

ANALYSIS FACTOR OF DIARRHEA WITH LATRINE OWNERSHIP AND CLEAN WATER AVAILABILITY IN INDONESIA: META ANALYSIS 2016-2021

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ABSTRACT

Analysis Factor of Diarrhea with Latrine Ownership and Clean Water Availability in Indonesia: Meta Analysis 2016-2021. The study examines the relationship between Diarrhea, Latrine Ownership, and Clean Water Availability in Indonesia, specifically focusing on 2016 to 2021. According to the 2018 RISKESDAS, the age group with the highest diarrhea prevalence, as health workers diagnosed, was 1 to 4 years (1.5%), followed by infants (9%). West Java Province had the highest prevalence of diarrhea by province, with a rate of 186.809. The purpose is to analyze data related to latrine ownership and the availability of clean water about the incidence of diarrhea in Indonesia. The method is meta-analysis. We used a cross-sectional approach to collect secondary data from articles from March to April 2023. The results show that ownership of a latrine that does not meet the requirements is 2,013 times more likely to cause diarrhea than ownership of a latrine that meets the requirements. From the results of the meta-analysis of the variable availability of clean water, it is known that the availability of clean water that does not meet the requirements is 1,858 times more at risk of causing diarrhea than the availability of clean water that meets the requirements. The conclusion is that the variable that has the most significant influence on latrine ownership and the availability of clean water is latrine ownership. We suggest minimizing risk factors by counseling the community, emphasizing the importance and benefits of having healthy latrines that meet requirements and the availability of clean water to prevent diarrheal disease.

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INTRODUCTION

Health is the most important thing for humans, but people often don't realize it or even ignore it. Both internal and external factors influence human health. Health has an important meaning for humans, who are often not aware that all activities of daily life can take place optimally if the human body is in good health. According to Law Number 36 of 2009, the definition of health is a healthy state both physically, spiritually, mentally, and socially, which allows everyone to live productively both socially and economically. If someone experiences health problems or illness, it can affect productivity and daily activities. Diarrhea is defined

as bowel movements or defecation with a more liquid stool consistency that occurs more than three times a day, with the exception of newborns or babies less than one month who are breastfed, who typically defecate about five to six times a day with consistency, both of which are considered normal ⁽¹⁾. Diarrheal disease is an endemic disease that has the potential to cause extraordinary events (KLB), which are often followed by death in Indonesia ⁽²⁾. Diarrheal disease is closely related to basic sanitation conditions; if basic sanitation is poor, then there is a risk of causing diarrhea ⁽³⁾. Factors that have the most potential to cause diarrhea are food sanitation, hygiene, water, and family latrines ⁽⁴⁾.

According to the WHO, diarrhea is the second-leading cause of death in children after pneumonia. Every year, there are 1.7 billion children who experience diarrhea, and at least 525,000 dies from diarrhea ⁽⁵⁾. There are 760,000 deaths of children under five each year, especially in countries with low-income levels ⁽⁶⁾. Based on data from the Directorate General of Public Health, Ministry of Health of the Republic of Indonesia in 2019 and the 2020 Ministry of Health, it is known that diarrhea is the most common cause of death among children under five (12–59 months) in Indonesia. According to the 2018 RISKESDAS, the age group with the highest prevalence of diarrhea based on a diagnosis by health workers occurs at the age of 1 to 4 years at 11.5% and in infants at 9%. The age group of 75 years and older also has a high prevalence of 7.2%. While the prevalence of diarrhea is relatively higher in women, rural areas, low-educated people, and fishermen compared to other groups, According to RISKESDAS data for 2018, the province with the highest prevalence of diarrhea was West Java Province, with 186,809. West Java Province in Indonesia has the highest prevalence of diarrhea among toddlers, with a rate of 17,228. According to statistical tests, there is a significant correlation between the ownership of latrines and the incidence of diarrhea. This is because latrines are difficult to flush out with water, and faeces, if not stored and processed in a closed manner, are easily accessible to the diarrheal disease vector. This vector can then land on food or drink, potentially contaminating it ⁽⁷⁾.

