Journal of Health Promotion and Behavior (2022), 07(03): 225-237
Masters Program in Public Health, Universitas Sebelas Maret

Meta-Analysis

Meta Analysis: Application of Health Belief Model Theory on COVID-19 Acceptance in General Population

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ABSTRACT

Background: The COVID-19 vaccine is an effective strategy to prevent viral infection during global pandemic. Health belief model has been recommended to explain the acceptance of COVID-19 vaccination behavior in the community. This study aimed to estimate the perceived susceptibility to COVID-19 and the perceived benefit in receiving the COVID-19 vaccine.
Subjects and Method: This study used a systematic review study design and a meta-analysis using PICO, Population: Society, Intervention: Perceptions of high susceptibility to COVID-19 and high perceptions of benefits about the COVID-19 vaccine. Comparison: Low perceived susceptibility to COVID-19 and low perceived benefit of COVID-19 vaccine, Outcome: Acceptance of COVID-19 vaccine. The articles used in this study came from 4 databases, namely Pubmed, Sciencedirect, SpringerLink and Google Scholar. The keywords used in the article search were as follows "Health Belief Model" OR "HBM" AND "Acceptance" OR "Receive" AND "COVID-19 Vaccine" AND "General Population". The articles included in this study were full paper articles, cross sectional study designs, in 2020-2022 and the size of the relationship of Adj Odds Ratio (aOR).
Results: A total of 9 cross-sectional studies with 12,713 people from 3 continents, namely America (United States), Asia (Bangladesh, China, Hong Kong, Lebanon, and Saudi Arabia) and Europe (Russia) were obtained. From data processing, it was found that a high perceived susceptibility to COVID-19 increased acceptance of COVID-19 vaccination by 1.33 times compared to a low perceived susceptibility and this result was statistically significant (aOR= 1.33; 95% CI= 1.08 to 1.65; p= 0.008) . A high perceived benefit increased acceptance of COVID-19 vaccination by 3.28 times compared to a low perceived benefit and this result was statistically significant (aOR= 3.28; CI 95%= 1.87 to 5.74; p< 0.001).
Conclusion: Perceived susceptibility and perceived benefit increase the likelihood of acceptance of the COVID-19 vaccination in the community.

Keywords: Health Belief Model, perceived susceptibility, perceived benefit, COVID-19 vaccination.

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Cite this as:
Yuliani RD, Prasetya H, Murti B (2022). Meta Analysis: Application of Health Belief Model Theory on COVID-19 Acceptance in General Population. J Health Promot Behav. 07(03): 225-237. https://doi.org/10.-26911/thejhpb.2022.07.03.05.

BACKGROUND

Corona Virus Disease (COVID-19), caused by Seveere Acute Respiratory Syndrome Coronaavirus 2 (SARS-COV-2) and has had a major impact on health and the global economy since its emergence at the end of

2019. COVID-19 was declared a global pandemic by the World Health Organization in March 2020 (Shmueli, 2021). The clinical manifestations of COVID-19 range from asymptomatic infection, with mild symptoms including fever, fatigue, cough, difficulty breathing (shortness of breath), chest pain, and even death. Lung disease, DM, and the elderly are the most common co-morbidities (Knowns, 2020) in (Kurniawati et al., 2021). Based on WHO data, cases of COVID-19 until January 17, 2022 are estimated to reach 23,211,628 with a mortality rate of 59,417 (WHO dashboard, 2021).

The burden of COVID-19 is further exacerbated by the emergence of new variants and their very rapid spread in society. Several prevention and control efforts have been carried out such as the implementation of 5M, namely using masks, washing hands, maintaining a minimum distance of 2 meters, staying away from crowds, reducing mobility and large-scale social restrictions (PSBB). Brodin et al (2020) in Fresna et al (2021) show that community knowledge and behavior is positively correlated with preventive measures related to COVID-19. In addition, as an effective measure to limit viral infections and global pandemics, the COVID-19 vaccine is considered an appropriate strategy and effort.

According to the World Health Organization (WHO) in of April 5, 2021, there are 184 vaccines being evaluated in the preclinical stage, 85 in the clinical evaluation stage, and some have passed phase III clinical trials (Cai et al., 2021). Based on WHO dashboard data (2021), 4,904,935,-610 and 4,327,599,641 people who have been vaccinated with 1 dose have been vaccinated with the complete dose.

