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DOI: [10.31965/infokes.Vol23.Iss4.1838](https://doi.org/10.31965/infokes.Vol23.Iss4.1838)Journal homepage: <https://jurnal.poltekkeskupang.ac.id/index.php/infokes>**RESEARCH****Open Access****Factors Associated with the Diarrhea Incident in Children Ages 12-59 Months****Sumarah^{1a*}, Salsabilla Jannah^{1b}, Yuliantisari Retnaningsih^{1c}, Sri Winarni^{2d}**¹ Department of Midwifery, Poltekkes Kemenkes Yogyakarta, Yogyakarta, Indonesia² Department of Public Health, Faculty of Public Health, Diponegoro University, Semarang, Indonesia^a Email: sumarahakbid@gmail.com^b Email: salsabillajannah09@gmail.com^c Email: sumarahakbid@gmail.com^d Email: salsabillajannah09@gmail.com

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Abstract

Diarrhea remains one of the leading causes of mortality among children under five years of age and ranks as the second most common cause of death among Indonesian children aged 12–59 months. Given its endemic nature and potential to cause outbreaks, identifying modifiable risk factors is essential for effective prevention. This study aimed to analyze factors associated with the occurrence of diarrhea among children aged 12–59 months in Bantul, Indonesia. An observational analytic study with a retrospective case–control design was conducted using purposive sampling. A total of 160 children aged 12–59 months were included, comprising 80 diarrhea cases and 80 controls. Data were collected from mothers using structured questionnaires, while children's nutritional status was assessed using the Growth Monitoring Card. Data analysis was performed using chi-square tests and multivariable logistic regression. The results demonstrated significant associations between diarrhea incidence and nutritional status ($p = 0.041$; OR = 2.343), economic status ($p = 0.024$; OR = 2.200), household water source ($p = 0.016$; OR = 1.209), hand-washing behavior ($p < 0.001$; OR = 3.646), and history of exclusive breastfeeding ($p < 0.001$; OR = 5.479). Multivariate analysis identified a history of exclusive breastfeeding as the strongest factor associated with diarrhea occurrence ($p < 0.001$; OR = 4.140; 95% CI: 1.938–8.843). In conclusion, diarrhea among children aged 12–59 months is significantly associated with nutritional status, socioeconomic conditions, water sources, hand hygiene practices, and exclusive breastfeeding history, with exclusive breastfeeding showing the greatest protective effect. Strengthening parental education and public health programs that promote exclusive breastfeeding is essential for reducing diarrhea incidence in young children.

Keywords: Children Aged 12-59 Months, Diarrhea, Hand Washing Practices, Exclusive Breastfeeding.

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1. INTRODUCTION

Diarrhea is among the top five causes of mortality among children under five years old, representing around 9% of all fatalities in this demographic worldwide. This indicates that almost 1,200 young infants die each day. The annual total approaches 444,000 children (UNICEF, 2024). In 2023, the incidence of child mortality under five years in Indonesia rose compared to the previous three years. Diarrhea is the second leading cause of mortality among children aged 12 to 59 months in Indonesia (Kementerian Kesehatan Republik Indonesia, 2024). The endemic disease diarrhea could trigger an outbreak. It's often associated with death, especially in developing countries like Indonesia (Wolfheim, Fontaine, & Merson, 2019).

The 2023 National Socio-Economic Survey Data revealed that the biggest proportion of health complaints is among children aged 0-4 years and the elderly aged 60 years and older. In children under five years of age, the immune system remains in development, with 37.40% experiencing health issues (Badan Pusat Statistik, 2023). Children may encounter a minimum of 2-3 episodes of diarrhea annually, which is an infection of the digestive system (Lita, Fradianto, & Tafwidhah, 2021). Diarrhea consistently ranks among the top ten illnesses with the highest incidence in Yogyakarta. The greatest incidence of child mortality in the 0-59 months age group was seen in Bantul (Dinas Kesehatan D.I. Yogyakarta, 2023).

