Review

Interventions and Strategies to Improve Sexual and Reproductive Health Outcomes among Adolescents Living in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis

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Abstract: Adolescent access to quality sexual and reproductive health and rights has been a major issue in most low- to middle-income countries (LMICs). This systematic review aims to identify the relevant community and school-based interventions that can be implemented in LMICs to promote adolescents’ sexual and reproductive health and rights. We identified 54 studies, and our review findings suggested that educational interventions, financial incentives, and comprehensive post-abortion family planning services were effective in increasing their knowledge and use of Adolescent Sexual and Reproductive Health and Rights (ASRHR) services, such as contraception, which led to a decrease in unwanted pregnancies. However, we found inconclusive and limited evidence on the effectiveness of interventions for improved violence prevention and adolescent behavior towards safe sexual practices. More rigorous studies with long-term follow-ups are needed to assess the effectiveness of such interventions.

Keywords: Adolescent Sexual and Reproductive Health and Rights (ASRHR); interventions; outcomes; ASRHR services; condom use; teenage pregnancy; contraception

1. Background

Adolescence is a critical period during which young people experience extensive biological, psychological, and social changes [1]. Sexual and reproductive health (SRH) and access to SRH services are basic human rights, and based on sustainable development goals (SDG) (target 3.7), universal access to SRH services should be attained by 2030. However, SRH knowledge and service remains limited to many in low- to middle-income countries (LMICs) [2], home to 90% of the world’s approximately 1.2 billion people aged 10–19 [3–5].

Adolescent Sexual and Reproductive Health and Rights (ASRHR) are distinct from those of adults, and the neglect of a specific ASRHR can affect an adolescent’s physical and mental health, future employment, economic well-being, and the ability to reach his or her full potential [6,7]. Despite efforts to improve the uptake of SRH knowledge and services, unmet SRH needs remain high and are particularly dire for young people living in LMICs. There is also a substantial lack of research on the effectiveness and scaling-up of community-based interventions focused on improving SRH among young people in specific cultural contexts. Further research is needed to better understand which SRH interventions have demonstrated effectiveness for improving SRH in LMICs to increase evidence-based practices and inform decisions to invest in scaling-up of effective interventions.

Presently, adolescents living in LMICs suffer disproportionately from undesirable SRH outcomes, such as early or unintended pregnancy, unsafe abortions, sexual violence, and sexually transmitted infections (STIs), including HIV [7,8]. Young women, particularly adolescent girls, from LMICs are particularly vulnerable to poor SRH. Almost half of...
women aged 20–24 in Asia and Africa are married by the age of 18, which puts them at a higher risk for early pregnancy, maternal and child disability, and mortality [9,10]. The environment in which adolescents are making decisions related to their SRH is also rapidly evolving. Rates of initial sexual activity during early young age are growing in many LMICs [11,12], and childbearing and marriage are increasingly unlinked [13]. In many countries, a high prevalence of HIV increases the risks associated with early sexual activity [14,15]. For example, in many countries in Sub-Saharan Africa, HIV/AIDS is a generalized epidemic, and young people account for almost two-thirds of people living with HIV [16]. Therefore, developing, implementing, and evaluating interventions that can facilitate the development of healthy sexual behavior and relationships among adolescents is a priority. Community and school-based programs appear to be a logical choice for SRH education since most young children attain at least some education [17,18], particularly with the international recognition of the importance of schooling. In addition, studies have also reported that community-based interventions aimed at providing SRHR information and services can help to reduce ASRHR health challenges associated with adolescent pregnancies and marriages [19–21].

A growing body of evidence emphasized the scaling up and sustainable implementation of ASRHR community-based health interventions to strengthen ASRHR [22–28]. However, many questions remain about what interventions work and which interventions can be sustainable and potentially scalable. No existing systematic review has examined the evidence for the effects of community and school-based interventions across multiple areas of ASRHR in LMICs. To address this gap, we conducted a systematic review to assess the range and nature of community and school-based interventions implemented to improve the SRH of adolescents in LMICs. The findings will aid in the development of a research program to better meet the SRH needs of this population. The further objectives of this review are to identify and evaluate the effectiveness of different interventions employed to improve ASRHR in LMICs, understand the approaches and strategies in successful delivery of ASRHR intervention, and identify knowledge gaps in those contexts.

2. Methods

This systematic review has been registered with the International Prospective Register of Systematic Reviews (PROSPERO) database under ID number CRD42019136323 and follows the recommendations established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [29].

A systematic literature search was conducted on 11 April 2020, and re-updated in April 2021 using MEDLINE, EMBASE, PsychINFO (Psychological Abstracts), Ovid Global Health, CINAHL (Cumulative Index to Nursing and Allied Health Literature), the Cochrane Central Register of Controlled Trials, ProQuest Sociological Abstracts, ProQuest Dissertations, and Theses Global, Scopus, Web of Science, Centre for Reviews and Dissemination Databases, and the WHO library and other relevant websites (that publish ASRHR material). To avoid publication bias, we searched grey literature, the bibliographies of all relevant papers, and conference proceedings. We contacted experts in the field to identify any missing papers or programs. (Sexual and Reproductive Health, adolescents, low- and middle-income countries, and study design). The full search strategy and terms used are available in Supplementary File S1. No language restrictions were applied; however, only papers published after 1990 were included as the adolescent SRH agenda was formally started at that time.

We included all randomized controlled trials (RCTs), quasi-RCTs, and controlled before–after (CBA) studies on adolescents aged 10–19 living in low- and middle-income countries (LMICs) as defined by the World Bank [30]. Studies were included if they delivered interventions to improve SRH such as delaying early and forced marriage; improving or promoting family planning, contraception and the spacing of pregnancy; providing access to safe abortion; preventing and treating HIV/AIDS and other STIs; addressing intimate partner and sexual violence; menstruation and feminine hygiene; or any other
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indirect interventions such as education, economic development, and empowerment. We included studies that compared these interventions with no intervention or standard interventions. We also included studies at a cross-cutting age when data on adolescents was reported separately. We excluded studies with no control arm, and those conducted in high-income countries.

Primary outcomes of interest were unintended pregnancies, rate of abortion, use of family planning methods, teenage pregnancy, repeated teenage pregnancy, the incidence of STI/HIV, and rates of unprotected sex. Secondary outcomes of interest were knowledge related to ASRHR, use of ASRHR services, quality of life measured using any scale; and maternal/child morbidity and mortality.

Two reviewers (MR and SA) independently screened the titles and abstracts for eligibility. After the initial search, full texts of relevant articles were examined for inclusion and exclusion criteria. Primary studies that fulfilled the inclusion criteria were selected for this systematic review. Any disagreement among the authors was resolved through consensus or consulting a senior reviewer (SM). Two authors (MR and SA) extracted relevant information independently from the studies. The following items were extracted from each study if available: author’s name, study design, country, target population, intervention, and study outcome. The methodological quality of included RCTs was assessed using the Cochrane risk of bias tool [31] and q-RCTs were assessed using EPOC criteria [32]. Two reviewers (SM, SA) independently assessed the quality of the studies. Disagreements between reviewers were resolved by consensus or by the decision of a third independent reviewer (ZL).

