

Meta-Analysis: Effects of Adolescent's Knowledge, Attitude, and Parental Support, on Human Papilloma Virus Immunization Uptake

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ABSTRACT

Background: Human papillomavirus (HPV) is one of the most common sexually transmitted viruses worldwide. HPV vaccination coverage is still low, especially for adolescents, some influential factors are lack of knowledge, rejection, and support of the closest environment in receiving vaccination services. This study aims to estimate the effect size of knowledge, attitudes, and parental support on the use of HPV immunization services in adolescents.

Subjects and Method: A systematic review and meta-analysis study using PRISMA diagrams. The article search was conducted based on eligibility criteria with the PICO Model. Population: female adolescents, Intervention: high knowledge, positive attitude, strong parental support, Comparison: less knowledge, negative attitude, poor parental support, Outcome: Use of HPV immunization services. The articles used were from Google Scholar, Europe PMC, PubMed, and Science Direct published from 2016 – 2023. The keywords used in the search were "adolescent" OR "young women" OR "Parental of Adolescent" AND "Knowledge" AND "attitude" OR "awareness" AND "HPV" OR "HPV Vaccination" OR "Immunization". The study subjects were female adolescents, and articles published in English. The study used multivariate analysis with an adjusted Odds Ratio. Eligible articles were analyzed using the RevMan 5.3.

Results: The meta-analysis included 10 cross-sectional studies from Asia, Australia, Africa, Europe, and America. High knowledge increased the likelihood of HPV immunization uptake in female adolescents (aOR= 3.24; 95% CI = 2.43 to 4.32; p<0.001). The meta-analysis included 7 cross-sectional studies showed that positive attitude increased HPV immunization uptake in female adolescents (aOR= 4.10; CI 95% = 2.78 to 6.05; p<0.001). 7 cross-sectional studies showed that strong parental support increased HPV immunization uptake (aOR=2.53; CI95% = 1.79 to 3.58; p<0.001).

Conclusion: High knowledge, positive attitude, and strong parental support increase the likelihood of HPV immunization uptake.

Keywords: knowledge, attitude, parental support, adolescents, HPV vaccination.

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BACKGROUND

One of the leading causes of death in the world is cancer. Cancer is an abnormal and uncontrollable growth of cells, which damages surrounding tissues and can spread to locations far from its origin and is called metastasis. According to data from Global Burden of Cancer (GLOBOCAN) the number of cancer cases until 2018 was 18.1 million cases with a death toll of 9.6 million deaths worldwide. These deaths are expected to continue to rise to more than 13.1 million by 2030 (Bray et al., 2018).

It is mentioned that several countries in Asia such as China, India, and Indonesia have the most contribution to the incidence of cancer cases worldwide, one of which includes cervical cancer (Bray et al., 2018). Cervical cancer is caused by infection with the Human Papilloma Virus, and HPV types 16 and 18 are the high-risk types that are responsible for more than 70% of cervical cancer cases. Not only cervical cancer, but HPV can also cause cancer of the vulva, vagina, penis, anus, oropharynx, and genital warts. Statistical data shows that cervical cancer morbidity is among the highest in the age group of 20 to 44 years (Workowski, 2015).

To date, there are more than 290 million women infected with HPV. One of the efforts that can be taken to prevent cervical cancer is to conduct the HPV vaccine. As it is recommended by WHO, the HPV vaccine is included in national immunization programs, provided that prevention of cervical cancer or other HPV-related diseases is a public health priority. HPV vaccines should be introduced as part of a coordinated and comprehensive strategy to prevent cervical cancer and other diseases caused by HPV (WHO, 2016). There are two types of vaccines available today: bivalents that protect against HPV types 16 and 18 which are the most common causes

of genital warts. As well as quadrivalent which also provides protection against HPV types 6, 11, 16, and 18. The HPV vaccine is recommended by the American Cancer Society (2014) to be given to girls aged more than 9 years to 26 years.

This is in line with the WHO (2016), which recommends that the HPV vaccine can be given to adolescent girls aged 9 to 13 years who have never had sexual intercourse. The statement is reinforced by the Regulation of the Minister of Health of the Republic of Indonesia Number 12 of 2017 that in Indonesia, the HPV vaccine is recommended for girls over 9 years old. (Kemenkes RI, 2017). HPV virus infection can affect anyone, ranging from women aged 20 years to women who are no longer in productive age.

Some risk factors for HPV infection include the age of early marriage and sexual intercourse before the age of 18, women with a high frequency of sexual activity and multiple sexual partners, smokers, having a history of sexually transmitted diseases, parity (number of births), and long-term oral contraceptive use. These groups have a 5 times greater risk of being infected with the HPV virus.

In developing countries, the number of children and poverty are the main factors that lead to a very cervical cancer high incidence. The high risk in women from the age of 20 indicates that adolescent girls or women who have experienced menstruation should start to care about their reproductive health.

The benefits of getting HPV vaccination which is a primary prevention effort can reduce the occurrence of high-risk HPV infection, and reduce the incidence of cervical cancer carcinogenesis which has proven effective in preventing the highest prevalence of HPV types 16 and 18. The vaccine is reported to provide 90% protec-

tion, in HPV types 6 and 11 (which cause about 90% of genital infections or genital warts). Vaccinations containing HPV vaccine types 16 and 18 are referred to as bivalent vaccines, while HPV vaccine types 6, 11, 16, and 18 are referred to as quadrivalent vaccines (Wilson et al., 2016).

In a trial carried out Setiawati (2014) based on the perceived benefits of female students, believes that HPV vaccination can prevent cervical cancer (89.2%), can improve quality of life (70.9%), and provide a feeling of security (71.6%). The results obtained show that many respondents are already aware of the various benefits of using HPV vaccination services, including preventing cervical cancer, improving quality of life, and providing a feeling of security (Setiawati, 2014).