Diarrhea in childhood may result in enduring health repercussions, such as stunted development and cognitive deficits. Diarrheal bouts may impede nutritional absorption and overall physical development (Manetu, M'masi, & Recha, 2021). A 2022 study identified a correlation between stunting and diarrhea, with a p-value of 0.007 (Irawan & Hastuty, 2022). Diarrhea may induce fluid imbalances that disrupt renal function and diminish blood volume, blood flow, hemoconcentration, and peripheral circulation. This results in dehydration. Severe dehydration is identified as a risk factor for mortality due to diarrhea. This revelation was not surprising, considering that toddlers with diarrhea often succumb to dehydration (Hartman et al., 2023).

Diarrhea in children under 5 is connected with a variety of distinct variables, both direct and indirect. The direct factors are direct sickness caused by bacterial, viral, and parasitic diseases. While the indirect determinants include socio-demographics, including the child's gender, child's age, mother's education, mother's age, and family income, history of breastfeeding, nutritional status, household water supply, sanitation, sites for defecation, and hand-washing practice (Saha et al., 2022). According to the results of a similar research performed by Fitriani et al., the determinants of diarrhea include exclusive breastfeeding, vaccination, home water supply, mother education, socio-economic status, and hand-washing habits (Fitriani, Darmawan, & Puspasari, 2021).

Understanding the determinants of diarrhea is crucial for diarrhea prevention among children under 5 years. It also enhances the awareness of parents and caregivers to safeguard the children from diarrhea. Socio-demographic variables such as having a child >12 months are 3.3 times more likely to have diarrhea (Mosisa et al., 2021). The purpose of this study is to identify the variables related to the incidence of diarrhea in children aged 12-59 months.

2. RESEARCH METHOD

In Bantul, Yogyakarta, this research was conducted during April and May of 2024. This observational research employed a case-control technique. An analytical observational study gives a retrospective description of the research methodologies used to discover the causes of episodes and correlations between variables. Children aged 12-59 months who resided within the service area of the public health clinics in Bantul made up the study's population. A purposive sampling strategy was adopted, comprising 80 samples in the case groups and 80 in

the control groups. The number of samples was selected using the Lemeshow hypothetical test calculation (Sugiyono, 2018).

Purposive sampling entails the evaluation of criteria to get representative samples for each case and control group (Sugiyono, 2018). Children between the ages of 12 and 59 months who had ever been diagnosed with diarrhea in the past 6 months were the samples for case groups. Otherwise, individuals who had never been diagnosed with diarrhea were the samples for the control groups. The inclusion criteria were children who were healthy at the time of data collection and who resided within the service area of the public health facilities in Bantul (Piyungan Health Center, Bantul I Health Center, Pleret I Health Center, Jetis I Health Center, and Sedayu II Health Center). Meanwhile, the exclusion criteria were children aged 12-59 months who had milk allergy, children with HIV/AIDS, and children whose moms had HIV/AIDS. Data on children aged 12-59 months, children with HIV/AIDS, and children whose mothers with HIV/AIDS were gathered from the health center's registration of children under five and verified with data from the questionnaire filled out by the mother. The questionnaire was administered by researchers to women with children aged 12-59 years who were assessed at the public health clinics and/or attended the integrated health post. It was also used to examine the history of milk allergy in children.

Nutritional status, economic position, household water supply, hand-washing behaviors, and history of exclusive breastfeeding were the independent factors of the research. The incidence of diarrhea among children aged 12-59 months was the dependent variable. Data were obtained using a standard questionnaire that has been verified for mothers with children aged 12-59 months. The Growth Monitoring Card in the Maternal and Child Health Book was utilized to determine nutritional status among children.

The study questionnaire was developed using a version of the National Basic Health research (Riskesdas) by the year 2018 questionnaire to evaluate the incidence of diarrhea, home water sources, hand-washing behaviors, and history of exclusive breastfeeding. The validity test was performed at Sewon II Health Center, which was believed to contain respondents with characteristics comparable to the target respondents of the research. Nutritionists were the collaborators who verified the questionnaire. The study questionnaire was reliable, as demonstrated by a Cronbach's alpha score of 0.650.