One of the main reasons for the low vaccination rate is that many people are concerned about the safety, efficacy and reaction after being vaccinated against COVID-19. Several studies have reported that antibody response rates vary depending on vaccination protocol, vaccine type, and population (Chen et al., 2021). Although the implementation of the COVID-19 vaccination has a different reaction or response for each individual, the community accepts the vaccination program implemented in each country. Shmueli (2021) states that there are eighty percent of the 398 respondents who meet the requirements and are willing to carry out the vaccine.

One of the recommended theories to explain and understand health behavior including the acceptance of COVID-19 vaccination in the community is the health belief model. Factors that can influence a person's acceptance of COVID-19 vaccination based on the theory of health belief models, namely high perceived susceptibility to COVID-19 infection and the benefits of the COVID-19 vaccine.

Research by Alobaidi et al. (2021) stated that among the HBM variables, the perceived susceptibility and the perceived benefit were important facilitators for vaccination. The results of various studies which state that there is an influence between the HBM model in the acceptance of COVID-19 vaccination, encourage researchers to conduct a meta-analysis. Therefore, the aim of this study was to estimate the perceived susceptibility to COVID-19 and the perceived benefit in receiving the COVID-19 vaccine, with a meta-analysis of the primary studies conducted by previous investigators.

SUBJECTS AND METHOD

1. Study Design

This study used a systematic review and meta-analysis study design. The articles

used in this study came from various sources. Article searches were carried out comprehensively through search engines with 4 databases, namely Pubmed, Sciencedirect, SpringerLink and Google Scholar. The keywords used in the article search are as follows "Health Belief Model" OR "HBM" AND "Acceptance" OR" Receive" AND "COVID-19 Vaccine" AND "General Population".

2. Inclusion Criteria

The articles included in this study were full paper articles, observational study designs, especially cross sectional, articles published from 2020-2022 and the analysis used the adj Odds Ratio (aOR) measure. The subject of the study was the community. The intervention used was a high perceived susceptibility to COVID-19 disease and a high perceived benefit about the COVID-19 vaccine. The outcome of this study is acceptance of the COVID-19 vaccine.

3. Exclusion Criteria

The exclusion criteria in this study were duplication of articles, articles using a randomized controlled trial, case control, and cohort research design.

4. Operational Definition of Variables

Acceptance of COVID-19 Vaccine is the process/way a person receives a special vaccine that can provide or increase a person's active immunity toward COVID-19.

Perceived Susceptibility is a person's beliefs about the risk of being easily exposed to COVID-19.

Perceived Benefit is one belief that by having COVID-19 vaccine, it is an effort to benefit and provide and increase individual immunity against COVID-19.

5. Instruments

This study is guided by PRISMA flow diagrams and assessment of the quality of research articles using the Critical Appraisal Checklist for Cross-sectional Study from the Center for Evidence Based Management (CEBM, 2014). Here are 12 questions on the check-list that were used:

The 12 cross-sectional study questions used are as follows:

1. Do the study objectives clearly address the study problem?
2. Are study methods appropriate in providing answers to study questions?
3. Is the study subject selection method clearly written?
4. Does sampling create bias?
5. Can the study sample be representative of the designated population?
6. Is the sample size determination based on pre-study considerations?
7. Is the measurement method achievable?
8. Are the study instruments valid and reliable?
9. Is there a value of statistical significance?
10. Is a Confidence Interval (CI) assigned to the main outcome?
11. Are there any confounding factors that have not been taken into account?
12. Can the results be implemented in your study?

6. Data Analysis

Research data were analyzed using the RevMan 5.3 application, to calculate the effect size and heterogeneity of the study. 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 PubMed, Sciencedirect, Googlescholar, SpringerLink it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

The primary research that met the criteria consisted of 9 articles from 3 continents namely America consisting of the United States of America, Asia consisting of countries (Bangladesh, China, Hong Kong, Lebanon, and Saudi Arabia,) and Europe is Russia.

Table 1 shows the research quality assessment of 15 articles using the Critical Appraisal Checklist for Cross-sectional. Table 2 showed a summary of the articles of cross-sectional that were included in the meta-analysis.

