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Meta-Analysis

The Relationship between Health Belief Model Applications with Smoking Quitting Behavior: A Meta-Analysis

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ABSTRACT

Background: Smoking is a habit of smoking cigarettes that is carried out in daily life, cigarettes are also a necessity that cannot be avoided for people who have a tendency to cigarettes. HBM is a model of individual health beliefs in determining the actions to be taken and is explained as a concept formulated with the aim of understanding why individuals do or do not perform various healthy behaviors. Therefore, this study aimed to determine the level of effectiveness of the Health Believe Model (HBM) application in the decision to quit smoking.
Subjects and Method: This article was compiled with a systematic review and meta-analysis study. This study uses the PICO Model. The meta-analysis study was conducted by searching for articles from databases in electronic form including PubMed, Springer Link, Elsevier and Google Scholar. "Health Belief Model Application", or "Quit Smoking Behavior" or "Perceived Susceptibility" and "Perceived Severity". The inclusion criteria for this study were full articles using a cross-sectional study, with the publication year 2014-2021. Analysis of articles in this study using RevMan 5.3 . software.
Results: A total of 12 cross-sectional studies from Asia, and Africa were selected for systematic review and meta-analysis. The data collected showed that high perceived vulnerability increase 2.11 times to smoking quitting behavior compared with low perceived vulnerability, but its statistically not significant (OR= 2.09; 95% CI= 0.81 to 5.37; p= 0.130), and high perceived severity increase 1.43 times to smoking quitting behavior compared with low perceived severity (OR= 1.43; 95% CI= 0.57 to 3.58; p= 0.450), increase 2.11 times to smoking quitting behavior compared with low perceived vulnerability, but iw was statistically not significant.
Conclusion: Perceived vulnerability, and perceived severity was not statistically significant in smoking quitting behavior.

Keywords: health belief model, smoking qutting behavior, perceived vulnerability, perceived severity.

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BACKGROUND

Smoking is a habit of smoking cigarettes that is carried out in daily life, cigarettes are also a necessity that cannot be avoided for people who have a tendency to cigarettes. There are addictive ingredients in cigarettes, meaning that it can cause dependence for the wearer. The addictive nature of cigarettes comes from the nicotine they contain. After a person inhales cigarette

smoke, within 7 seconds the nicotine will reach the brain.

In Indonesia, cigarettes are one of the health problems because the level of use is still high. Based on the 2013 National Basic Health Research (Riskerdas) data, the current average proportion of smokers in Indonesia is 24.3% of the total population. As many as 11.2% of smokers started smoking since the age of teenagers, namely 15-19 years, while the prevalence of men in 2013 was 64.9% (Rusma & Nuddin: 2020). In fact, Indonesia is the third country with the highest number of smokers in the world after China and India with a percentage of 35% of the total population or equivalent to 75 million people (Djannah: 2020). According to the Ministry of Health of the Republic of Indonesia (2018), the number of smokers in Indonesia has not decreased, in fact the number tends to increase every year. For example, East Java is one of the provinces in Java Island with a fairly high prevalence of smokers with a prevalence rate of 27.78% in 2020.

In line with these findings, the World Health Organization (WHO) also warned that more than 40 percent of smokers in the world died from lung diseases, such as cancer, chronic respiratory disease, and tuberculosis. The warning comes ahead of World No Tobacco Day on Friday 31 May 2019, with the theme, "Don't let tobacco take our breath away." WHO says that every year, tobacco use kills at least eight million people. The UN agency reports 3.3 million users will die from lung-related diseases. This number includes people who are exposed to secondhand smoke, including more than 60,000 children under the age of five who died from lower respiratory tract infections due to passive smoking. There are many factors behind the occurrence of smoking behavior such as biological, behavioral, psychological, and social factors that influence each other (Iffah & Faradina, 2018).

A person's socioeconomic conditions such as education level, income, and also one's occupation can lead to smoking behavior. For smokers, they think that smoking can provide a sense of pleasure, form a positive mood, and is a form of coping with stress. In addition, smoking can also help reduce tension, help concentrate, and a fun thing.

