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Meta-Analysis: Factors Related to Pap Smear Service Utilization Using Health Belief Model

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ABSTRACT

Background: Cervical cancer or cervical cancer is the most frequently diagnosed cancer and the fourth leading cause of death from cancer in women. Regular cervical cancer screening with the Papanicolaou (Pap) smear test remains an effective public health intervention in preventing and reducing the incidence of cervical cancer morbidity and mortality. The health belief model (HBM) is a psychological health behavior change model which shows that belief, perception, and attitude about a disease determine their willingness to use preventive interventions such as disease screening. This study aims to analyze the effect of the health belief model on the utilization of Pap smear screening services.
Subjects and Method: This was a systematic review and meta-analytic study. This study uses the PICO model. The meta-analytic study was carried out by searching for articles from databases in electronic form using PubMed, Google Scholar and Proquest. Article search was carried out for 1 month. The keywords used were "Cervical Cancer Screening" OR "Pap Smear" AND "Health Belief Model" OR "Health Belief" AND Cervical Cancer". The inclusion criteria for this study were complete articles using cross-sectional, 2013-2023. Analysis of the articles in this study used RevMan5.3 software.
Results: A total of 15 cross-sectional studies from several countries, namely Indonesia, Ethiopia, Ghana, Iran, Italy, Lebanon, South Korea and the United States. The results of the meta-analysis showed that women of childbearing age with a high perceived vulnerability had a 1.19 times higher likelihood of utilizing Pap Smear screening services than those with a low perceived vulnerability (aOR= 1.19; 95% CI= 1.08 to 1.32; p< 0.001). High perceived benefit (aOR= 1.12; 95% CI= 1.07 to 1.16; p< 0.001) and high self-efficacy (aOR= 1.17; 95% CI= 1.01 to 1.36; p= 0.040) increased utilization of Pap smear screening services.
Conclusion: Perceived vulnerability, perceived usefulness and self-efficacy significantly influence the utilization of Pap Smear screening services.

Keywords: cervical cancer, cervical cancer screening, pap smear, health belief model, HBM.

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BACKGROUND

Cervical cancer or cervical cancer is the most frequently diagnosed cancer and the fourth leading cause of death from cancer in women (Kashyap et al., 2019). According to data from the Global Burden of Cancer Study released by the World Health Organization, the total cases of cervical cancer in the world in 2020 reached 604,127 cases with a total death of 341,831 cases, accounting for 8% of all cancer deaths each year (Arbyn et al., 2020)). Indonesia is the tenth country in Asia, with cervical cancer sufferers as many as 28.6% of all women (Hartati, 2019). In a previous study conducted at the Anatomical Pathology Laboratory of Sanglah Hospital, Denpasar, the number of cervical cancer patients increased every year (Oktaviani et al., 2018). Cervical cancer is the most frequently diagnosed cancer in 28 countries and the leading cause of cancer death in 42 countries, especially in Sub-Saharan Africa and Southeast Asia (Bray et al., 2018). The average age of diagnosis of cervical cancer worldwide is 53 years.

The average age they die from cervical cancer worldwide is 59 years (Arbyn et al., 2020). Epidemiological studies report that almost all cases of cervical cancer are caused by the Human Papillomavirus, but about 5% of tumors are not associated with persistent HPV infection (Ferndanes et al., 2022). In Indonesia, only 5% have cervical cancer screening done so that 76.6% of patients develop to an advanced stage after being diagnosed, because cervical cancer usually shows no symptoms at an early stage (Setiawati, 2014).

Screening aims to detect precancerous lesions which, if left untreated, can cause cervical cancer (Mukti, 2020). High-quality screening programs are also important for preventing cervical cancer among unvaccinated older women (Ferndanes et al., 2022). Regular cervical cancer screening with the Papanicolaou smear test remains an effective public health intervention in preventing and reducing the incidence, morbidity and mortality of cervical cancer. Screening tests such as the Pap smear serve to detect cervical cancer early. In recent years, this population-based screening method has reduced the incidence and death from cervical cancer by as much as 65% in developed countries. Approximately 50-90% of women who develop or die from cervical cancer have never been screened (Okunowo et al., 2018).

The Health Belief Model is one of the most widely used models. The Health Belief Model is a “psychological health behavior change model which shows that beliefs, perceptions and attitudes about a disease determine their willingness to use preventive interventions such as disease screening” (Wahyusantoso, 2021). HBM describes an individual's belief about the possibility of experiencing a condition or disease that may affect their health, an individual's interpretation of the severity of an illness, a person's belief that using preventive services will benefit the individual, preventing disease and factors that are considered to hinder the adoption of a person's healthy behavior, for example costs or service convenience. Further analysis is needed to reach a conclusive conclusion. This study aims to analyze previous primary studies in assessing the effect of the health belief model on the utilization of Pap smear screening services.

