

Effects of Peer-Based Intervention on Prevention Behavior of Sexually Transmitted Infections and Unwanted Pregnancy in Adolescents: A Meta Analysis

Denanda Agnes Safitri¹⁾, Setyo Sri Rahardjo²⁾, Bhisma Murti¹⁾

¹⁾Masters Program in Public Health, Universitas Sebelas Maret

²⁾Faculty of Medicine, Universitas Sebelas Maret

ABSTRACT

Background: In facing the transition period, many adolescents tend to explore their sexuality and engage in risky sexual behavior. This risky behavior is a main contributor to sexually transmitted infections (STIs) and unintended pregnancy. Peer-based intervention is often used in programs that promote sexual and reproductive health in adolescents, including prevention of STIs and unintended pregnancy. This study aimed to examine the effect of peer-based intervention on STI and unintended pregnancy preventive behavior among adolescents.

Subjects and Method: This was a meta-analysis study that was carried out according to the PRISMA guidelines. The articles with randomized controlled trial study designs published in 2000-2020 were included for the meta-analysis. Several databases were used in searching for the articles. The articles obtained were screened to obtain the articles that met the eligibility criteria. The articles were analyzed using RevMan 5.4.

Results: There were 14 articles that met the criteria for a meta-analysis with a sample size of 18,325. The study showed that peer-based intervention was statistically significant in improving sexually transmitted infection preventive behavior (RR= 1.15; 95%CI= 1.02 to 1.30; p= 0.020) and unintended pregnancy preventive behavior among adolescents (RR= 1.14; 95% CI= 1.00 to 1.30; p=0.040).

Conclusion: Peer-based intervention should be considered as an effort to promote STIs and unintended pregnancy preventive behavior among adolescents.

Keywords: peer-based intervention, sexually transmitted infection, unintended pregnancy

Correspondence:

Denanda Agnes Safitri. Masters Program in Public Health, Universitas Sebelas Maret. Jl. Ir. Sutami 36A, Surakarta 57126, Central Java. Email: denandagnesafitri@gmail.com

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BACKGROUND

The transition period among adolescents causes them to start exploring their sexuality and engaging in risky sexual behavior. This is the main contributor to sexually transmitted infections (STIs) and unintended pregnancy (Maria et al., 2017; Masa et al., 2019).

UNICEF (2012) stated that ± 2.2 million adolescents in the world were infected

with HIV. In addition, in the United States, half of all new STI cases (± 20 million cases/year) occurred in adolescents aged 15-24 years (Maria et al., 2017). In 2018, the CDC reported more than 20% of new HIV cases occurred in adolescents aged 13-24 years. The dominant STI cases were chlamydia, gonorrhoea, and syphilis (Peskin et al., 2019; Wesche et al., 2019).

Besides, another serious problem for adolescents is unintended pregnancy. Oman et al. (2018) stated that at least 1 in 3 American girls who lived in foster families have had pregnancy at the age of 17-19 years. In addition, 18% of teenage boys were at high risk of getting someone pregnant. Most of these pregnancies were unwanted pregnancies. The unintended pregnancy in adolescents caused abortion. In Spain, the highest incidence of abortion was in women aged 20-24 years (García-Vázquez et al., 2019).

Intervention is needed to minimize the problems occur. Peer education is often used in programs that promote adolescent sexual and reproductive health. Information delivery is considered successful due to the social effect of peer groups which has a strong impact on adolescents (Maley & Eckenrode, 2017; Raidoo & Kaneshiro, 2017). Peer education helps adolescents feel emotional security, self-esteem, and self-confidence, and provides opportunities for problems without feeling awkward (Mezey et al., 2015).

Based on the high incidence of sexually transmitted infections (STIs) and unintended pregnancy among adolescents and the need for appropriate treatment, the researchers were interested in conducting a meta-analysis to examine the effectiveness of peer-based intervention on STI and unintended pregnancy preventive behavior among adolescents based on the previous primary study.