Table 1. Assessment of the Quality Studies by Center for Evidence Based Management (CEBM, 2014)

Primary Study	Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Coe et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24
Jiang et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Lai et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Banik et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Mahmud et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Qin et al. (2022)	2	2	2	2	2	2	2	2	2	2	2	2	24
Wong et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Youssef (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
Tran et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24

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

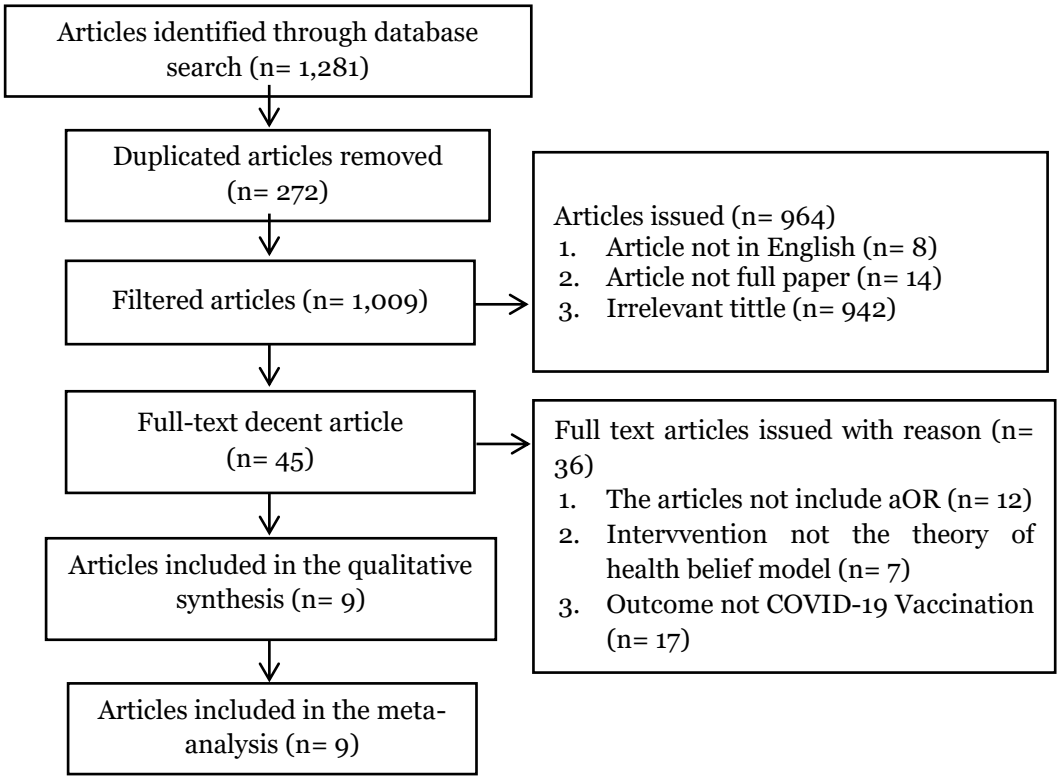

Figure 1. Results of Prisma Flow Diagrams

Figure 2. Resarch Distribution Map

1. Application of perceived susceptibility in receiving COVID-19 vaccination.

Table 2 showed 8 cross-sectional study articles regarding the perception of high susceptibility to COVID-19 in receiving COVID-19 vaccinations that fulfilled the qualitative and quantitative requirements.

a. Forest plot

A high perception of susceptibility to COVID-19 influenced the acceptance of COVID-19 vaccination. Based on Figure 3, it can be seen that high perceived susceptibility to COVID-19 increased the acceptance of COVID-19 vaccination by 1.33 times higher and this result is statistically significant (aOR= 1.33; CI 95%= 1.08 to 1.65; p= 0.008).

b. Funnel plot

The funnel plot in Figure 4 showed that there was no publication bias as indicated by the symmetric distribution between the right and left plots. There are 4 plots on the left and 4 plots on the right. The plot on the left of the graph appears to have a standard error (SE) between 0.1 and 0.3 and the plot on the right has a standard error (SE) between 0 and 0.4.

2. Application of perceived benefit in receiving COVID-19 vaccination

There are 9 articles of cross-sectional study regarding a high perceived benefits in receiving COVID-19 vaccinations.

a. Forest plot

Based on Figure 5, it can be seen that the high perceived benefits increased the acceptance of COVID-19 vaccination by 3.28 times and this result was statistically significant (aOR= 3.28; CI 95%= 1.87 to 5.74; p< 0.001).

b. Funnel plot

Based on Figure 6, it can be concluded that there was a publication bias which was indicated by the asymmetry of the right and left plots where there are 3 plots on the right, 6 plots on the left. The plot on the right is between the standard error (SE) 0 and 0.4. The plot on the left is between the standard error (SE) 0 and 0.6 .