The most common and frequent reasons given for refusing the HPV vaccine are lack of vaccine information and support from doctors, lack of need for the vaccine, lack of knowledge and safety concerns as well as parental concerns about the safety or potential side effects that the vaccine will cause (Oldach, 2012).

This is supported by a study showing that the factors that can affect the proportion of HPV vaccination decision-making among female students are knowing about the HPV vaccine (aOR= 2.50; 95% CI= 1.05 to 5.96), in addition, willingness based on self-awareness (aOR= 2.53; 95% CI= 1.51 to 4.26), and supportive family (parent) attitudes (aOR= 2.05; 95% CI= 1.15 to 3.64) are the identified key factor as associated with the increased vaccination uptake (Beyen et al., 2022).

Based on these data and problems, it requires a comprehensive review of various primary studies on the influencing factors related to the use of HPV immunization services. This study aims to estimate the effect size of knowledge, attitudes, and

parental support on the use of HPV immunization services.

SUBJECTS AND METHOD

1. Study Design

It was a quantitative study with a Meta-analysis study design. This review was systematically analyzed using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. The article search process was conducted systematically and comprehensively using electronic databases including Europe PMC, Google Scholar, PubMed, and Science Direct with the search keywords used are "adolescent" OR "young women" OR "Parental of Adolescent" AND "Knowledge" OR "Information" AND "attitude" OR "awareness" AND "HPV" OR "HPV Vaccination". Based on the database search, 24 articles were selected that met the criteria, namely full-text articles with a cross-sectional study design".

2. Step of Meta-Analysis

The meta-analysis was carried out in five steps as follows:

- 1) Formulate research questions in the PICO format (Population, Intervention, Comparison, Outcome).
- 2) Search for primary study articles from various electronic and non-electronic databases.
- 3) Conduct screening and critical assessment of primary research articles.
- 4) Perform data extraction and synthesize effect estimates into RevMan 5.3.
- 5) Interpret and conclude the results

3. Inclusion Criteria

The full-text paper study article using a cross-sectional study design. The analysis used in the article was multivariate by ensuring the adjusted odds ratio (aOR). The subjects of the study were female adolescents. The interventions were in the form of high knowledge, positive attitudes, and

strong parental support. The outcome is the use of HPV immunization services.

4. Exclusion Criteria

The exclusion criteria for articles used in this study were articles published in a non-English language, articles published before 2016, and paid or inaccessible articles.

5. Operational Definition of Variables

In formulating research problems, researchers used the PICO model. The population in this study was adolescent girls. The intervention was high knowledge, positive attitudes, and strong parental support. The comparisons were less knowledge, negative attitudes, and poor parental support. The outcome was the use of HPV immunization services.

Knowledge is a result of knowing obtained after a person senses a particular object. Sensing occurs through the five senses possessed by humans, namely the senses of sight, hearing, smell, taste, and touch. The instrument used was questionnaires.

Attitude can be a readiness or willingness to act, and is not an implementation of any particular motive. The instruments used were interviews and questionnaires.

Parental support is one's perception who states that he is part of a community in which some members support each other and has a very important role. The instrument used was an interview.

The Use of HPV Immunization Services is cost-effective upstream health intervention method to reduce morbidity, disability, and death due to diseases (viruses that can infect parts of the skin (epidermis) and mucous membranes of humans, such as oral mucosa, esophagus, conjunctiva, larynx, trachea, genital, and anus) that can be prevented by immunization. The instruments used were interviews and questionnaires.

6. Instruments

Quality assessment in this study used a critical appraisal checklist for cross-sectional studies published by CEBMa (Center for Evidence-Based Management).

7. Data Analysis

The collected articles were then screened using predetermined criteria. The study was a meta-analysis study that used secondary data in the form of data from the results of previous primary studies, in which the data processing used Review Manager (RevMan 5.3). The variety of study data was divided into two, namely the Fixed Effect Model (FEM) and Random Effect Model (REM). The results of data processing were presented in forest plots and funnel plots graphs to illustrate the size of the combined effect of each variable studied.

RESULTS

The primary article searches in this study used databases, namely Pubmed, Google Scholar, Science Direct, and Europe PMC. The process of screening articles according to the research criteria can be seen in the PRISMA flow diagram (Figure 1). The initial search process obtained 1,576, the process of removing articles resulted in 398 articles, then a selection of eligible articles was conducted so that 24 articles were included in the meta-analysis study. The articles obtained came Australia, the United States, Texas, South Korea, China, India, Canada, France, Malaysia, and several cities in Ethiopia.

Study quality assessment was carried out quantitatively, where this study used study quality assessment for a cross-sectional study based on the Center for Evidence-Based Management (CEBMa) in 2014. The results of the study quality assessment based on CEBMa can be seen in Table 1.

