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Meta-Analysis

Meta Analysis: Health Belief Model on Cervical Cancer Screening among Women of Reproductive Age

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ABSTRACT

Background: Cervical cancer is one of the most common cancers and the most common cause of death in women worldwide. Health Belief Model is a theoretical model that explains the influence of beliefs on a person's health behavior, including cervical cancer prevention behavior. This study aims to determine the effect of the HBM construct on cervical cancer screening behavior among women of childbearing age based on a primary study conducted by previous researchers.
Subjects and Method: This study is a systematic review and meta-analysis with PICO as follows: Population: women of reproductive age, Intervention: HBM constructs of high perceived severity and high self-efficacy. Comparison: low perceived severity and low self-efficacy. Outcome: cervical cancer screening. The articles used in this study were taken from several databases, namely Google Scholar, Pubmed, SpringerLink, Scopus, and SAGE. The keywords used for the search were "Health Belief Model" AND "Cervical Cancer Screening" OR "Cervical Cancer Test" OR "Pap Smear" OR "Papanicolaou Test" OR "VIA Test" OR "Visual Inspection Acetic-Acid" AND "Adjusted Odds Ratio" OR aOR. Inclusion criteria were full-text articles in English and Indonesian with a cross-sectional study design, population of women of childbearing age, and cervical cancer screening as an outcome, analyzed multivariately by including adjusted Odds Ratio/aOR. Articles were selected using the PRISMA flow diagram and analyzed using the Review Manager 5.3 application.
Results: A total of 7 cross-sectional studies from Europe, Asia, Africa, and Australia were reviewed and meta-analyzed. The results showed that women of childbearing age with high perceived severity were 1.61 times more likely to have cervical cancer screening than those with low perceived severity (aOR = 1.61; 95% CI = 1.11 to 2.34; p = 0.01). The data also showed that women of childbearing age with high self-efficacy were 5.91 times more likely to undergo cervical cancer screening than women with low self-efficacy (aOR= 5.91; 95% CI= 3.25 to 10.75; p<0.001).
Conclusion: Severity perception and self-efficacy are predictors for tertiary prevention of type 2 Diabetes Mellitus.

Keywords: health belief model, perceived severity, self-efficacy, cervical cancer screening.

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BACKGROUND

Cervical cancer is a tumor or abnormal cell growth that arises in the lower part of the uterus that leads to the vagina, namely the cervix or cervix (Informed Health, 2012). Cervical cancer is the fourth leading cause

of death in women with an estimated 570,000 new cases and 311,000 deaths (Zhang et al., 2021). In Indonesia, cervical cancer ranks second in terms of incidence in 2020, which is 9.3% after breast cancer and the third mortality rate is 8.8% after breast and liver cancer (WHO, 2020).

Almost all cases of cervical cancer are caused by chronic infection of the oncogenic subtype of the human papillomavirus (HPV). HPV subtypes 16 and 18 are the subtypes associated with high-grade cervical dysplasia. Included in the risk factors for HPV infection are; early sexual intercourse, multiple sexual partners or high-risk partners, immunosuppressed states, history of sexually transmitted infections, history of dysplastic lesions of the vulva or vagina, and absence from cervical cancer screening efforts (Cohen et al., 2019).

In an effort to control cervical cancer, cervical cancer screening plays an important role in overall prevention in addition to HPV vaccination, especially if it is done with the right method (Zhang et al., 2020). Cervical cancer screening is a secondary prevention recommended by WHO. Cervical cancer screening for developing countries, according to WHO recommendations, namely; cervical cytology (conventional and liquid-based Pap smears), Visual Inspection with Acetic Acid (VIA) or Visual Inspection with Lugol Iodine (VILI) tests, and high-risk HPV screening (subtypes 16, 18.31, 33, 45, and 58). The screening interval is every 3-5 years for VIA and cytology tests, and every 5 years for HPV virus screening. Screening is recommended for women aged 30-49 years (Chan et al., 2019).