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

No	Author	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (CI 95%)
1.	Banik et al., (2021)	Bangladesh	Cross Sectional	894	Adults aged between 18–60 years old	a. High perceived susceptibility to COVID-19. b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of COVID-19 vaccination	a. 1.64 (1.06 to 2.537) b. 2.35 (1.38 to 3.98)
2.	Coe et al., (2021)	USA	Cross Sectional	1047	Adults aged 18 years old	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of COVID-19 vaccination	a. 1.01 (0.81 to 1.2) b. 2.82 (2.24 to 3.56)
3.	Jiang et al., (2021)	China	Cross Sectional	1039	Adults aged 18 years old and above	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of COVID-19 vaccination	a. 1.12 (0.89 to 1.41) b. 2.49 (1.84 to 3.36)

No	Author	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (CI 95%)
4.	Lai et al., (2021)	China	Cross Sectional	1145	Adults aged between 18–59 years old	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of the COVID-19 Booster vaccination	a. 1.00 (0.48 to 2.08) b. 1.64 (1.04 to 2.61)
5.	Mahmud et al., (2021)	Saudi Arabia	Cross Sectional	1387	Adults aged (≥18 years old)	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of COVID-19 vaccination	a. 1.76 (1.39 to 2.24) b. 16.3 (11.2 to 22.2)
6.	Qin et al., (2022)	China	Cross Sectional	3199	Adults aged 18 years old and above	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of the COVID-19 Booster vaccination	a. 2.48 (1.42 to 4.31) b. 1.78 (0.56 to 5.66)
7.	Tran et al., (2021)	Russia	Cross Sectional	876	Adults aged 18 years old and above	High perceived benefits of the COVID-19 vaccine	Low perceived benefits of the COVID-19 vaccine	Acceptance of COVID-19 vaccination	8.80 (5.21 to 14.87)

No	Author	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (CI 95%)
8.	Wong et al., (2021)	Hong Kong	Cross Sectional	1200	Adults aged 18 years old and above	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine		a. 0.98 (0.83 to 1.17) b. 1.22 (1.01 to 1.48)
9.	Youssef et al., (2021)	Lebanon	Cross Sectional	2802	Adults aged 18 years old and above	a. High perceived susceptibility to COVID-19 b. High perceived benefits of the COVID-19 vaccine	a. Low perceived susceptibility to COVID-19 b. Low perceived benefits of the COVID-19 vaccine	Acceptance of COVID-19 vaccination	a. 1.56 (1.19 to 2.04) b. 4.57 (3.32 to 6.30)

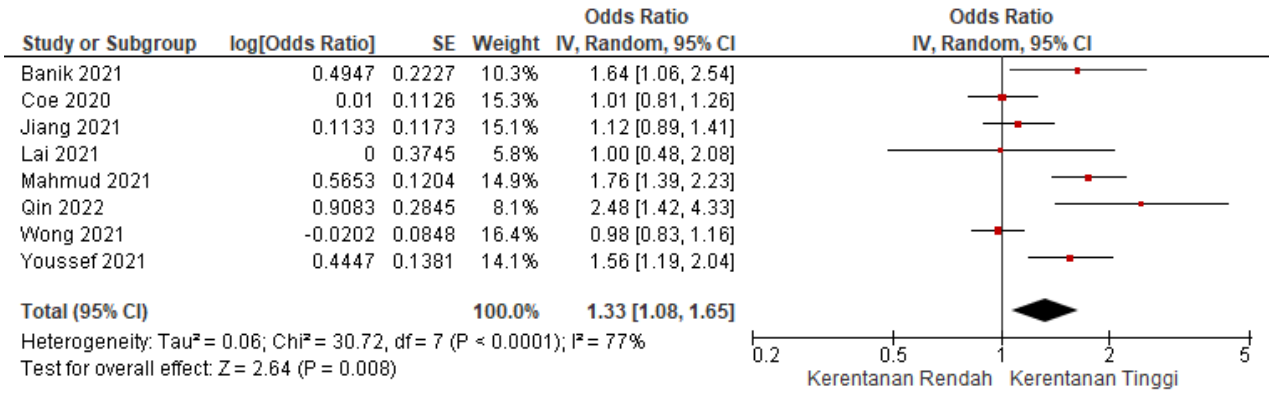

Figure 3. Forest Plot of perceived susceptibility application in receiving COVID-19 vaccination