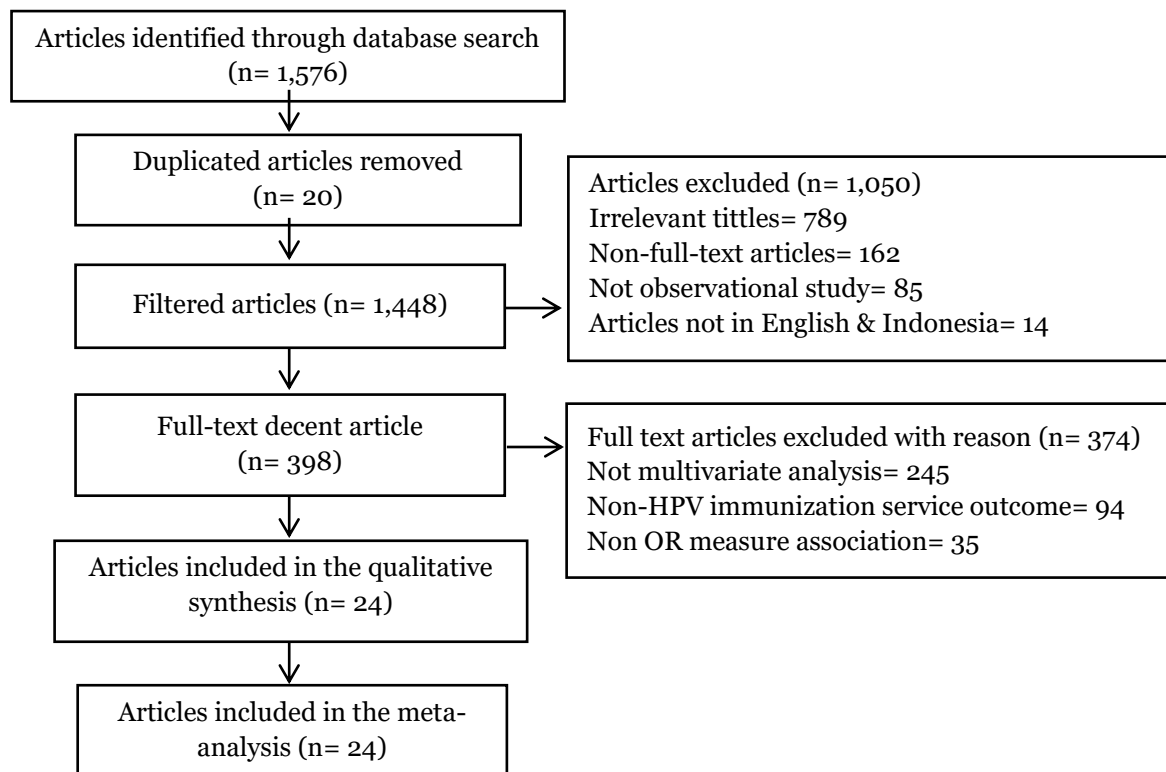


Figure 1. Results of Prisma Flow Diagrams



Figure 2. Research Distribution Map

Figure 2 shows that the study area of the effect of knowledge, attitudes of adolescents, and parental support on the use of HPV immunization services are America with 6 studies (4 studies from Texas, 1

study from Canada, and 1 study from the United States), Europe with 1 study (1 study from France), Australia with 1 study (1 study from Australia), Asia with 6 studies (2 studies from South Korea, 2 studies

from China, 1 study from India and 1 study (10 studies from the Ethiopian region).
 from Malaysia) and Africa with 10 studies

Table 1. The Quality Assessment Result of Articles with a Cross-Sectional Study using CEBM.

Primary Study	Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Abraham et al. (2018)	1	1	1	1	1	1	1	1	1	1	1	1	12
Annalyn et al. (2021)	1	1	1	1	1	1	1	1	1	1	1	1	12
Erika et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Etenesh et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Haewon et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Kim et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Mulgeta et al. (2020)	1	1	1	0	1	1	1	1	1	1	1	1	11
Nebiyu et al. (2021)	1	1	1	1	1	1	1	1	1	1	0	1	11
Shapiro et al. (2021)	1	1	1	1	1	1	1	1	1	1	1	1	12
Yilma et al. (2017)	1	1	1	1	1	1	1	1	1	1	1	1	12
Etenesh et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Alene et al. (2020)	1	1	1	1	1	1	1	1	1	1	1	1	12
Won et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
W.Kim et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Mulgeta et al. (2020)	1	1	1	0	1	1	1	1	1	1	1	1	11
Nebiyu et al. (2021)	1	1	1	1	1	1	1	1	1	1	0	1	11
Yilma et al. (2017)	1	1	1	1	1	1	1	1	1	1	1	1	12
Alene et al. (2020)	1	1	1	1	1	1	1	1	1	1	1	1	12
Erika et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1	12
Iris et al. (2016)	1	1	1	1	1	1	1	1	1	1	1	1	12
Kristin et al. (2017)	1	1	1	1	1	1	1	1	1	1	1	1	12
Mastura et al. (2017)	1	1	1	0	1	1	1	1	1	1	1	1	11
Rey et al. (2018)	1	1	1	1	1	1	1	1	1	1	1	1	12
Osaghae et al. (2023)	1	1	0	1	1	1	1	1	1	1	1	1	11

Description of the question criteria:

1. Does the study clearly address the focused issue?
2. Did the author use the appropriate method to answer the research question?
3. Was the sample measured accurately to minimize bias?
4. Are the subjects and settings of the study described in detail?
5. Are the study instruments valid and reliable?
6. Was the sample size based on pre-study consideration?
7. Could a satisfactory response rate be achieved?
8. Was statistical significance assessed?
9. Was a confidence interval given for the main result?
10. Are the results applicable to designated populations?
11. Could there be confounding factors that have not been recorded?
12. Can the results be applied to the local community?

Description of scoring:

Yes = 2; Hesitate=1; No =0

Table 3. Description of the study of the effect of knowledge on the use of HPV immunization services.

Author (years)	Countries	Study Design	Sample	P	I	C	O
Abrhm et al. (2018)	India	Cross-Sectional	831	Female adolescents aged 11-15 years	High knowledge	Less knowledge	HPV Immunization Service
Analyn et al. (2021)	North Texas	Cross-Sectional	223	Female adolescents aged 9-17 years	High knowledge	Less knowledge	HPV Immunization Service
Erika et al. (2022)	USA	Cross-Sectional	1192	Female adolescents aged 9-17 years	High knowledge	Less knowledge	HPV Immunization Service
Etnesh et al. (2022)	Bahir dar, Ethiopia	Cross-Sectional	620	Female adolescents aged 15-24 years	High knowledge	Less knowledge	HPV Immunization Service
H.won et al. (2022)	China	Cross-Sectional	317	Female adolescents aged 18-24 years	High knowledge	Less knowledge	HPV Immunization Service
H.kim et al. (2022)	South Korea	Cross-Sectional	273	Female adolescents aged 18-24 years	High knowledge	Less knowledge	HPV Immunization Service
Mulgeta et al. (2020)	Ambo, Ethiopia	Cross-Sectional	422	Female adolescents aged 14-18 years	High knowledge	Less knowledge	HPV Immunization Service
Nebiyu et al. (2021)	Addis Ababa, Ethiopia	Cross-Sectional	430	Female adolescents aged 9-17 years	High knowledge	Less knowledge	HPV Immunization Service
Shapiro et al. (2021)	Canada	Cross-Sectional	847	Female adolescents aged 9-16 years	High knowledge	Less knowledge	HPV Immunization Service
Yilma et al. (2017)	Southwest Ethiopia	Cross-Sectional	550	Female adolescents aged 9-14 years	High knowledge	Less knowledge	HPV Immunization Service