SUBJECTS AND METHOD

1. Study Design

This study was a meta-analysis of primary studies published between 2000-2020. The databases involved in searching for articles were: PubMed, Science Direct, Research Gate, and Google Scholar. The keywords were “peer education” OR “peer led” OR

“peer counseling” OR “peer approach” OR “peer teaching” OR “peer mentoring” AND “sexually transmitted diseases” OR “sexually transmitted infections” OR “unwanted pregnancy” OR “unintended pregnancy” AND adolescent AND “randomized controlled trial”.

The extraction for the articles was carried out based on PRISMA 2009 Flow Diagram. After the final result of the article extraction, there was an assessment of the quality of the study using an 8-item-scale plus 1 item regarding the sample size (>100). Each assessment criterion was given 1 score (one) if 'yes' and 0 (zero) if 'no'.

2. Inclusion Criteria

The articles were included if: (1) they were full paper article with RCT design, (2) Single or double blind, (3) the intervention given was about sexual education of peer-based intervention with comparator of non-peer-based intervention, (4) the study subjects aged 10 -24 years, (5) the outcomes was sexually transmitted infections and or unintended pregnancy preventive behavior.

3. Exclusion Criteria

The researchers excluded the articles of the primary study if they were not full text, published before 2000, and published in non-English language.

4. Operational Definition of Variables

Peer-based intervention was an educational intervention that involved someone from the peer group as a teacher to share information on sexual and reproductive health that supported healthy decision making among adolescents.

STI preventive behavior was an outcome after peer-based sexual and reproductive health education interventions in the form of actions conducted by adolescents to prevent STIs. It could be the condom use behavior, the behavior of having safe vaginal sexual intercourse, and substance risk-related behavior.

Unintended pregnancy preventive behavior was an outcome after peer-based sexual and reproductive health education interventions in the form of actions conducted by adolescents to prevent unintended pregnancies. It could be the condom use or the use of hormonal contraceptives.

5. Data Analysis

This study used RevMan 5.4 in the meta-analysis to determine the combined effect

of the result of the primary study of eligible RCTs. This study used a random effect model to analyze the data.

RESULTS

The articles were obtained from multiple databases with unique keyword combinations by the researchers. The article review process can be seen in Figure 1.