According to Notoatmajo (2011), factors that can cause diarrhea include the availability of clean water, the availability of latrines, the habit of washing hands with soap and running water, personal hygiene, ownership of landfills and sewerage (SPAL), socio-economic conditions, education, and societal behavior ⁽⁸⁾. The availability of latrines is considered a crucial factor, as research by Pertiwi in 2019 revealed that residents without latrines are more susceptible to diarrhea than those with family latrines ⁽⁹⁾. Owning a latrine is extremely important because it can prevent the development of various diseases, such as digestive tract diseases caused by human waste or feces that cannot be managed properly ⁽¹⁰⁾. The benefits of owning a latrine include its ability to prevent diarrheal disease, prevent water and environmental pollution, maintain aesthetics and odors, and prevent the growth of germs, insects, and disease vectors ⁽¹¹⁾. Healthy latrines must not contaminate the soil surface around them, not contaminate groundwater, not cause unpleasant odors, and not become breeding grounds for insects and disease vectors ⁽¹²⁾.

One of the dominant factors causing diarrhea is the availability of clean water. If clean water is polluted by diarrhea germs and accumulated by unhealthy behaviour, it can cause diarrhea. In addition, clean water facilities that do not meet the requirements can also have an impact on the incidence of diarrhea ⁽¹³⁾. Water is a source of disease because disease vectors, especially diarrhea, multiply and spread quickly through it; therefore, household water must be of good quality ⁽¹⁴⁾. Clean water facilities must meet health requirements, such as dug wells with walls and a well lip within ± 10 meters of livestock pens; apart from that, they must also have separate wastewater disposal channels ⁽¹⁵⁾. The majority of diarrhea is caused by a bacterial infection that is transmitted via the fecal-oral route. Diarrhea can be transmitted through fluids contaminated with feces ⁽¹⁶⁾. This study aimed to analyze the impact of latrine ownership on the incidence of diarrhea, the relationship between the availability of clean water and diarrhea, and the sensitivity of these factors to the incidence of diarrhea in Indonesia.

MATERIALS AND RESEARCH METHODS

This research uses the meta-analysis method. The meta-analysis method is a method that combines two or more similar research results in order to obtain a combination of quantitative data with the same hypothesis to reach a conclusion. The technique used in summarizing the meta-analysis was derived quantitatively from various research results by looking for a summary value or effect size ⁽¹⁷⁾. The literature used in this study is related to the factors of latrine ownership and the availability of clean water in relation to the incidence of diarrhea in Indonesia. This study uses secondary data. The main data source in this study is data obtained from a number of articles and journals obtained from Google Scholar (2016–2021) and Science Direct (2016–2021).

The search was conducted using the following keywords: "incidence of diarrhea," "latrine ownership," "clean water availability," "latrine ownership and area," "clean water availability and area," and "sanitation." The population used in this study consists of international and national research articles that are related to the research objectives. The selected article is an article that examines the factors of latrine ownership and the availability of clean water in relation to the incidence of diarrhea in Indonesia. The selection of both journals and articles is necessary for conducting meta-analytic research, specifically:

1. Search journal articles

In searching for journal articles, the keyword used to search for articles is the PICOS method ⁽¹⁷⁾. The acronym PICOS stands for population or problem, intervention or indicator, comparison, results, and study design.

2. Method of collecting data

If the data collection method has been obtained, it must be selected first based on clear inclusion and exclusion criteria. The journal articles to be reviewed are in Indonesian and English. The research focuses on the ownership of latrines and the availability of clean water in relation to the incidence of diarrhea in Indonesia. The articles used as data were published in 2016–2021. After searching, filtering is carried out according to the abstract analysis. In the screening process based on abstracts, the completeness of articles also needs to be selected, as does the exclusion of articles that are not in full text condition. After that, the articles will be re-screened based on the research study design. In this study, only articles with a cross-sectional study design were used.