Table 4. aOR and 95% CI data of of knowledge on the use of HPV immunization services.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Abrhm et al. (2018)	1.22	0.70	1.74
Analyn et al. (2021)	0.56	0.22	0.90
Erika et al. (2022)	0.64	0.40	0.88
Etnesh et al. (2022)	3.57	2.49	4.65
H.won et al. (2022)	1.51	1.25	1.77
H.kim et al. (2022)	1.49	1.22	1.76
Mulgeta et al. (2020)	0.73	0.32	1.14
Nebiyu et al. (2021)	2.32	1.56	3.08
Shapiro et al. (2021)	1.05	0.96	1.14
Yilma et al. (2022)	0.53	0.29	0.77

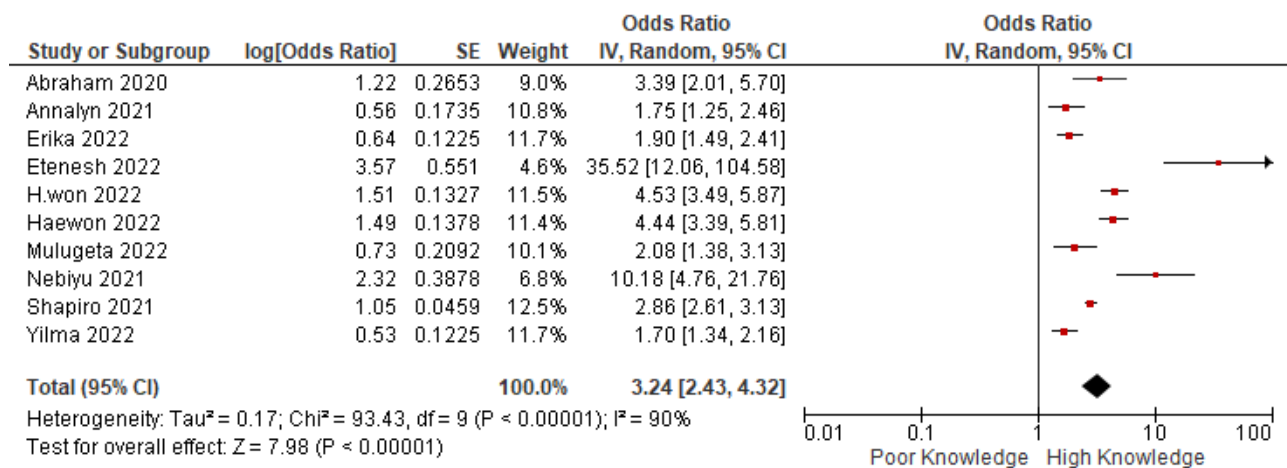


Figure 3. Forest plot of the effect of knowledge on the use of HPV immunization services in female adolescents

The forest plot in Figure 3. shows that there was an effect of knowledge on the use of HPV immunization services, and the effect was statistically significant. Female adolescents with high knowledge of HPV immunization were 3.24 times more likely to use HPV immunization services than

those with less knowledge (aOR= 3.24; CI 95%= 2.43 to 5.32; p< 0.001). The forest plot also shows that heterogeneity of effect estimates across the studies was high (I²= 90%; p< 0.001). Thus the calculation of the average effect estimates was conducted by using a random effect model approach.