One theory that can be used to identify or describe individual beliefs about a healthy behavior is the Health Believe Model (HBM). In carrying out a behavior, a person will be based on the beliefs they have. HBM is a model of individual health beliefs in determining the actions to be taken and is explained as a concept formulated with the aim of understanding why individuals do or do not perform various healthy behaviors. The intended goal is to avoid health problems of potential severity, especially in the case of smoking. Therefore, this study aims to determine the level of effectiveness of the Health Believe Model (HBM) application in the decision to quit smoking.

SUBJECTS AND METHOD

1. Study Design

This was a systematic review and meta-analysis. This research article was obtained from the electronic databases of PubMed, Springer Link, Elsevier and Google Scholar. The keywords used are "Health Belief Model Application", or "Quit Smoking Behavior" or "Perceived Susceptibility" and "Perceived Severity".

2. Inclusion Criteria

The inclusion criteria used in this study is a full paper article with a cross-sectional research method that analyzes the Relationship between the health belief model applications with smoking quitting behavior.

The measure of the relationship used is the Adjusted Odd Ratio (aOR) with a 95% confidence interval.

3. Exclusion Criteria

Exclusion criteria in this study included articles published other than English and Indonesian, non-cross-sectional study design, non-full text articles, articles published before 2014.

4. Operational Definition of Variables

The search for articles was carried out by considering the eligibility criteria determined using the PICO model. Decision-making behavior for individual or group health, such as one's attempt to quit smoking. Smoking cessation behavior is one of the efforts made by a smoker to maintain health and avoid health risks that will be used to describe the occurrence. Perceived susceptibility is a smoker's belief that smoking behavior makes him susceptible to disease. Perceived Severity is a smoker's belief that smoking behavior can increase the severity of illness in the family.

The application of the Health Belief Model theory is one of the behavioral theories used to describe decision making for individual or group health such as one's attempt to quit smoking.

Smoking cessation behavior is one of the efforts made by a smoker to maintain health and avoid health risks that will occur. Perceived susceptibility is a smoker's belief that smoking behavior makes him susceptible to disease. Perceived Severity is a smoker's belief that smoking behavior can increase the severity of illness for himself and his family.

5. Data Analysis

Articles were analyzed using the Review Manager (RevMan) 5.3 application to calculate effect size and heterogeneity, and form the final results of the meta-analysis. The results of data processing are presented in the form of forest plots and funnel plots.

RESULTS

Process of searching article wascarried out by searching several journal databases including PubMed, Springer Link, Elsevier and Google Scholar, it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

Figure 1. Research related to exclusive breastfeeding in mothers who visited ante-natal care consisted of 12 articles from the initial search process yielding 917 articles, after the deletion process, articles were published with 2,458 requirements for full-text review more carry on. A total of 12 articles that met the quality assessment were included in the quantitative synthesis using a meta-analysis.

It can be seen in Figure 2 that the research articles come from two continents, namely Africa (Ghana, Nigeria, Ethiopia) and Asia (Japan, Taiwan, Bangladesh, Saudi Arabia, Indonesia, Iran).

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 study formulate the research question (research problem) clearly?
2. Is the cross sectional research method appropriate to answer the research ques-tion?
3. Is the method for selecting research subjects clearly described?
4. Does the sampling technique not introduce bias (selection)?
5. Is the sample representative of the research target population?
6. Is the sample size based on consideration of the results of previous studies regarding statistical power?
7. Is the minimum response rate achieved?

8. Is the instrument in determining screen time and fast food valid and reliable?
9. Has statistical significance been tested?
10. Did the researcher report confidence intervals?
11. What confounding factors have been taken into account?
12. Are the results applicable in practice or in the community?

