Journal of Health Promotion and Behavior (2022), 07(03): 182-196
Masters Program in Public Health, Universitas Sebelas Maret

Meta-Analysis

Face Mask Wearing and Hand Washing Behavior on the Prevention of COVID-19 Infection: A Meta-Analysis

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ABSTRACT

Background: People infected with the COVID-19 virus can infect others through close droplets, these droplets are water-filled particles with a diameter of >5 m - 10 m. ways to reduce or contract COVID-19 by wearing a mask and washing hands both with soap and hand sanitizer. This study aimed to determine the effect of wearing masks and washing hands on the transmission of COVID-19.
Subjects and Method: This research is a meta-analysis study using PRISMA flowchart guidelines. The article search process was carried out between 2020-2021 using databases from PubMed, Science direct, and Google Schoolar. The article search was carried out taking into account the eligibility criteria defined in the PICO model. Population= community. Intervention= use masks and wash hands. Comparison= do not use masks and wash hands. Outcome= infection with COVID-19. The keywords used are "face mask OR wearing mask AND hand hygiene OR hand washing AND coronavirus OR covid19 OR SAR-CoV-2 AND adjusted odds ratio". Based on the database, there are 17 articles that meet the inclusion criteria. The analysis was carried out using software RevMan 5.3.
Results: Meta-analyses were conducted on 17 articles from Bangladesh, Ethiopia, Japan, China, Australia, Greece, Taiwan, and Ghana. The results of data processing show that using a mask can reduce 0.48 times than not wearing a mask at all, the results are statistically significant (aOR= 0.48; 95% CI= 0.31 to 0.76; p = 0.002) and hand washing can reduce 0.42 times than people who did not wash their hands at all with either soap or hand sanitizer, these results were statistically significant (aOR= 0.42; 95% CI= 0.26 to 0.68; p< 0.001).
Conclusion: The results of this meta-analysis concluded that the use of masks and washing hands during the pandemic can prevent the transmission of COVID-19.

Keywords: masks, wash hands, COVID-19.

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Cite this as:
Siswanto A, Murti B, Prasetya H (2022). Face Mask Wearing and Hand Washing Behavior on the Prevention of COVID-19 Infection: A Meta-Analysis. J Health Promot Behav. 07(03): 182-196. https://doi.org/10.26911-/thejhpb.2022.07.03.02.

BACKGROUND

The SARS-CoV-2 virus is an acute respiratory disease that is transmitted through droplets (Mboowa et al., 2021). Since the World Health Organization announced that COVID-19 was a pandemic and a global health threat (Howard, 2021) and the confirmed positive cases of COVID-19 continued to increase until December 29, 2021 which was published in the WHO Coronavirus (COVID-19) Dashboard, there were a total of cases in in the world 281,808,270 while

the total cases of death were 5,411,759 and in Indonesia the total cases were 4,262,351 while the total cases of death were 144,081.

The SARS-CoV-2 virus attacks the respiratory tract starting from the nasal cavity, mouth and then to the lungs. The SAR-CoV-2 virus grows along the walls of the respiratory tract and people whose bodies have been infected with the SARS-CoV-2 virus then cough, sneeze, talk where the virus that sticks to the respiratory tract will come out along with the splash of saliva that very small or known as droplets. The droplets spread outwards and can directly hit other people around the triangle of the face or the droplets that come out of the object and then unconsciously touch the object and touch the mouth, nose or eyes so that transmission occurs. And in preventing someone from contracting or infecting other people, the community wears a mask and washes hands using soap and running water is the most effective way to prevent transmission (Ministry of Health, 2020)

The use of masks and hand washing is an effort to control SAR-CoV-2 that has been implemented by most countries, and the practice of wearing masks and washing hands is highly recommended in controling infection and breaking the chain of transmission of COVID-19 (Li et al., 2020), In addition, the public to maintain distance, avoid crowds, limit activities except for security activities, markets and the use of masks is highly emphasized in breaking the chain of transmission of COVID-19 (Mboowa et al., 2021).