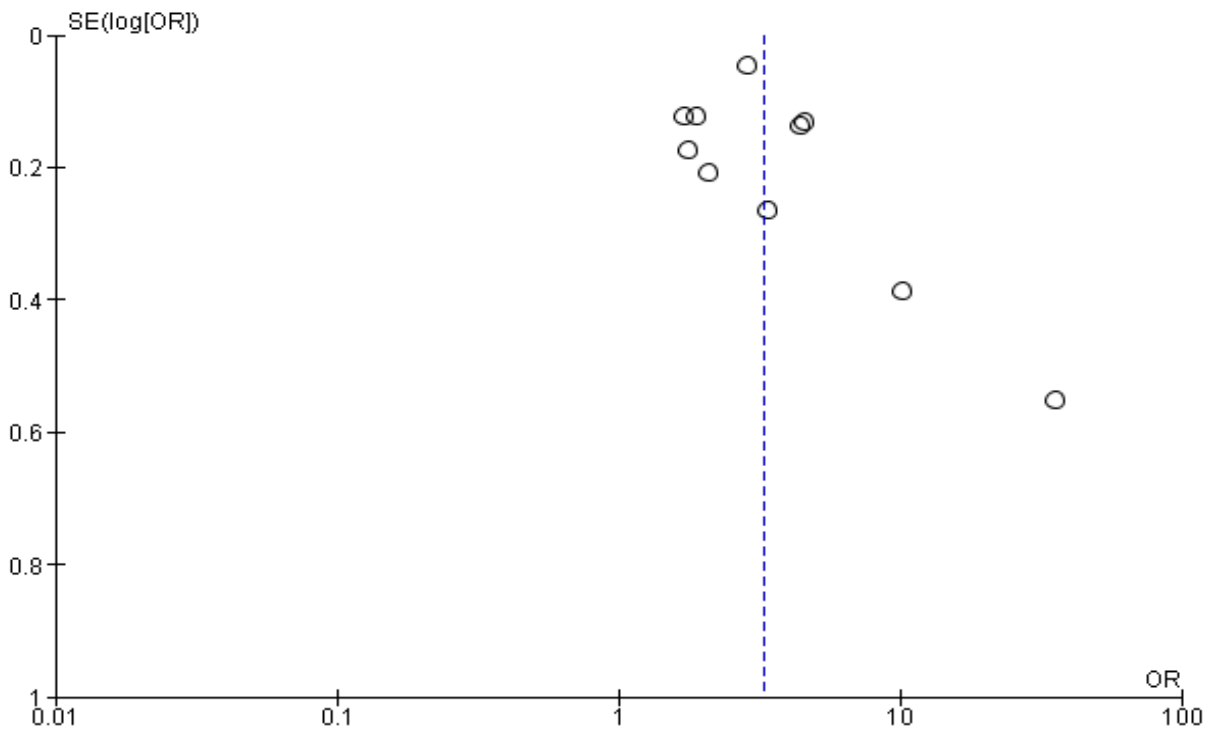


Figure 4. Funnel plot of the effect of knowledge on the use of HPV immunization services in female adolescents

The funnel plot in Figure 4 shows the distribution of effect estimates that are asymmetrical to the right and left of the vertical line. There are more distributions of effect estimates on the left of the vertical line than on the right, indicating a publi-

cation bias. Since the diamond shape location of the average estimates in the forest plots in Figure 3 is also to the right of the vertical line of the null hypothesis, the publication bias tended to overestimate the effect.

Table 5. Description of the studies of the effect of attitudes on the use of HPV immunization services.

Author (years)	Countries	Study Design	Sample	P	I	C	O
Alene et al. (2020)	Northwest Ethiopia	Cross-Sectional	899	Female adolescents aged 9-16 years	Positive Attitude	Negative Attitude	HPV Immunization Service
Etenesh et al. (2022)	Bahir dar, Ethiopia	Cross-Sectional	620	Female adolescents aged 15-24 years	Positive Attitude	Negative Attitude	HPV Immunization Service
Haewon et al. (2022)	China	Cross-Sectional	317	Female adolescents aged 18-24 years	Positive Attitude	Negative Attitude	HPV Immunization Service
Kim et al. (2022)	South Korea	Cross-Sectional	273	Female adolescents aged 18-24 years	Positive Attitude	Negative Attitude	HPV Immunization Service
Mulgeta et al. (2020)	Ambo, Ethiopia	Cross-Sectional	422	Female adolescents aged 14-18 years	Positive Attitude	Negative Attitude	HPV Immunization Service
Nebiyu et al. (2021)	Addis Ababa, Ethiopia	Cross-Sectional	430	Female adolescents aged 9-17 years	Positive Attitude	Negative Attitude	HPV Immunization Service
Yilma et al. (2022)	Southwest Ethiopia	Cross-Sectional	550	Female adolescents aged 9-14 years	Positive Attitude	Negative Attitude	HPV Immunization Service

Table 6. Table 4. aOR and 95% CI data the effect of attitudes on the use of HPV immunization services.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Alene et al. (2020)	2.15	1.60	2.70
Etenesh et al. (2022)	1.49	1.08	1.90
Haewon et al. (2022)	1.30	1.09	1.51
Kim et al. (2022)	1.20	1.02	1.38
Mulgeta et al. (2020)	2.04	1.15	2.93
Nebiyu et al. (2021)	5.03	1.63	8.43
Yilma et al. (2022)	0.54	0.29	0.79

The forest plot in Figure 5 shows that there was an effect of attitude toward the use of HPV immunization services, and the effect was statistically significant. Female adolescents with a positive attitude about HPV

immunization were 4.10 times more likely to use HPV immunization services than those with a negative attitude (aOR= 4.10; CI 95%= 2.78 to 6.05; p< 0.001), the forest plots also show the heterogeneity of effect

estimates across the studies was high ($I^2=88\%$; $p < 0.001$). Thus, the calculation of the

average effect estimates was carried out with a random effect model approach.

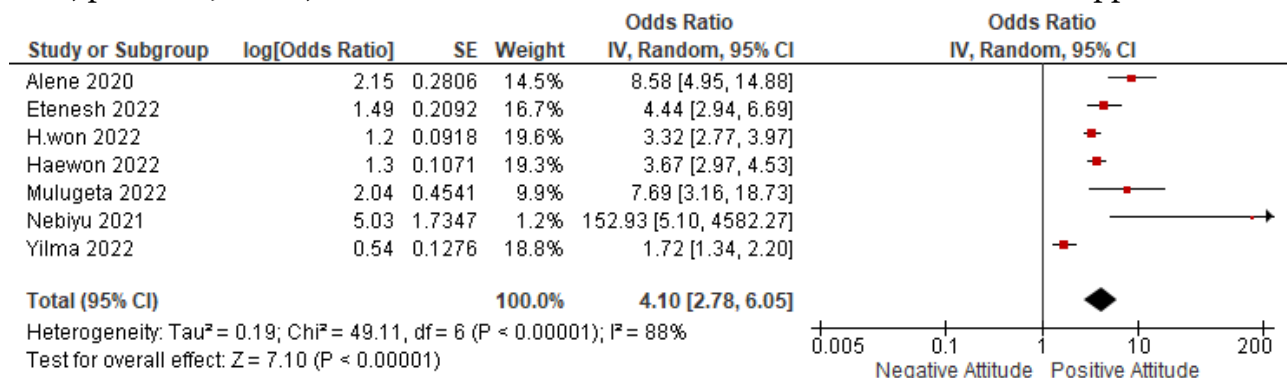


Figure 5. Forest plot of the influence of attitudes toward the use of HPV immunization services in female adolescents.