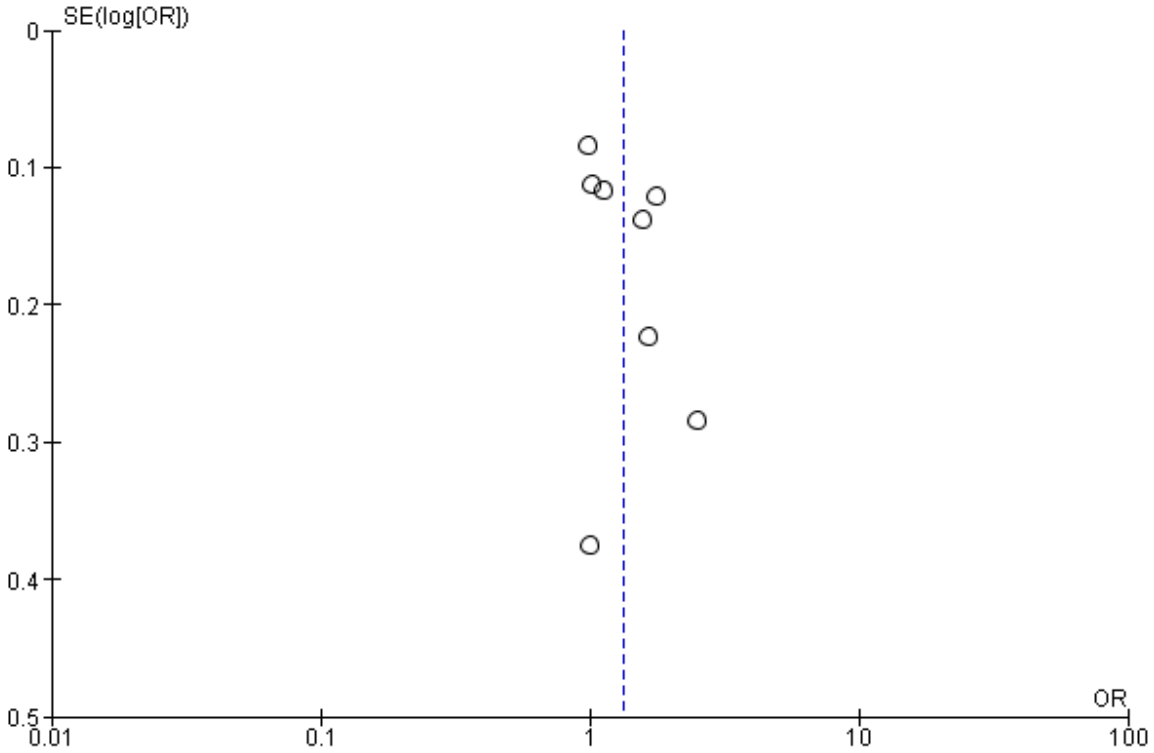

Figure 4. Funnel plot of perceived susceptibility application in receiving COVID-19 vaccination

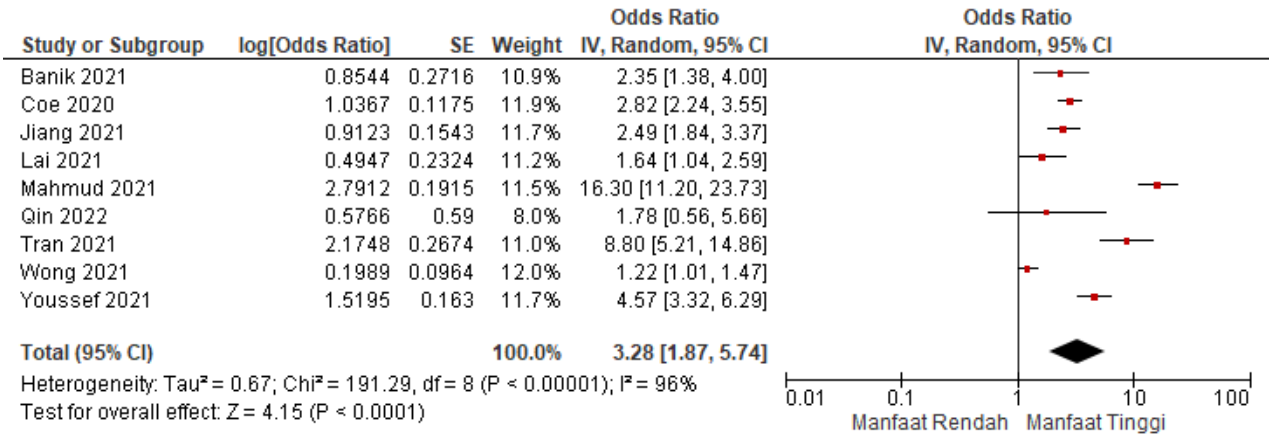

Figure 5. Forest Plot of perceived susceptibility application in receiving COVID-19 vaccination

