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Masters Program in Public Health, Universitas Sebelas Maret

Meta-Analysis

Meta-Analysis of Public Trust in the Implementation of the COVID-19 Vaccination Based on the Health Belief Model

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ABSTRACT

Background: Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The magnitude of the global spread of COVID-19, and the declaration by the WHO as a public health emergency pandemic, has created an urgent need for rapid diagnosis, vaccines and therapies for COVID-19. This study aims to determine the relationship between perceptions of COVID-19 and vaccination with the Health Belief Model theory approach, one of which is perceived benefit, with the acceptance of COVID-19 vaccination.
Subjects and Method: This study uses a systematic review and meta-analysis with PICO, population: people with an age range of 18-65 years. Intervention: health belief model. Comparison: not health belief model. Outcome: Receiving the COVID-19 Vaccine (Perceived Benefit). The articles used were obtained from several databases, namely Google Scholar, Pubmed, Science Direct, MDPI. The article search keywords were "Health Belief Model" AND "vaccination COVID-19" OR COVID-19 vaccine" AND "COVID-19" The inclusion criteria for research articles were full-text articles using a cross-sectional study design, community research subjects with a range of aged 18-65 years, with the result of the study being receiving the COVID-19 Vaccine (Perceived Benefit) after which a multivariate analysis was carried out with adjusted Odds Ratio (aOR). Data were analyzed using the Review Manager application (RevMan 5.4).
Results: A total of 9 cross-sectional studies involving 31,055 vaccine recipient communities spread across Bangladesh, China, South Asia, Hong Kong and Malaysia were selected for a systematic review and meta-analysis. The data collected showed that a person with a high level of confidence in the benefits of the vaccine had a major influence on the acceptance of the COVID-19 vaccine as much as 3.96 times compared to someone with no confidence in the benefits of the COVID-19 vaccine (aOR = 3.97; CI 95 % = 2.62 to 6.02; $p < 0.001$).
Conclusion: People with a high level of confidence in the benefits of the COVID-19 vaccine can increase the impact of receiving the COVID-19 vaccine.

Keywords: health belief model, COVID-19 vaccine, vaccine acceptance

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BACKGROUND

According to the Ministry of Health in (Hakim and Bangun, 2021) stated that Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). SARS-CoV-2 is a new type of coronavirus that has never been previously identified in humans (Akseer et al., 2020). There are at least two types of coronaviruses that are known to cause diseases that can cause severe symptoms, such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Common signs and symptoms of COVID-19 infection include symptoms of acute respiratory distress such as fever, cough and shortness of breath. The average incubation period is 5-6 days with the longest incubation period being 14 days (WHO., 2020). In severe cases of COVID-19, it can cause pneumonia, acute respiratory syndrome, kidney failure, and even death (Kemenkes RI., 2020).

The World Health Organization on December 31, 2019, the China Country Office reported a case of pneumonia of unknown etiology in the city of Wuhan, Hubei Province, China. On January 7, 2020, China identified the case as a new type of coronavirus. On January 30, 2020, WHO declared the incident a Public Health Emergency of International Concern (PHEIC) and on March 11, 2020, WHO had declared COVID-19 a pandemic (Kemenkes RI, 2020).

Vaccine acceptance is a global health concern. Several previous studies in the United States have shown that many Americans are unwilling or unsure about participating in the COVID-19 vaccination and less than 70% of Americans are willing to be vaccinated. A survey conducted in March 2020, during the COVID-19 pandemic in France, found that 26% of French people are reluctant to be vaccinated, compared to 31% in the United Kingdom and 14% in Turkey according to a survey conducted in May 2020. Several studies conducted in China between May and July 2020 to check the COVID-19 vaccination intentions of the Chinese public, about 20% of the population reported that they did not want to be vaccinated.

Most of the research on vaccine doubt in China linked vaccine doubt and responses to the incidence of vaccines being negative. Studies on COVID-19 are currently very limited to vaccination intent, which was carried out after the COVID-19 vaccine was gradually promoted and used around the world. As with all vaccines, acceptance of the COVID-19 vaccine and the factors that affect it may change with vaccine availability and the epidemic situation. Even high-quality vaccines and well-organized vaccination programs can face social resistance and fail to achieve satisfactory results. Take influenza vaccination for example, although influenza vaccination is considered the most effective approach to prevent influenza, the vaccination rate in China is very low, only 2% (Wong et al., 2020).