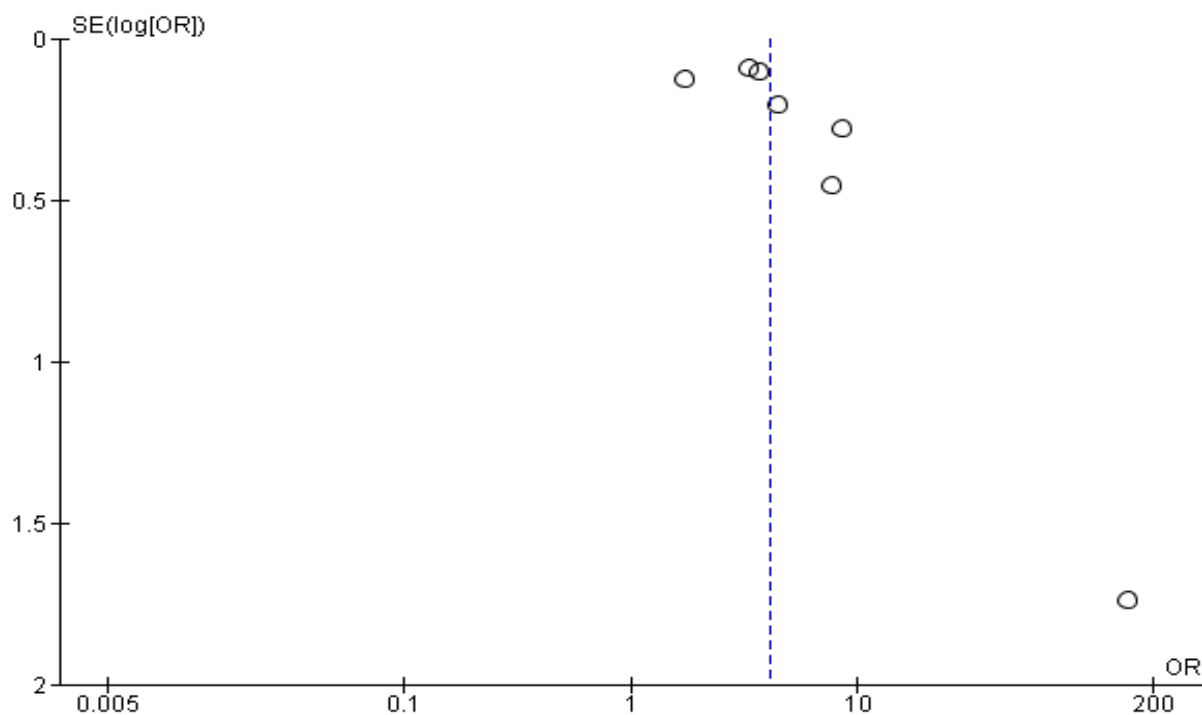


Figure 6. Forest plot of the influence of attitudes toward the use of HPV immunization services in female adolescents.

The funnel plot in Figure 6 shows the distribution of effect estimates that are asymmetrical to the right and left of the vertical line. There are more distributions of effect estimates on the right of the vertical line than on the left, indicating publication bias.

Since the diamond shape location of the average estimates in the forest plot in Figure 5 is also located to the right of the vertical line of the null hypothesis, the publication bias tended to overestimate the effect.

Table 7. Description of the studies of the effect of parental support on the use of HPV immunization services

Author (years)	Countries	Study Design	Sample	P	I	C	O
Alene et al. (2020)	Northwest Ethiopia	Cross-Sectional	899	Female adolescents aged 9-16 years	Strong parental support	Poor parental support	HPV Immunization Service
Erika et al. (2022)	Texas	Cross-Sectional	1192	Female adolescents aged 9-17 years	Strong parental support	Poor parental support	HPV Immunization Service
Iris et al. (2016)	Australia	Cross-Sectional	417	Female adolescents aged 18-25 years	Strong parental support	Poor parental support	HPV Immunization Service
Kristin et al. (2017)	Texas	Cross-Sectional	949	Female adolescents aged 13-17 years	Strong parental support	Poor parental support	HPV Immunization Service
Mastura et al. (2017)	Malaysia	Cross-Sectional	280	Female adolescents aged 11-16 years	Strong parental support	Poor parental support	HPV Immunization Service
Rey et al. (2018)	France	Cross-Sectional	958	Female adolescents aged 11-15 years	Strong parental support	Poor parental support	HPV Immunization Service
Osaghae et al. (2023)	North Texas	Cross-Sectional	1283	Female adolescents aged 9-18 years	Strong parental support	Poor parental support	HPV Immunization Service

Table 8. Table 4. aOR and 95% CI data the effect of attitudes on the use of HPV immunization services.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Alene et al. (2020)	0.84	0.42	1.26
Erika et al. (2022)	0.42	0.27	0.57
Iris et al. (2016)	2.27	1.37	3.17
Kristin et al. (2017)	0.72	0.53	0.91
Mastura et al. (2017)	0.44	0.18	0.77
Rey et al. (2018)	1.61	1.32	1.90
Osaghae et al. (2023)	0.9	0.6	1.20

The forest plot in Figure 7 shows that there was an effect of parental support on the use of HPV immunization services, and the effect was statistically significant. Young women with strong parental support about HPV immunization were 2.53 times more likely to use HPV immunization services

compared to those with poor parental support (aOR= 2.53; CI 95%= 1. 79 to 3. 58; p< 0.001).

The forest plots also show the heterogeneity of across studies effect estimates was high (I²= 91%; p< 0.001). Thus, the calculation of the average effect estimates

was carried out with a random effect model approach.