3. Data Type

Secondary data from selected research articles that have been filtered is used. In this study, the incidence of diarrhea in Indonesia is the dependent variable. The independent variables in this study are latrine ownership and clean water availability.

4. Data analysis technique

There are four stages involved in conducting a meta-analysis of data:

A. Data abstraction

From each research article, information and data will be obtained. After that, the data is changed and inputted in a uniform table format, including the year of publication, presentation, location, research design, and results of each study.

B. Data analysis

Data analysis was performed using the fixed effect model or the random effect model with JASP software. JASP software was used to perform data meta-analysis. The results of processing the received data will be presented as a forest plot graph, which illustrates the combined effect size of each of the variables studied.

C. Publication Bias Test

To identify publication bias in this study, the funnel plot technique was used.

D. Sensitivity Test

To prove that the results of the meta-analysis are relatively stable against changes, a sensitivity test is carried out. The sensitivity test in this study compared the results obtained from the analysis using the fixed effect model with those obtained from the analysis using the random effect model.

The articles that have been collected will be synthesized to obtain data that can fulfil the objectives of this research. We will compile and analyze the data to provide problem-solving material for the meta-analysis. The flowchart (prism) below illustrates the process of conducting a literature search for data collection.

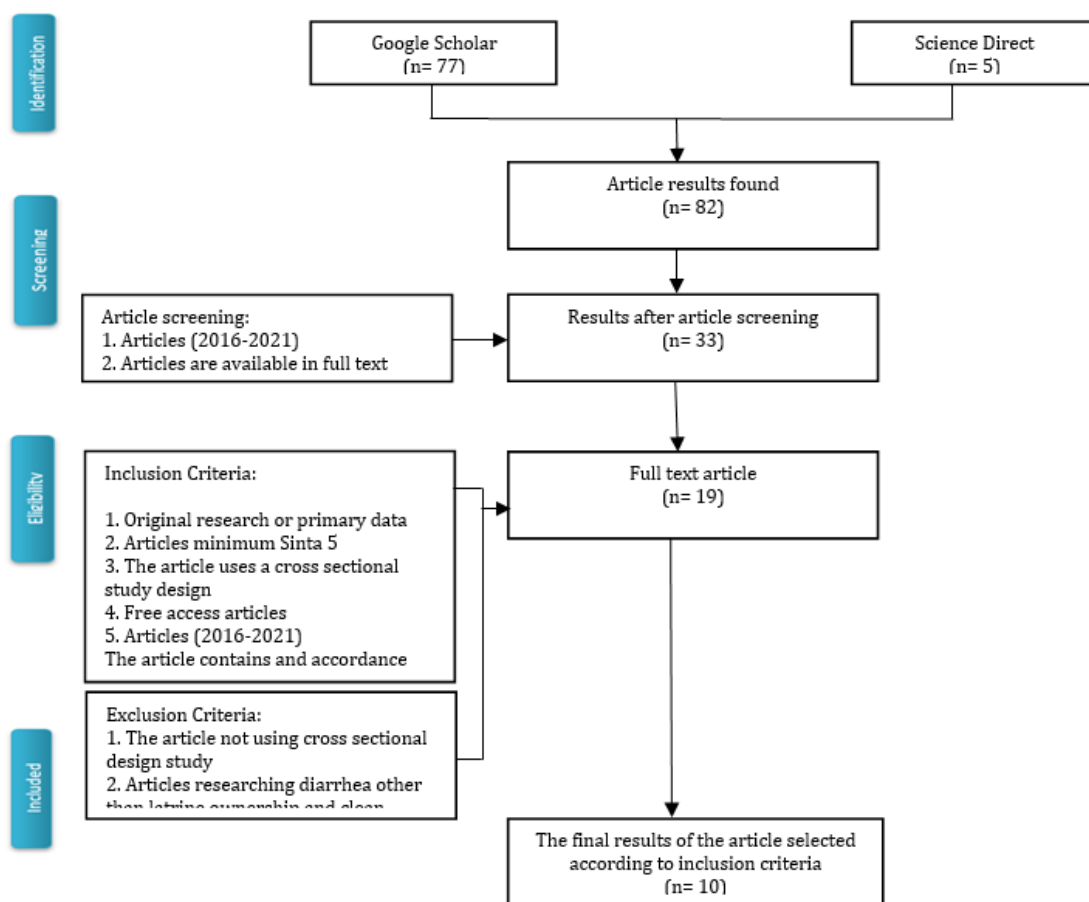