SUBJECTS AND METHOD

1. Study Design

Meta-analysis was performed using the PRISMA flow chart using PubMed, Google Scholar, and Proquest databases published from 2013 to 2023. The keywords used were “Cervical Cancer Screening” OR “Pap

Smear" AND "Health Belief Model" OR "Health Belief "AND Cervical Cancer". There were 15 studies with a cross-sectional study design that met the inclusion criteria. Analysis was performed with RevMan 5.3 software.

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

This research article is a full-text paper with a cross-sectional study design that analyzes the utilization of Pap smear screening services. The influence measure used is the OR. Multivariate analysis was used with adjusted odds ratio (aOR) and 95% confidence interval. The research subjects were women of childbearing age. 2013-2023 year range.

4. Exclusion Criteria

Articles published other than in English, outcomes not utilizing Pap smear services and articles published before 2013.

5. Operational Definition of Variables

Perceived vulnerability is defined as an individual's perception of the risk of developing cervical cancer.

Perceived benefit is an individual's perception of the positive value of having Pap smear screening and achieving the desired results if the individual does Pap smear screening.

Self-efficacy is a person's ability to perform cervical cancer screening.

Pap smear screening is one part of the annual gynecological examination, and is relatively fast.

6. Instruments

This study adopts the PRISMA flowchart and uses a cross-sectional critical assessment study of CEBM.

7. Data Analysis

Data analysis using RevMan 5.3. Forest plots and funnel plots are used to determine the size of the relationship and the heterogeneity of the data. The fixed effect model is used for homogeneous data, while the random effect model is used for heterogeneous data across studies.

RESULTS

The primary article searches in this study used databases, namely PubMed, Google Scholar, and Proquest. 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 9,102, the process of removing articles resulted in 6,688 articles, then a selection of eligible articles was conducted so that 15 articles were included in the meta-analysis study. The articles obtained came from Iran, Ethiopia, Lebabnon, Ghana, USA, Italia, Indonesia, South Korea.

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.

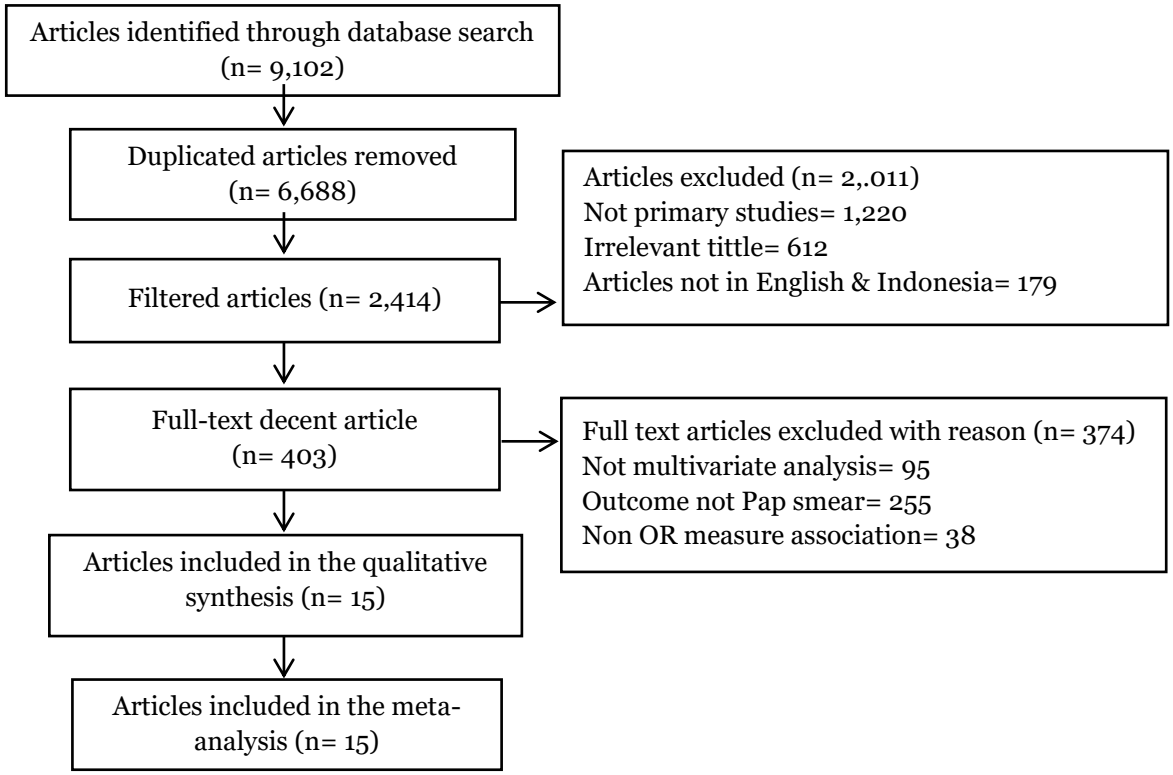

Figure 1. Results of PRISMA flow diagrams factors related to pap smear service utilization using health belief model

