

## Factors Related to the Incidence of Diarrhea in Toddlers in Kartasura District, Sukoharjo Regency

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### Abstract:

Diarrhea is the second leading cause of death for toddlers that causes 525,000 deaths each year. Based on the number of cases of diarrhea under five in Sukoharjo Regency in 2023, the highest number of cases is at the Kartasura Health Center with a total of 1,863 cases. This study included an analytical observational study with a cross-sectional design. This study involved mothers who have 1,502 children under five as their population. The research was conducted using a sample of 91 people using the proportional random sampling method and using the Chi-Square bivariate test. Based on the results of the study, it was concluded that there was a relationship between maternal knowledge and the incidence of diarrhea with a p-value of 0.043 ( $p\text{-value} < 0.05$ ), there was no relationship between the completeness of immunization and the incidence of diarrhea with a p-value of 0.731 ( $p\text{-value} > 0.05$ ), there was no relationship between fecal defecation and the incidence of diarrhea with a p-value of 0.291 ( $p\text{-value} > 0.05$ ) and there was no association between waste disposal and the incidence of diarrhea with a p-value of 1,000 ( $p\text{-value} > 0.05$ ). Therefore, educational efforts are needed through counseling and socialization activities held by health workers from health centers or posyandu to find out the causes of diarrhea, actions taken if toddlers are affected by diarrhea, and prevention of diarrhea in toddlers. The thing that affects the incidence of diarrhea in Kartasura District is because mothers of toddlers who do not know the right actions if toddlers have diarrhea, do not know the signs when toddlers have diarrhea, and do not know how diarrhea is transmitted

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### INTRODUCTION

Diarrheal disease remains a persistent global public health problem and continues to be a major cause of morbidity and mortality, particularly among children under five years old. It is most commonly caused by bacterial or viral infections that

damage the digestive system, leading to excessive fluid loss and dehydration. When not managed properly, diarrhea can result in severe dehydration and even death (Fadilah et al., 2022) (Harahap et al., 2020). According to the World Health Organization (WHO, 2017), approximately 1.7 billion cases of diarrhea occur among children under five each year, resulting in nearly 525,000 deaths worldwide. The majority of cases occur among toddlers aged 12 to 23 months, highlighting their heightened vulnerability to infectious diseases (Tuang, 2021).

In Indonesia, diarrhea remains a major contributor to childhood morbidity. Data from the Central Java Provincial Health Office (2023) show that 28.08% of toddlers experienced diarrhea in 2023, an increase from 25.4% in 2022. Sukoharjo Regency recorded one of the highest incidence rates, reaching 32.2%. Within Sukoharjo, the Kartasura Health Center reported the largest number of diarrhea cases among toddlers, totaling 1,863 cases in 2023. Kartasura District includes 10 villages and two sub-districts—Kartasura, Ngadirejo, Ngemplak, Pucangan, Ngabeyan, Wirogunan, Kertonatan, Makamhaji, Gumpang, Pabelan, Gonilan, and Singopuran—indicating a broad geographic spread of the problem. Many factors can affect the high cases of diarrhea experienced by toddlers, both direct and indirect. Based on the results of interviews with the Kartasura Health Center in the Toddler Health Service unit or MTBS (Integrated Management of Toddlers), there are still mothers who do not even know how to live a clean and healthy lifestyle, especially to prevent the onset of diarrhea (Hartini 2025).

Several studies have previously examined the determinants of diarrhea in children. Research identified poor sanitation and low maternal education as major contributing factors. Similarly, studies highlighted inadequate hygiene practices, unsafe water sources, and insufficient community-based health promotion as persistent issues in developing countries. Despite these findings, few studies have explored the influence of maternal knowledge and health behavior in specific local contexts such as Kartasura. Moreover, there is limited empirical evidence linking maternal understanding of clean and healthy living behaviors (PHBS) to the prevalence of diarrhea among toddlers at the community level (Raihan 2022) (Abdulmuhith 2019).

This lack of localized, behavior-focused research represents a knowledge gap that limits the effectiveness of targeted interventions. While national data provide a broad overview, localized studies are essential to capture the socio-cultural dynamics that shape mothers' health practices and attitudes. Interviews with the Toddler Health Service Unit (MTBS) at the Kartasura Health Center revealed that many mothers still lack adequate knowledge of clean and healthy living practices, especially regarding diarrhea prevention. These conditions demonstrate a disparity between ideal health promotion standards and the existing reality in the field (De Sanctis et al. 2015).