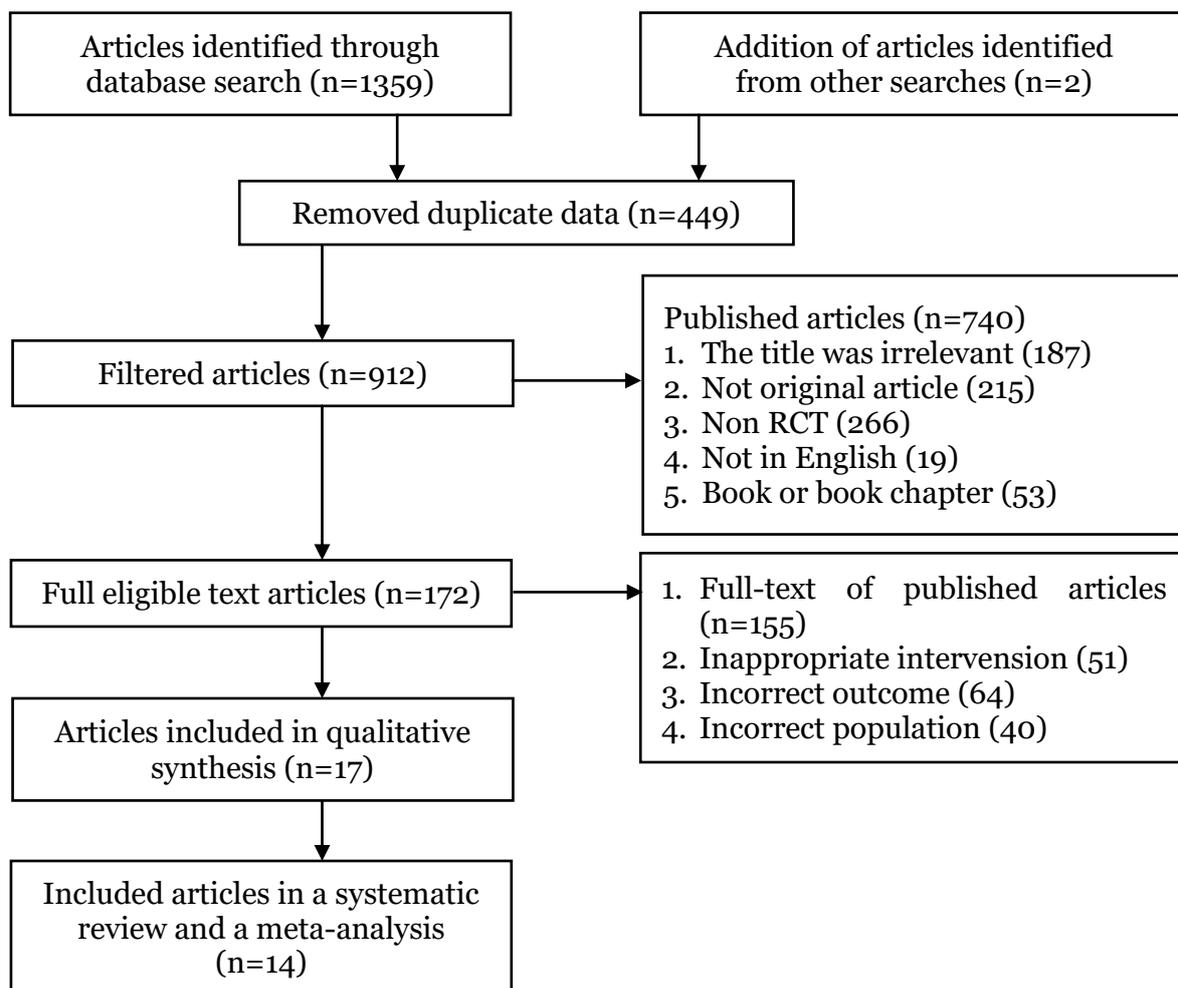


Figure 1. PRISMA Flow Diagram

The initial search results found 1359 articles. There were 449 duplicate articles which were then deduplicated to obtain 912 articles. Furthermore, an initial screening was conducted and 172 articles were identified which considered for a full text review.

155 articles were excluded because the intervention studied was not peer-based intervention, the outcome was not STI and unintended pregnancy preventive behavior, and the study population was incorrect. In the final result of the article extraction, 14 articles met the requirements.

Table 1. The assessment of the Study Quality

| Publication | Cohort | With control group | Pre/post intervention | Random assignment | Random selection for assessment | Sample size (>100) | Follow up rate $\geq 80\%$ | Comparable sociodemographic between study arms | Comparable baseline outcome measures between study arms | Total |
|-------------------------------|--------|--------------------|-----------------------|-------------------|---------------------------------|--------------------|----------------------------|--|---|-------|
| (Bonell et al., 2013) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| (Garfein et al., 2007) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 8 |
| (Giménez-García et al., 2018) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| (Ibrahim et al., 2012) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 8 |
| (Kelly et al., 2007) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| (Kemigisha et al., 2019) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 8 |
| (Morales et al., 2015) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 9 |
| (Okonofua et al., 2003) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| (Sherman et al., 2009) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| (Sieving et al., 2011) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 8 |
| (Sieving et al., 2013) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 8 |
| (Sieving et al., 2014) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 8 |
| (Strange et al., 2006) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| (Tobin et al., 2011) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |

Fourteen articles were primary studies of RCTs conducted in Asia, Europe, America, and Africa. There were 2 articles of primary studies conducted in Asia: articles from Malaysia and Thailand. There were 4 studies in Europe. 2 studies came from England and another 2 studies came from Spain. Besides, 6 articles of primary study came from the United States. 2 studies came from the African continent, one from Uganda and one from Nigeria. After that, the researcher conducted an assessment of the quality of the study (Table 1).