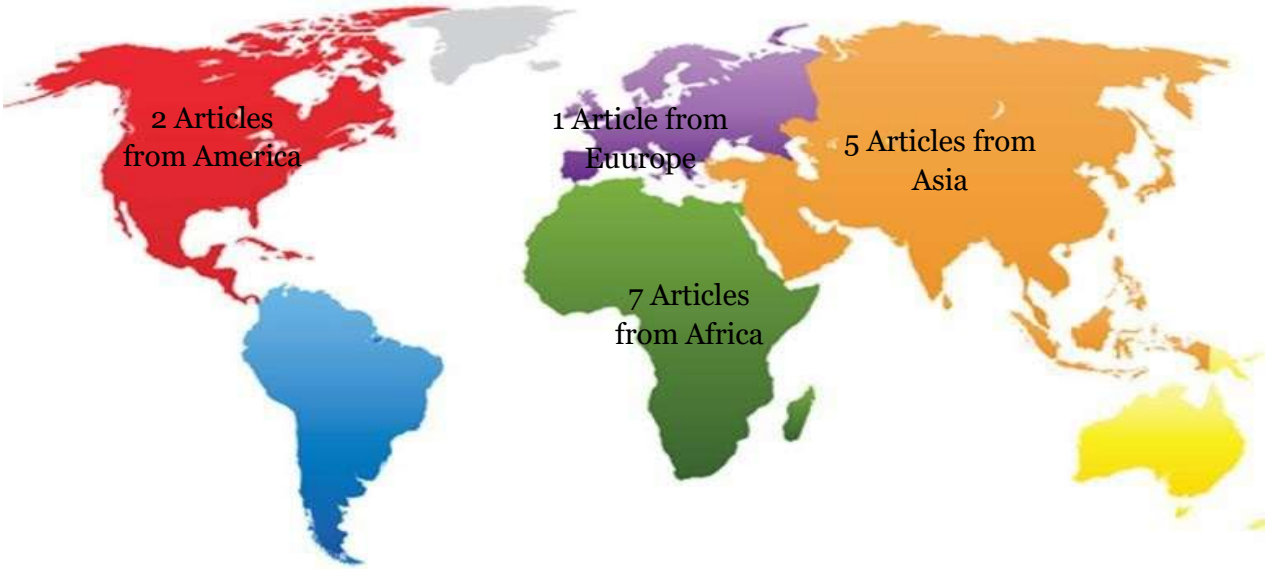

Figure 2. Research distribution map factors related to pap smear service utilization using health belief model

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

Primary Study	Criteria												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
Babazadeh et al. (2018)	2	2	2	2	2	2	2	1	2	2	1	2	22
Bantayehu (2022)	2	2	2	2	2	2	2	2	2	2	2	2	24
Bayu et al. (2016)	2	2	2	2	2	2	2	2	2	2	2	2	24
Bou-Orm et al. (2017)	2	1	2	2	2	2	2	2	2	2	2	2	23
Ebu and Ogah (2018)	2	2	2	2	2	2	2	1	2	2	2	2	23
Eo and Kim JS (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
Gemeda et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24
Lambert (2013)	2	2	2	2	2	2	2	2	2	2	2	2	24
Lambert et al. (2015	2	2	2	2	2	2	2	2	2	2	2	2	24
Mabotja et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Nigussie et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
Restivo et al. (2018)	2	2	2	2	2	2	2	2	2	2	2	2	24
Solomon et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
Tahmasebi et al. (2014)	2	2	2	2	2	2	2	2	2	2	2	2	24
Wati et al. (2021)	2	2	2	2	2	2	2	2	2	2	1	2	23

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. Are the results be applied to the local community?

Description of scoring:

0= No
1= Hesitate
2= Yes

Table 2. PICO of cross-sectional articles perceived susceptibility.