Chi-square and logistic regression were applied in the data analysis. Chi-square is a statistical tool used to test hypotheses between variables. The resultant odds ratio (OR) illustrates the comparison between the chances of something occurring in the risk group and the chances of something happening in the no-risk group. A multivariate study using logistic regression highlights variables connected to diarrhea. The research was accepted by the Poltekkes Kemenkes Yogyakarta ethics committee under permission number DP.04.03/E-kepk.1/412/2024.

3. RESULTS AND DISCUSSION

Children aged 12-59 months in the case group had ever been diagnosed with diarrhea. In the control group were non-diarrhea children. The factors associated with diarrhea were evaluated using chi-square, as shown in Table 1.

Table 1. The factors related to diarrhea in children aged 12-59 months

Variables	Diarrhea		Non-Diarrhea		p-value	OR	95% CI	
	n=80	%	n=80	%			Lower	Upper
Nutritional status								
Moderately underweight (-3 s.d. <-2 SD)	25	31.3	13	16.3	0.041*	2.343	1.096	5.005

Normal weight (-2 SD s.d. +1 SD)	55	68.7	67	83.7				
Economic status								
Below the Provincial Minimum Wage	55	68.7	40	50				
Above the Provincial Minimum Wage	25	31.3	40	50	0.024*	2.200	1.155	4.192
Household water source								
Poor	42	52.5	26	32.5				
Good	38	47.5	54	67.5	0.016*	2.296	1.209	4.360
Hand-washing practices								
Poor	52	65	27	33.7				
Good	28	35	53	66.3	0.000*	3.646	1.898	7.001
History of exclusive breastfeeding								
Poor	48	53.7	14	17.5				
Good	37	46.3	66	82.5	0.000*	5.479	2.653	11.313

Table 1 illustrates the distribution of children aged 12-59 months in the diarrhea and non-diarrhea groups depending on nutritional quality, economic position, home water supply, hand-washing behaviors, and history of exclusive nursing. Diarrhea is a digestive condition. It's characterized by an increased frequency of bowel motions. Children under 5 years are at the biggest risk for diarrhea. This is because they are developing and their immune system is still weak (Ugboko et al., 2020).

The normal weight among children aged 12-59 months was reported at 68.7% who had been diagnosed with diarrhea in the recent six months. While 83.7% had ever been diagnosed with diarrhea. While the majority of poor economic status with a household income below the Provincial Minimum Wage (<2.066.438,82) was 68.7% in the diarrhea group. Half of children aged 12-59 months who had an inadequate home water supply, with a proportion of 52.5% suffering diarrhea. Similarly, children who were not exclusively breastfed have been diagnosed with diarrhea at a frequency of 53.7%. The inadequate hand-washing habit was found to be high, with a proportion of 65% getting diarrhea.

The following characteristics were connected to diarrhea in children aged 12-59 months: nutritional level, economic position, home water supply, hand-washing behaviors, and history of exclusive breastfeeding as also can be shown in Table 1. The study findings, shown in Table 1, reveal a connection between nutritional status and diarrhea among children aged 12-59 months with a p-value of 0.041. This conclusion is consistent with recent research indicating a high association between children's nutritional status and the prevalence of diarrhea in those between the ages of 12 and 59 months (Hartati, Kamesyworu, & Elviani, 2023; Oktariana, et al, 2023).

This current investigation indicated that a high prevalence with a percentage of 83.7% was found among the youngsters with normal weight in the non-diarrhea group. Consistent with our data, research by Reni and Kurnia also indicated that a larger percentage of normal weight was identified among the children with non-diarrhea during the past 1 month (Sari & Agustin, 2023). Nutritional status may be determined by the body weight of the youngsters. The form of malnutrition is portrayed as being underweight, overweight, and obese. Children who are malnourished have reduced immune systems, which makes it difficult for them to fight off diseases. In general, being well-nourished offers the body the potential to protect itself against diseases (Morales et al., 2024).

The outcome of the chi-square statistical test association between economic level and diarrhea is a p-value of 0.024. Low economic status in this research was established based on a household income below the Provincial Minimum Wage (<2.066.438,82). Diarrhea in children between the ages of 12 and 59 months is connected with economic status. A link between socioeconomic class and diarrhea was identified in a similar research (Fauzi & Sari, 2020). Children under 5 with a lower wealth index had increased chances of diarrhea. Low-income households usually depend on poor sanitation, unimproved water sources, and insufficient nourishment. Children with these disorders are more vulnerable to infections, such as diarrhea (Demissie et al., 2021; Kurniawati & Astutik, 2023).