1. The meta-analysis of the effect of peer-based intervention on STI preventive behavior.

There were 13 articles examining the effect of peer-based intervention on STI preven-

tive behavior (articles No.1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14). The summary sources related to the study were in Table 2.

The forest plot in Figure 2 shows that peer-based intervention was able to increase STI preventive behavior in adolescents 1.15 times better than non peer-based intervention. These results were statistically significant (RR= 1.15; 95%CI=1.02 to 1.30; p= 0.020). The Random Effect Model was used due to high heterogeneity (I²= 84%; p <0.00001).

In Figure 3, the funnel plot shows the asymmetry of shape. There is 1 plot on the left side away from the vertical center line. This indicates a publication bias.

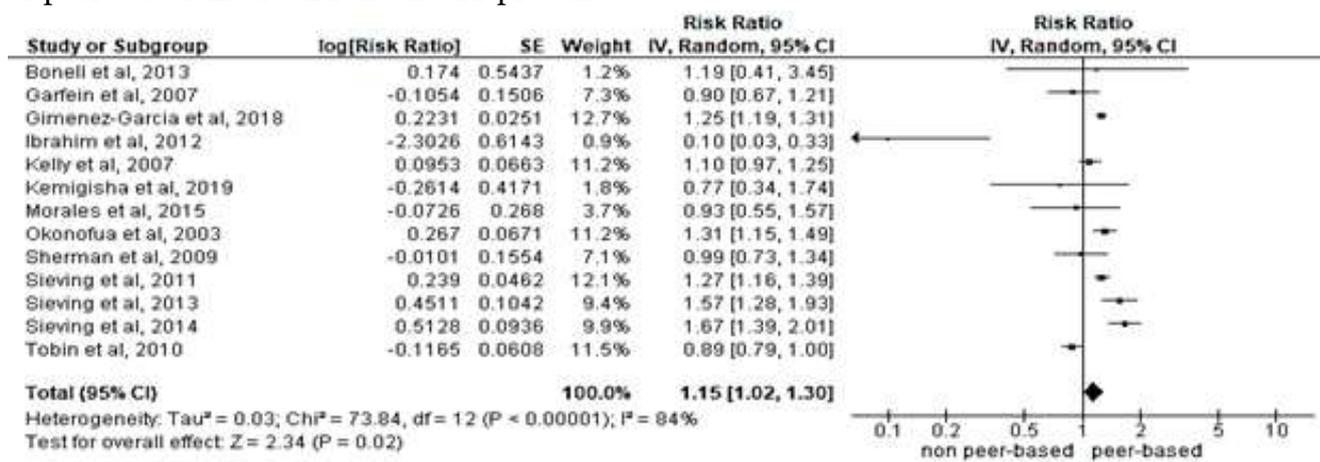


Figure 2. The Forest Plot of Peer-based Intervention on Sexually Transmitted Infection (STI) Preventive Behavior

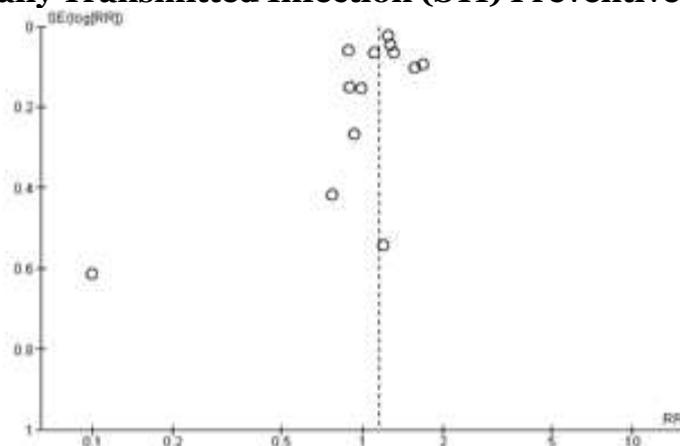


Figure 3. The Funnel Plot of Peer-Based Intervention on Sexually Transmitted Infection (STI) Preventive Behavior