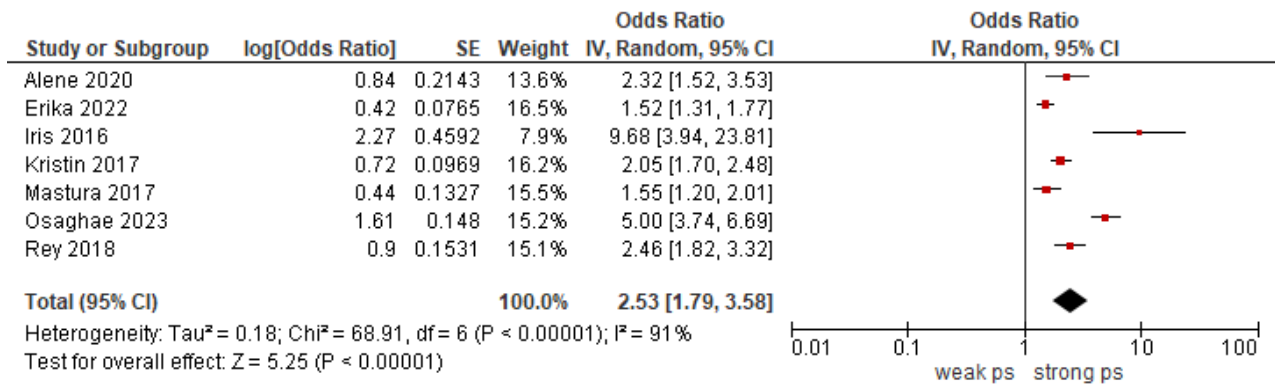


Figure 7. Forest plots of the effect of parental support on the use of HPV immunization services in female adolescents.

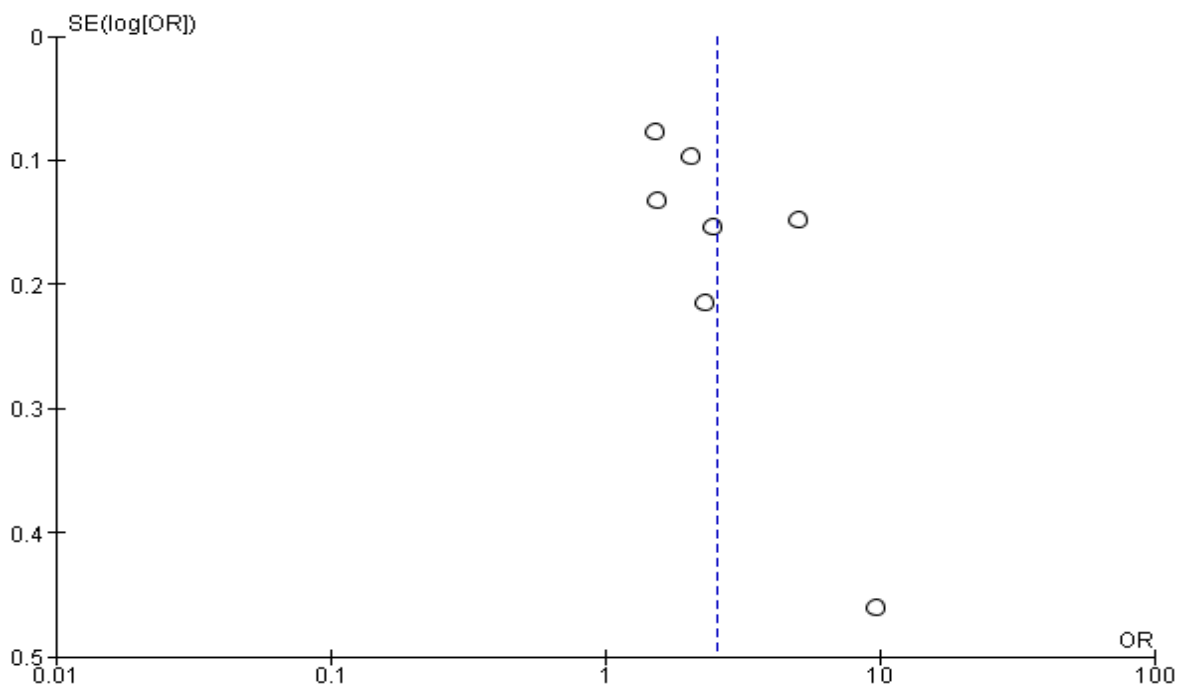


Figure 8. Funnel plots of the effect of parental support on the use of HPV immunization services in female adolescents.

The funnel plot in Figure 8 shows the distribution of effect estimates that are asymmetrical to the right and left of the vertical line. The distribution of effect estimates is more on the left of the vertical line than on the right, indicating a publication bias. Because the diamond shape location of the average estimates in the forest plot in Figure 7 is also located to the right of the vertical line of the null

hypothesis, the publication bias tended to overestimate the effect.

DISCUSSION

This systematic review and meta-analysis study discussed the effect of knowledge, adolescent attitude, and parental support on the use of HPV immunization services. This study used primary study sources, where the independent variables analyzed

were knowledge, attitude, and parental support. The dependent variable studied was HPV immunization services. An epidemiological study states that one of the risk factors for cervical cancer is the low use of HPV immunization services. Human Papilloma Virus is one of the most common sexually transmitted viruses worldwide. One of the efforts that can be made to prevent cervical cancer is by doing the HPV vaccine. As the WHO recommends, HPV vaccines are included in national immunization programs, and providing the prevention of cervical cancer or other HPV-related diseases is a public health priority.

1. The Effect of Knowledge on the Use of HPV immunization services

A total of 10 study articles with cross-sectional studies becoming the source of meta-analysis of the effect of knowledge on the use of HPV immunization services showed that there was an effect of knowledge on the use of HPV immunization services, and the effect was statistically significant. Female adolescents with high knowledge of HPV immunization were 3.24 times more likely to use HPV immunization services than those with less knowledge (aOR= 3.24; 95% CI= 2.43 to 5.32; $p < 0.001$), the forest plots also show that the heterogeneity of effect estimates across studies was high ($I^2 = 90\%$; $p < 0.001$).

Thus, the calculation of the average effect estimates was conducted by using a random effect model approach. A study conducted by Beyen et al. (2022) states that along with increasing levels of knowledge about HPV vaccination among girls. They are more likely to have receptivity toward vaccination services than those who have not been exposed to knowledge about HPV vaccination (aOR= 3.98; 95% CI=2.40 to 6.58; $p < 0.001$). Because knowledge is the result of a belief and domain that is very important in shaping one's behavior.