The Health Belief Model (HBM) is one of the most widely used theoretical models to study health behavior including vaccination. Perceived vulnerability, perceived severity, perceived usefulness, perceived inhibition, self-efficacy and cues to action are the main components of the Health Belief Model. Through the theoretical framework of the Health Belief Model to study the acceptance of the COVID-19 vaccine and the factors that influence vaccination intentions, it can help to find the focus of vaccination promotion and provide specific suggestions for future vaccination programs. On this basis, the analysis of this article aims to determine the relationship between perceptions of COVID-19 and

vaccinations included in the HBM component, one of which is perceived benefit, and acceptance of COVID-19 vaccination (Jiang et al., 2021).

The implementation of the COVID-19 vaccination targeting the community is expected to be the desire of all the general public, especially men and women over the age of 18 with healthy conditions to participate in the implementation of the vaccination, considering the awareness of the needs and benefits of the COVID-19 vaccine, so that researchers are interested in conducting a systematic review and meta-analysis of research results that aim to measure the success of implementing the Health Belief Model on the implementation of vaccinations in the context of overcoming the Corona Virus Diseases-19 (COVID-19) pandemic in the general public (Hakim and Bangun., 2021).

SUBJECTS AND METHOD

1. Study Design

This research is a systematic research and meta-analysis. The articles used in this study were obtained from several databases, namely Google Scholar, Pubmed, Science Direct, MDPI, between 2012 and 2022. The keywords to search for articles were as follows “Health Belief Model” AND “vaccination COVID-19” OR COVID- 19 vaccines” AND “COVID-19”.

2. Inclusion Criteria

The inclusion are: full text article using an English cross-sectional study design, with the results of the study being the acceptance of the COVID-19 vaccine, multivariate analysis with adjusted Odds Ratio (aOR). The intervention used in writing the article is the Health Belief Model, with the research subjects being adults, and the outcome in this article is the acceptance of the COVID-19 vaccine (in terms of its usefulness).

3. Exclusion Criteria

The exclusion criteria in this research article were articles published before 2012, articles on primary studies with RCTs and observational studies other than cross-sectional (cohort and case-control), primary studies that had meta-analysis.

4. Operational Definition of Variables

In formulating research problems, researchers use PICO. The population used is the community with an age range of 18-65 years. The intervention used is the health belief model, with the result being the acceptance of the COVID-19 vaccine (in terms of its usefulness).

The Health Belief Model is one of the theories that is often used to understand health attitudes and behavior about disease. HBM consists of several main components, one of which is the perception of benefits. In relation to vaccines, perceived benefit can be defined as an individual's belief in carrying out the vaccination.

Acceptance of the COVID-19 vaccine (in terms of usefulness) is a person's belief in the effectiveness of the various available efforts in reducing the threat of disease, or the perceived benefits in taking these health efforts, especially the benefits of the COVID-19 vaccine.

5. Data Analysis

Articles were analyzed using the Review Manager (RevMan) 5.4 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 Google Scholar, Pubmed, Science Direct and MDPI, it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