Table 2. Summary source

| Author, year | Location | Sample Size | Intervention (I) and Comparator (C) | Outcome | Effect | |
|-------------------------------|-----------------|-------------|--|-------------------------|-------------------|--------------------|
| | | | | | OR (95% CI) | RR (95% CI) |
| (Bonell et al., 2013) | England | 449 | I: peer-led sex education with T&T method C: non peer-based intervention | Condom use | 1.2 (0.4-3.1) | 1.19 (0.41-3.45) |
| (Sieving et al., 2011) | United States | 253 | I: peer-based intervention with Prime Time program C: non peer-based intervention | Condom use | 1.45 (1.26-1.67) | 1.27 (1.16-1.38) |
| (Sieving et al., 2013) | United States | 253 | I: peer-based intervention with Prime Time program C: non peer-based intervention | Condom use | - | 1.57 (1.28-1.93) |
| (Sieving et al., 2014) | United States | 253 | I: peer-based intervention with Prime Time program C: non peer-based intervention | Condom use | - | 1.67 (1.39-2.01) |
| (Kemigisha et al., 2019) | Uganda | 1096 | I: peer-based intervention C: non peer-based intervention | Condom use | 0.76 (0.32-1.80) | 0.77 (0.34-1.73) |
| (Ibrahim et al., 2012) | Malaysia | 276 | I: peer-based HIV education intervention C: non peer-based HIV education | Substance risk behavior | 0.07 (0.02, 0.34) | 0.10 (0.03-0.34) |
| (Morales et al., 2016) | Spain | 1563 | I: peer-based intervention C: non peer-based intervention | Condom use | 0.87 (0.38, 2.09) | 0.93 (0.55-1.57) |
| (Giménez-García et al., 2018) | Spain | 225 | I: peer-led HIV education intervention C: non peer-based HIV education intervention | Safe vaginal sex | 3.33 (2.21, 5.05) | 1.25 (1.19-1.33) |
| (Garfein et al., 2007) | United States | 854 | I: peer-led HIV-HCV education C: non peer-led HIV-HCV education | Condom use | - | 0.90 (0.67, 1.21) |
| (Sherman et al., 2009) | Thailand | 983 | I: peer-based STIs education intervention C: non peer-based STIs education intervention | Condom use | 0.98 (0.61-1.57) | 0.99 (0.73-1.34) |
| (Strange et al., 2006) | England | 9508 | I: peer-based sex education intervention C: non peer-based intervention | Contraception use | 0.85 (0.55-1.34) | 0.976 (0.90-1.036) |
| (Tobin et al., 2011) | United States | 227 | I: peer-based STIs education C: non peer-led STIs education | Condom use | 0.61 (0.42-0.89) | 0.89 (0.79-1.00) |
| (Kelly et al., 2007) | Amerika Serikat | 527 | I: peer-based intervention C: non peer-based education | Condom use | 0.149 (0.89-2.24) | 1.10 (0.97-1.25) |
| (Okonofua et al., 2003) | Nigeria | 1858 | I: peer-based STDs education intervention C: non peer-based STDs education | Condom use | 1.50 (1.22-1.79) | 1.31 (1.15-1.49) |

2. The meta-analysis of the effect of peer-based intervention on unwanted pregnancy preventive behavior.

Twelve articles examining the effect of a peer-based intervention on unintended pregnancy preventive behavior (articles No.1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14). The summary sources related to the study are shown in Table 2.

The forest plot in Figure 4 shows that peer-based intervention was 1.14 times better than non-peer-based intervention in

increasing unintended pregnancy preventive behavior and the result was statistically significant (RR 1.14; 95%CI=1.00 to 1.30; p=0.040). Besides, there was high heterogeneity between experiments (I²=84%; p<0.00001). Therefore, it used the Random Effect Model.

The Funnel plot in Figure 5 indicates no publication bias. There was a symmetrical plot on both sides. In addition, it formed an inverted funnel.