The Health Belief Model (HBM) theory as introduced by Rosenstock in 1966 is a theoretical model related to decision making and seeks to explain the circumstances in which a person will perform an individual health behavior such as undergoing a screening examination of a disease or trying to get treatment for the disease he is suffering from. Luger, 2013). HBM is one of the most widely applied theories of health behavior, which suggests that there are 6 constructs in predicting a person's health behavior, namely; perceived vulnerability, perceived severity, perceived benefit, perceived action, self-efficacy, and cues to action (Jones et al., 2015).

The Health Belief Model has been used in various studies to assess the relationship between beliefs about health and health behavior, as well as to shape interventions (Tavafian, 2012). The cross-sectional study by Mehraban et al. (2018) on 200 married women concluded that perceived benefits, perceived severity and self-efficacy are factors that influence preventive behavior against cervical cancer. Meanwhile, research by Aldohaian et al. (2019) showed the opposite result, namely in a sample of 450 women who had a perception of the benefits of cervical cancer screening as much as 82% and a perception of barriers to screening as much as 27%, it was found that vaccination and cervical cancer screening were low, namely 1% and 26%, respectively.

Two HBM constructs that will be discussed in this study are perceived severity and self-efficacy. Perception of severity, namely feelings about the seriousness of getting a disease or leaving it without treatment, including all the medical and clinical consequences that can occur. Self-efficacy is a belief in one's own ability to perform an action (Champion and Skinner, 2008).

Based on this background, it is necessary to have a comprehensive study of various primary studies on the effect of HBM on cervical cancer screening examinations among women of childbearing age. This study will be carried out by collecting pri-

mary studies and analyzed by systematic review and meta-analysis.

SUBJECTS AND METHOD

1. Study Design

This study is a systematic review and meta-analysis study. The articles included in this study were collected from various databases, namely; Google Scholar, Pubmed, SpringerLink, Scopus, and SAGE. The keywords used in the search were "Health Belief Model" AND "Cervical Cancer Screening" OR "Cervical Cancer Test" OR "Pap Smear" OR "Papanicolaou Test" OR "VIA Test" OR "Visual Inspection Acetic-Acid" AND "Adjusted Odds Ratio" OR aOR.

2. Inclusion Criteria

The inclusion criteria for articles in this study are: full-text articles with cross-sectional study design, research subjects are women of reproductive age, research outcomes are cervical cancer screening with multivariate analysis and include adjusted odds ratio (aOR).

3. Exclusion Criteria

The exclusion criteria for this study are; the articles were published in languages other than English and Indonesian, the intervention was not a Health Belief Model, and the statistical analysis was a bivariate analysis.

4. Operational Definition of Variables

The search for articles was carried out taking into account the eligibility criteria defined according to the PICO. The study population is women of childbearing or reproductive age. Intervention: Health Belief Model, namely the perception of high severity and high self-efficacy. Comparison: perception of low severity and low self-efficacy. Outcome: cervical cancer screening (Pap smear and VIA test).

The Health Belief Model is a theory that explains the relationship between health beliefs and behavior, with a construct consisting of perceived vulnerability, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. In this meta-analysis, the constructs to be analyzed are perceived severity and self-efficacy. The measurement scale is categorical, namely high and low.

Cervical Cancer Screening is a method used to perform early detection of cervical cancer lesions, including the commonly used Pap Smear method and the VIA test. The instrument used is a history of using one of the cervical cancer screenings methods. The measurement scale is categorical.

5. Instruments

This research was conducted based on the PRISMA flow diagram and the assessment of the quality of the study using the Critical Appraisal Checklist for Cross-sectional Study.

6. Data Analysis

The data were analyzed using the Review Manager application, namely Revman 5.3 using funnel plots and forest plots to determine the magnitude of the relationship and heterogeneity of the data.

RESULTS

In the process of searching for articles to be synthesized, meta-analysis is carried out by searching several databases including Google Scholar, Pubmed, SpringerLink, Scopus, and SAGE, it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

From a total of 1,035 articles obtained in the database search, exclusion and screening were carried out so that 7 articles were found that were included in the quantitative synthesis process with meta-analysis. The 7 articles came from 4 continents as shown in Figure 2, namely 3 articles from the African continent, 2 from the Asian continent, 1 from the European continent, and 1 from the Australian continent.