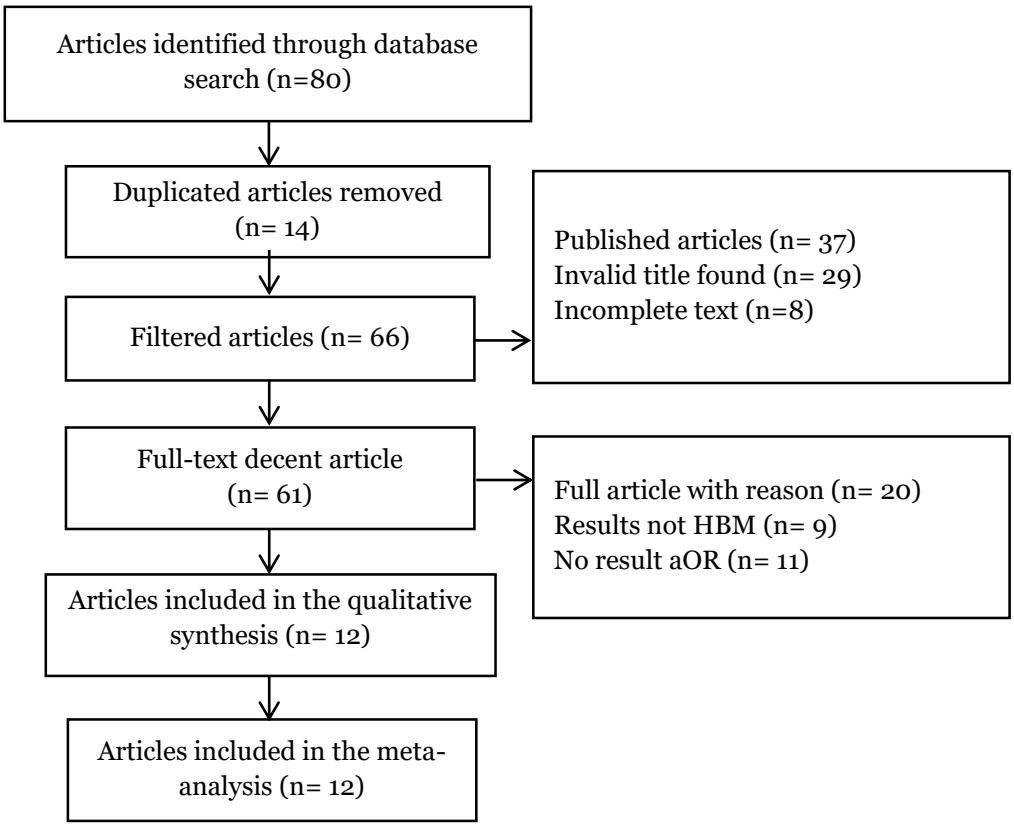

Figure 1. Results of Prisma Flow Diagrams

Figure 2. Research Distribution Map

Table 1. showed that the research consists of 9 articles from the initial search process yielding 80 articles. A total of 9 articles that met the quality assessment were included in the quantitative synthesis using meta-analysis. The research comes from 1 continent, namely Bangladesh, China, South Asia, Hong Kong, Malaysia. Table 1, the authors make an assessment of the quality of the study. Table 2 shows a description of the main studies included in the primary study meta-analysis.

Table 1. Assessment of study quality published by the Centre for Evidence-Based Medicine

No	Indicator	Publication (Author and Year)								
		Banik et al. (2021)	Chen et al. (2021)	Hawlader et al. (2021)	Hossain et al. (2021)	Jiang et al. (2021)	Lai et al. (2021)	Martin et al. (2021)	Qin et al. (2021)	Wong et al. (2021
1	Does the research formulate the research question (research problem) clearly?	2	2	2	2	2	2	2	2	2
2	Is the cross sectional research method appropriate to answer the research question?	2	2	2	2	2	2	2	2	2
3	Is the research subject selection method clearly explained?	2	2	2	2	2	2	2	2	2
4	Is the sampling technique free of bias (selection)?	2	2	2	2	2	2	2	2	2
5	Is the sample representative of the research target population?	2	2	2	2	2	2	2	2	2
6	Has statistical significance been tested?	2	2	2	2	2	2	2	2	2
7	Are the results of this study reported in aOR?	2	2	2	2	2	2	2	2	2
8	Do you believe the results?	2	2	2	2	2	2	2	2	2
9	Are the results obtained can be applied in the community?	2	2	2	2	2	2	2	2	2
	Total	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**