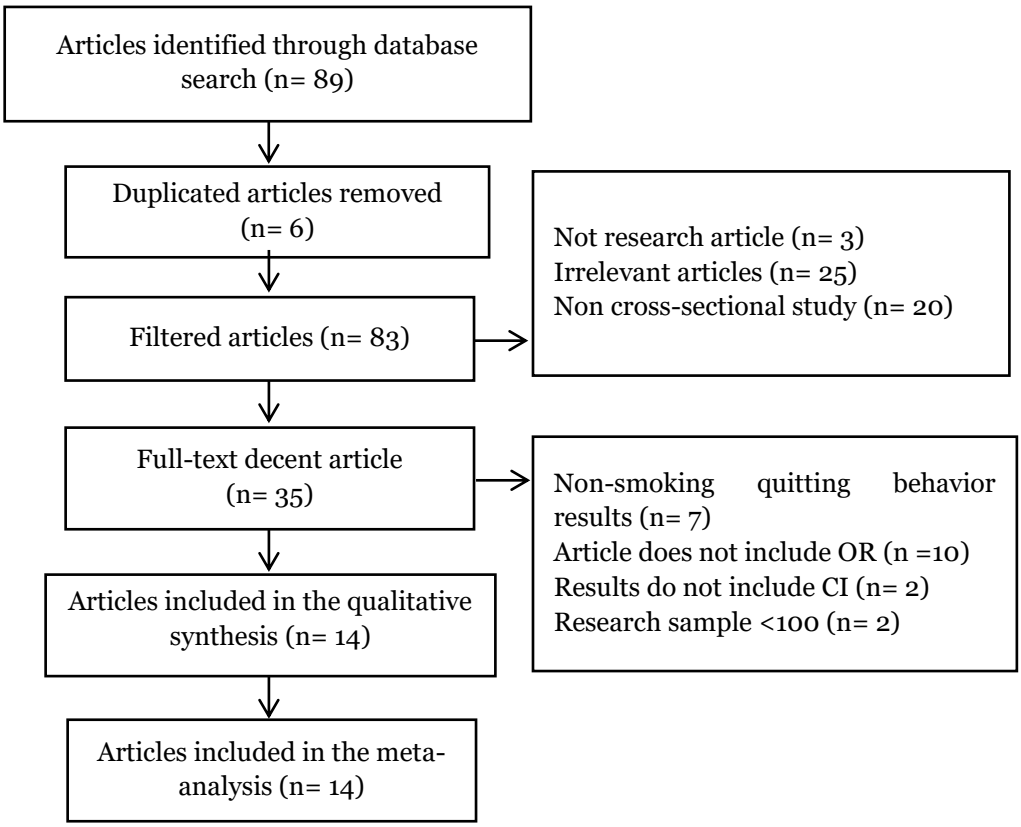

Figure 1. Results of Prisma Flow Diagrams

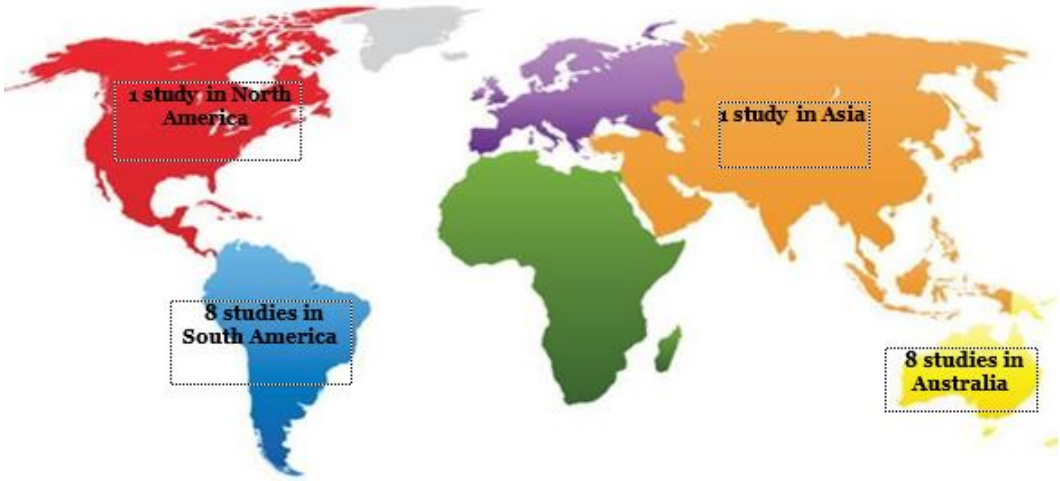

Figure 2. Research Distribution Map

Table 1. Research Quality Assesment

Primary Study	Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Aryal et al. (2014)	1	1	1	0	1	1	1	1	1	1	1	1	11
Chen et al. (2017)	1	1	1	0	1	1	1	1	1	1	0	1	11
Kowitt et al. (2020)	1	1	1	1	1	1	1	1	1	1	0	1	10
Owotomo et al. (2020)	1	1	1	1	1	1	1	1	1	1	1	1	12
Poggiolini (2019)	1	1	1	1	1	1	1	0	1	1	1	1	10
Purnaningrum et al. (2017)	1	1	1	1	1	1	1	1	1	1	1	1	11
Kaufman et al. (2018)	1	1	1	1	1	1	1	1	1	1	0	1	11
Kim et al. (2019)	1	1	1	1	1	1	1	1	1	1	0	1	11
Nyman et al. (2021)	1	1	1	1	1	0	1	1	1	1	1	1	11
Ozoh et al. (2017)	1	1	1	1	1	1	1	1	1	1	1	1	11
Rigotti et al. (2021)	1	1	1	1	1	1	1	1	1	1	1	1	11
Upadhyay et al. (2019)	1	1	1	1	1	1	1	1	1	1	1	1	12
Weinberger et al. (2015)	1	1	1	1	1	1	1	1	1	1	1	1	12

Table 2 showed the description of primary studies. A total of 14 articles were designed as a cross-sectional study that analyzed the relationship between health belief model applications with smoking quitting behavior.

Based on table 2, there are 14 articles were divided into section, 7 articles of relationship perceived vulnerability with smoking quitting behavior, and 7 articles relationship of perceived severity with smoking quitting behavior.

Figure 3 showed the results of forest plot perceived vulnerability to smoking quitting behavior there is a very high heterogeneity (I^2= 94%), so the data analysis on the forest plot uses a random effects model. People who have a high perceived vulnerability have a smoking quitting behavior 2.11 times compared with people who have a low perceived vulnerability (aOR= 2.09; 95% CI= 0.81 to 5.37; p= 0.130), but it was statistically not significant.