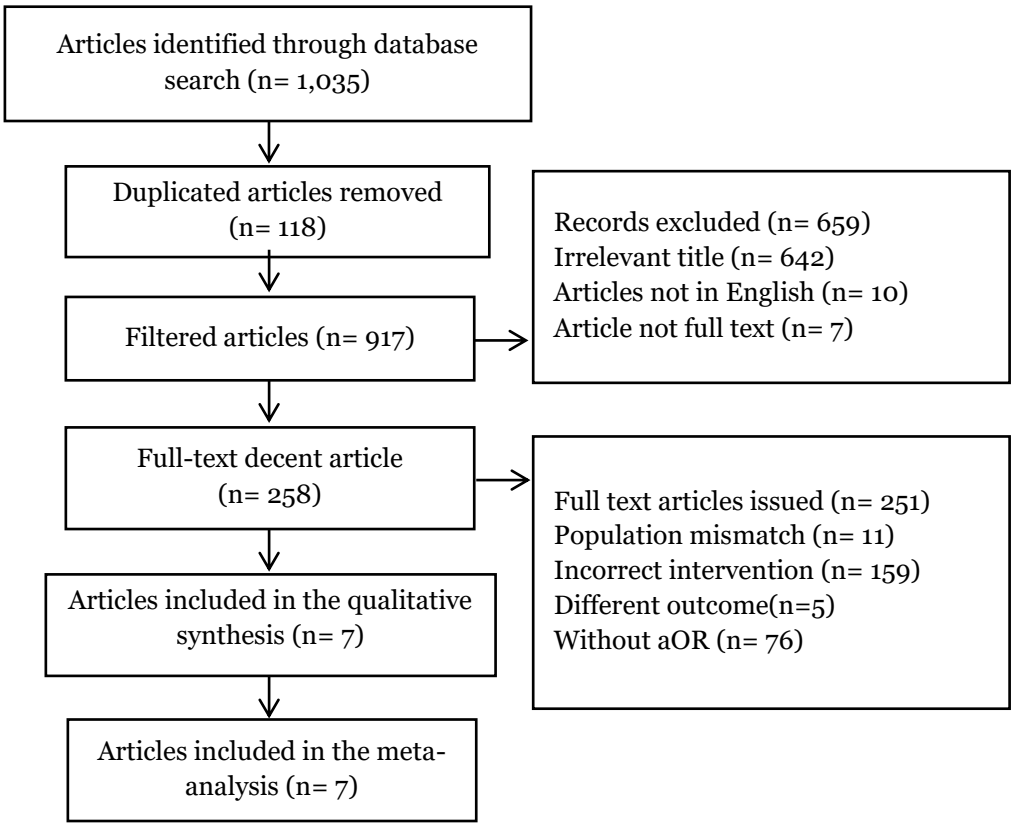

Figure 1. Results of Prisma Flow Diagrams

Figure 2. Research Distribution Map

Research Quality Assesment

Furthermore, an assessment of the quality of the studies is shown in Table 1. Table 2 contains descriptions of 7 cross-sectional studies that prove the effect of the Health Belief Model on cervical cancer screening examinations.

Assessment of the quality of research articles using the Critical Appraisal Checklist for cross-sectional study which can be seen in table 1. The criteria for evaluating articles with cross-sectional study design are as follows:

1. Does the objective clearly address the research focus or problem?
2. Is the research method (study design) suitable to answer the research question?
3. Is the research subject selection method clearly written?
4. Does the sampling method give rise to selection bias?
5. Is the sample representative of the research target population?
6. Was the sample size based on pre-study considerations?
7. Was a satisfactory response achieved?
8. Is the measurement (questionnaire) valid and reliable?
9. Has statistical significance been tested?
10. Did the researcher report confidence intervals?
11. Are there any confounding factors that have not been taken into account?
12. Are the results applicable in practice/community?