It is in accordance with a study by Khatiwada et al. (2021) that states that 68% out of 433 female students who participated have good knowledge about HPV vaccination and show a strong willingness to receive HPV vaccination services. Because they believe that the HPV vaccine is safe and effective for protecting against Human Papilloma Virus infection.

Respondents' knowledge of the HPV vaccine itself is the basis for the formation of respondents' interest to conduct HPV vaccination. With a knowledge of the HPV vaccine, there will be a sense of interest in the respondents to conduct HPV vaccination. From this interest, enthusiasm will grow within the respondents. So that the wider and better the knowledge possessed by respondents, the higher the enthusiasm that grows in them to make receptivity.

In this case, the respondents with good knowledge who can receive and process information wisely are influenced by several factors including education, environment, social, and experience. It is in line with a study conducted by Nurlaila et al. (2016) that shows there is an association between knowledge and receptivity behavior of HPV vaccination. This is influenced by knowledge gained from education about cervical cancer vaccination, information obtained from friends, media, environment, or experience. It is in line with the theory that knowledge is the collection of information shared by a person or group, or a particular culture and mental components that result from all processes of any kind, whether born of innate or achieved through experience. Knowledge is the determining factor of how humans think, feel, and act. The results of this study are supported by a study by Watson et al. (2012) that discovers that good knowledge shows an association with increased use of HPV immunization services (aOR= 2.73; 95% CI= 0.91 to 8.13;

$p < 0.001$). Since knowledge is important in determining individual behavior (overt behavior).

This is in accordance with the theory of knowledge is the result of knowing and this occurs after a person senses a certain object. Sensing occurs through the five human senses, namely: the senses of sight, hearing, smell, taste, and touch. Most human knowledge is acquired through the eyes, and ears.

2. The Effect of Attitude on the Use of HPV immunization services

A total of 7 study articles with cross-sectional studies becoming the source of meta-analysis of the effect of attitude on the use of HPV immunization services showed that there was an effect of attitude on the use of HPV immunization services, and the effect was statistically significant. Female adolescents with a positive attitude about HPV immunization were 4.10 times more likely to use HPV immunization services than those with a negative attitude (aOR= 4.10; 95% CI= 2.78 to 6.05; $p < 0.001$), the forest plots also show heterogeneity of effect estimates across studies was high ($I^2=88\%$; $p < 0.001$). Thus, the calculation of the average effect estimates was conducted with a random effect model approach.

The results of this study are supported by a study Beyen et al. (2022) that states there is an association between adolescents who had a positive attitude towards the receptivity of Human Papilloma Virus vaccination services (aOR=2.53; 95% CI= 1.51 to 4.26) compared to adolescents who have a negative attitude. A theory states that a person's knowledge of an object contains two aspects, namely positive aspects and negative aspects. These two aspects will determine the person's attitude. The more positive aspects, the more positive attitude toward a certain object. A study conducted

by Kassie et al. (2020) shows that adolescents with a positive attitude are more likely to have an interest in receiving vaccination services than adolescents with a negative attitude regarding human papillomavirus vaccination (aOR= 6.09; 95% CI= 1.90 to 34.36; $p < 0.001$).

This is in accordance with a theory that attitude is a reaction or response of someone who is still closed-minded to a stimulus or object. An attitude affects the formation of interest because of the tendency for the subject to accept or reject, respond or not respond, whether an object is valuable or not. Adolescents who have been informed about the HPV vaccine will then appreciate in factors that involve emotions, and an understanding of deeper experiences. A person who has obtained and profoundly comprehend the information will begin to grow an interest (receptivity) in an object, and he will be interested in the object and will always follow the development of information about the object. The experience and information that has been obtained become a domain in the formation of one's attitudes and interest.

3. The effect of parental support on the use of HPV immunization services

A total of 7 study articles with cross-sectional studies becoming the source of meta-analysis of the effect of parental support on the use of HPV immunization services showed that there was an effect of parental support on the use of HPV immunization services, and the effect was statistically significant. Female adolescents with strong parental support about HPV immunization were 53 times more likely to use HPV 2 immunization services compared to those with poor parental support (aOR= 2.53; 95% CI= 1.79 to 3.58; $p < 0.001$), the forest plots also show the heterogeneity of effect estimates across

studies was high ($I^2=91\%$; $p < 0.001$). Thus, the calculation of the average effect estimates was conducted with a random effect model approach.

The results of this study are supported by a study conducted Kahee et al. (2017) that shows strong parental intention and support have an effect on increasing the receptivity of HPV vaccination services in children (aOR= 1.57; 95% CI= 1.05 to 2.35) compared to poor parental support. In this study, the effect of parental attitude that supports female adolescents to conduct HPV vaccination is in accordance with the theory that the higher the family support, the lighter the healthy behavior among adolescents, and vice versa the lower the family support given, the heavier the level of healthy life receptive behavior among adolescents (Pendit et al., 2020).

Family support, especially from parents, is the most important factor in shaping the attitude of a teenager, the teenager, in this case, is late adolescent (aged 19 to 21 years) who according to the theory in this period the late adolescent begins to see himself as an adult and begins to be able to show increasingly mature thoughts, attitudes, behaviors as well. Therefore, parents and society begin to give proper trust to late adolescents and interaction with parents also became better and smoother. Therefore, family functions, especially affective functions, can work better, this is what makes adolescents obtain support from parents and it shapes an attitude to support cervical cancer prevention through the receptivity of HPV vaccination services (Wijaya et al., 2012).

The limitation of the study is the occurrence of language bias because the articles used in this study are articles published in English, thus ignoring non-English articles. And there was a publication bias shown in the funnel plots in a

cross-sectional study on variables of knowledge, attitudes, and parental support.

AUTHOR CONTRIBUTION

Wiwit Marliana WAS the main researcher who chose the topic, conducted searching, collected data in this study. Uki Retno Budihastuti and Eti Poncorini Pamungkasari conducted data analysis and review of study documents.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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