Author (years)	Country	Sample	P	I	C	O
Babazadeh et al. (2018)	Iran	280	Married women	High perceived susceptibility	Low perceived susceptibility	Pap smear screening
Bayu et al. (2016)	Ethiopia	1286	Women aged 21 and over	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Bantayehu (2018)	Ethiopia	420	Women aged 21 and over	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Bou-Orm et al. (2017)	Lebanon	2255	Women aged 18 to 65 years	Perception of high vulnerability	Low perceived vulnerability	Pap smear screening
Ebu and Ogah (2018)	Ghana	660	HIV positive women aged 20 to 65 years	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Lambert (2013)	USA	400	Women aged 18 years and over	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Lambert et al. (2015)	USA	300	Women aged ≥18 years with HIV infection	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Mabotja et al. (2021)	Ethiopia	280	Women aged 30 years and over	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Restivo et al. (2018)	Italia	365	Women aged 25 to 64 years	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Tahmasebi et al. (2014)	Iran	350	Women aged 18 to 65 years	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Wati et al. (2021)	Indonesia	195	Women aged 20 to 50 years	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening
Bou-Orm et al. (2017)	Lebanon	2255	Women aged 18 to 65 years	Perception of high vulnerability	Perceived low vulnerability	Pap smear screening

Table 3. aOR and 95% CI data of perceived susceptibility to the utilization of Pap Smear screening services.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Babazadeh et al. (2018)	1.02	0.95	1.08
Bantayehu (2022)	1.79	1.06	3.02
Bayu et al. (2016)	2.23	1.31	3.79
Bou-Orm et al. (2017)	1.07	1.04	1.10
Ebu and Ogah (2018)	2.57	0.95	6.95
Lambert (2013)	1.08	1.00	1.17
Lambert et al. (2015)	1.09	1.00	1.18
Mabotja et al. (2021)	0.70	0.40	1.22
Nigussie et al. (2019)	3.02	1.64	5.56
Restivo et al. (2018)	3.24	1.92	5.47
Tahmasebi et al. (2014)	1.21	0.89	1.64
Wati et al. (2021)	28.77	3.74	221.67

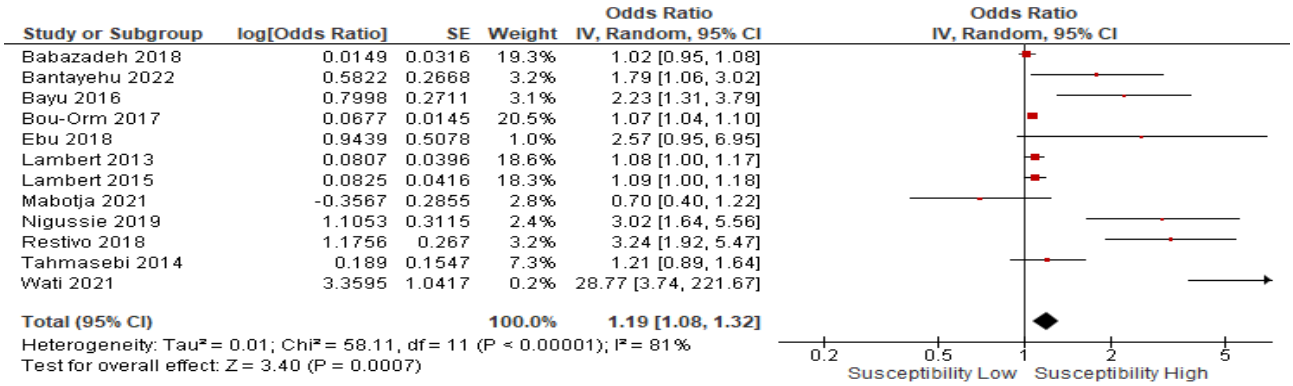

Figure 3. Forest plot of the effect of perceived susceptibility on the utilization of Pap smear screening services

Forest plot Figure 3. shows that there is an effect of perceived vulnerability on the possibility of utilizing Pap smear screening services and this effect is statistically significant. Women of childbearing age with perceptions of high vulnerability have the possibility of utilizing Pap smear screening services 1.19 times higher than women of childbearing age with perceptions of low vulnerability (aOR= 1.19; 95% CI= 1.08 to 1.32; p=0.0007). The forest plot also showed high heterogeneity of effect estimates between primary studies (I2 = 81%, p<0.001). Thus the calculation of the effect estimate is carried out using the random effect model approach.