Note: Answer 0= No, 1= can't tell, 2= Yes

Table 2. Description of Primary Research included in the Meta-Analysis

No	Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	aOR (CI 95%)
1	Banik et al. (2021)	Bangladesh	Cross-sectional	894	Male and Female aged 18-45 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	3.08 (1.8 hingga 5.19)
2	Chen et al. (2021)	China	Cross-sectional	2531	Male and Female aged 18-59 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	1.05 (0.49 hingga 2.29)
3	Hawlader et al. (2021)	South Asia	Cross-sectional	4780	Male and Female aged ≤25-≥56 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	2.05 (1.77 hingga 2.36)
4	Hossain et al. (2021)	Bangladesh	Cross-sectional	1497	Male and Female aged 18-65 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	0.85 (0.79 hingga 0.91)
5	Jiang et al. (2021)	China	Cross-sectional	1309	Male and Female aged 18-59 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	0.21 (0.15 hingga 0.29)
6	Lai et al, 2021)	China	Cross-sectional	1145	Male and Female aged 18-59 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	1.64 (1.04 hingga 2.61)
7	Martin et al. (2021)	Hongkong	Cross-sectional	1200	Male and Female aged 18-65 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	1.22 (1.01 hingga 1.48)
8	Qin et al. (2021)	China	Cross-sectional	3119	Male and Female aged 18-50 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	1.78 (0.56 hingga 5.66)
9	Wong et al. (2021)	Malaysia	Cross-sectional	1159	Male and Female aged 18-50 years	Health Belief Model	Not Health Belief Model	Receiving the COVID-19 Vaccine (Perceived Benefit)	2,19 (1.03 hingga 4.65)

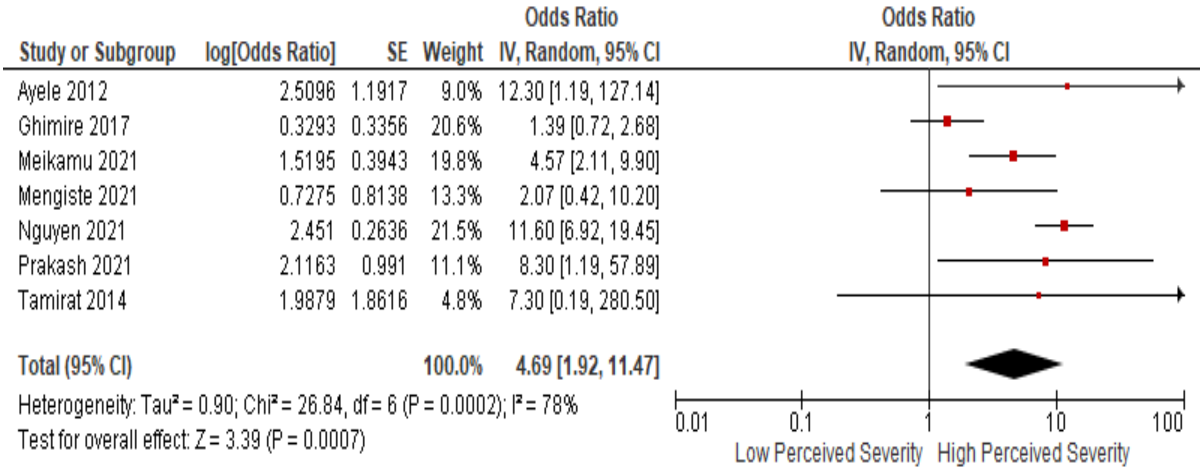

Figure 5. Forest Plot of Community Trust in the Implementation of COVID-19 Vaccination based on the Health Belief Model Theory

Based on the results of the forest plot, the cross sectional study showed a high heterogeneity value, namely I^2= 98%, so that the distribution of the data was declared heterogeneous (random effect model).

The forest plot shows that adults with the health belief model believed in the usefulness of receiving the COVID-19 vaccine 3.96 times compared to adults without the health belief model (aOR= 3.96; 95% CI= 2.62 to 6.00; p<0.001).