SUBJECTS AND METHOD

1. Study Design

In this study, the method of systematic review and meta-analysis was used. Research data was searched using in-search databases which included PubMed, Google Schoolar, and Science Direct. The keywords in the search were “face mask OR wearing mask AND hand hygiene OR hand washing AND coronavirus OR covid19 OR SAR-CoV-2 AND adjusted odds ratio”.

2. Inclusion Criteria

The inclusion criteria in this study were Full-text paper, the relationship measure used was AOR, English, Articles between 2020-2021, Intervention using masks and washing hands.

3. Exclusion Criteria

Exclusion criteria in this study were articles published not in English, articles published before 2020, not multivariate analysis studies.

4. Operational Definition of Variables

Article search using PICO. Population: community, Intervention: masks and washing hands, Comparison: not wearing masks and washing hands, Outcome: infected with COVID-19.

Mask is wearing a mask to protect yourself from the transmission of the COVID-19 virus, both cloth masks, surgical masks, N95 masks, KN 95, KF95 with categorical measurement scales.

Washing hands are people who wash their hands with soap or hand sanitizer or alcohol-based to prevent the transmission of COVID-19 with a categorical measurement scale.

5. Instruments

This study uses PRISMA flow diagrams and assessment of article quality using the Critical Appraisal from the Centre for Evidence Based Medicine (CEBM, 2014).

6. Data Analysis

Data processing using analysis software, namely Review Manager 5.3 (RevMan 5.3). To show heterogeneity and relationship of sample size, forest plots and funnel plots were used. In the meta-analysis, two models can be selected, namely fixed effect and random effect. If I^2 <50%, it is considered homogeneous and uses a fixed effect. If

I^2>50%, then heterogeneity is very high, and we have to use random effects model for meta-analysis.

RESULTS

Process of searching article wascarried out by searching several journal databases PubMed, Science Direct, Scopus, and Google Schoolar it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

The initial search process resulted in a total of 998 articles, after deleting the duplicated articles, 752 articles were found, of which 183 articles were eligible for a full text review. A total of 17 articles that meet the criteria according to the quantitative synthesis meta-analysis.