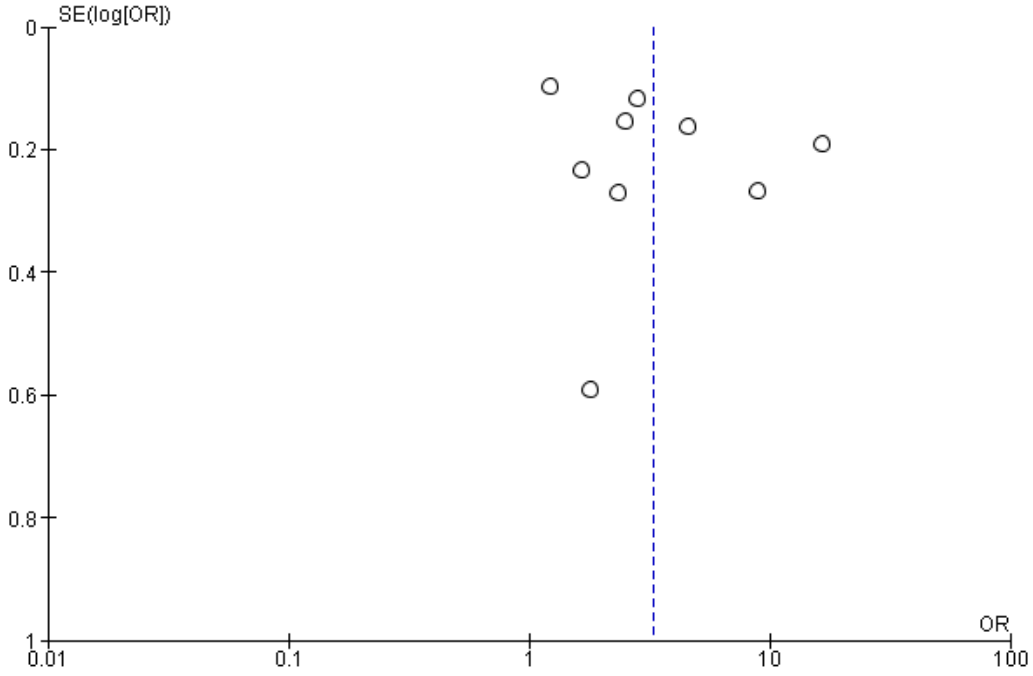

Figure 5. Funnel Plot of perceived susceptibility application in receiving COVID-19 vaccination

DISCUSSION

Vaccines are biological products containing antigens in the form of microorganisms or their parts and or the resulting substances have been processed in such a way that they are safe and will provide active immunity against a disease when given to a person (Ministry of Health RI, 2021). Vaccines can also protect individuals from debilitating and even life-threatening diseases.

A high perception of susceptibility to COVID-19 influences the acceptance of COVID-19 vaccination. Based on the results of the study that high perceived susceptibility to COVID-19 increased acceptance of COVID-19 vaccination by 1.33 times compared to low perceived susceptibility to

COVID-19 and this result was statistically significant (aOR= 1.33; CI 95%= 1.08 to 1.65; p= 0.008).

The results of this study were supported by Youssef (2021) who confirmed that a high perceived susceptibility to COVID-19 could increase a person's likelihood of getting vaccinated against COVID-19 by 1.56 times (aOR= 1.56; 95% CI= 1.19 to 2.04; p= 0.001). Another study by Qin et al (2022) revealed that a high perceived susceptibility to COVID-19 can increase individuals to receive the COVID-19 vaccine by 2.48 times among adults in China. The results of this study are also statistically significant with the results of (aOR= 2.48; CI 95%= 1.42 to 4.31; p< 0.001).