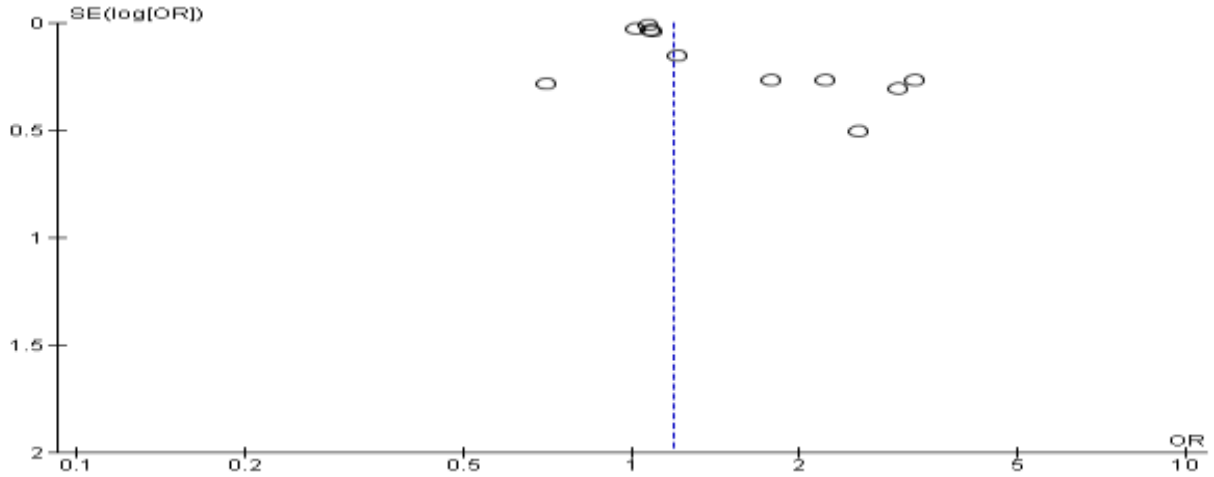

Figure 4. Funnel plot of the effect of perceived susceptibility on the utilization of Pap smear screening services

The funnel plot in Figure 4 shows that the distribution of effect estimates between studies is asymmetric, that is, the distribution or distribution of effect estimates to the right of the average vertical line of effect estimates is relatively larger than to the left (overestimated). Thus this funnel plot indicates publication bias.

Table 4. PICO table summary of cross-sectional articles perceived benefit from primary study.

Author (years)	Country	Sample	P	I	C	O
Babazadeh et al. (2018)	Iran	280	Married women (IRT)	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Bou-Orm et al. (2017)	Lebanon	2255	Women aged 18 to 65 years	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Ebu and Ogah (2018)	Ghana	660	HIV positive women aged 20 to 65 years	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Eo and Kim (2019)	Korea Selatan	196	Immigrant woman	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Gemeda et al. (2020)	Ethiopia	838	Women aged 25 years and over	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Lambert et al. (2015)	USA	300	Women aged 18 years and over with HIV infection	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Mabotja et al. (2021)	Ethiopia	280	Women aged 30 years and over	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Nigussie et al. (2019)	Ethiopia	737	Women aged 30 to 49 years	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Restivo et al. (2018)	Italia	365	Women aged 25 to 64 years	Perceived benefits are high	Perceived benefit is low	Pap smear screening
Tahmasebi et al. (2014)	Iran	350	Women aged 18 to 65 years	Perceived benefits are high	Perceived benefit is low	Pap smear screening

Table 5. Adjusted Odds Ratio (aOR) data on the effect of perceived benefits on the utilization of Pap Smear screening services.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Babazadeh et al. (2018)	1.11	1.02	1.21
Bou-Orm et al. (2017)	1.14	1.08	1.20
Ebu and Ogah (2018)	1.68	1.05	2.69
Eo and Kim (2019)	1.20	0.84	1.71
Gemeda et al. (2020)	2.70	0.80	9.11
Lambert et al. (2015)	1.03	0.93	1.14
Mabotja et al. (2021)	1.00	0.70	1.43
Nigussie et al. (2019)	1.13	0.55	2.32
Restivo et al. (2018)	1.58	0.89	2.80
Tahmasebi et al. (2014)	0.83	0.50	1.38