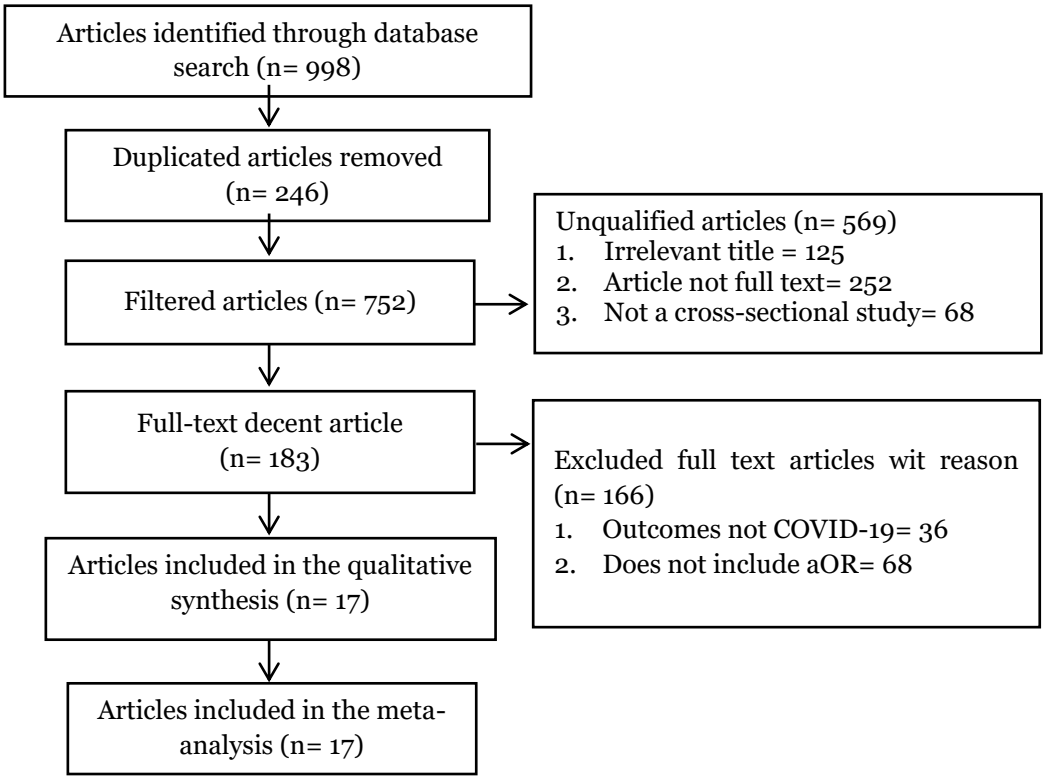

Figure 1. Results of Prisma Flow Diagrams

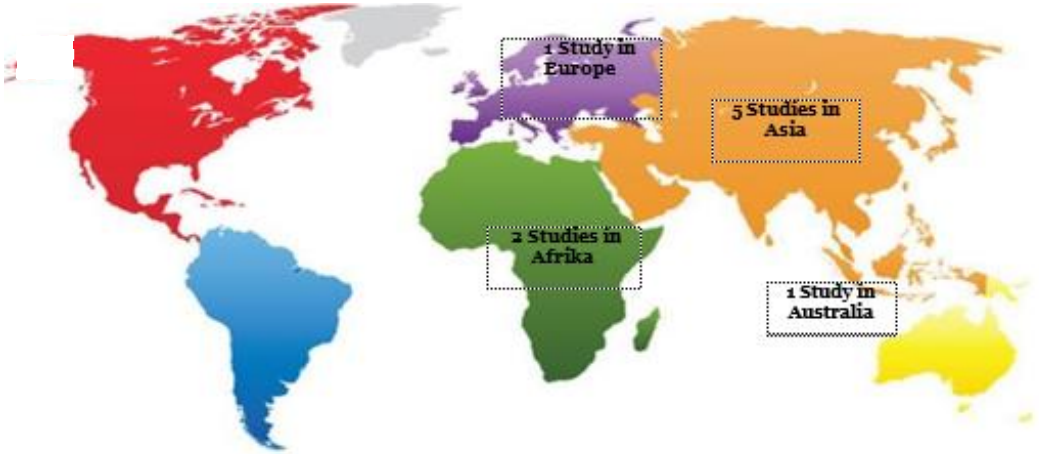

Figure 2. Resarch Distribution Map

Figure 1. Research related to face mask wearing and hand washing behavior on the prevention of COVID-19 infection consisted of 17 articles from the initial search process yielding 998 articles, after the deletion process, articles were published with 183 requirements for full-text review more carry on. A total of 17 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 five continents such as Europe, Asia, Afrika and America.

An assessment of the quality of the articles the effect of wearing a mask on the prevention of COVID-19 used in this study can be seen in table 1, and the effect of using hand washing on the prevention of COVID-19 in table 2.

Then Table 3 shows that 17 articles from a cross-sectional study provide evidence about face mask wearing and hand washing behavior on the prevention of COVID-19 infection, also in table 3 it can be seen about the details of the articles used in this study, such as the study population, intervention, comparison, and the results of each study. All articles used in this study are articles with a cross-sectional study design.

Based on the results of the forest plot (figure 3) of the cross-sectional study design, showed that using a mask can reduce COVID-19 infection by 0.48 times than not wearing a mask (aOR= 0.48; 95% CI= 0.31 to 0.76; p= 0.002). The heterogeneity of the data in the study showed I^2= 89% so that the distribution of the data was declared heterogeneous (random effect model).

In figure 4 it can be seen about the Funnel Plot from the results of the data analysis that has been carried out, where it can be seen that Figure 4 shows that there is a publication bias which is indicated by the asymmetry between the right and left plots where there are 2 plots on the left and 6 plots on the right. The graph on the left shows that the standard error is between 0.2 and 0.6 while on the right the standard error line is between 0 and 0.8.