Data were entered and analyzed using Review Manager (RevMan) version 5.4. A mean difference (MD) with a 95% confidence intervals (CI) was used for continuous data and relative risk (RR) with 95% CI was used for dichotomous data. Heterogeneity between the studies was explored using the $p$-value of Chi$^2$ and I$^2$. Fixed-effect models were used, but when the outcomes were heterogenous, random effect models were used. Subgroup analysis was performed based on the type of strategies employed (school-based interventions, community-based intervention, or a combination of these or other interventions) and the type of study design used.

3. Results
3.1. Study Characteristics

The search strategy identified 5715 articles. After removing 122 duplicates, 5593 were screened on title abstracts and 679 were retrieved for full texts. Based on the final inclusion criteria, 54 articles were included in our systematic review. Studies excluded after full-text screening are mentioned in the PRISMA flow diagram (Figure 1). Of the 54 included studies, 12 were quasi-RCTs and 42 were RCTs. Three studies were entirely conducted on young people aged 10–24 (n = 5929), whereas the remaining 51 studies were conducted either with adolescents aged 10–19 (n = 69,553) or youth aged 15–24 (n = 19,348). Regarding geographical distribution, 38 studies were conducted in Africa [24,33–69], 9 in Asia [70–78], and 7 in North America (the Caribbean) [79–85]. Of the 54 studies, 39 were meta-analyzed; however, 15 could not be pooled because either they did not report the outcome of interest or reported it differently. Table 1 presents the characteristics of the studies. The methodological qualities are provided in Figure 2. Studies were not excluded based on assessment scores as the purpose was to examine and gain insight into the rigor of existing research. (Table 2 presents the findings from the meta-analysis discussed in the sections below).
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|--------------------|---------------------|--------------|-----------------------|-------------------|--------------|---------------|-------------|
| 1   | Cowan 2010 [48]    | Zimbabwe; community setting | RCT          | 12–24 years           | Intervention: 2319 Control: 2353 Total: 4672 | Community-based multi component HIV and reproductive health intervention (youth program for in and out of school youth, community-based program for parents and community stakeholders and training program for nurses and other staff in rural clinics) (n age 18–20 = 1557) | No intervention | Knowledge, attitude and behavior of young men and women towards SRHR, Prevalence of HIV, HSV2 and pregnancy |
| 2   | Dancy 2014 [33]    | Malawi; community setting | qRCT         | Males and females aged 13–19 years | Intervention: 384 Control: 393 Total: 777 | HIV risk reduction community-based peer group intervention | No intervention | HIV knowledge and attitude, HIV risk reduction behaviors, self-efficacy for condom use and safer sex |
| 3   | Kaufman 2012 [79]  | Dominican Republic; community | qRCT         | Adolescents           | Intervention: 99 Control: 41 Total: 140 | Sports-based HIV prevention intervention | No intervention | HIV-related knowledge, attitudes, and communication |
| 4   | Meekers 2000 [54]  | Soweto and Umlazi districts, South Africa; community setting | qRCT         | Adolescents aged between 17–20 years | Intervention: 219 Control: 211 Total: 420 | Targeted social marketing program on reproductive health beliefs and behaviors via radio, TV, information booklet on adolescent reproductive health | No intervention | Knowledge of risk of pregnancy, condom use, HIV/AIDS prevention |
| 5   | Ross 2007 [43]     | Tanzania; community setting | RCT          | Primary school        | Intervention: 2607 Control: 2496 Total: 9645 | Multi component intervention (community activities, teacher-led, peer-assisted sexual health education, training and supervision of health workers to provide YFHS, peer-based condom social marketing) | Standard activities | Knowledge and reported attitudes towards SRHR, reported STIs and pregnancy rates |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|-------------------|---------------------|--------------|------------------------|-------------------|--------------|--------------|------------|
| 6   | Walker 2006 [80]  | Morelos, Mexico; school setting | RCT          | Students aged 15–18 years | Intervention: 5617 Control: 1867 Total: 7484 | School based HIV prevention programme | Biology-based sex education course | Condom use, knowledge and attitude towards HIV and emergency contraception |
| 7   | Kinsler 2004 [81] | Belize City, Belize; school setting | qRCT         | adolescents (aged 13–17) | Intervention: 75 Control: 75 Total: 150 | Cognitive behavioral peer-facilitated school-based HIV/AIDS education program | HIV/AIDS educational Handbook | HIV knowledge, Condom use, condom attitudes, condom intentions, condom self-efficacy |
| 8   | Brieger 2001 [57] | Nigeria and Ghana; school setting | qRCT         | Male and Female adolescents | Intervention: 908 Control: 893 Total: 1801 | Adolescent reproductive health peer education program | No intervention | Reproductive health knowledge, contraceptive use, willingness to buy contraceptives, self-efficacy in contraceptive use |
| 9   | Darabi 2017 [70]  | Iran; school setting | RCT          | First Year High School girls (12–16 years) | Intervention: 289 Control: 289 Total: 578 | Theory of Planned Behaviour (TPB) school-based educational intervention on sexual and reproductive health with adolescents and parents | No intervention | SRHR behavior and attitude, subjective norms, perceived parental control and perceived behavioral control |
| 10  | Gong, 2009 [82]   | Bahamas; school and community | qRCT         | preadolescents aged 10–14 years | Intervention Group 1: 436 Intervention Group 2: 427 Control Group: 497 Total: 1360 | HIV/AIDS Prevention Intervention program based on Protection Motivation Theory (Intervention Group 1: Youth HIV intervention + Parental HIV education intervention; Intervention Group 2: Youth HIV intervention + parental goal setting intervention) | Youth environmental protection intervention + parental goal setting intervention | HIV/AIDS knowledge, sexual perception and condom use intention |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|--------------------|---------------------|-------------|----------------------|-------------------|--------------|---------------|-------------|
| 11  | Mon, 2017 [71]     | Myanmar; community setting | RCT         | Adolescents aged 10–16 years with HIV-infected parent(s) | Intervention: 72 Controls: 72 Total: 144 | Mindfulness-integrated reproductive health intervention | Group activities conducted including playing games, preparing food and eating together at the office of people living with HIV | Reproductive health knowledge |
| 12  | Parwej 2005 [72]   | Chandigarh, India; school setting | RCT         | 15–19 years. | Intervention Group 1—Peer education: 84 Intervention Group 2—Conventional education by nurses: 95 Control Group: 94 Total: 273 | Reproductive Health Education via peer education and conventional education in schools | No intervention | Reproductive health knowledge |
| 13  | Kim, 2001 [51]     | Zimbabwe; community setting | qRCT        | 10–24 years male and female | Intervention: 1000 Controls: 400 Total: 1400 | Multimedia campaign (posters, leaflets, newsletters, radio program, launch events, theatre programs, peer education and hot line) with youth to promote SRHR | No intervention | Knowledge of family planning methods, adoption of safe sexual behaviors and uptake of sexual health services |
| 14  | Shuey 1999 [42]    | Soroti, Uganda; school setting | RCT         | 13–14 years male and female students | Intervention: 567 Controls: 233 Total: 800 | School health education programme on AIDS prevention | Standard school health AIDS education program of Uganda | Sexual abstinence, safe sexual behaviors and communication regarding sexual matters with teachers and peers |
| 15  | Njue 2015 [40]     | Kenya; community and school settings | RCT         | 10–19 years | Community Intervention Group 1: 1232 Community + school-based intervention Group 2: 1279 Controls: 1247 Total: 3758 | Community and school-based reproductive health HIV program | No intervention | Knowledge, attitude and behavior towards SRHR |
### Table 1. Cont.

| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome(s) |
|-----|--------------------|---------------------|--------------|-----------------------|-------------------|--------------|---------------|------------|
| 16  | Chen 2009 [83]     | Bahamas; school setting | RCT          | Sixth grade aged 10–11 years | Intervention: 863  
Control: 497  
Total: 1360  
School based adolescent HIV prevention program | Wondrous Wetlands Conservation program focusing on water conservation, wildlife and other natural resources | Sexual behavior |
| 17  | Jewkes 2006 [50]   | Eastern Cape, South Africa; community setting | RCT          | Young people aged 16–23 | Intervention: 1409  
Control: 1367  
Total: 2776  
17 community-based behavioral intervention sessions aimed at reducing HIV incidence were conducted | 1 community-based session on HIV and safer sex was conducted | HIV incidences, knowledge and attitude towards SRHR, HIV related sexual behavior risk factors |
| 18  | Naved 2018 [73]    | Bangladesh; community setting | RCT          | Women aged 15–29 | Intervention: 2670  
Control: 1026  
Total: 3696  
Multisectoral, multi-tier 20-month SAFE program (interactive sessions on gender health, rights and life skills; community campaign; health and legal services and referrals) | Community campaign and SAFE health and legal services | Physical, sexual, economic and emotional intimate partner violence |
| 19  | Stark 2018 [41]    | Ethiopia; community setting | RCT          | Refugee adolescent girls ages 13–19 years | Intervention: 457  
Control: 462  
Total: 919  
Life skills and safe spaces program | No intervention | Sexual violence, physical violence, emotional violence, transactional sex and child marriage |
| 20  | Dunbar 2014 [58]   | Zimbabwe; community setting | RCT          | Female adolescents and maternal orphans aged 16–19 years (out of school) | Intervention: 158  
Control: 157  
Total: 315  
Shaping the Health of Adolescents in Zimbabwe—SHAZ program focusing on HIV and SRH services, life skills-based HIV education, vocational training and provision of micro grant to improve economic outcomes and integrated social support. | Life skills-based HIV education, reproductive health services and home-based care training | Economic and social empowerment, sexual risk behaviors, HIV/STI prevalence and unintended pregnancy |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome(s) |
|-----|---------------------|---------------------|--------------|-----------------------|-------------------|--------------|--------------|------------|
| 21  | Erulkar 2004 [35]   | Nairobi, Kenya; community setting | qRCT         | Unmarried young people aged 10–24 years | Intervention: 1408 Control: 457 Total: 1865 | Life skills-based curriculum was implemented by training health educators who conducted door to door visits in the community | No intervention | Reproductive health–related behaviors, condom use and communication between adolescents and parents/adult on SRHR |
| 22  | Lou 2004 [74]       | Shanghai, China; community setting | RCT          | Unmarried youth aged 15–24 years | Intervention: 1220 Control: 1007 Total: 2227 | Community-based interventions to promote contraceptive use (dissemination of educational materials, videos and lectures, provision of FP counseling at youth health centre and provision to access to FP services at FP unit) | No intervention | Contraceptive use |
| 23  | Lightfoot 2007 [37] | Uganda; community setting | RCT          | Youth aged 14–21 years | Intervention: 50 Control: 50 Total: 100 | Culturally adopted HIV prevention program | No intervention | Condom use, number of sexual partners |
| 24  | Ybarra 2013 [44]    | Uganda, secondary schools setting | RCT          | Youth aged 12 years and older | Intervention: 183 Control: 183 Total: 366 | Cyber Senga—An internet-based HIV prevention program | School-based sexuality education program | Abstinence, sexual behavior and unprotected vaginal sex |
| 25  | Agha 2004 [24]     | Zambia; school setting | RCT          | Male and female adolescents in grades 10 and 11 aged 14–23 years | Intervention: 254 Control: 162 Total: 416 | School-based peer sexual health intervention | Peer education session on water purification | Knowledge and normative beliefs about abstinence, condom use, HIV risk perception and sexual behaviors |
| 26  | Aderibigbe 2008 [35]| Nigeria; public secondary schools setting | qRCT         | Adolescents aged 10–19 years | Intervention: 262 Control: 259 Total: 521 | Health Education Session on risky sexual behaviour | No intervention | Condom use, sexual partners and frequency of sexual intercourse |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome(s) |
|-----|-------------------|---------------------|--------------|-----------------------|-------------------|--------------|---------------|------------|
| 27  | Mathew 2012 [53]  | Cape Town and Mankweng, South Africa, and Dar es Salaam, Tanzania; school setting | RCT | Adolescents aged 12–14 years | Intervention: 6801 Control: 5338 Total: 12,139 | Teacher-led school HIV prevention programmes | No intervention | Delayed sexual debut and condom use |
| 28  | Okonofua 2003 [60] | Nigeria; school settings | RCT | Youth aged 14–20 years | Intervention: 643 Control: 1253 Total: 1896 | Creation of reproductive health clubs in schools to conduct health awareness campaigns on STD, training of club members as peer educators on STD prevention and treatment and training of health care professionals on STD | No intervention | STD symptoms, condom use, treatment seeking behavior and notification of partners by adolescents on STD symptoms |
| 29  | Mason-Jones 2011 [52] | Western Cape, South Africa; school setting | qRCT | Grade 10 students aged 15–16 years | Intervention: 2049 Control: 1885 Total: 3934 | Peer education program on relationships, sexual health and well-being and confidence building | Usual life orientation program | Age of sexual debut and condom use |
| 30  | Wang 2014 [85] | Bahamas; school setting | RCT | Grade 10 students aged 13–17 years | Intervention Group 1—Bahamian Focus on Older Youth (BFOOY) + Caribbean Informed Parents and Children Together—CiMPACT): 664 youth and 505 parents Intervention Group 2—BFOOY + Goal Focused Intervention: 559 youth and 387 parents Intervention Group 3—BFOOY only: 569 youth and 389 parents Control Group—Healthy Family Life Education: 772 youth and 552 parents Total: 2564 youth and 1833 parents | Parental involvement in an effective risk reduction intervention program (BFOOY + CiMPACT) | Existing Bahamian Healthy Family Life Education program (HFLE) | Sexual Debut and Condom use |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|-------------------|---------------------|--------------|-----------------------|-------------------|--------------|---------------|-------------|