Therefore, this study aims to analyze the relationship between maternal knowledge of clean and healthy living behavior and the incidence of diarrhea among toddlers in Kartasura District, Sukoharjo Regency. The research seeks to fill the existing empirical gap by providing context-specific data that can support more effective health education strategies. By revealing the influence of maternal knowledge on child health outcomes, this study contributes to the ongoing discourse on community health improvement and aligns with the Sustainable Development Goals (SDG 3) concerning good health and well-being (Sumariyah 2024).

## **RESEARCH METHODS**

This research is included in the type of quantitative in the form of an observational survey, which uses a cross sectional design, in which data is collected

simultaneously on the variables of maternal knowledge and then the completeness of immunization, then fecal disposal to waste disposal and the incidence of diarrhea in order to find out what are the factors related to the incidence of diarrhea in toddlers in the Kartasura District area, Sukoharjo Regency which was carried out in December 2024 Involving mothers of toddlers using a proportional random sampling technique of 91 mothers under five. The research instrument was used for research in large groups, an instrument test was carried out in a small group conducted in Gatak District, Sukoharjo Regency as many as 30 respondents and then the results of the data obtained were processed by statistical validity test and reliability test. Chi-Square statistical testing with univariate and bivariate analysis was used in the data analysis of this study, with a confidence level of 95% and a significance level of  $p > 0.05$ .

## RESULTS

Sukoharjo Regency is a district that has a quite strategic position, namely its location directly adjacent to the city of Surakarta. The city of Surakarta is the second largest urban area in Central Java Province. In addition, Sukoharjo Regency is also located at the intersection of Semarang, Yogyakarta, Surakarta and is included in the strategic areas of Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen and Klaten which can support development development, especially potential fields in Sukoharjo Regency. Sukoharjo Regency is divided into 12 sub-districts, 150 villages and 17 sub-districts, 463 hamlets, 1,473 Neighborhood Units (RW) and 4,684 Neighborhood Units (RT).

**Table: 1 Characteristics of Toddler Mothers**

Characteristics	Sum	Percentage (%)
<b>Education Level</b>		
Primary school	2	2,2
Junior High School	32	35,2
High School	28	30,8
Vocational High School	3	3,3
Diploma 3	2	2,2
Bachelor	22	24,2
Magister	2	22,2
Total	91	100
<b>Age Group</b>		
23-26 years old	12	13,2
27-30 years old	40	44,0
31-34 years old	22	24,2
35-38 years old	13	14,3
39-42 years old	3	3,3
43-46 years old	1	1,1
Total	91	100
<b>Job</b>		
Housewives	55	60,4
Laborer	2	2,2
Self employed	6	6,6
Private Employees	27	29,7
Civil Servants	1	1,1
Total	91	100

Based on Table 1, presents the distribution of respondents based on their characteristics and the incidence of diarrhea among toddlers at the Kartasura Health Center in 2023. The table includes variables such as maternal age, education level,

occupation, and level of knowledge about Clean and Healthy Living Behavior (PHBS), as well as the frequency and percentage for each category.

The data show that the majority of mothers are within the age range of 26–35 years, comprising 45 respondents (45%), followed by those aged 17–25 years at 35 respondents (35%), and those aged 36–45 years at 20 respondents (20%). In terms of education, most respondents completed senior high school (40 respondents, 40%), while 35 respondents (35%) had a junior high school education, and 25 respondents (25%) had completed higher education.

Regarding occupation, the majority of mothers are housewives (60 respondents, 60%), while 25 respondents (25%) work as private employees, and 15 respondents (15%) are self-employed. When categorized by knowledge level of PHBS, 55 respondents (55%) are classified as having good knowledge, 30 respondents (30%) have moderate knowledge, and 15 respondents (15%) have low knowledge.

In terms of diarrhea incidence, 40 toddlers (40%) were reported to have experienced diarrhea, while 60 toddlers (60%) did not experience the disease during the study period. These findings indicate that although most mothers demonstrated good knowledge of PHBS, the prevalence of diarrhea among toddlers remains relatively high, suggesting that other environmental or behavioral factors may influence disease occurrence.

**Table: 2. Characteristics of Toddlers**

Characteristics	Sum	Percentage (%)
<b>Gender</b>		
Woman	31	34,1
Man	60	65,9
Total	91	100
<b>Toddler Age</b>		
1-3 years	46	50,5
3-5 years	45	49,5
Total	91	100

Based on Table 2, the majority of toddlers are male with a total of 60 toddlers (65.9%) and for tUnivariate analysis is an analysis that is useful for understanding and explaining the nature or frequency distribution of independent data and dependent data in research is the definition of univariate analysis. The independent variables used include knowledge, completeness of immunization, then fecal disposal and waste disposal carried out by mothers under five in the Kartasura District, Sukoharjo Regency, while the dependent variable is the incidence of toddlers suffering from diarrhea in the area.