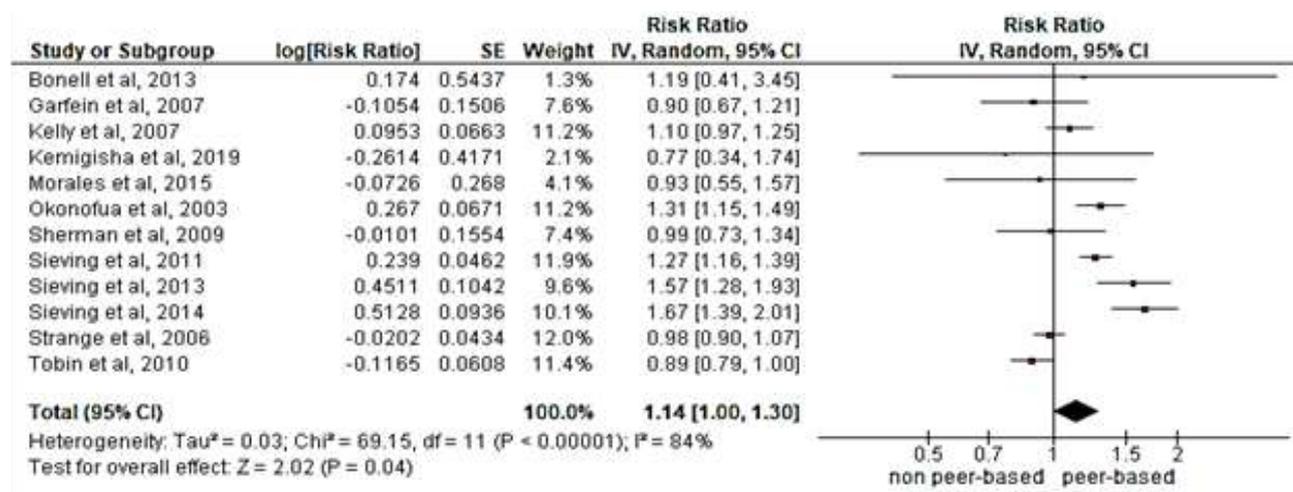


Figure 4. The Forest Plot of Peer-Based Intervention on Unwanted Pregnancy Preventive Behavior

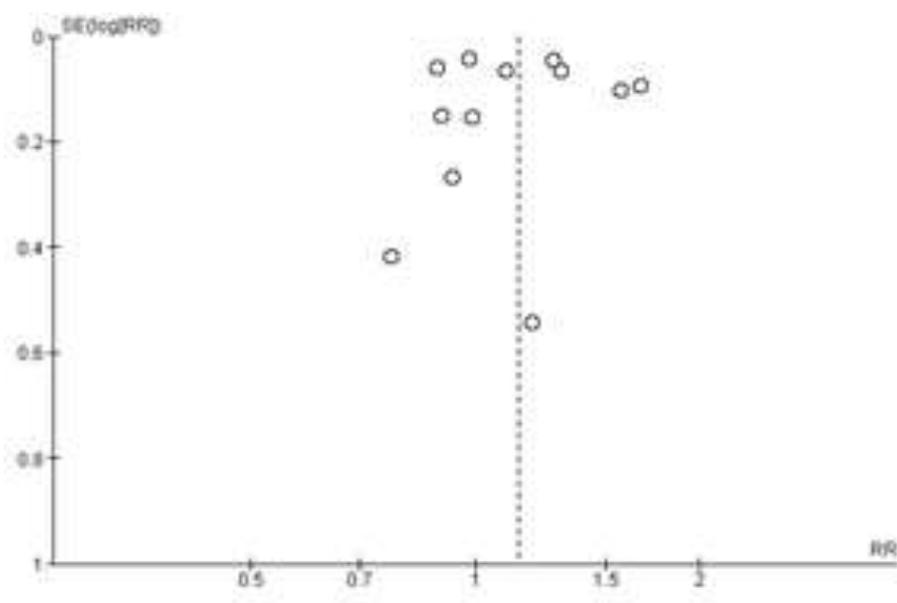


Figure 5. The Funnel Plot of Peer-Based Intervention on Unwanted Pregnancy Preventive Behavior

DISCUSSION

There were 14 articles with a sample size of 18.325. From all articles, 3 articles used RR as the statistical outcome. Based on the data analysis, the researchers considered converting OR to RR. The OR calculation was converted into RR using <http://www.clinicalcalc.com/Stats/ConvertOR.aspx>

Based on the results of the meta-analysis, peer-based intervention was 1.15 times better in improving sexually transmitted infection preventive behavior in adolescents. These results were statistically significant (RR 1.15; 95%CI=1.02 to 1.30; $p=0.020$).