Figure 1. Prism Flowchart of Factor Analysis of Latrine Ownership and Availability of Clean Water with Diarrhea in Indonesia

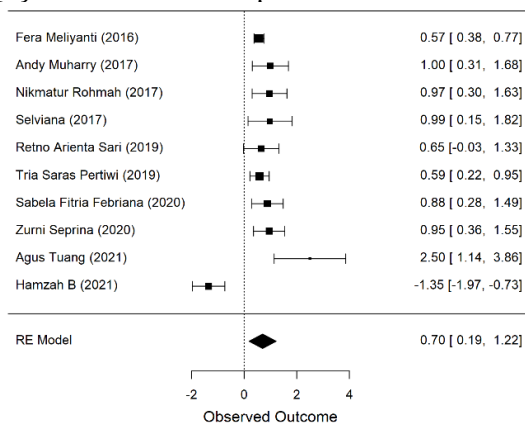
After the articles were obtained, a data meta-analysis of 10 research articles was carried out. To obtain an estimate of the pooled odds ratio, data meta-analysis was performed using the Mentel-Haenzel method for the fixed effect analysis model and the DerSimonian-Laind method for the random effect model analysis. If the variation between variables is known and the heterogeneity p value is greater than 0.05, then it is said to be homogeneous. Meanwhile, if it is known that the p-value of heterogeneity is less than 0.05, then it is heterogeneous, and the analysis model used is the random effects model. The meta-analysis used to calculate the prevalence ratio (PR) looks like this:

1. If the PR value is > 1 and the degree of confidence is less than 1, then this variable is a risk factor between latrine ownership, clean water availability, and the incidence of diarrhea.
2. If the PR value is < 1 and the degree of confidence is not greater than 1, then this variable is a protective factor between latrine ownership and clean water availability with the incidence of diarrhea.
3. If the PR value is 1 and the degree of confidence is not greater than 1, then this variable has nothing to do with the incidence of diarrhea.

RESEARCH RESULTS AND DISCUSSION

Ownership of Latrine and Availability of Clean Water with Diarrhea in Indonesia

(A) Latrine Ownership Variable



(B) Clean Water Availability Variable

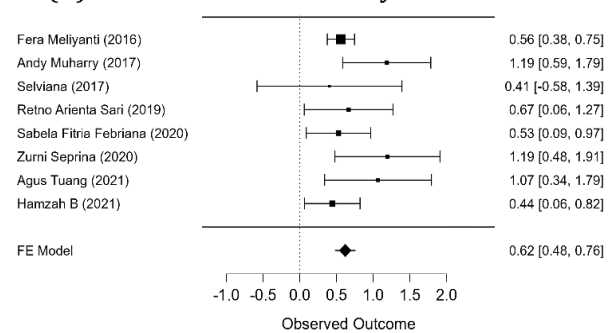


Figure 2. (a) Forest Plot of Latrine Ownership Factors with Diarrhea Figure 2(b) depicts the Forest Plot of the Clean Water Availability Factor. The RE model, or FE model, represents the prevalence ratio and has a 95% CI value.