Table 1. Results of Study Quality Assesment

Primary Study	Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Destaw *et al.* (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Jirojwong *et al.* (2001)	2	2	2	1	2	2	2	2	1	2	1	2	21
Gemeda *et al.* (2020)	2	2	2	2	2	2	2	2	1	2	2	2	23
Nigussie *et al.* (2019)	2	2	2	2	2	2	2	2	1	2	2	2	23
Oktaviana (2015)	2	2	2	2	2	1	2	2	2	2	1	2	22
Restivo *et al.* (2018)	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	2	2	24

Note: Answer 2= Yes; Answer 1= Hesitant; Answer 0= No

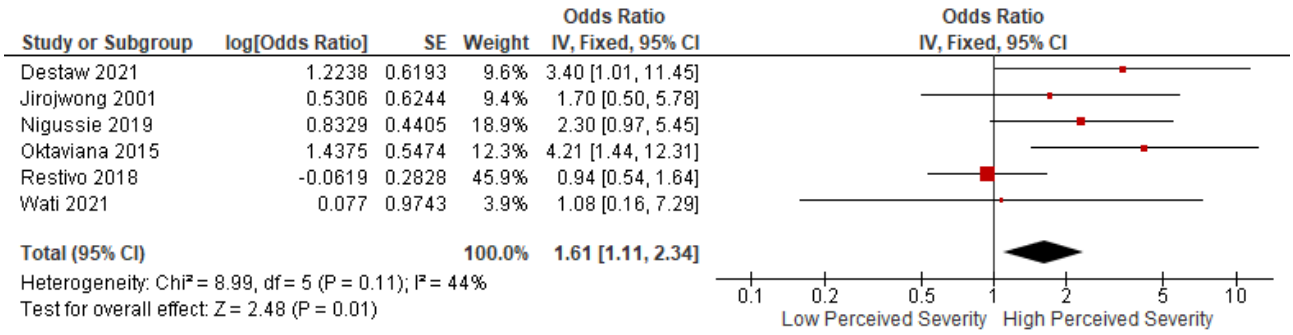

Figure 3. Forest Plot for the construct of HBM perceived severity on cervical cancer screening

Table 1. Description of Primary Research included in the Meta-Analysis

Author (Year)	Country	Study Design	Total Sampel	P (Population)	I (Intervention)	C (Comparison)	O (Outcome)	aOR (CI 95%)
Destaw et al. (2021)	Ethiopia	Cross Sectional	464	Women aged 30-49 years	High perceived severity	Low perceived severity	Cervical cancer screening uptake	3.4 (1.01-11.65)
					High self-efficacy	Low self-efficacy		5.0 (2.16-11.6)
Jirojwong et al. (2001)	Australia	Cross Sectional	134	Thai women living in Brisbane	High perceived severity	Low perceived severity	Use of Pap Smear test	1.7 (0.5-5.8)
					High self-efficacy	Low self-efficacy		7.9 (1.2-50.5)
Gemeda et al. (2020)	Ethiopia	Cross Sectional	838	Women aged 25 and above	High self-efficacy	Low self-efficacy	Cervical cancer screening uptake	4.4 (1.5-12.8)
Nigussie et al. (2019)	Ethiopia	Cross Sectional	737	Women aged 30-49 years	High perceived severity	Low perceived severity	Cervical cancer screening utilization	2.3 (0.97-5.48)
Oktaviana (2015)	Indonesia	Cross Sectional	100	Reproductive age women	High perceived severity	Low perceived severity	VIA test utilization	4.21 (1.44-12.3)
Restivo et al. (2018)	Italy	Cross Sectional	590	Women aged 25-64 years	Yes, to having perceived severity	No, to having perceived severity	Getting a Pap test within the past 3 years	0.94 (0.54-1.62)
Wati et al. (2021)	Indonesia	Cross Sectional	195	Women aged 20-50 years	High perceived severity	Low perceived severity	Utilization of cervical cancer screening program	1.08 (0.16-7.35)
					High self-efficacy	Low self-efficacy		34.44 (4.34-273.11)

The results of the forest plot as shown in Figure 3 show that women of childbearing age with high perceived severity are 1.16 times more likely to undergo cervical cancer screening than women with low perceived severity (aOR = 1.61; 95% CI = 1.11 to 2.34), and the results were statistically significant (p= 0.010). The heterogeneity of the research data shows I^2= 44% so that the distribution of the data is said to be homogeneous (fixed effect model).