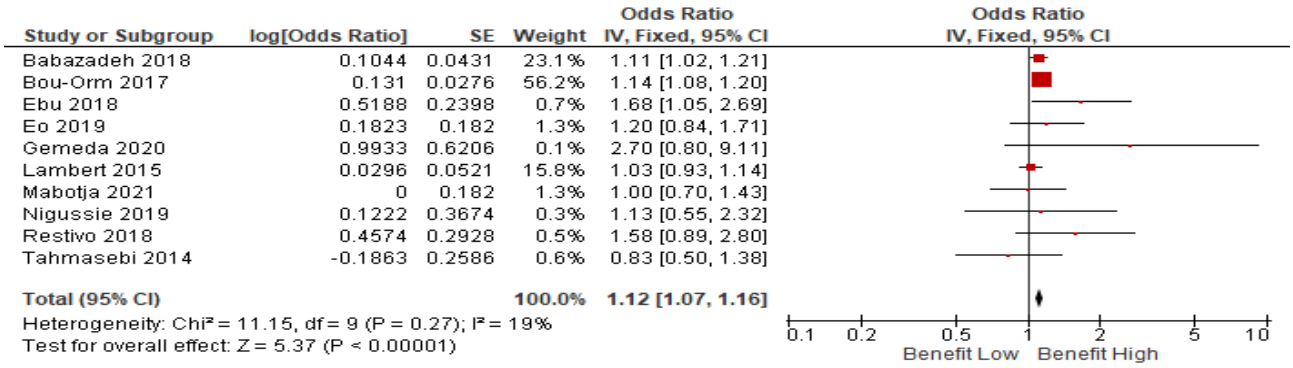

Figure 5. Forest plot of the effect of the perceived benefit of using Pap smear screening services.

The forest plot in Figure 5 shows that there is an effect of perceived benefit on the possibility of using Pap Smear screening services and this effect is statistically significant. Women of childbearing age with a high perceived benefit had a 1.12 times higher likelihood of utilizing Pap smear screening services compared to women of childbearing age with a low perceived benefit (aOR=1.12; 95% CI= 1.07 to 1.16; p<0.001). The forest plots also show homogeneity of effect estimates between primary studies (I2=19%; p=0.270). Thus the calculation of effect estimation is carried out using the fixed effect model approach.

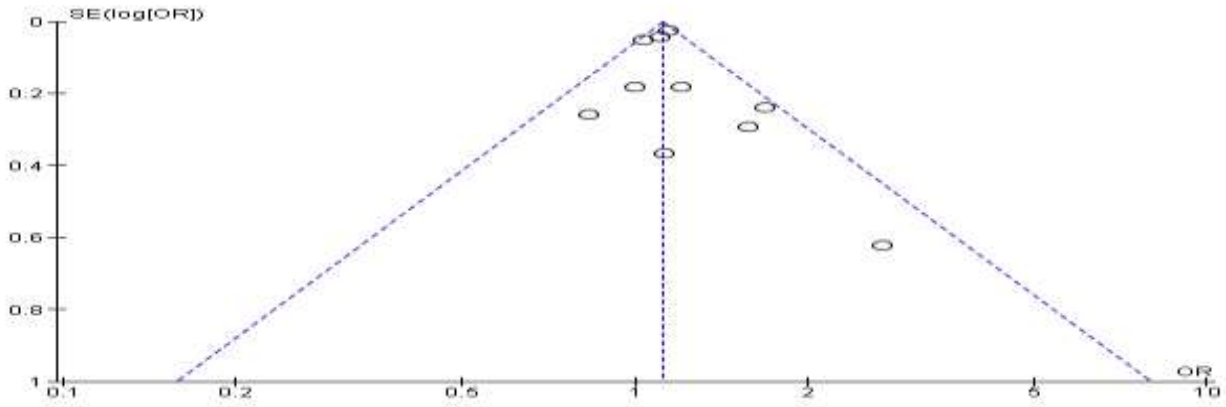

Figure 6. Forest plot of the effect of the perceived benefit of using Pap smear screening services.

The funnel plot in Figure 6 shows that the distribution of effect estimates between studies is asymmetric, that is, the distribution or distribution of effect estimates to the right of the average vertical line of effect estimates is relatively larger than to the left (overestimated). Thus this funnel plot indicates publication bias.

Table 6. PICO table summary of cross-sectional self-efficacy articles from primary study.

Author (years)	Country	Sample	P	I	C	O
Babazadeh et al. (2018)	Iran	280	Married women (IRT)	High self-efficacy	Low self-efficacy	Pap smear screening
Gemeda et al. (2020)	Ethiopia	838	Women aged 25 years and over	High self-efficacy	Low self-efficacy	Pap smear screening
Lambert et al. (2015)	USA	300	Women aged 18 years and over with HIV infection	High self-efficacy	Low self-efficacy	Pap smear screening
Mabotja et al. (2021)	Ethiopia	280	Women aged 30 years and over	High self-efficacy	Low self-efficacy	Pap smear screening
Solomon et al. (2019)	Ethiopia	475	Women aged 18 years and over with HIV-positive infection	High self-efficacy	Low self-efficacy	Pap smear screening
Wati et al. (2021)	Indonesia	195	Women aged 20 to 50 years	High self-efficacy	Low self-efficacy	Pap smear screening