| 31  | Rokicki 2017 [61] | Ghana; Community setting | RCT | Adolescents aged 14–24 years | Intervention Group 1—Unidirectional: 239 Intervention Group 2—Interactive: 196 Control Group: 273 Total: 708 | Intervention Group 1: Text-messages with reproductive health information Intervention Group 2: Engaging adolescents in text-messaging reproductive health quizzes | Placebo messages with information about malaria | Reproductive health knowledge, pregnancy risk and use of contraceptive methods |
| 32  | Jemmott 2010 [49] | Eastern Cape, South Africa; primary school setting | RCT | Grade 6 learners | Intervention: 545 Control: 477 Total: 1022 | School-based HIV/STD risk-reduction intervention | Health promotion intervention focusing on Non-communicable diseases | Unprotected vaginal intercourse, anal intercourse, sexually inexperienced and multiple sexual partners |
| 33  | Speizer 2001 [64] | Cameroon; community setting | qRCT | Adolescents aged 12–25 Years | Intervention: 403 Control: 413 Total: 815 | Peer-based adolescent reproductive health intervention | No intervention | Contraceptive prevalence, prevalence of STI/HIV and unintended pregnancy |
| 34  | Dupas 2011 [34]  | Kenya; community setting | RCT | Teenagers | Intervention Group 1: 164 schools Intervention Group 2: 71 schools Control Group: 93 schools Total: 328 | Intervention 1: The Teacher Training (TT) Program on National HIV Prevention Curriculum Intervention 2: TT program + The Relative Risk Information Campaign—information on distribution of HIV information by age and gender | No intervention | Teen childbearing, pregnancies and self reported sexual behavior |
| 35  | Maro 2009 [38]   | Dar es Salaam, Tanzania; in and out of school settings | qRCT | Adolescents aged 12–15 years | Intervention Group 1: 200 Intervention Group 2: 200 Control Group 1:200 Control Group 2: 200 Total: 800 | Intervention Group 1: Using peer coaches and sports to promote HIV/AIDS education with mastery coaching strategies Intervention Group 2: Using peer coaches and sports to promote HIV/AIDS education without mastery coaching strategies | Control Group 1: In-school children received traditional AIDS program Control Group 2: Out-of-school children received no education | HIV/AIDS knowledge |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|-------------------|---------------------|--------------|-----------------------|--------------------|--------------|---------------|-------------|
| 36  | Deveaux 2007 [84] | Bahamas; school setting | RCT | Sixth-grade students | Intervention Group 1—FOYC or CiMPACT: 822 youth and 238 parents Control Group 1—WW or GFI: 460 youth and 528 parents Intervention Group 2a—FOYC + CiMPACT: 417 youth and 238 parents Control Group 2—WW + GFI: 460 youth and 306 parents | | | Control Group 1: WW or GFI Control Group 2: WW + GFI | HIV risk and protective knowledge, condom use skills, perceptions, interventions and self-reported behaviors |
| 37  | Acharya 2017 [75] | Nepal; school setting | RCT | Secondary school children aged 14–18 years | Intervention: 201 Control: 247 Total: 448 | School based sex education intervention programme using participatory based approach | Conventional teacher-led sex education program | Knowledge and understanding of sexual health |
| 38  | Agha 2002 [62] | Zambia; school setting | RCT | Male and female adolescents grades 10–12 | Intervention: 421 Control: 338 Total: 759 | School-based peer sexual health intervention (education session about HIV/AIDS) | 1-h long session on water purification with the students | Knowledge and positive normative beliefs about abstinence and condoms perception of acquiring HIV |
| 39  | Aplasca 1995 [76] | Philippines; school setting | RCT | Adolescents in high schools | Intervention: 420 Control: 384 Total: 804 | Development and implementation of AIDS prevention program for high school students | No intervention | AIDS related knowledge, attitudes, and preventive behaviours and intended onset of sexual activity |
| 40  | Burnett 2011 [47] | Swaziland; school setting | RCT | Youth | Intervention: 69 Control: 66 Total: 135 | Life skills-based education program | No intervention | HIV knowledge, self-efficacy for abstinence and condom use |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|--------------------|---------------------|--------------|-----------------------|-------------------|--------------|---------------|-------------|
| 41  | Cartagena 2006 [77] | Mongolia; school setting | RCT | Secondary School Students | Intervention: 320 Control: 327 Total: 647 | Sexual health peer education program focusing on life skills for HIV awareness and prevention, computer technology, job readiness, community outreach and a mobile HIV testing unit | No intervention | HIV knowledge, self-efficacy for abstinence, condom use and HIV tests |
| 42  | Esere 2008 [59]   | Nigeria; school setting | qRCT | School-going adolescents aged 13–19 years | Intervention: 12 Control: 12 Total: 24 | Sex education programme | No intervention | STDs, multiple sexual partners, anal sex, oral sex and non-use of condom |
| 43  | Aninanya 2015 [56] | Ghana; community setting | RCT | Adolescents aged 10–24 years | Intervention: 1288 Control: 1376 Total: 2664 | Adolescents school-based curriculum and peer outreach activities | Community mobilization and Youth Friendly Health Services (YFHS) provider training | Uptake of ASRH services for STI management, HIV counselling and testing, antenatal and peri/postnatal services |
| 44  | Ybarra 2015 [45]  | Uganda; school setting | RCT | Students aged 13–18 years | 366 participants were randomly assigned to the intervention and control group | Internet-based HIV prevention program | School-based sexuality education program | HIV information, condom use and abstinence |
| 45  | Bell 2008 [46]   | South Africa; school setting | RCT | Youth aged 9–13 years | Intervention: 245 Control: 233 Total: 475 | Collaborative HIV Adolescent Mental Health Program South Africa (CHAMPSA) | Existing school-based HIV prevention curriculum | HIV transmission knowledge HIV stigma |
| 46  | Mmbaga 2017 [39] | Dar es Salaam, Tanzania; school setting | RCT | Adolescents aged 12–14. | Intervention: 2503 Control: 2588 Total: 5091 | PREPARE—an educational program consisted of 3 components: teachers, peer educators and health care providers at youth friendly health clinics, aiming to address adolescents risky sexual and reproductive health behaviors | No intervention | Sexual Debut Condom Use |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|--------------------|---------------------|-------------|-----------------------|-------------------|--------------|---------------|-------------|
| 47  | Klepp 1997 [36]    | Tanzania, school setting | RCT | Sixth Grade Students (Average age 13.6 years) | Intervention: 258 Control: 556 Total: 814 | Local HIV/AIDS education program | No intervention | HIV/AIDS related information, knowledge, communication attitudes and behavioral intentions |
| 48  | Austrian 2020 [63] | Zambia; community setting | cRCT | Adolescents 10–19 years girls | Interventions: 3978 Control: 1326 Total: 5304 | Adolescent Girls Empowerment program on mentor-led, girls group meetings on health, life skills and financial education | No intervention | Condom use Knowledge on reproductive health |