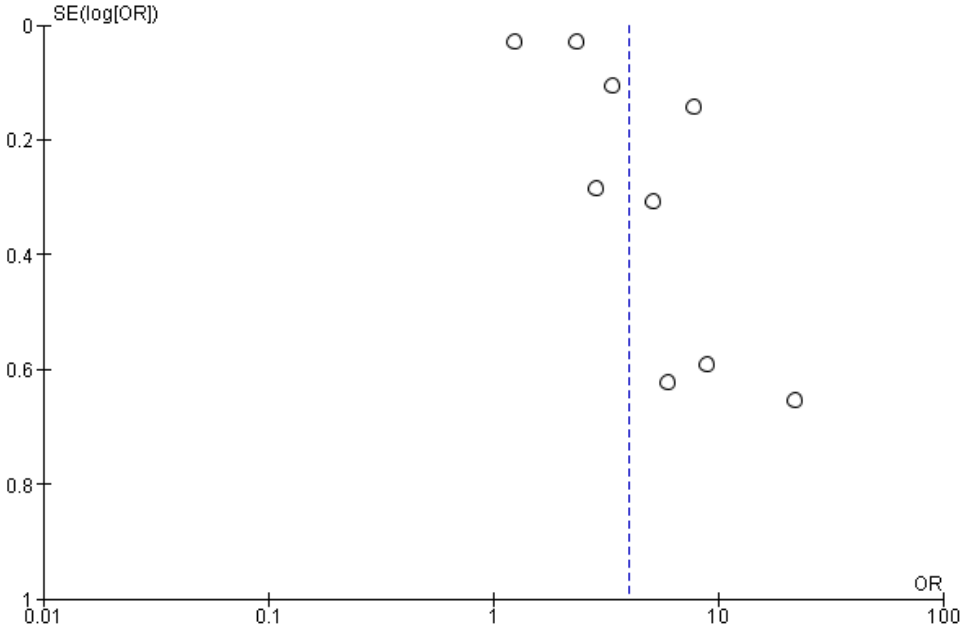

Figure 4. Funnel Plot Community Trust in the Implementation of COVID-19 Vaccination based on the Health Belief Model Theory

Based on figure 4, the funnel plot results show publication bias with an overestimation effect characterized by an asymmetric distribution between the right and left plots. There are five tiles on the right, four squares on the left.

DISCUSSION

This systematic review and meta-analysis took the topic of public trust in the implementation of the Covid-19 vaccination based on the Health Belief Model. The independent variable in this study is public trust and the dependent variable in the analysis is the health belief model. Tailored interventions are encouraged to reduce vaccination barriers, increase health confidence and promote COVID-19 vaccination intentions (Jiang et al., 2021).

This systematic research study and meta-analysis explains that the results show a statistically significant relationship between perceived benefits and vaccine acceptance. In this study, perception is described in 2 ways, namely vaccination is felt to reduce infection/complications and vaccination reduces worry. People with a high perceived benefit will have a greater chance of being vaccinated than those who are not (Banik et al., 2021).

The Health Belief Model theory developed by Rosenstock, states that the higher the effectiveness of the level of confidence in the strategic plan designed to reduce the threat of a disease, it will automatically take these preventive actions by vaccinating against COVID-19 (Chen et al., 2021).

Several similar studies suggest that there is a relationship between perceived benefits and acceptance of vaccines, especially the COVID-19 vaccine. Research in Malaysia found that people in Malaysia who received the vaccine also had a high perceived benefit value (Wong et al., 2021). A similar study in China also found the same thing, high vaccine acceptance (83%) was dominated by a high perceived benefit assessment (Wong et al., 2020).

Perceived benefits are beliefs about the benefits that are felt in individuals if they carry out healthy behavior. The construct of perceived benefit is a person's opinion about the usefulness of a new behavior in reducing the risk of disease. Individuals tend to be healthier when they believe a new behavior will decrease their likelihood of developing disease. Perceived benefits play an important role in determining behavior for secondary prevention (Hawlader et al., 2022).

In the opinion of the researcher, related to perceived benefits, one's belief in the effectiveness of the various available efforts in reducing the threat of disease, or the perceived benefits in taking these health efforts, especially the benefits of the COVID-19 vaccine. itself (Hawlader et al., 2022). People with a high level of confidence in the benefits of the COVID-19 vaccine can increase the effect of receiving the COVID-19 vaccine (aOR= 3.97; 95% CI= 2.62 to 6.02; $p<0.001$). The meta-analysis of 9 articles used a cross-sectional observational study design approach with $I^2= 98\%$. The limitations of this study are that there is a language bias because it only uses English articles and a search bias because it only uses four databases.

AUTHOR CONTRIBUTION

Ade Amallia and Agus Syukron Ma'ruf were the main researchers who chose topics, searched and collected research data, analyzed data, and wrote research manuscripts. Isna Nur Rohmah as a companion in research.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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