Table 7. aOR and 95% CI data the effect of self-efficacy on the utilization of Pap Smear screening services.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Babazadeh et al. (2018)	1.12	1.04	1.21
Gemeda et al. (2020)	4.40	1.50	12.91
Lambert et al. (2015)	1.02	0.96	1.08
Mabotja et al. (2021)	1.20	0.70	2.06
Solomon et al. (2019)	1.24	1.13	1.36
Wati et al. (2021)	34.40	4.34	272.66

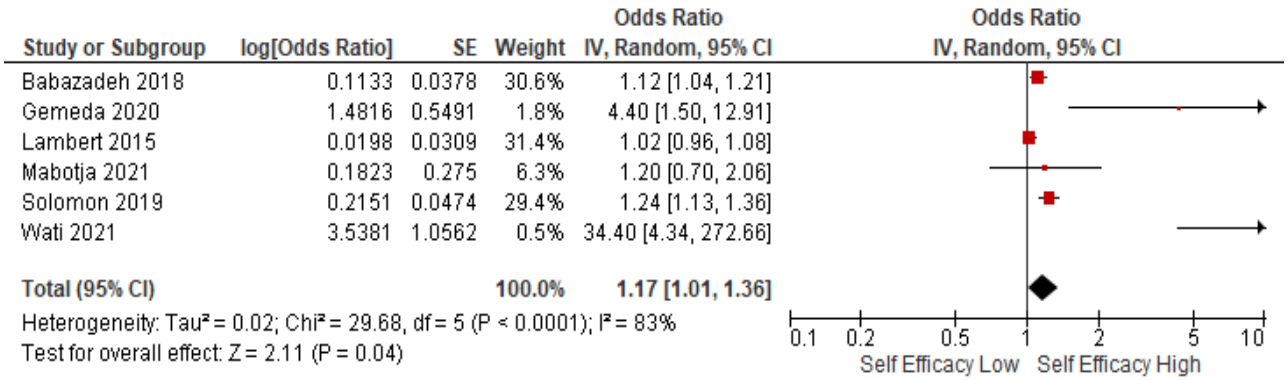

Figure 7. Forest plots of the effect of self-efficacy on the use of Pap smear screening services.

The forest plot in Figure 7 shows that there is an effect of self-efficacy on the possibility of utilizing Pap smear screening services and this effect is statistically significant. Women of childbearing age with high self-efficacy had the possibility of utilizing Pap smear screening services 1.17 times higher than women of childbearing age with low

self-efficacy (aOR= 1.17; 95% CI= 1.01 to 1.36; p= 0.040).

The forest plots also show heterogeneity of effect estimates between primary studies (I^2= 83%; p< 0.001). Thus the calculation of effect estimation is carried out using the random effect model approach.

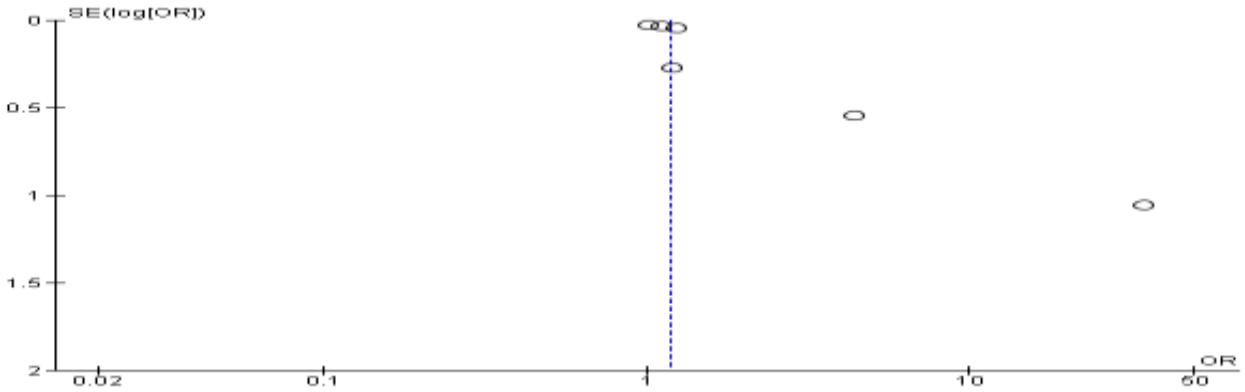

Figure 8. Funnel plots of the effect of self-efficacy on the use of Pap smear screening services.