A. Meta-Analysis of Latrine Ownership and Diarrhea Incidence in Indonesia

Table 1. Meta-Analysis Heterogeneity Test of Latrine Ownership with Diarrhea in Indonesia

	Q	df	p
Omnibus test of Model Coefficients	7.097	1	0.008
Test of Residual Heterogeneity	51.211	9	< 0.001

Notes. P-values are approximate

Table 1 of the heterogeneity test reveals a p-value of 0.001, which is less than 0.05. This value indicates that the variance between studies is heterogeneous, leading to the use of a random effect model in this study. Based on the results of the forest plots in Figure 2 point A, it is known that the pooled PR value is $e^{0.70} = 2.013$ (95% CI 0.19–1.22), so it can be concluded that ownership of a latrine that does not meet the requirements has a 2,013 times greater risk of experiencing diarrhea compared to ownership of latrines that meet the requirements, with a CI value of 95% not exceeding 1 so that there is a statistically significant difference between the case group and the control group.

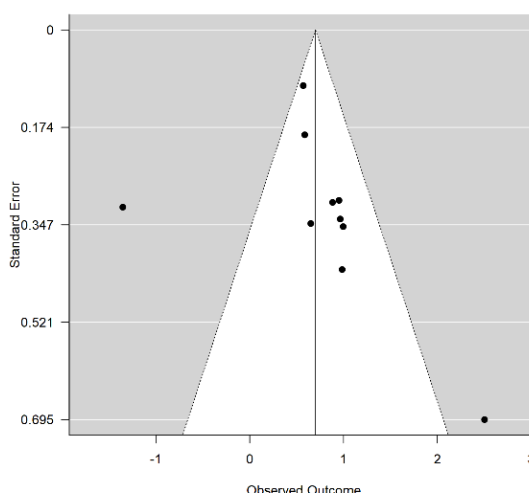


Figure 3. Funnel Plot of Factors Availability of Clean Water with Diarrhea in Indonesia

Based on Figure 3 it is known that the results of the funnel plot contain 2 black circles outside the triangular lines. To test for asymmetry, proceed with the Egger test.

Table 2. Egger's Test Meta-Analysis of Availability Factors of Latrine Ownership with Diarrhea in Indonesia

Egger's test	Z	p-value
	1.527	0.127

According to the Egger test, a p-value of 0.127 is obtained, which is greater than 0.05, indicating that there is no indication of publication bias.

This research is in line with Rimbawati's research in 2019, which stated that there was a relationship between latrine ownership and the incidence of diarrhea, as indicated by the chi square test, p-value = 0.000 ≤ .05. It is known that the incidence of diarrhea is 1.3%. This is because throwing feces into the river can cause disease, and throwing feces in the open can be used by flies to lay eggs (18). According to Harokan's research in 2022, there was also a relationship between latrine ownership and the incidence of diarrhea in the working area of the Tanjung Agung Health Centre, as indicated by the chi square p test value of 0.000 (P < 0,05). The impact of open defecation is catastrophic for health. Ownership of a family latrine has a major impact on reducing the risk of diarrheal disease (19). Other studies also state that there is a relationship between latrine ownership and the incidence of diarrhea. Respondents who did not have latrines (36.7%) experienced more diarrhea. The study's results also show that the chi square test p-value is 0,018 ≤ 0,05, which means that there is a relationship between latrines ownership and the incidence of diarrhea in toddlers in the work area of the Tanah Pasir Health Centre in 2019 (20).

B. Meta-Analysis of Factors Availability of Clean Water with the Incidence of Diarrhea in Indonesia

Table 3. Heterogeneity Test Meta-Analysis of Availability of Clean Water with Diarrhea in Indonesia

	Q	df	p
Omnibus test of Model Coefficients	76.354	1	< 0.001
Test of Residual Heterogeneity	8.962	7	0.255

Notes. P-values are approximate

Notes. The model is estimated using the Fixed Effects method

Based on Table 3, we know that the p-value is 0,255, a value greater than 0,05, indicating homogeneity in the variation between studies. Therefore, this study employs the fixed effect model for analysis. It is known The results of Figure 2 forest plot point (B) reveal a pooled PR value of $e0,62 = 1,858$ (95% CI 0,48–0,76). This suggests that the availability of clean water falls short of the required level, resulting in a diarrhea incidence that is 1,858 times higher than the availability of water net. The 95% confidence interval (CI) does not exceed 1, indicating a statistically significant difference between the case and control groups. ariable availability of clean water was not tested for publication bias because the data used in the meta-analysis was from less than 10 studies.