Based on Figure 4, results of funnel plot perceived vulnerability to smoking quitting behavior, it can be seen that there is publications bias marked by asymmetry of the left plot are 3 plots, and the right is 3 plots. The plot on the left is between standard errors of 0 and 0.5, and on the right side have standard error between 0 and 1.5. Bias can also be inferred from the imbalance of distances between studies on both the right and left sides.

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

No	Author (Year)	Country	Study Design	Sample	Population (P)	Inter-vention (I)	Compa-rison (C)	Outcome (O)	aOR (CI 95%)
1	Kaufman et al. (2018)	US	Cross-sectional	2738	NLST aged 55 to 74 years, current or former smokers (quitting within the last 15 years) with a history of 30 pack-years or more.	High severity	Low severity	Smoking cessation	1.17 (1.00 to 1.36)
2	Kim et al. (2019)	South Korea	Cross-sectional	488	The Korean Public Health Survey (CHS) data between 2011 and 2016 is 900 participants.	High severity	Low severity	Smoking cessation	0.87 (0.86 to 0.88
3	Nyman et al. (2021)	US	Cross-sectional	1223	Uninstitutionalized United States adults from data from October-November 2020 online survey	High severity	Low severity	Smoking cessation	5.15 (4.96 to 5.33)
4	Ozoh et al. (2017)	Nigeria	Cross-sectional	414	Long-distance drivers registered with the National Union of Road Transport Workers (NURTW) from selected parking lots in Lagos between March and July 2015	High severity	Low severity	Smoking cessation	1.09 (0.54 to 2.20)
5	Rigotti et al. (2021)	Boston	Cross-sectional	423	Inpatient units from three hospitals in Boston, MA Pittsburgh, PA, and Nashville, TN.	High severity	Low severity	Smoking cessation	0.91 (0.56 to 1.47)
6	Upadhyay et al. (2019)	US	Cross-sectional	494	Health Information National Trends Survey (HINTS) data, on the use of cancer-related information in American adults ≥18 years	High severity	Low severity	Smoking cessation	2.67 (1.24 to 5.74)
7	Wein-berger et al. (2015)	Indonesia	Cross-sectional	4523	High School Students in the state of Connecticut	High severity	Low severity	Smoking cessation	0.88 (0.55 to 1.40)