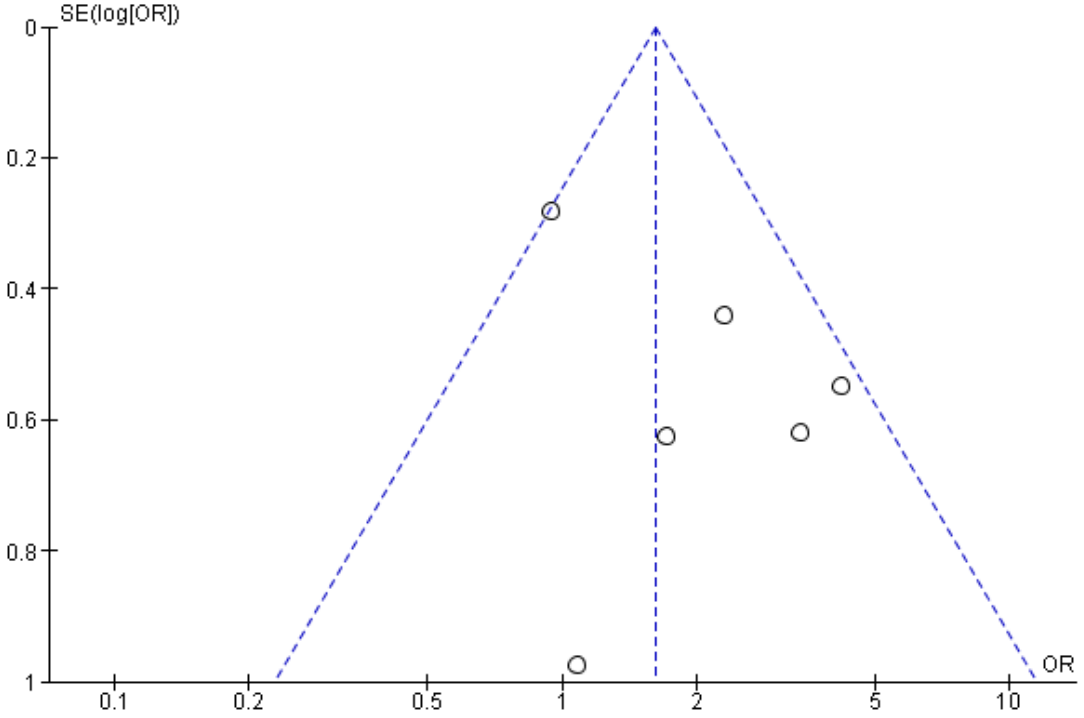

Figure 4. Funnel Plot for the construct of HBM perceived severity on cervical cancer screening

The funnel plot in Figure 4 shows a publication bias with an overestimated effect characterized by an asymmetric distribution between the right and left plots. There are three plots on the right, two plots on the left, and one plot touching the vertical line. The Standard Error (SE) of the plot on the left is 0.2 to 1, and the SE of the plot on the right is 0.4 to 0.8.

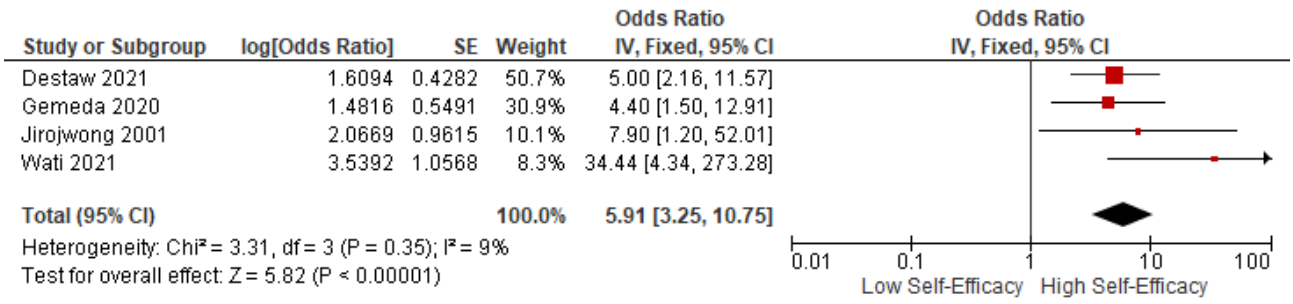

Figure 5. Forest Plot for the construct of HBM self-efficacy towards cervical cancer screening