**Comparison Group 2: Financial Incentive vs. No Intervention**

| 1   | Kranzer 2018 [68] | Zimbabwe; primary health center | RCT | Children and adolescents 8–17 years | Intervention Group 1—USD 2: 654 Intervention Group 2—Fixed incentive or lottery: 562 Control group: 472 Total:1688 | Financial incentive for HIV testing and counseling | No incentive | Uptake of HIV testing |

**Comparison Group 3: Comprehensive School Support vs. No Intervention**

| 1   | Hallfors 2011 [67] | Zimbabwe; school setting | RCT | Orphan girls aged 10–16 years | Intervention: 184 Control: 145 Total: 329 | Comprehensive school support (universal daily feeding program + provision of fees, uniforms, school supplies, helper) | Universal daily feeding program | HIV risk school dropout, marriage and pregnancy |
| 2   | Cho 2011 [65]     | Kenya; school setting    | RCT | Adolescent orphans aged 12–14 years | Intervention: 53 Control: 52 Total: 105 | Comprehensive School Support Program to prevent HIV (school uniform, tuition fees and a community visitor) and household support (mosquito nets and food supplements) | Received household support only (mosquito nets and food supplements) | School dropout, sexual debut and gender equity |
| S # | First Author, Year | Country and Setting | Study Design | Target Population/Sex | Total Participants | Intervention | Control Group | Outcome (s) |
|-----|--------------------|---------------------|--------------|------------------------|-------------------|--------------|---------------|-------------|
| 3   | Hallfors, 2017 [66]| Kenya; school setting | RCT          | Adolescents orphans in grades 7 and 8 | Intervention: 412 Control: 425 Total: 837 | Comprehensive school support as an HIV prevention strategy (school uniform, tuition fees and) | No intervention | HIV/HSV2 prevention |
| 1   | Zhu 2009 [78]      | China; hospital setting—abortion clinics | RCT          | Young women aged 15–24 years | Intervention: 592 Control: 555 Total: 1147 | Comprehensive post abortion family planning services: (i) training of abortion service providers, provision of service guidelines as per standard training schedule and module (two days) (ii) group education (iii) individual counseling of women on contraceptive methods (iv) free provision of contraceptives (v) male involvement in group and individual counseling (vi) referral of women to existing FP services | Standard post abortion family planning services (i) training of abortion service providers and provision of service guidelines as per standard training schedule and module (one day) (ii) group education and (iii) referral of women to FP services | Use of contraceptive methods, rate of pregnancy, unwanted pregnancy, and induced abortion |
| 1.  | Phillips-Howard 2016 [69] | Western Kenya; school setting | RCT          | Primary-school girls 14–16 years, 3 menses | Intervention: 444 Control: 200 Total: 644 | Puberty and hygiene training, provision of menstrual cups, sanitary pads, and hand washing soap | Continued usual practice + provision of pubertal education and hand washing soap | STI, RTI, school dropout, adverse events (e.g., toxic shock etc.) |

**Comparison Group 4: Comprehensive Post Abortion Family Planning Services vs. Standard Intervention**

**Comparison Group 4: Provision of Menstrual Products vs. Standard Intervention**

**Abbreviations:** HIV: Human Immunodeficiency Virus; AIDS: Acquired Immunodeficiency Syndrome; HSV2: Herpes Simplex Virus 2; STI: Sexually Transmitted Infections; SRHR: Sexual Reproductive Health and Rights; RCT: Randomized Controlled Trial; qRct: Quasi Randomized Controlled Trials.
Table 2. SRHR Interventions and Outcomes.

| Outcomes                                                                 | No of Studies; and Participants | Risk Ratio/Mean Difference (95% CI) | Heterogeneity Chi² p Value; I² (%) |
|--------------------------------------------------------------------------|---------------------------------|------------------------------------|-----------------------------------|
| Intervention 1: SRHR Information vs. No Information/Standard Intervention |                                 |                                    |                                   |
| Knowledge of Reproductive Health: HIV, STI, Pregnancy, Emergency Contraception | 6; 20,437                       | 1.16 (1.04, 1.29)                  | $(p < 0.001); I^2 = 94\%$          |
| • HIV acquisition knowledge                                              | 5; 7526                         | 1.17 (0.99, 1.38)                  | $(p < 0.001); I^2 = 92\%$          |
| • STI knowledge                                                          | 2; 2396                         | 1.10 (0.91, 1.33)                  | $(p = 0.05); I^2 = 66\%$           |
| • Risk of pregnancy knowledge                                            | 1; 65                           | 1.10 (0.96, 1.27)                  | Not applicable                     |
| • Pregnancy prevention knowledge                                         | 1; 3520                         | 1.63 (1.55, 1.72)                  | Not applicable                     |
| • Emergency contraception knowledge                                      | 1; 6930                         | 1.11 (0.94, 1.32)                  | $(p < 0.001); I^2 = 94\%$          |
| Knowledge of Reproductive Health—Overall—End of Intervention             | 8; 7328                         | 0.80 (0.44, 1.16)                  | $(p < 0.001); I^2 = 98\%$          |
| • HIV prevention                                                         | 1; 777                          | 0.28 (0.14, 0.43)                  | Not applicable                     |
| • HIV acquisition and prevention                                         | 2; 2625                         | 0.16 (−0.22, 0.55)                 | $(p = 0.02); I^2 = 80\%$           |
| • Overall SRHR knowledge                                                 | 5; 3926                         | 1.11 (0.54, 1.67)                  | $(p < 0.001); I^2 = 98\%$          |
| Improved SRHR Behavior                                                   | 2; 1338                         | 1.61 (0.89, 2.92)                  | $(p < 0.001); I^2 = 89\%$          |
| • Refused sex                                                            | 1; 421                          | 1.66 (1.22, 2.27)                  | Not applicable                     |
| • Sexually active adolescents                                            | 1; 63                           | 0.83 (0.60, 1.14)                  | Not applicable                     |
| • Adopted safe sexual behavior                                           | 1; 421                          | 1.69 (1.29, 2.21)                  | Not applicable                     |
| • Stuck to one sexual partner                                            | 1; 433                          | 20.16 (2.83, 143.31)               | Not applicable                     |
| Improved Attitude towards SRHR                                           | 5; 9324                         | 1.29 (1.13, 1.47)                  | $(p < 0.001); I^2 = 66\%$          |
| • Approved use of condoms                                                | 2; 1335                         | 1.20 (1.03, 1.40)                  | $(p = 0.03); I^2 = 70\%$           |
| • Intentions to have sex                                                 | 1; 1358                         | 0.97 (0.71, 1.32)                  | $(p = 0.34); I^2 = 0\%$            |
| • Approved use of contraception                                          | 2; 1335                         | 1.41 (1.12, 1.77)                  | $(p = 0.02); I^2 = 76\%$           |
| • Attitude towards HIV                                                   | 1; 682                          | 1.95 (1.66, 2.30)                  | Not applicable                     |
| • Condom self-efficacy                                                   | 1; 4614                         | 1.12 (1.03, 1.23)                  | $(p = 0.25); I^2 = 24\%$           |
| Overall attitude towards SRHR                                            | 1; 556                          | 16.70 (15.19, 18.21)               | Not applicable                     |
| Any Violence                                                             | 4; 8051                         | 1.10 (1.01, 1.19)                  | $(p = 0.35); I^2 = 9\%$            |
| • Intimate partner physical violence                                     | 3; 1995                         | 1.06 (0.92, 1.20)                  | $(p = 0.55); I^2 = 0\%$            |
| • Intimate partner sexual violence                                       | 3; 1995                         | 1.03 (0.87, 1.23)                  | $(p = 0.97); I^2 = 0\%$            |
| • Physical/sexual violence or rape                                       | 2; 1179                         | 0.65 (0.10, 4.46)                  | $(p = 0.15); I^2 = 52\%$           |
| • Spousal emotional violence                                             | 1; 665                          | 1.07 (0.90, 1.28)                  | $(p = 0.63); I^2 = 0\%$            |
| • Spousal economic violence                                              | 1; 2217                         | 1.19 (0.79, 1.80)                  | $(p = 0.01); I^2 = 85\%$           |
| Any contraceptive use                                                    | 11; 6235                        | 1.02 (0.91, 1.15)                  | $(p < 0.001); I^2 = 83\%$          |
| • Community-based intervention                                           | 2; 2514                         | 0.90 (0.64, 1.26)                  | $(p < 0.001); I^2 = 92\%$          |
| • Counseling intervention based on cognitive behavioral therapy          | 1; 100                          | 1.58 (1.27, 1.97)                  | Not applicable                     |
| • Peer group intervention                                                | 2; 1346                         | 1.09 (0.74, 1.61)                  | $(p < 0.001); I^2 = 95\%$          |
| • School-based intervention                                              | 1; 270                          | 0.41 (0.24, 0.72)                  | Not applicable                     |
| • Internet-based intervention                                            | 1; 366                          | 1.01 (0.90, 1.13)                  | Not applicable                     |
| • Communication campaign                                                | 1; 1264                         | 1.42 (1.13, 1.80)                  | Not applicable                     |
| • Multi-component intervention                                          | 3; 375                          | 0.98 (0.85, 1.13)                  | $(p = 0.96); I^2 = 0\%$            |
Table 2. Cont.