No	Author (Year)	Country	Study Design	Sample	Population (P)	Inter-vention (I)	Compa-rison (C)	Outcome (O)	aOR (CI 95%)
8	Aryal et al. (2014)	Nepal	Cross-sectional	352	909 teenagers aged 14-16 living in JD-HDSS	High susceptibility	Low susceptibility	Smoking cessation	11.9 (3.68 to 39.0)
9	Chen et al. (2017)	Mary-land	Cross-sectional	18.392	From 22,007 complete surveys, this study considered data from 18,392 adolescent respondents	High susceptibility	Low susceptibility	Smoking cessation	6.6 (3.79 to 11.46)
10	Kowitt et al. (2020)	America	Cross-sectional	777	Cigar Smokers in the United States	High susceptibility	Low susceptibility	Smoking cessation	1.31 (1.03 to 1.65)
11	Owotomo et al. (2020)	US	Cross-sectional	7,644	Waves 2 and 3 of the Tobacco Population and Health Assessment Study (PATH)	High susceptibility	Low susceptibility	Smoking cessation	0.34 (0.18 to 0.64)
12	Poggiolini (2019)	Switzer-land	Cross-sectional	362	Daily smoker in Switzerland	High susceptibility	Low susceptibility	Smoking cessation	0.49 (0.35 to 0.68)
13	Purnaning rum et al. (2017)	Central Java	Cross-sectional	100	All Youth in Colomadu District, Karanganyar Regency	High susceptibility	Low susceptibility	Smoking cessation	22.58 (2.41 to 210.70)

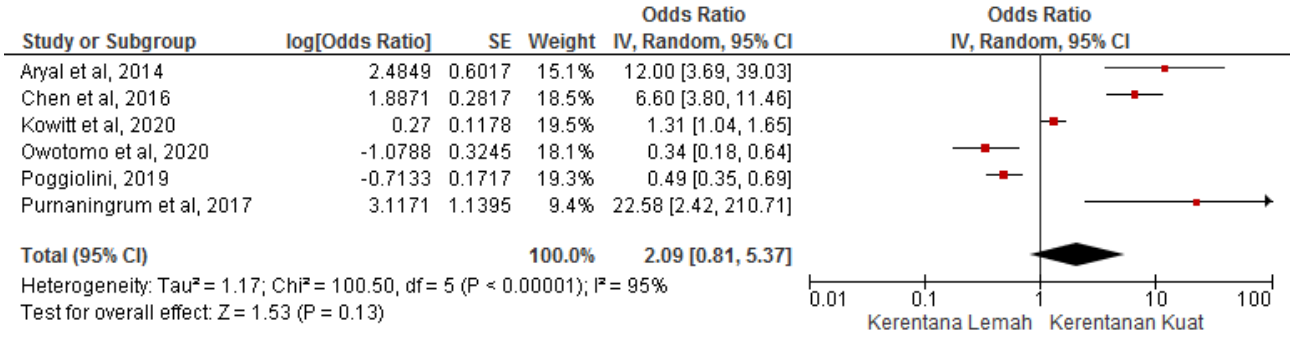

Figure 3. Forest plot Relationship of Perceived Vulnerability to Smoking Quitting Behavior