Figure 5 is the results of the meta-analysis process can be seen from the forest plot, it showed that washing hands can reduce infection with COVID-19 by 0.42 times than not washing hands with (aOR= 0.42; 95% CI= 0.26 to 0.68; p < 0.001). The heterogeneity of the data in the study showed I^2= 67% so that the distribution of the data was declared heterogeneous (random effect model).

Based on Figure 6 there is no publication bias which is indicated by the symmetry between the right and left plots where there are 3 plots on the left and 3 plots. on the right and 2 plots in the center line. The graph on the left shows that the standard error is between 0 and 1.5, while on the right the standard error line is between 0 and 1.5.

Table 1. Assessment of study quality the effect of wearing a mask on the prevention of COVID-19.

No	Indicator	Publication (Author and Year)								
		Sharif *et. al.* (2021)	**Hassen *et. al.* (2021)**	**Ochi *et al.* (2021)**	**Pan *et al.* (2020)**	**Natnael *et al.* (2021)**	**Khalil *et al.* (2020)**	**MacIntyre *et al.* (2021)**	**Souliotis *et al.* (2021)**	**Cheng *et al.* (2021)**
1	Does this research clearly address the focused problem?	1	1	1	1	1	1	1	1	1
2	Was the group recruited in an acceptable way?	1	1	1	1	1	1	1	1	1
3	Is social support accurately measured to minimize bias?	1	1	1	1	1	1	1	1	1
4	Was the outcome (smoking habit) measured accurately to minimize bias?	1	1	1	1	1	1	1	1	1
5	Did the authors identify all the important confounding factors?	1	1	1	1	1	1	1	1	1
6	Was the subject follow-up complete enough? Was the follow-up of the subject long enough?	1	1	1	1	1	1	1	1	1
7	Are the results of this study reported in aOR?	1	1	1	1	1	1	1	1	1
8	What is the precision of the result?	1	1	1	1	1	1	1	1	1
9	Do you believe the results?	1	1	1	1	1	0	1	0	1
10	Can the results be applied to local residents?	1	1	1	1	1	1	1	1	1
11	Are the results of this study consistent with other available evidence?	1	0	1	1	1	1	1	1	0
12	What are the implications of this research for practice?	1	1	1	1	1	1	1	1	1
	Total	**12**	**11**	**12**	**12**	**12**	**11**	**12**	**11**	**11**

Table 2. Assessment of study quality of the effect of using hand washing on the prevention of COVID-19.

No	Indicator	Publication (Author and Year)							
		Adola *et al.* (2021)	**Ameme *et al.* (2021)**	**Atnafie *et al.* (2021)**	**Sharif *et al.* (2021)**	**Baye *et al.*(2021)**	**Ochi *et al.* (2021)**	**Pan *et al.* (2020)**	**Khalil *et al.* (2020)**
1	Does this research clearly address the focused problem?	1	1	1	1	1	1	1	1
2	Was the group recruited in an acceptable way?	1	1	1	1	1	1	1	1
3	Is social support accurately measured to minimize bias?	1	1	1	1	1	1	1	1
4	Was the outcome (smoking habit) measured accurately to minimize bias?	1	1	1	1	1	1	1	1
5	Did the authors identify all the important confounding factors?	1	1	1	1	1	1	1	1
6	Was the subject follow-up complete enough? Was the follow-up of the subject long enough?	1	1	1	1	1	1	1	1
7	Are the results of this study reported in aOR?	1	1	1	1	1	1	1	1
8	What is the precision of the result?	1	1	1	1	1	1	1	1
9	Do you believe the results?	1	1	1	1	1	0	1	0
10	Can the results be applied to local residents?	1	1	1	1	1	1	1	1
11	Are the results of this study consistent with other available evidence?	1	0	1	1	1	1	1	1
12	What are the implications of this research for practice?	1	1	1	1	1	1	1	1
	Total	**12**	**11**	**12**	**12**	**12**	**11**	**12**	**11**