Perceived susceptibility is a person's belief about vulnerability to the risk of a disease that encourages a person to behave healthier (Rachmawati, 2019). The greater the perceived vulnerability of a person's perceived risk or vulnerability, the more likely the individual is to engage in behavior to reduce the risk.

People will believe if they are at risk of disease, then they tend to do something to prevent it, on the other hand, if people believe they are not at risk or have a low perceived risk of susceptibility, unhealthy behavior tends to occur. A high perceived susceptibility to COVID-19 infection was also associated with increased vaccination intentions (Wong et al., 2020). Acceptance of a person's perception of susceptibility to a condition that is believed to cause seriousness (perceived threat) encourages it to produce a force that supports behavior change. This is because the COVID-19 vaccine will provide protection against the transmission of COVID-19 to people, their family, and the environment (Hardiansyah, et al., 2022).

This study also analyzed the perceived benefits of the COVID-19 vaccine, which has a high influence on the acceptance of the COVID-19 vaccination. A high perception of the benefits of the COVID-19 vaccine can increase the acceptance of the COVID-19 vaccination by 3.28 times. These results were reported to be statistically significant (aOR = 3.28; 95% CI = 1.87 to 5.74; p < 0.001).

The results of this study are in line with the research of Tran et al. (2021) which showed that the perceived benefit of having a risk of 8.80 in receiving COVID-19 vaccination in adults in Russia. This is because vaccination can help reduce the risk of being infected with the COVID-19 virus. In this study also had statistically significant results, namely (aOR = 8.80; 95% CI = 5.21 to 14.87; p <0.001). Another study by Mahmud et al. (2021) stated that a high perceived benefit of the COVID-19 vaccine had a 16.3 times risk of vaccinating against COVID-19 among adults in Saudi Arabia (aOR= 16.3; 95% CI= 11.2 to 22.2; p<0.001) and it was statistically significant.

According to the Indonesian Ministry of Health (2021) the vaccination program has several benefits, namely as a protection for the community from the threat of COVID-19 so that they are socio-economically productive, anticipate the transmission of COVID-19, reduce morbidity and mortality, and achieve group immunity in the community. With perceived benefits, it increases one's confidence in the effectiveness of the various available efforts in reducing the threat of a disease or the perceived benefits of taking these health efforts, especially the benefits of the COVID-19 vaccine itself (Hardiansyah, et al., 2022).

AUTHOR CONTRIBUTION

Resta Dwi Yuliani contributed in choosing topics, searching, collecting and processing research data. Hanung Prasetya and

Bhisma Murti contributed in analyzing data and reviewing research documents.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

ACKNOWLEDGMENT

We are very grateful to database providers PubMed, Google Scholar, ScienceDirect, SpringerLink.

REFERENCES

Alobaidi S (2021). Predictors of intent to receive the COVID-19 vaccination among the population in the kingdom of saudi arabia: A survey study, J. Multidiscip. Healthc., 14: 1119–1128. doi: 10.2147/JMDH.S306654

Banik R, Islam S, Pranta MUR, Rahman QM, Rahman M, Pardhan S, Driscoll R, et al. (2021). Understanding the determinants of COVID-19 vaccination intention and willingness to pay: findings from a population-based survey in Bangladesh, BMC Infectious Diseases, 21(1): 2-15 doi: 10.1186/-s12879-021-06406-y.

Cai C, Peng Y, Shen E, Huang Q, Chen Y, Liu P, Guo C, et al. (2021). A comprehensive analysis of the efficacy and safety of COVID-19 vaccines, Mol. Ther. 29(9): 2794–2805. doi: 10.-1016/j.ymthe.2021.08.001.

Center for Evidence Based Management (2014). Critical Appraisal Checklist for Cross-sectional Study.

Chen JJ, Lee TH, Tian YC, Lee CC, Fan PC, Chang CH (2021). Immunogenicity rates after SARS-COV-2 vaccination in people with end-stage kidney disease a systematic review and meta-analysis, JAMA Netw. Open, 4(10): 1-22. doi: 10.1001/jamanetworkopen.-2021.31749.

Coe AB, Elliot MH, Gatewood SBS, Goode JVR, Moczygemba LR, et al. (2020). Perceptions and predictors of intention to receive the COVID-19 vaccine, RSAP. hal 1-7. doi: 10.1016/j.sapharm.2021.04.023

Fresna RH, Murti B, Prasetya H (2021). Meta-Analysis the effect of residence on the risk of anxiety and depression in general population during COVID-19 Pandemic, JEPH 6(3): 381–391. doi: 10.26911/jepublichealth.2021.-06.03.12.