This aligns with previous research demonstrating a correlation between the availability of clean water and the incidence of diarrhea in Sei Kepayang Tengah Village, Asahan Regency, in 2020. This correlation is demonstrated by DF 1 at a significance level of 0,00, indicating a relationship between the availability of clean water and the incidence of diarrhea ⁽²¹⁾. According to Sari's research in 2019, there are still many respondents who have suggestions that clean water does not meet the requirements, namely that the SAB distance is less than 11 meters, and the water is still cloudy and dark in colour ⁽²²⁾. However, this is not in line with Hasanah's research in 2023, which states that there is no relationship between the availability of clean water and the incidence of diarrhea in the West Ampana work area because all research respondents have sufficient clean water, both from PDAM water and clean water wells in their respective homes. respondent. In addition, clean water is collected and stored in closed water reservoirs to reduce the possibility of contamination ⁽²³⁾. In another study, it was also explained that there was no relationship between the incidence of diarrhea and the availability of clean water, as indicated by the chi-square test with a p-value of 0,732 ⁽²⁴⁾. Another study showed that 56.3% of respondents did not have a closed water storage container, which caused a high incidence of diarrhea in Pecut Sei Tuan Village ⁽²⁵⁾.

Sensitivity Test of Risk Factors of Latrine Ownership and Availability of Clean Water with Diarrhea in Indonesia

A sensitivity test is used to identify heterogeneity, prove meta-analysis results are relatively stable, and interpret the effect of research quality.

Table 4. Comparison Sensitivity Test of Randomized Model Prevalence Ratio Pooled and Fixed Model

No.	Research Variable	N	Heterogeneity (P-value)	Fixed Effect Models		Random Model		Effect	
				PR	95% CI	PR	95% CI		
1.	Latrine Ownership with Diarrhea Incidence	10	0.001	1.786	0.44 – 0.72	2.013	0.19 – 1.22		
2.	Clean Water Availability with Diarrhea Incidence	8	0.255	1.858	0.48 – 0.76	1.896	0.48 – 0.81		

According to Table 4, the variable of latrine ownership has a pooled PR value of 2,013 (95% CI 0,19–1,22), which is higher than the variable of clean water availability's pooled PR value of 1,858 (95% CI 0,48–0,76). This means that the variable of latrine ownership is the most important factor between the variables of latrine ownership and the availability of clean water.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the meta-analysis of the variable latrine ownership, it is known that the latrine ownership factor that does not meet the requirements has a higher risk of causing diarrhea, 2,013 times greater than the latrine ownership factor that meets the requirements. The results of the meta-analysis on the variable availability of clean water reveal that the risk of diarrhea is higher when the availability of clean water does not meet the requirements, with the risk being 1.858 times higher than when the availability of clean water meets the requirements. condition. We did a sensitivity test above by comparing the pooled PR fixed model to the random model. The results showed that the latrine ownership variable has the most impact on the availability of clean water. This is because the pooled PR value of the latrine ownership variable, $e0,70 = 2,013$ (95% CI 0,19–1,22), is higher than the pooled PR value of the availability of clean water variable, $e0,62 = 1,858$ (95% CI 0,48–0,76)..

We can make efforts to reduce risk factors by educating the community about the importance and benefits of having healthy latrines that meet the requirements. Additionally, we can provide counseling and promote the availability of latrines and clean water to prevent diarrhea. It is better for every household to have a latrine and clean water that meet the requirements.

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