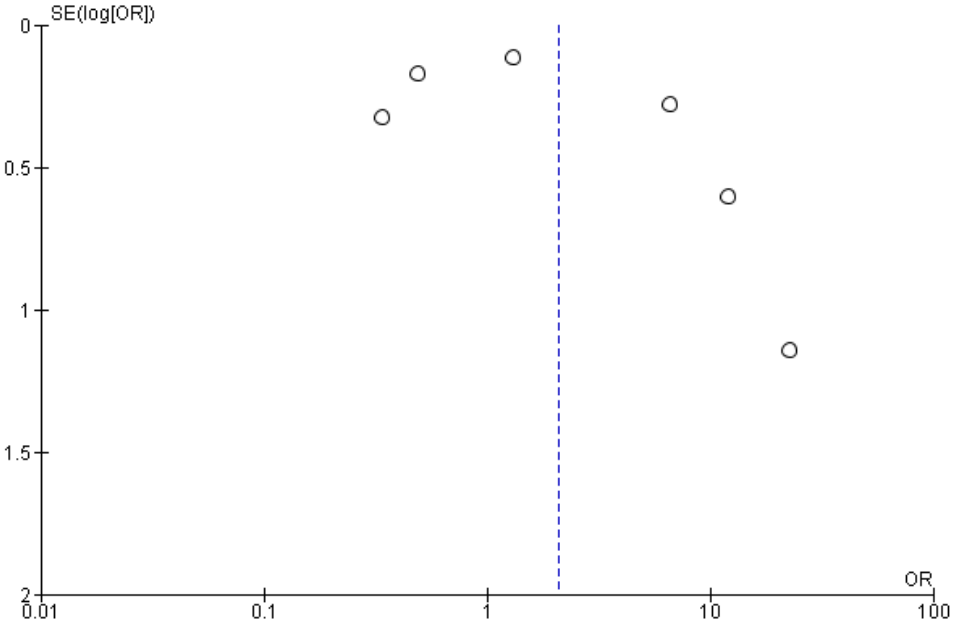

Figure 4. Funnel plot Relationship of Perceived Vulnerability to Smoking Quitting Behavior

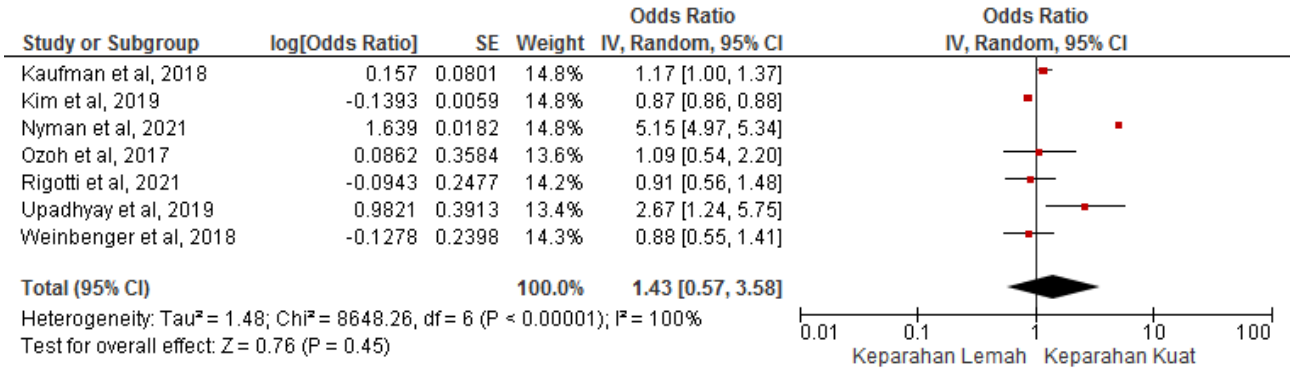

Figure 5. Forest plot Relationship of Perceived Severity to Smoking Quitting Behavior