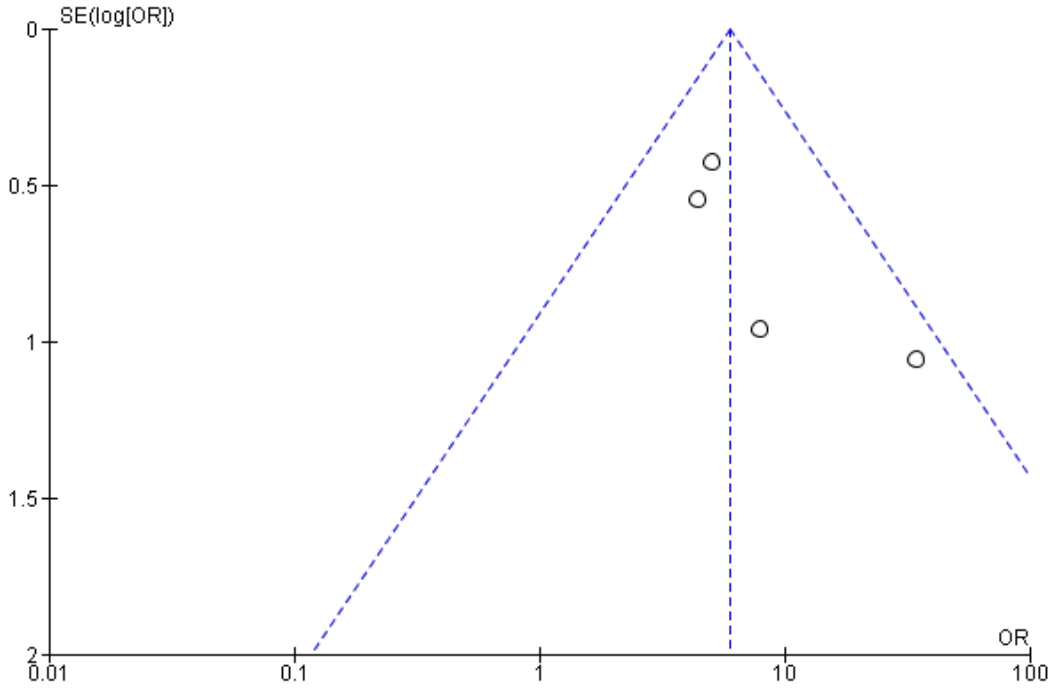

Figure 6. Funnel Plot for the construct of HBM self-efficacy towards cervical cancer screening

The forest plot in Figure 5 shows that women of childbearing age with high self-efficacy are 5.91 times more likely to undergo cervical cancer screening than women with low self-efficacy (aOR = 5.91; 95% CI = 3.25 to 10.75), and the results were statistically significant (p <0.001). The heterogeneity of the research data shows I^2 = 9% so that the distribution of the data is said to be homogeneous (fixed effect model).

Figure 6 is a funnel plot that shows no publication bias characterized by a symmetrical distribution between the right and left plots. There are two plots on the right and two plots on the left. The Standard Error (SE) of the plot on the left is 0 to 1, and the SE of the plot on the right is 1 to 1.5.

DISCUSSION

This study is a systematic review and meta-analysis study on the effect of the Health Belief Model on cervical cancer screening examinations among women of childbearing age. The independent variables in this study are the constructs of the Health Belief Model, namely perceived severity and self-efficacy. While the dependent variable is the cervical cancer screening examination, which can be in the form of a Pap smear or an VIA test.

The results of the analysis using the Review Manager 5.3 application are presented in the form of Forest plots and Funnel plots. The results show that high perceived severity increases the likelihood of women of childbearing age to have cervical cancer screening examinations by 1.61 times compared to those with low perceived severity (aOR= 1.61; 95% CI= 1.11 to 2.34; p = 0.01) and an asymmetrical graph in funnel plots show publication bias. The results also showed that high self-efficacy in women of childbearing age increased the likelihood of undergoing cervical cancer screening by 5.91 times compared to those with low self-efficacy (aOR= 5.91; 95% CI = 3.25 to 10.75; p<0.001), and a symmetric funnel plot showing no publication bias. The result of I2 <

50% indicates homogeneous research data (fixed effect model).