Table 3. 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 (95 % CI)
1	Sharif (2021)	Bangladesh	Cross-Sectional	1,690	Society of men and women	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.04 (0.02 to 0.43)
2	Hassen (2021)	Ethiopia	Cross-Sectional	413	Bank Workers	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.48 (0.22 to 1.04)
3	Ochi (2021)	Japan	Cross-Sectional	13,277	People aged 18-74 years	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.66 (0.17 to 2.55)
4	Pan (2020)	China	Cross-Sectional	3,035	Factory worker age 18 years	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.71 (0.50 to 0.99)
5	Natnael (2021)	Ethiopia	Cross-Sectional	417	Taxi Driver	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.81 (0.39 to 1.69)
6	Khalil (2020)	Bangladesh	Cross-Sectional	190	Hospital Doctor	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.37 (0.15 to 0.87)
7	MacIntyre (2021)	Australia	Cross-Sectional	2,343	People aged 18 years	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.85 (0.63 to 1.14)
8	Souliotis (2021)	Yunani	Cross-Sectional	923	People aged 17 years	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.54 (0.36 to 0.80)
9	Cheng (2021)	Taiwan	Cross-Sectional	1,075	People aged 20 years	Wearing a Mask	Not Wearing a Mask	COVID-19 prevention	0.83 (0.70 to 0.99)
10	Adola (2021)	Ethiopia	Cross-Sectional	281	Health workers	Washing hands	Not Washing Hands	COVID-19 prevention	0.04 (0.01 to 0.23)
11	Ameme (2021)	Ghana	Cross-Sectional	800	shop customer	Washing hands	Not Washing Hands	COVID-19 prevention	0.10 (0.01 to 0.59)
12	Atnafie (2021)	Ethiopia	Cross-Sectional	418	Health workers aged 18-54 years	Washing hands	Not Washing Hands	COVID-19 prevention	0.44 (0.20 to 0.97)
13	Sharif (2021)	Bangladesh	Cross-Sectional	1,690	Society Men and women	Washing hands	Not Washing Hands	COVID-19 prevention	0.46 (0.27 to 0.78)

No	Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	aOR (95 % CI)
14	Baye (2021)	Ethiopia	Cross-Sectional	384	Pharmacy Officer at RSU	Washing hands	Not Washing Hands	COVID-19 prevention	0.98 (0.52 to 1.85)
15	Ochi (2021)	Japan	Cross-Sectional	13,277	People aged 18-74 years	Washing hands	Not Washing Hands	COVID-19 prevention	0.10 (0.02 to 0.50)
16	Pan (2020)	China	Cross-Sectional	3,035	Factory Worker Age 18 Years	Washing hands	Not Washing Hands	COVID-19 prevention	0.58 (0.50 to 0.67)
17	Khalil (2020)	Bangladesh	Cross-Sectional	190	Hospital Doctor	Washing hands	Not Washing Hands	COVID-19 prevention	0.87 (0.21 to 3.65)