| Outcomes | No of Studies; and Participants | Risk Ratio/Mean Difference (95% CI) | Heterogeneity |
|----------|---------------------------------|-----------------------------------|---------------|
| Condom use | 16; 31,371 | 1.28 (1.15, 1.43) | (p < 0.001); I² = 87% |
| • School-based intervention | 4; 13,118 | 1.41 (1.11, 1.79) | (p < 0.001); I² = 84% |
| • School-based peer education intervention | 2; 1769 | 0.82 (0.59, 1.15) | (p = 0.08); I² = 60% |
| • Community-based intervention | 3; 5289 | 1.17 (0.92, 1.50) | (p < 0.001); I² = 93% |
| • Counseling intervention based on cognitive behavioral therapy | 2; 2764 | 2.70 (0.37, 19.97) | (p < 0.0001); I² = 96% |
| • Community-based peer group intervention | 1; 776 | 1.79 (1.11, 2.89) | (p < 0.009); I² = 85% |
| • Communication campaign | 1; 433 | 10.37 (1.44, 74.77) | Not applicable |
| • Multi-component intervention | 3; 7222 | 1.26 (1.01, 1.56) | (p = 0.07); I² = 46% |
| • Communication campaign (School-based Intervention) | 5; 3704 | 0.37 (0.17, 0.57) | (p < 0.001); I² = 84% |
| • Reported condom attitude | 1; 50 | 1.36 (0.74, 1.98) | Not applicable |
| • Self-efficacy for condom use | 2; 1896 | 0.22 (0.04, 0.40) | (p = 0.02); I² = 74% |
| • Intention to use condom | 2; 1222 | 0.79 (−0.36, 1.93) | (p = 0.0003); I² = 92% |
| • Uptake of condoms | 1; 50 | 0.54 (−0.02, 1.11) | Not applicable |
| Prevalence of STI/HIV | 2; 4672 | 0.71 (0.62, 0.82) | (p = 0.55); I² = 0% |
| • School-based intervention | 1; 1896 | 0.69 (0.59, 0.82) | Not applicable |
| • Community-based intervention | 1; 2776 | 0.76 (0.58, 1.01) | Not applicable |
| • Text messaging program (Unidirectional) | 1; 381 | 0.57 (0.17, 1.93) | Not applicable |
| • Text messaging program (Interactive intervention) | 1; 331 | 0.86 (0.27, 2.75) | Not applicable |
| • Multi-component intervention | 2; 5482 | 1.01 (0.92, 1.10) | (p = 0.44); I² = 0% |
| Unprotected Sex | 2; 1326 | 0.75 (0.48, 1.19) | 0.44 (1.29, 2.07) |
| • School-based intervention | 1; 1022 | 0.50 (0.25, 1.01) | Not applicable |
| • Internet-based intervention | 1; 304 | 1.02 (0.56, 1.86) | (p = 0.44); I² = 0% |
| Self-efficacy for safer sex | 1; 777 | 0.26 (0.19, 0.33) | 1.64 (1.29, 2.07) |
| • Multiple sex partners | 9; 18,670 | 0.66 (0.48, 0.91) | 1.64 (1.29, 2.07) |
| • Community-based intervention | 2; 9616 | 0.92 (0.64, 1.33) | (p < 0.001); I² = 91% |
| • Community-based peer group intervention | 1; 777 | 1.24 (0.87, 1.78) | Not applicable |
| • School-based intervention | 4; 2746 | 0.59 (0.27, 1.30) | (p < 0.008); I² = 71% |
| • Multi-component intervention | 1; 3666 | 0.90 (0.72, 1.11) | (p = 0.97); I² = 0% |
| • Community-based intervention by health educators | 1; 1865 | 0.02 (0.01, 0.05) | Not applicable |
| • Number of multiple sexual partners | 1; 400 | −0.60 (−1.02, −0.18) | Not applicable |
| Uptake of ASRH Services | 5; 7851 | 1.45 (1.17, 1.80) | (p < 0.001); I² = 91% |
| • Community-based peer group intervention | 2; 1441 | 1.64 (1.29, 2.07) | (p = 0.07); I² = 53% |
| • Multi-component intervention | 2; 5146 | 1.00 (0.95, 1.06) | (p = 0.86); I² = 0% |
| • Communication campaign | 1; 1264 | 3.64 (2.51, 5.27) | Not applicable |
| Prevalence of STI diseases | 2; 14,150 | 0.86 (0.75, 0.99) | (p < 0.001); I² = 89% |
| • Prevalence of Gonorrhea | 1; 1308 | 2.03 (0.62, 6.69) | (p = 0.97); I² = 0% |
| • Prevalence of Syphilis | 1; 1308 | 0.88 (0.43, 1.78) | (p = 0.90); I² = 0% |
| • Prevalence of HIV | 2; 3643 | 1.12 (0.79, 1.57) | (p = 0.94); I² = 0% |
### Table 2. Cont.

| Outcomes                                      | No of Studies; and Participants | Risk Ratio/Mean Difference (95% CI) | Heterogeneity |
|-----------------------------------------------|---------------------------------|------------------------------------|---------------|
| • Prevalence of HSV2                          | 2; 3643                         | 1.07 (0.88, 1.30)                  | (p = 0.69); I² = 0% |
| • Prevalence of Trichomonas                   | 1; 1696                         | 0.18 (0.13, 0.25)                  | Not applicable |
| • Prevalence of Chlamydia                     | 1; 2552                         | 5.00 (2.44, 10.25)                 | (p = 0.05); I² = 75% |