Hardiansyah H, Hakim L, Bangun HA (2022). Implementasi health belief model terhadap pelaksanaan vaksinasi untuk penanggulangan pandemi Corona Virus Diseases-19 (COVID-19) pada tenaga kesehatan Kabupaten Nagan Raya (Implementation of a health belief model for the implementation of vaccinations for the prevention of the Corona Virus Diseases-19 (COVID-19) pandemic for health workers in Nagan Raya Regency), Jurnal SAGO Gizi dan Kesehatan, 3(1): 95. doi: 10.30867/gikes.v3i1.767.

Jiang T, Zhou X, Wang H, Dong S, Wang M, Akezhuoli H, Zhu H (2021). COVID-19 vaccination intention and influencing factors among different occupational risk groups: a cross-sectional study. Hum Vaccin Immunother, 17(10): 3433–3440 doi: 10.1080/216-45515.2021.1930473.

Kementerian Kesehetan RI (2021). PMK No 10 Tahun 2021 tentang pelaksanaan vaksinasi dalam rangka penanggulangan pandemi Corona Virus Disease 2019 (COVID-19) (PMK No. 10 of 2021 concerning the implementation of vaccinations in the context of dealing with the Corona Virus Disease

2019 (COVID-19) pandemic), Permenkes RI, 2019, p. 33. Available at: https://persi.or.id/wp-content/uploads/2021/02/pmk10-2021.pdf.

Kurniawati O, Prasetya H, Murti B (2021). Meta-analysis the effects of obesity and type 2 diabetes mellitus on COVID-19 mortality, JEPH, 6(2): 177–191. doi: 10.26911/jepublichealth.2021.06.02.05.

Lai X, Zhu H, Wang J, Huang Y, Jing R, Lyu Y, Zhang H, et al. (2021). Public perceptions and acceptance of COVID-19 booster vaccination in china: A cross-sectional study', Vaccines, 9(12):1–17. doi: 10.3390/vaccines912-1461

Mahmud I, Kabir R, Rahman MA, Mohamed AA, Vinnakota D, Al- Mohaimeed A (2021). The health belief model predicts intention to receive the covid-19 vaccine in saudi arabia: Results from a Cross-Sectional Survey, Vaccines, 9: 1-11 doi: 10.3390-/vaccines9080864.

Qin C, Wang R, Tao L, Liu M, Liu J (2022). Acceptance of a Third Dose of COVID-19 Vaccine and Associated Factors in China Based on Health Belief Model: A National Cross-Sectional Study, Vaccines, 10(1): 1-13. doi: 10.3390/-vaccines10010089.

Rachmawati WC (2019). Promosi Kesehatan dan Ilmu Perilaku (Health Promotion and Behavioral Science). Malang: Wineka Media among the general population using the health belief model and the theory of planned behavior model'. doi: 10.-1186/s12889-021-10816-7.

Shmueli L (2021). Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behavior model, BMC public health, 21(1):804. doi: 10.1186/s12-889-021-10816-7.

Tran VD, Pak TV, Gribkova EI, Galkina GA, Loskutova EE, Dorofeeva VV, Dewey RS, et al. (2021). Determinants of COVID-19 vaccine acceptance in a high infection-rate country: A cross-sectional study in Russia, Pharmacy Practice, 19(1): 1–9. doi: 10.18549/-PharmPract.2021.1.2276.

WHO (2021). WHO coronavirus (COVID-19) Dashboard. World Health Organization. Retrieved from https://covid19.who.int/.

Wong LP, Alias H, Wong PF, Lee HY, Abubakar Z (2020). The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay, Human Vaccines and Immunotherapeutics, 16(9): 2204–2214. doi: 10.1080/21645515.2020.1790279.

Wong MCS, Wong ELY, Huang J, Cheung AWL, Law K, Chong MKC, Ng RWY, et al. (2021) Acceptance of the COVID-19 vaccine based on the health belief model: A population-based survey in Hong Kong, Vaccine, 39(7): 1148–1156. doi: 10.1016/j.vaccine.20-20.12.083.

Youssef D (2021). Integrating health belief model to determine factors associated with COVID-19 vaccine acceptance in Lebanon: Differences between health care workers and non-healthcare workers, Res Sq, hal.1–27. doi: 10.1016/-j.ijid.2021.12.147