers (Santa Maria et al., 2021). These findings indicate that the level of sexual activity remained low in both groups during the six-month follow-up period.

Enhancing sexual and reproductive health can be achieved through health education grounded in the Health Belief Model (HBM) of behavior change (Yakubu et al., 2019). Not only HBM theory but there are other theories such as reproductive health education research that uses the Transtheoretical Model (Karatana et al., 2023). The theory has five stages of behavior change from the Transtheoretical Model, namely pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska et al., 2015). This process of behavioral change offers adolescents both knowledge and motivation to adopt healthier sexual and reproductive behaviors (Vela & Ortega, 2020). The advantage of using a behavior change model is that each concept aims to shift negative behaviors, such as adolescent reproductive health attitudes, towards more positive ones (Prochaska et al., 2015). Based on these studies, it shows that using the behavior change model theory can be a reference in making interventions to prevent risky reproductive health behaviors (Karatana et al., 2023; Yakubu et al., 2019).

In addition to using offline interventions, using online interventions can improve adolescents' knowledge and attitudes in reproductive health. Proven in several studies that have been collected, the use of smartphones can be a medium that improves adolescent reproductive health, especially gen Z (Vanestanagh et al., 2021). The use of smartphone technology makes adolescents have a faster opportunity to get information and disseminate health messages cheaply and easily (Kaviani & Nelson, 2021). Mobile phone-based interventions have been shown to be effective for use in health education. (Benoit et al., 2022). Adolescents spend more than seven hours using media, making it an advantage to use smartphone-based interventions (Rideout & Robb, 2019). Several web-based interventions have been shown to

be effective in reducing health risk behaviors and improving health, especially in terms of knowledge and attitudes about reproductive health (Ampt et al., 2020; Scull et al., 2022).

In the message-based intervention, there were several obstacles, namely adolescents felt that the text messages they received were too much to handle because the text messages used numeric codes, and adolescents thought that it was a random message from the service provider (Mwaisaka et al., 2021). Even so, in accordance with previous research, the use of apps can increase awareness and use of sexual and reproductive health services in adolescents with research results that are proven to be significant (Nuwamanya et al., 2018). Another study, using an application on android and reading material about reproductive health within four weeks showed significant results in increasing reproductive health knowledge (Vanestanagh et al., 2021). Therefore, smartphone-based interventions are proven to improve adolescent reproductive health knowledge. Determining interventions to improve reproductive health knowledge and attitudes can be done based on the researcher's objectives. There are several types of offline and offline interventions found, and there are several advantages and disadvantages. However, the most important thing is that the provision of reproductive health knowledge should be given early in accordance with the age stages, especially during adolescence. In addition, adjusting to the characteristics of adolescents who will become respondents. Adolescents have typical behaviors such as experimenting, taking risks, and the process of reaching sexual and reproductive maturity (Getachew et al., 2022; WHO, 2024). Therefore, appropriate interventions are needed to improve adolescent reproductive health knowledge and attitudes.

CONCLUSION

Interventions to improve knowledge and attitudes related to reproductive health can be carried out through online and offline methods, with each having its own advantages. The choice of intervention method should be adjusted to the characteristics of the research respondents. Both intervention methods proved to be effective in improving

adolescents' knowledge and attitudes towards reproductive health. This provides implications for nurses in conducting reproductive health education with various approaches. Nurses can adjust educational methods based on the findings from the scoping review. In addition, nurses can also conduct further research to address existing research gaps related to improving adolescents' knowledge and attitudes about reproductive health.

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Conflict of Interest

The author declares no conflict of interest related to the conduct, analysis, or publication of this study.

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