**Intervention 2: Financial Incentive vs. No Intervention**

| Outcomes                                      | No of Studies; and Participants | Risk Ratio/Mean Difference (95% CI) | Heterogeneity |
|-----------------------------------------------|---------------------------------|------------------------------------|---------------|
| U of HIV testing services                     | 1; 1688                         | 2.24 (1.84, 2.71)                  | (p = 0.37); I² = 0% |
| • Financial incentive—Fixed incentive 2USD    | 1; 890                          | 2.43 (1.86, 3.17)                  | Not applicable |
| • Financial incentive—Lottery                 | 1; 798                          | 2.04 (1.54, 2.69)                  | Not applicable |

**Intervention 3: Comprehensive School Support vs. No Intervention**

| Rates of teenage pregnancy                   | 1; 329                          | 0.16 (0.01, 3.26)                  | Not applicable |

**Intervention 4: Comprehensive Post Abortion Family Planning Services vs. Standard Intervention**

| Use of family planning methods               | 1; 937                          | 1.16 (1.09, 1.24)                  | (p < 0.001); I² = 99% |
| • Use of any contraceptives                  | 1; 500                          | 1.01 (0.98, 1.03)                  | Not applicable |
| • Use of condoms                             | 1; 437                          | 1.97 (1.45, 2.66)                  | Not applicable |
| Compliance of contraceptives                  | 1; 83                           | 1.23 (0.93, 1.64)                  | Not applicable |
| Rate of unwanted pregnancies                 | 1; 1147                         | 0.33 (0.15, 0.72)                  | Not applicable |
| Induces abortion                             | 1; 1147                         | 0.36 (0.15, 0.87)                  | Not applicable |

**Intervention 5: Provision of Menstrual Products vs. No Intervention**

| Rates of STIs and RTIs                       | 1; 384                          | 0.79 (0.34, 1.79)                  | (p = 0.18); I² = 44% |
| • STIs                                       | 1; 174                          | 0.43 (0.13, 1.41)                  | Not applicable |
| • RTIs                                       | 1; 174                          | 1.05 (0.60, 1.83)                  | Not applicable |

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**Figure 1.** PRISMA Flow diagram for interventions to improve Adolescent Sexual and Reproductive Health and Rights (Adapted from Moher et al. 2009).
Figure 2. Methodological quality of the 54 studies (a) RCTs, (b) q-RCTs.
3.2. Summary of Adolescent Sexual and Reproductive Health and Rights (ASRHR) Interventions

Of the 54 studies, 48 studies focused on interventions related to ASRHR education, and of these, 33 were conducted in Africa [24,33–64]; 8 in Asia [70–77]; and 7 in North America (the Caribbean) [79–85]. These studies implemented ASRHR educational interventions in school and community settings in the form of community-based education programs, school and community-based peer education programs, sports-based interventions, internet-based programs, or a combination of the above (i.e., multicomponent interventions). Another three studies conducted in Africa, including Kenya [34,40,65]; and Zimbabwe (n = 1) [67], implemented interventions that focused on providing comprehensive school support packages to adolescents. These packages included uniforms, tuition fees, and helpers to school-going students. While the remaining three studies assessed a number of cross-cutting ASRHR interventions: one study focused on the provision of comprehensive post-abortion family planning service packages to young women in China (n = 1) [78]; another focused on evaluating the effect of financial incentives to caregivers to have adolescents undergo HIV testing and counseling services in Harare, Zimbabwe, (n = 1) [68]; and the third focused on addressing menstrual health and hygiene by providing menstrual products to school-going adolescents in rural western Kenya (n = 1) [69] (See Table 2).

3.3. ASRHR Education Interventions

Our pooled results suggested that educational interventions had a significant impact on improving adolescents’ knowledge of ASRHR (RR 1.16; 95% CI 1.04 to 1.29; n = 6 studies), their attitudes towards ASRHR (RR 1.29; 95% CI 1.13 to 1.47; n = 5 studies) (Figure 3), and their practices related to ASRHR, such as the use of ASRHR services (RR 1.45; 95% CI 1.45 to 1.80; n = 5 studies), condom use (RR 1.28; 95% CI 1.15 to 1.43; n = 16 studies) (Figure 4), limiting multiple sexual partners (RR 0.68; 95% CI 0.51 to 0.92; n = 10 studies); refusing sex (RR 1.66; 95% CI 1.22 to 2.27; n = 1 study); adopting safe sexual behaviors (RR: 1.69; 95% CI: 1.29 to 2.21; n = 1 study), and having one sexual partner (RR 20.16; 95% CI 2.83 to 143.31; n = 1 study). However, the evidence for the latter three outcomes come from single studies. Moreover, these interventions were also effective in reducing the prevalence of STIs (RR 0.86; 95% CI 0.75 to 0.99; n= 2 studies) and HIV among adolescents (RR 0.71; 95% CI 0.62 to 0.82; n = 2 studies) (Table 2).

Subgroup analysis based on the type of ASRHR educational interventions revealed that sports-based interventions in schools, community-based peer-group interventions, and multicomponent interventions were effective in improving knowledge of ASRHR (Figure 4). The multicomponent interventions included a range of interventions that aimed to increase ASRHR knowledge to adolescents via mass media campaigns, peer education, and targeted condom distribution in communities. Whereas interventions including counseling based on cognitive behavioral therapy, school-based programs, and communication campaign interventions were effective in improving the use ASRHR services, contraceptive methods, and condom use. The communication campaign incorporated various wide-distribution strategies to reach out to different audiences and reinforce ASRHR messages: posters in the community with key messages around sexual responsibility, peer pressure, AIDS, drugs, and alcohol; five different leaflets on saying “no” to sex, postponing sex, delaying parenthood, and STIs; newsletters by peer educators and schools on reproductive health issues. The campaign also entailed peer education, the launch and implementation of radio campaigns, community theatre and events, and a hotline to provide ASRHR support (Table 2).
It is significant to note that ASRHR education interventions like Internet-based programs and text messaging (unidirectional or interactive) were not found effective for improving ASRHR outcomes related to family planning (Internet-based programs RR 1.01; 95% CI 0.90 to 1.13; n = 1 study); or pregnancy rates (via unidirectional text messaging RR 0.57; 95% CI 0.17 to 1.93, n = 1 study; via interactive text messaging intervention RR 0.86; 95% CI 0.27 to 2.75; n = 1 study). Similarly, community-based behavioral interventions with teenage girls and community-based interventions that included group sessions and the provision of health and legal services were not found effective in decreasing the rates of violence among adolescents (RR 1.10; 95% CI 1.01 to 1.19; n = 4 studies) (Table 2; Supplementary File S2; Figures S1–S3).
Figure 4. Impact of Adolescent Sexual and Reproductive Health and Rights (ASRHR) information on condom use.
3.4. Provision of Financial Incentives to Improve the Uptake of HIV Testing and Counseling Services

One study conducted in Harare, Zimbabwe, examined the effect of providing fixed or lottery-based financial incentives to caregivers of children and adolescents for them to seek HIV testing and counseling services [68]. Findings from the meta-analysis revealed them to be significantly effective (fixed incentive RR 2.43; 95% CI 1.86 to 3.17, and lottery-based incentive RR 2.04; 95% CI 1.54 to 2.69) (Table 2).