The funnel plot in Figure 8 shows that the distribution of effect estimates between studies is asymmetric, that is, the distribution or distribution of effect estimates to the right of the average vertical line of effect estimates is relatively larger than to the left (overestimated). Thus, this funnel plot indicates publication bias.

DISCUSSION

1. Perceived susceptibility to Utilization of Pap Smear Screening Services.

The primary research included in this meta-analysis totaled 12 articles originating from several countries, namely Indonesia, Iran, Ghana, Italy, Lebanon, the United States and Ethiopia. The meta-analysis concluded that there is an effect of perceived susceptibility on the possibility of utilizing Pap Smear screening services. Women of childbearing age with perceived high susceptibility had a 1.19 times higher likelihood of utilizing Pap smear screening services than perceived low susceptibility (aOR= 1.19; 95% CI=1.08 to 1.32; p< 0.001).

According to research by Bayu et al. (2016), women's perceptions of potential susceptibility to cervical cancer are another important factor in predicting the possibility of screening. Participants who had a receptive perception of potential susceptibility to developing cervical cancer were 2 times more likely to undergo screening than those with a nonreceptive perception of susceptibility (aOR=2.23; 95% CI=1.31 to 3.78).

A study by Niggusie et al. (2019) reveals that perceived susceptibility to cervical cancer is a factor influencing the utilization of cervical cancer screening. Women with a high perceived vulnerability were more likely to be screened than those with a low perceived vulnerability (aOR= 3.02; 95% CI= 1.64 to 5.56). As for the previous study conducted by Restivo et al (2017) perceived susceptibility (aOR = 3.24; 95% CI= 1.92 to 5.48) increases the likelihood of carrying out a Pap test. Research from Wati (2021) explains that perceptions of high vulnerability increase the possibility of women of childbearing age to take ad-

vantage of cervical cancer screening programs.

2. Perceived benefits of Utilizing Pap Smear Screening Services

A meta-analysis of 10 cross-sectional studies originating from several countries, namely Ethiopia, Ghana, South Korea, Lebanon, Iran, Italy and the United States. The total sample size is 6.065. The meta-analysis concluded that there is an effect of perceived benefit on the probability of using Pap Smear screening services and this effect is statistically significant. Women of childbearing age with high perceived benefits had 1.12 times higher likelihood of using Pap smear screening services than those with low perceived benefits (aOR= 1.12; 95% CI= 1.07 to 1.16; p< 0.001). This meta-analysis demonstrated high homogeneity of effect estimates between the primary studies (I^2= 19%; p= 0.270). Thus, the calculation of effect estimation is carried out using the fixed effect model. The funnel plot shows that there is a publication bias.

Research by Babazadeh et al. (2018) shows that housewives who experience more benefits from having a Pap test (aOR= 1.11; 95% CI= 1.01 to 1.21) are more likely to have cervical cancer screening behavior. Perceived benefit is the main determinant of cancer screening among housewives. In a study conducted by Restivo et al. (2018) the most important perception about the Pap smear test for cervical cancer is the perceived benefit with 75%. With perceived benefit (aOR= 1.94; 95% CI= 1.18 to 3.18). Research by Bou-Orm (2017) the most important determinant of screening behavior is perceived benefits. Women who had had a Pap test had a higher perceived benefit than those who had never had a Pap smear (aOR= 1.14; 95% CI=1 .08 to 1.21).

Research conducted by Ebu and Ogah (2018) is one of the determinants of the intention to screen cervical cancer by HIV-positive women is the perceived benefits. HIV-positive women with a high perceived benefit were 1.7 times more likely to be screened than those with a low perceived benefit (aOR= 1.68; 95% CI= 1.05 to 2.69).

3. Self-efficacy for Utilization of Pap Smear Screening Services

Meta-analysis of 6 cross-sectional studies originating from several countries, namely Indonesia, Ethiopia, Iran and the United States. The meta-analysis concluded that there is an effect of self-efficacy on the probability of using Pap Smear screening services.

A study by Babazadeh et al. (2018) the results of the analysis show three variables with significant odds ratios. Housewives with higher levels of self-efficacy (aOR= 1.12; 95% CI= 1.04 to 1.19) to take the test are more likely to have had cervical cancer screening in the previous three years. Research by Gemeda et al (2020) study respondents who felt high self-efficacy were 4 times more likely to undergo cervical cancer screening when compared to low self-efficacy. High perceived self-efficacy (aOR=4.40, 95% CI= 1.50 to 12.8) is a significant predictor of uptake of cervical cancer screening services.

AUTHOR CONTRIBUTION

Ayun Safitri as a researcher who selects topics, searches for and collects research data. Argyo Demartoto and Hanung Prasetya analyzed the data and reviewed research documents.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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