For the home water source variable, the findings indicated that household water source is related to diarrhea in children aged 12-59 months with a p-value of 0.016. Research using an examination of the Indonesian Health Demographic Survey's findings revealed that a clean water source is associated with diarrhea (Ramadhani, Muniroh, & Abihail, 2023). Improving access to a clean water source is essential for child health and preventing communicable diseases. It's associated with a reduction of diarrheal disease among children under 5 years (Merid et al., 2023). Access to a clean water source is also critical for maintaining good hygiene practices, such as hand-washing practices and washing utensils. Good washing of eating utensils properly is found to be associated with the amount of bacteria on eating utensils (Sinaga, 2013). Children can be exposed to bacteria remaining on eating utensils while eating. It may cause an illness in children under 5 years, which increases the risk of diarrhea.

Our findings, based on Table 1 with a p-value of 0.000, demonstrated that there is an association between hand-washing behaviors and diarrhea. This outcome is similar to the prior research in 2023. The research indicated that there is a link between hand-washing habits and the occurrence of diarrhea in children. Poor hygiene standards contribute to diarrhea in children under 5 years (Niska, Shifa, & Hartono, 2024). A study in Ethiopia revealed that hand-washing practice among mothers at a critical time was found to be low. Thus, the majority of them have poor hand-washing practices. The likelihood of daily hand-washing is predicted by the presence of a clean water supply close to the home (Agaro et al., 2022). It's indicated that various factors mutually affect the prevalence of diarrhea in children aged 12-59 months.

Diarrhea among children aged 12-59 months is also related to a history of exclusive breastfeeding, with a p-value of 0.000. This present study is similar to several studies that found that the history of exclusive breastfeeding is related to diarrhea (Hatta, 2020; Rafid, Sari, & Delima, 2022). In Indonesia, exclusive breastfeeding is recognized as a key factor in reducing diarrhea. Breast milk provides vital nourishment, strengthens the baby's immune system, and prevents illnesses like diarrhea. Additionally, it guards against contaminated foods (Santika et al., 2020).

The results of multivariate analysis using logistic regression highlight the factors linked to diarrhea in children between the ages of 12 and 59 months. In the multivariate analysis, factors associated with diarrhea that had a chi-square test p-value of <0.25 were included. Meanwhile, if sustainable, factors with a p-value of >0.25 may also be taken.

Table 2. Analysis of the most influential factors in diarrhea among children aged 12-59 months using logistic regression.

Variables	p-value	Exp (B)	95%CI	
			Lower	Upper
Hand-washing practices	0.011	2.479	1.228	5.006
History of exclusive breastfeeding	0.000	4.140	1.938	8.843
Constant	0.000	0.024	-	-

Table 2 demonstrated that a history of exclusive breastfeeding and hand-washing behaviors concurrently impacts diarrhea among children aged 12-59 months. This current

investigation indicated that the odds of people who are not exclusively breastfed and have inadequate hand-washing routines getting diarrhea are 50%. Whereas, the most important factor of diarrhea, as can be observed in Table 2. The most important factor is the history of exclusive breastfeeding, with a p-value of 0.000, OR 4.140 (95% CI 1.938-8.843). Children between the ages of 12 and 59 months who are not exclusively breastfed are 4.14 times more likely to suffer diarrhea than those who are. It's bolstered by a study's results revealing that infants who had not experienced exclusive breastfeeding for the first 6 months of their life were 4.7 times more likely to develop diarrhea as compared to children who had exclusive breastfeeding (Feleke, Legesse, & Abebe, 2022). Another study found higher odds of children with non-exclusively breastfed by 8 times having diarrhea (Sasmito et al., 2023).