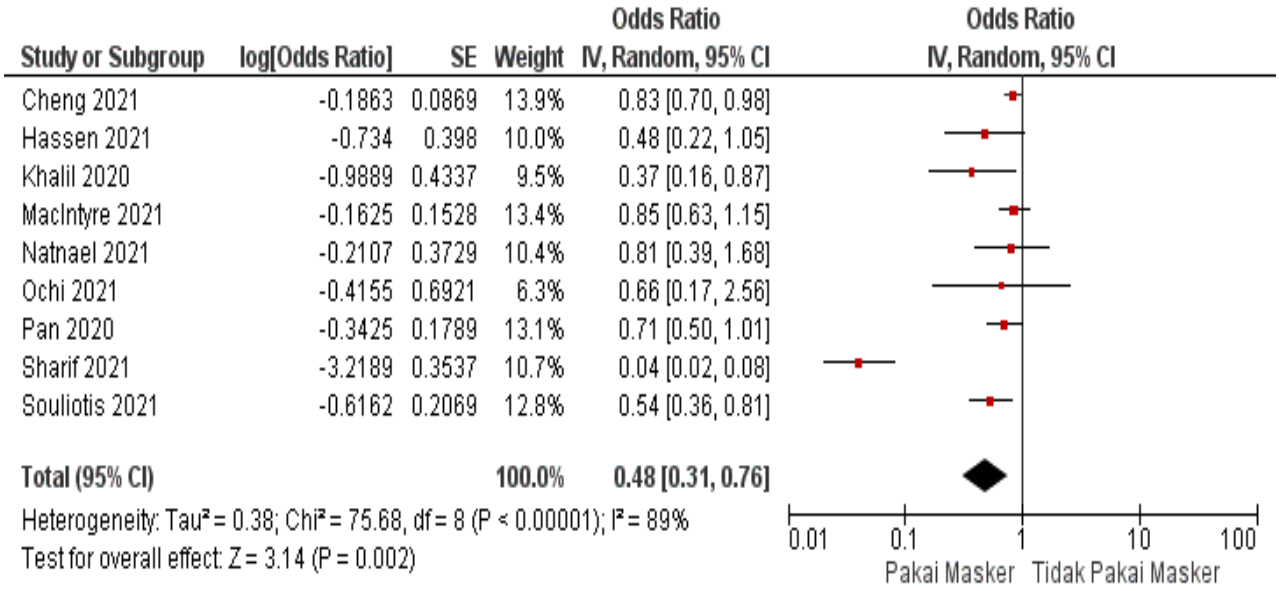

Figure 3. Forest plot the effect of wearing a mask on the prevention of COVID-19

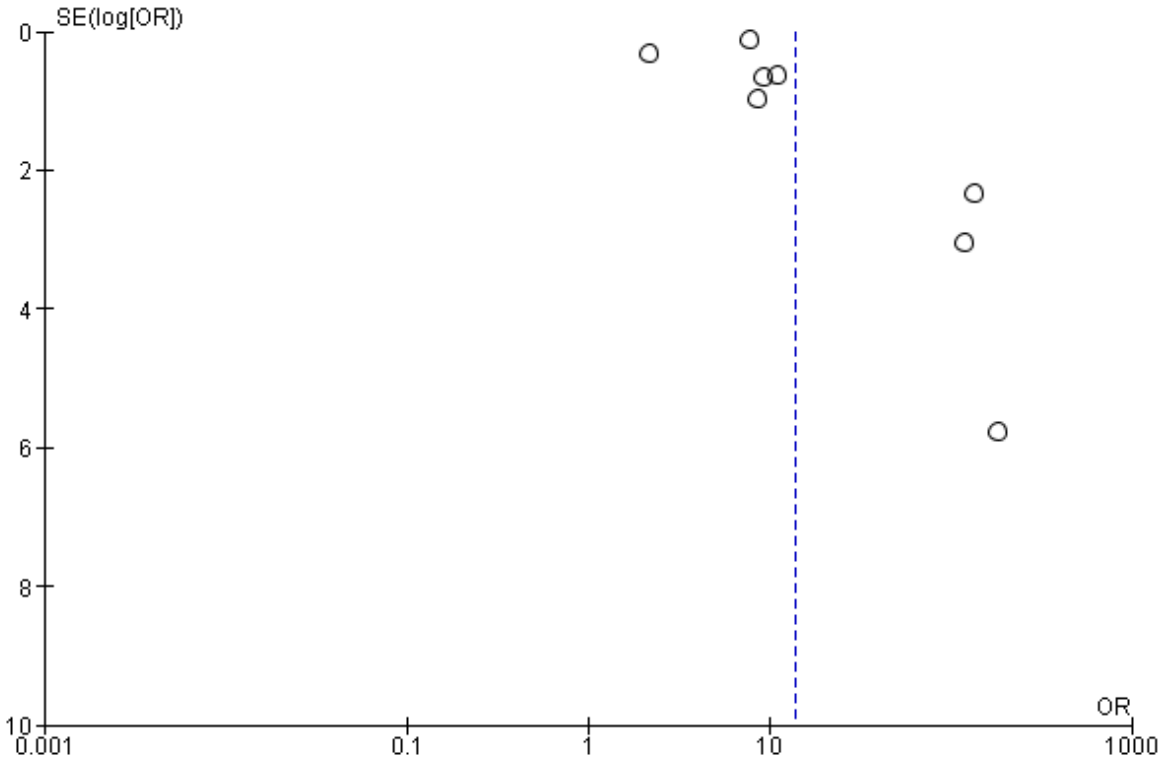

Figure 4. Funnel plot the effect of wearing a mask on the prevention of COVID-19

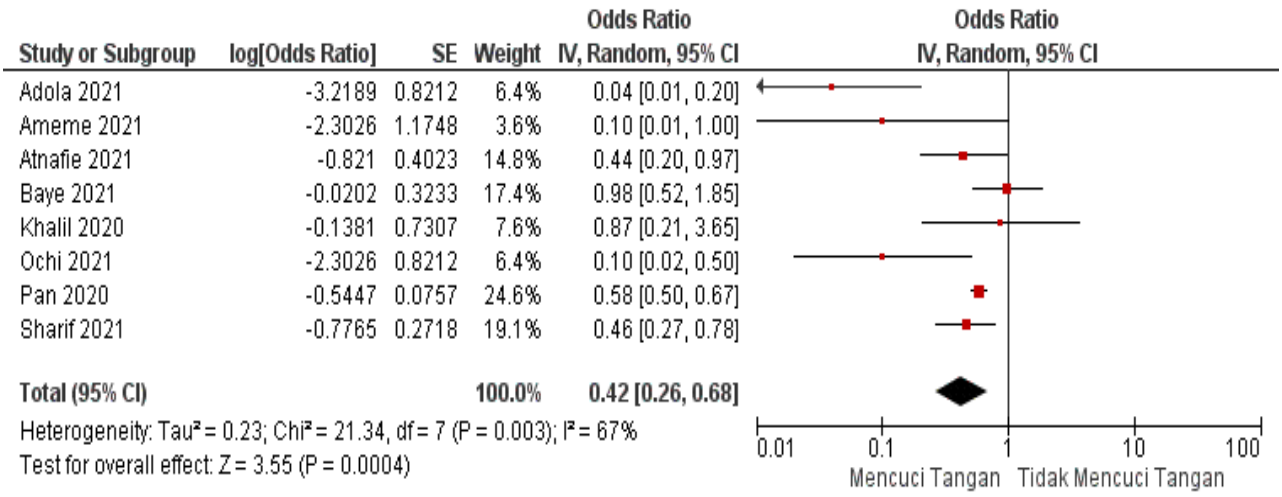

Figure 5. Forest plot the effect of hand washing on the prevention of COVID-19

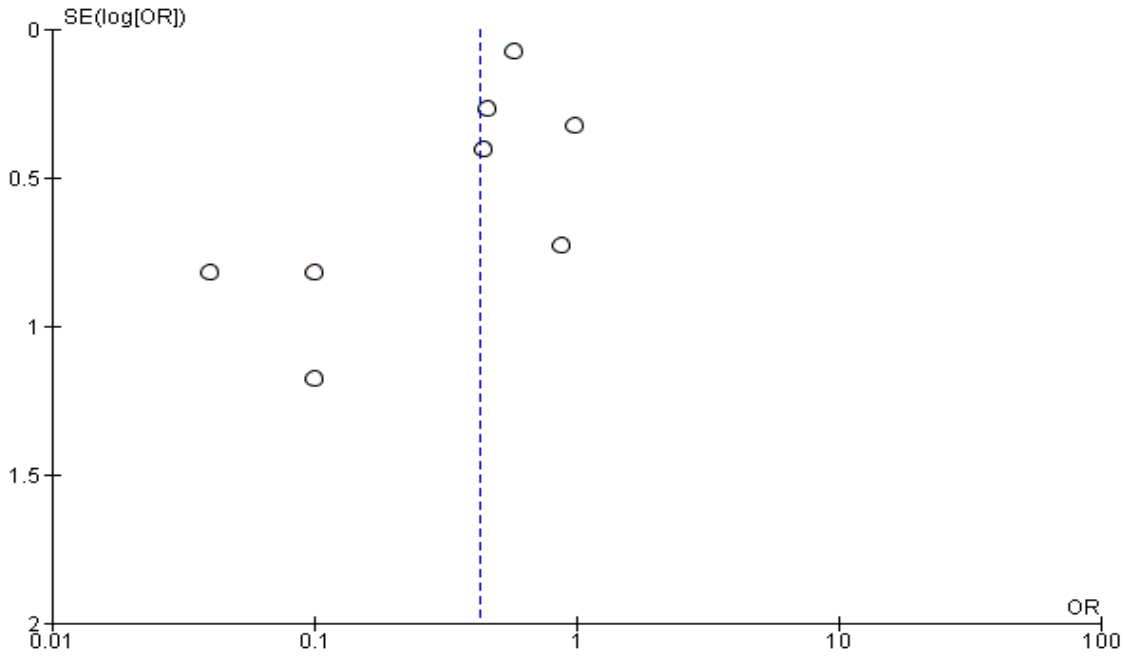

Figure 6. Funnel plot the effect of hand washing on the prevention of COVID-19

DISCUSSION

This study uses a meta-analysis to examine the effect of wearing masks and washing hands on the prevention of COVID-19. In the results of a study from Sharif (2021) involving 1,690 participants and a cross sectional study revealed that wearing a mask can reduce the risk of infection with COVID-19 0.04 times than those who do not wear a mask at all (aOR= 0.04; 95% CI= 0.02 to 0.43; p= 0.005).

The results of research from Khalil (2020) explained that in his research on doctors who worked in health facilities in Bangladesh. Conducted from May to June 2020 involving 190 doctors working in

health care facilities using masks can reduce the risk of COVID-19 transmission by 0.37 times compared to those who do not wear masks at all with values (aOR= 0.37; 95% CI= 0.159 to 0.873; p= 0.021).