Various studies have investigated the effect of HBM constructs perceived severity and self-efficacy on cervical cancer screening among women of childbearing age, and showed inconsistent results. Research by Mabotja et al. (2021) showed that there was an increase of 1.3 times in taking Pap smears for every 5 units increase in perceived severity score which was statistically significant (aOR= 1.3; 95% CI= 1.0 to 1.6; p=0.017), and an increase of 1.2 times in taking tests. Pap smear on the increase of every 5 units of self-efficacy score which was not statistically significant (aOR= 1.2; 95% CI= 0.7 to 2.1; p = 0.572). Solomon et al. (2019) in a different study population, namely in women receiving anti-retroviral therapy for HIV, showed that every 1 unit increase in self-efficacy score increased cervical cancer screening tests by 1.2 times and was statistically significant (aOR= 1.24; 95% CI = 1.12 to 1.36, p<0.001).

In general, the HBM construct has been proven by many other studies that it can predict individual participation in cervical cancer screening examinations (Tavafian, 2012). However, various studies also suggest that there are various factors that influence the behavior of cervical cancer screening examinations in women of childbearing age in general. The study by Tracy et al. (2013) which aims to determine the behavior of cervical cancer screening examinations among lesbians, showed that there were significant differences in sociodemographic factors such as marriage, occupation, income, and education, in the group that screened regularly and those who did not.

Kaneko (2018) also suggests that several sociodemographic factors, sexual behavior, history of HPV vaccination, and psychosocial factors can influence cervical cancer screening among unmarried women of reproductive age in Japan. In line with that, Yenikkerem et al. (2018) reported significant differences in several sociodemographic factors (age, occupation, education, number of children) between women who had Pap smears compared to those who did not, and reported significant differences in the mean constructs of HBM (benefits, susceptibility, and barriers) based on sociodemographic factors.

In addition to sociodemographic factors, the bias regarding HBM that has not been widely considered is the existence of "social desirability", where respondents may be aware of the purpose of the study and tend to answer questions according to what is expected of them both in questions about their beliefs and behavior (Abraham and Sheeran, 2015).).

The results of previous studies confirm that sociodemographic factors may be related to the use of cervical cancer screening screening facilities and the HBM itself. With multivariate analysis controlling the effect of confounding variables, various studies have proven that the HBM construct can predict the participation of women of childbearing age in cervical cancer screening. Therefore, various HBM-based intervention models have been used to increase cervical cancer screening participation. HBM-based interventions are effective when they adjust to the individual's specific perception of their susceptibility, barrier, and self-efficacy (Tavafian, 2012).

A quasi-experiment by Parsa et al. (2017) who examined the effect of HBM-based group counseling showed significant differences in the HBM construct (perceived susceptibility, perceived benefits, perceived barriers, perceived severity, and perceived self-efficacy) before and after the intervention, in the treatment group compared to the control group. After the inter-

vention, the percentage of subjects who had a Pap smear was higher in the intervention group than in the control group and the results were statistically significant.

The study by Ebu et al. (2019) showed that health education with lectures, discussions, videos and leaflets formed knowledge about cervical cancer screening, changed perceptions and increased self-efficacy. However, there are obstacles that can prevent women of reproductive age from doing cervical cancer screening even though they have increased self-efficacy. This needs to be considered in providing interventions in an effort to improve cervical cancer screening. In addition, to increase social sensitivity about cervical cancer and the importance of Pap smears, collaboration with cross-sectoral approaches is needed (Yenikkerem et al., 2018).

It can be concluded that in this meta-analysis study, the HBM construct is a factor that influences cervical cancer screening examinations among women of childbearing age after controlling for various confounding factors. Furthermore, it is hoped that HBM-based interventions can be used to increase the participation of women of childbearing age in cervical cancer screening examinations.

AUTHOR CONTRIBUTION

Afifa Intifadha Habibatullah and Adetya Wulandari were the main researchers who chose the topic, explored and collected research data. Aurina Firda Kusuma plays a role in data analysis and review of research documents.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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