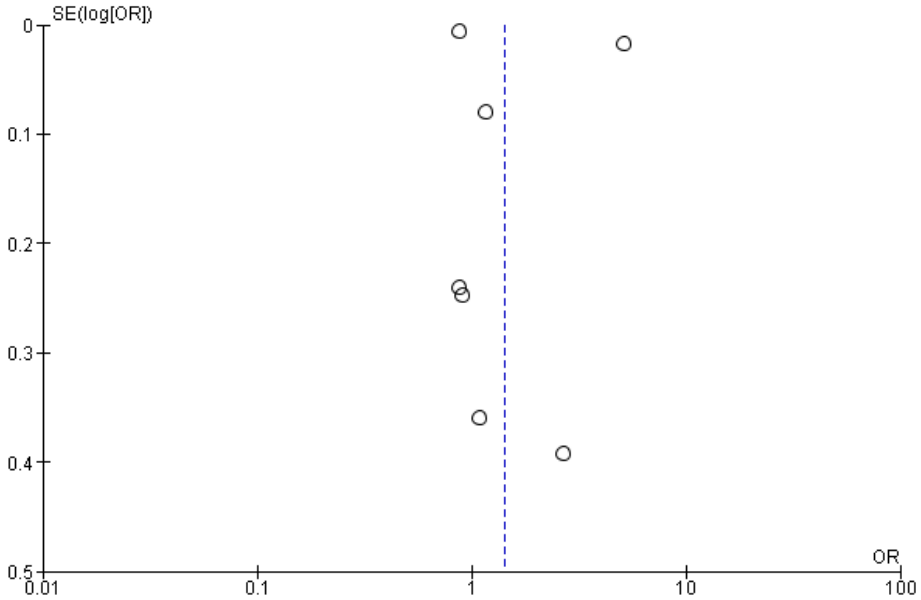

Figure 6. Funnel plot Relationship of Perceived Severity to Smoking Quitting Behavior

Figure 5 showed that there is high heterogeneity (I^2= 100%), so the data analysis on the forest plot uses a random effects model. People with high perceived severity have 1.43 times compared with a low perceived severity to smoking quitting behavior, but the results are statistically not significant (aOR= 1.43; 95% CI= 0.57 to 3.58; p= 0.450). Based on Figure 6, the results of funnel plot, showed a publication bias, in the left plot have 5 plots, and 2 plots on the right. The plot on the left is between standard errors of 0 and 0.4, and on the right is between 0 and 0.5 errors.

DISCUSSION

This systematic review and meta-analysis study took the theme of implementing the Health Belief Model Application with smoking cessation behavior. The dependent variable in this study is smoking cessation behavior. While the independent variable is the perceived susceptibility to the perceived severity.

This study uses a review manager application (Revman 5.3). By calculating the effect size and heterogeneity values to determine the model of combining research with the final results of the meta-analysis.

Perceived susceptibility to smoking cessation behavior Of the seven articles designed with a cross-sectional study analyzing the application of perceived vulnerability to smoking cessation behavior, six articles stated that perceived susceptibility influences smoking cessation behavior.

This refers to a person's subjective perception of the risks of his health condition. In the case of medical illness, these dimensions include acceptance of the diagnosis, personal estimation of the presence of resusceptibility (resusceptibility), and susceptibility to disease in general. In a pandemic situation, smoking can increase the risk of susceptibility to contracting COVID-19. Because smoking is a risk factor for PTM (diabetes, hypertension, heart disease, cancer) which is a comorbid COVID-19, so it can cause severity when exposed to COVID-19.

Accordance to Nancy et al. (2021) who conducted a cross-sectional survey in May-

June 2020 with 694 current and former daily smokers as respondents (mean age 53 years, 40% male, 78% white). Subjects had been hospitalized prior to Covid-19 and enrolled in a smoking cessation clinical trial at hospitals in Massachusetts, Pennsylvania, and Tennessee. After conducting various experiments, 68% of respondents believe that smoking can increase the risk of contracting with COVID-19.

Perceived severity of smoking cessation behavior According to this study, from seven studies, five studies stated that perceived severity affects smoking cessation. The results of research in the UK show that approximately 50% of smokers who smoked since adolescence will die from diseases related to smoking habits. Smoking still become a global public health problem that requires major attention. In Indonesia, cigarettes are the fourth highest risk factor as a cause of premature death and disability, where Indonesia also has the highest daily average number of male smokers worldwide.

Indonesian women have a lower daily smoking rate than men, but two thirds of Indonesian women are second hand smokers. Smoking is also the most likely risk factor to prevent the emergence of various cancers, cardiovascular and respiratory diseases (Listyoko and Djajalaksana S, 2020).

Based on research Adinat et al. (2021) which stated that current and former smokers who are .65 years old (younger) significantly increase the risk of disease severity (OR= 1.58; 95% CI= 1.16 to 2.15; p = 0.004; and (OR= 2.48; 95% CI= 1.64 to 3.77; p< 0.001). Smoking is also the most likely risk factor to prevent the emergence of various cancers, cardiovascular and respiratory diseases (Listyoko et al., 2020).

AUTHOR CONTRIBUTION

Gadis, Faridah, as the principal investigator, designed this study, collected articles from electronic journal databases and analyzed the data. Bhisma Murti provides direction in data interpretation. Herawati provides direction in the preparation of publications.

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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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