Another study, Cheng (2021) explained that in his research randomly with interviews about positive behavior and knowledge of COVID-19 that were selected randomly by involving 1,075 respondents, the use of masks could reduce the transmission of COVID-19 by 0.83 times compared to those who did not. wearing a mask with values (aOR= 0.83; 95% CI= 0.70 to 0.99; p= 0.040).

In the results of research from Adola (2021) it was explained that people who frequently washed their hands 0.04 times were less likely to be infected with COVID-19 than those who did not wash their hands at all with a value (aOR= 0.04; 95% CI= 0.01 to 0.24; p= 0.001) and was carried out involving 281 respondents to health workers at health facilities in the Guji Barat region, Southern Ethiopia.

Research from Ameme (2021) involving 777 respondents revealed that washing hands reduces the risk of contracting COVID-19 by 0.1 times compared to those who do not wash their hands at all with values (aOR = 0.10; 95% CI= 0.01 to 0.59; p= 0.010) used to determine compliance in preventing and controlling infection with COVID-19, especially in washing hands, wearing masks in the Greater Accra region, Ghana.

The results of the study from Atnafie (2021) explained that washing hands can reduce the risk of contracting COVID-19 by 0.44 times compared to those who do not wash their hands at all with a value (aOR= 0.44; 95% CI= 0.20 to 0.95; p= 0.036). The study involved 418 participants in health workers in the Amhara region, Ethiopia.

The results of Ochi's research (2021) explained that washing hands during the COVID-19 pandemic could reduce the occurrence of COVID-19 infection by 0.10 times compared to those who did not wash their hands at all with values (aOR= 0.10; 95% CI = 0.02 to 0.56; p = 0.010). in this study involved 13,277 participants.

Another supporting study in the Pan study (2020) explains that hand washing can reduce the risk of transmitting COVID-19 by 0.78 times compared to those who do not wash their hands at all with values (aOR = 0.58; 95% CI = 0.50 to 0.68; p < 0.001).

AUTHOR CONTRIBUTION

Andi Siswanto is the main researcher, seeking and collecting research materials. Bhisma Murti and Hanung Prasetya analyze data and review research documents.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

ACKNOWLEDGMENT

We thank the database providers from Google Scholar, Pubmed, and Science Direct.

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