This result is in line with a study conducted by Calloway et al. (2014) that peer education that focused on the components of the Health Belief Model, skill-building, and peer effect was an effective strategy in reducing risky behavior of having STI. This is in line with a study conducted by Bulduk & Erdogan (2012) and Mmbaga et al. (2017) that peer education had a significant effect on delaying sexual initiation and condom use behavior by adolescents who participated in peer education.

The findings of this study are in line with the study conducted by Saad et al (2012) that risky sexual behavior by adolescents decreased steadily in the intervention group. The effectiveness of sexual education interventions depended on the teaching method. Therefore, peer-based intervention had succeeded in reducing risky sexual behavior in adolescents.

This is confirmed by Adeomi et al. (2014) that the effectiveness of peer education in adolescents occurred due to adequate training and supportive supervision. Peer involvement could increase youth skills and awareness of STI preventive efforts. In peer education, there was a peer effect that became one of the determining

factors for adolescents to carry out a behavior.

In addition, to prevent unintended pregnancy, peer-based intervention could increase unintended pregnancy preventive behavior in adolescents 1.14 times better than non-peer-based intervention and statistically significant (RR 1.14; 95% CI=1.00 to 1.30; $p=0.040$).

The ability of peer-based intervention in increasing unintended pregnancy preventive behavior is supported by a study conducted by Stephenson et al (2008) that peer-based intervention was worthy to be considered as a strategy to prevent unintended pregnancy in adolescents. Adolescent girls who received education about sexual and reproductive health with a peer education approach were more likely to report condom use. In addition, a study conducted by Calise et al (2016) described a decrease in the prevalence of unsafe vaginal sex in adolescent girls after participating in peer-based sexual and reproductive health education interventions.

Harrison et al (2016) emphasized that consistent condom use was the right effort for adolescents to anticipate unintended pregnancies. However, he found no significant difference in condom use in the intervention group and the control group after peer-based intervention. This supported the findings in the authors' meta-analysis that there was low power of the influence of peer-based intervention on unintended pregnancy preventive behavior in adolescents.

Sarnquist et al (2016) explained that the low power of influence ($1.00 \leq RR \leq 1.50$) on the effectiveness of peer-based intervention could occur due to the fact that pregnancy in adolescents was a complex problem. A series of factors related to this were poverty, gender bias, and inadequate access to education. Therefore, the best way to

promote unintended pregnancy prevention behavior in adolescents was by providing educational interventions that were in line with the provision of a comprehensive range of services.

Considering that the results of the meta-analysis of this study were in line with several studies, conducting peer-based intervention as a strategy in promoting healthy behavior related to STIs and unintended pregnancy was worth considering.

The limitation of this study was that the researchers excluded the studies that were not written in English. This allowed for bias and reduced the precision of the combined estimation of the effects of the intervention. In addition, the researchers used 4 databases only to search for primary studies. The next researchers are expected to expand the search by adding other databases besides the database of the researchers used in this study.

AUTHOR CONTRIBUTION

Conceptualization: Denanda Agnes Safitri, Setyo Sri Rahardjo, Bhisma Murti

Data curation: Bhisma Murti, Setyo Sri Rahardjo

Data analysis: Denanda Agnes Safitri

Writing – original draft: Denanda Agnes Safitri

Writing – review & editing: Denanda Agnes Safitri, Setyo Sri Rahardjo, Bhisma Murti

CONFLICT OF INTEREST

The researchers stated that there was no financial relationship or commercial purpose that could create a conflict of interest.

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