History of exclusive breastfeeding has a substantial link with the prevalence of diarrhea in children under 5 years (Hatta, 2020). Breast milk includes lactoferrin, which are positively charged molecules, responsible for the capacity to bind many kinds of cells, nucleic acids, and several other proteins. Lactoferrin has the capacity to inhibit viruses and germs, including a lot of mucosal secretions that offer powerful defensive activities. Breast milk may protect against various illnesses and even avert some baby deaths. This is because breast milk has a long-term protective effect, and colostrum includes essential antibodies that make it exceedingly rare for pathogens to enter the child's body (Dewi, 2020; Telang, 2018). A previous study found that exclusive breastfeeding also influenced the nutritional status of children under 5 years. The majority of well-nourished children were exclusively breastfed (Aty, Herwanti, & Mochsen, 2021). As a result of this study, nutritional status is one of the factors related to diarrhea in children aged 12-59 months.

Analysis of hand-washing behaviors resulted in a p-value of 0.011, OR 2.479 (95% CI 1.228-5.006). Children aged 12-59 months with inadequate hand-washing routines are 2.48 more times likely to develop diarrhea. Similarly, a meta-analysis performed in Indonesia indicated a relationship between hand-washing behaviors and diarrhea. The risks of diarrhea were 2.89 for children who did not wash their hands properly compared to those who did (Wulandari et al., 2022). While the study in 2023 stated that mothers who have good hand-washing behavior tend not to experience diarrhea in their children 3 times more than mothers who have poor hand-washing behavior (Ilsa & Atzmardina, 2023).

Appropriate hand hygiene measures may save lives. Germs are typically spread via hands. Thus, the most critical step in limiting the transmission of hazardous germs is washing hands. Infections may be prevented by practicing regular hand-washing every day. By washing your hands, you may lessen your probability of having acute respiratory infections by 16–23%, pneumonia by 50%, neonatal infections by 48%, and diarrhea by 48%. It has been established that hand washing with soap for at least 40–60 seconds and by following all the guidelines is an effective technique to remove germs. This is vital to learn and grow accustomed to as a means to avoid disease, especially diarrhea (World Health Organization, 2022).

Numerous factors influence exclusive breastfeeding. A systematic review revealed that husband support is the factor most commonly found in some studies. The psychological aspect of the mother, which is the primary determinant in the success of breastfeeding, is how partner and family variables affect breastfeeding practice (Supriatin et al., 2024). Moreover, mothers' knowledge about exclusive breastfeeding was associated with exclusive breastfeeding. This indicates that knowledge about exclusive breastfeeding, which can protect from child disease, is essential for mothers and their families. Mothers with good knowledge tend to exclusively breastfeed their babies (Dukka, Talahatu, & Nur, 2022). The fact is that mothers serve as the primary caregivers and food handlers in the household.

Mothers and caregivers with appropriate hand-washing procedures may prevent the children from diarrhea. Despite this, youngsters should also be habituated to appropriate hand-washing procedures. It's crucial to wash hands after using the toilet, after assisting the kid with their bowel motions, before preparing meals, and before eating or feeding the child. Pathogens are typically extremely contaminated when food is produced in unhygienic environments. This pollution causes diarrhea and malnutrition among youngsters (Mosisa et al., 2021; Omona, et al., 2020). To lower the incidence of diarrhea in children under 5 years, it is necessary to encourage both exclusive breastfeeding and proper hand-washing practices.

Several limitations of this research must be addressed. The questionnaire was answered by the women with children aged 12-59 years when they visited the public health clinics and/or the integrated health post, who may be less concentrated on finishing the questionnaire. In addition, several of the items in the questionnaire require the mother's recall memory to complete them, which might have affected our findings.

4. CONCLUSION

Factors associated with diarrhea in young children include nutritional status, economic position, household water supply, hand-washing behaviors, and history of exclusive breastfeeding. Exclusive breastfeeding is the most crucial determinant of diarrhea. Children aged 12-59 months who are not exclusively breastfed have a risk of diarrhea by 4.14 times compared to children who are exclusively breastfed. Parents and caregivers need to be informed about exclusive breastfeeding techniques. Mothers with superior expertise are likely to nurse their newborns exclusively. Primary public health facilities and allied government agencies help to promote diarrhea prevention via exclusive breastfeeding. The outcomes of this research might be a reference for future study development. The next study may identify another cause of diarrhea and an effective way to lower the incidence of diarrhea in children aged 12-59 months.

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