3.5. Comprehensive Post-Abortion Family Planning Services

We identified one study that found significant intervention effects related to family planning. Zhu et al. [78] examined the impact of providing comprehensive post-abortion family planning service packages to young women in three different cities in China. These included training of abortion service providers, group education and individual counseling of women on contraception, male involvement in education and counseling sessions, and referral of women to family planning services. Interestingly, our meta-analysis of this intervention revealed significant improvement in the use of any contraceptive method (RR 1.01; 95% CI 0.98 to 1.03); condom use (RR 1.97; 95% CI 1.45 to 2.66); unwanted pregnancies (RR 0.33; 95% CI 0.17 to 0.72); and induced abortions (RR 0.36; 95% CI 0.15 to 0.87) (Table 2).

3.6. Comprehensive School Support to Adolescents in Schools

Hallfors et al. examined the effect of providing comprehensive school support to school-going adolescents on rates of teenage pregnancy in Zimbabwe [67]. The school support package included tuition fees, uniforms, and helpers. However, the meta-analysis indicated that the intervention was not effective in reducing teenage pregnancy rates (RR 0.16; 95% CI 0.01 to 3.26) (Table 2).

3.7. Provision of Menstrual Products to the School-Going Adolescents

The study in rural western Kenya conducted by Phillips-Howard et al. explored the effect of providing menstrual products (menstrual cups and pads) to in schools to decrease rates of STIs and Reproductive Tract infections (RTIs) [69]. Findings from the analysis revealed that such interventions may not be effective (RR 0.79; 95% CI 0.34 to 1.79) (Table 2).

4. Discussion

Our systematic review aimed to evaluate the effectiveness of community and school-based ASRHR interventions in LMICs. The review also aimed to understand the approaches and strategies taken to successfully implement ASRHR interventions in these limited-resource settings. The findings suggest that ASRHR education (school and community-based interventions, sports-based interventions, counseling based on cognitive behavioral therapy, multi-component interventions, and communication campaigns) are effective for improving young people’s knowledge, attitudes, and practices toward ASRHR. The outcomes that were significantly improved through these interventions were the increased use of contraceptive methods, reduced sexual partners, adopting safe sexual behaviors, decreased rates of STIs and HIV, and the increased use of ASRHR services. On the other hand, technology-based ASRHR interventions were not found effective regarding protected sex and reducing unwanted pregnancies. Our findings are consistent with existing studies related to digital-based ASRHR interventions. A systematic review found statistically significant impacts mostly for the knowledge-based outcomes [86]. However, these may not essentially translate into meaningful reductions in sexually risky behavior [86]. Very limited RCTs or qRCTs studies were conducted to evaluate the effectiveness of digital or mHealth interventions, but more RCT studies are needed to understand the effectiveness, replicability, and scalability of new digital/mHealth-based ASRHR interventions in LMICs [87].

Our review also found that non-drug interventions such as providing financial incentives can be effective in improving the use of ASRHR services such as HIV testing and...
counseling services. This finding was consistent with another systematic review conducted by Wekesah et al., which evaluated non-drug interventions on maternal health [88]. Cost-sharing programs between public and health care facilities and output-based approach (OBA) vouchers to cover the cost of certain maternal health services (antenatal visits and facility-based deliveries) have the potential to increase access to these services among the poor and reduce maternal mortality [88]. Similarly, our findings also suggested that the use of contraception can be increased among sexually active young people through comprehensive post-abortion family planning services. Comprehensive training of abortion service providers and counseling of both partners on contraceptive methods can be effective for reducing unwanted pregnancy and unsafe abortion. Globally, comprehensive post-abortion family planning services have been endorsed as a high-impact practice in family planning services [89]. Several studies found that providing family planning services as part of postabortion care can increase contraceptive use and reduce repeat abortions [89,90].

Interestingly, our review suggested that comprehensive school support programs (provision of tuition fees, uniforms, and helpers to adolescents) to decrease school dropout rates, are not effective for reducing teenage pregnancy. However, our findings are insignificant compared to the available evidence on the effectiveness of comprehensive school support programs. According to Ferre (as cited in a guidance document by UNFPA, 2015), the World Bank estimates that the risk of pregnancy declines every year when a young girl remains in school after age 11 [91]. Moreover, a systematic literature review conducted to evaluate the influence of education on teenage pregnancy in low-income countries, suggests that teenage girls who remained longer in schools had delayed pregnancy longer than girls who had little or no education or had been out of school [92]. Moreover, the study suggested that social workers should focus on interventions that ensure enrollment of girls in LMICs and provide opportunities to them to be able to attend school [92]. Such interventions can facilitate decreasing the burden of teenage pregnancy [92]. Similarly, our review suggested that the provision of free menstrual cups and sanitary pads in schools may not decrease the rates of STIs and RTIs. However, this finding is inconsistent with the available evidence attesting to their effectiveness. According to a scientific review conducted by Van Eijk et al., menstrual cups are safe for menstruation management [93]. Furthermore, the review found that there was no increased risk of infection associated with their use.

5. Limitations

There are certain limitations to this study. We restricted our search strategy to RCTs, quasi-RCTs, and CBA studies as we aimed to gather evidence of those ASRHR interventions that were evaluated via rigorous scientific methods in LMICs settings. We also excluded those studies that were evaluated via pre- or post-test evaluation strategies. This eventually led to the exclusion of many studies such as on female genital mutilation/cutting and digital/mHealth interventions to improve ASRHR outcomes. Many of the evidence came from single studies. Heterogeneity was higher for most of outcomes that suggested more robust trials be conducted to overcome these. In addition, many studies failed to use allocation concealment, blinding, and randomization to optimize their outcomes. Hence, most were rated as low or moderate in methodological quality. Moreover, because we restricted our inclusion criteria to LMICs, the findings of this study cannot be generalized to high-income countries.

6. Conclusion

Given the urgent need to identify strategies to promote ASRHR, this systematic review provided a comprehensive summary of effective interventions that can be implemented to improve ARSHR in LMICs. This review also provided potentially useful insights for the adaptation of evidence-based interventions to prevent and control adverse ASRHR outcomes. Our review suggested that a range of comprehensive interventions targeting sexual health education, counseling, and consistent birth control promotion and provision have the potential to promote ASRHR and prevent and control the adverse outcomes.
However, more rigorous studies with long-term follow-ups are needed to assess how the interventions are designed, carried out, and evaluated. The findings of this review can enable key stakeholders including public health practitioners, program managers, policymakers, and donors to make evidence-based decisions regarding the replicability and scalability of the ASRHR interventions in LMICs.

**Supplementary Materials:** The following are available online at https://www.mdpi.com/article/10.3390/adolescents1030028/s1, File S1: Search Strategy; Figure S1: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on the Uptake of SRHR Services by the Adolescents; Figure S2: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on Adolescents Overall Knowledge Related to SRHR; Figure S3: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on Adolescents Behavior Towards Sexual Practice—Multiple Sexual Partners.

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