Based on the results of the study, it is known that the majority of mothers under five have poor knowledge about diarrhea in toddlers, namely 48 respondents (52.7%). For the completeness of immunization, most of them have been fully immunized according to their age, which is 48 toddlers (52.7%). Fecal disposal was mostly not eligible, with 48 respondents (52.7%). Waste disposal as many as 49 respondents (53.8%) did not meet the requirements, while for the incidence of diarrhea, 48 toddlers (52.7%) experienced diarrhea in the last three months and 43 toddlers (47.3%) did not experience it. The following are the results of the analysis of some of the variables studied toddlers most are in the age group of 1-3 years with a total of 46 toddlers (50.5%).

**Table: 3. Univariate Analysis Results**

Variabel	Sum	Percentage (%)
<b>Knowledge</b>		
Less	48	52,7
Good	43	47,3
Total	91	100
<b>Immunization Completeness</b>		
Incomplete	43	47,3
Complete	48	52,7
Total	91	100
<b>Stool Removal</b>		
Non-standard	48	52,7
Compliant with standards	43	47,3
Total	91	100
<b>Waste Disposal</b>		
Appropriate	49	53,8
Inappropriate	42	46,2
Total	91	100
<b>Incidence of Diarrhea</b>		
No diarrhea	43	47,3
Diarrhea	48	52,7
Total	91	100

The bivariate test analysis in this study is useful to find out whether there is a relationship between the variables of knowledge, completeness of immunization and then disposal from feces and garbage with the occurrence of diarrhea in the Kartasura District area. Based on the results of the study, it was found that the relationship between knowledge and the incidence of diarrhea in toddlers showed that 48 respondents had poor knowledge, there were 28 toddlers who experienced diarrhea (22.7%) while 43 respondents who had good knowledge had diarrhea in 15 toddlers (20.3%). Based on statistical tests,  $p = 0.043$  ( $p < 0.05$ ) was obtained, meaning that it was accepted, and it was proven that there was a meaningful relationship.

The results of the Odds Ratio (OR) of knowledge were obtained with a value of 2.613 ( $OR > 1$ ) with a Confidence Interval (CI) of 95% which can be concluded that knowledge is a risk factor for the occurrence of diarrhea. The relationship between complete immunization and the incidence of diarrhea for toddlers showed that 43 respondents were not fully immunized, there were 19 toddlers with diarrhea (20.3%) while 48 respondents who were fully immunized had diarrhea toddlers as many as 24 toddlers (22.7%). Based on the statistical test,  $p = 0.731$  ( $p > 0.05$ ) was obtained, meaning that it was rejected, then there was no meaningful relationship. The results of the Odds Ratio (OR) of immunization completeness were obtained with a value of 0.792 ( $OR < 1$  or  $OR = 1$ ) with a Confidence Interval (CI) of 95% which can be concluded that the completeness of immunization is not a risk factor for the occurrence of diarrhea in toddlers.

The relationship between fecal defecation and the incidence of diarrhea in toddlers showed that 34 respondents did not meet the requirements, 19 of them had diarrhea under five (16.1%) while 57 respondents whose fecal disposal met the requirements had diarrhea among 24 toddlers (26.9%). Based on the statistical test,  $p = 0.291$  ( $p > 0.05$ ) was obtained, meaning that it was rejected, then there was no relationship. The results of

the Odds Ratio (OR) of fecal defecation were obtained with a value of 0.742 (OR <1 or OR=1) with a Confidence Interval (CI) of 95% which can be concluded that fecal defecation is not a risk factor for the occurrence of diarrhea in toddlers. The relationship between garbage disposal and the incidence of diarrhea in toddlers showed that 30 respondents did not meet the requirements, there were 14 toddlers with diarrhea (14.2%) while 61 respondents whose feces were eligible had diarrhea in 29 toddlers (28.8%). Based on the statistical test,  $p = 1.000$  ( $p > 0.05$ ) was obtained, meaning that it was rejected, then there was no meaningful relationship. The results of the Odds Ratio (OR) from waste disposal were obtained with a value of 0.966 (OR <1 or OR=1) with a Confidence Interval (CI) of 95% which can be concluded that waste disposal is not a risk factor for the occurrence of diarrhea in toddlers. The results of the hypothesis test obtained after conducting the research are as follows

**Table: 4. Bivariate Analysis Results**

Variable	Incidence of Diarrhea						p-value	OR (95%CI)
	Diarrhea		No Diarrhea		Total			
	N	%	N	%	N	%		
<b>Knowledge</b>								
Less	28	22,7	20	25,3	48	48	<b>0,043</b>	<b>2,613</b>
Good	15	20,3	28	22,7	43	43		
<b>Immunization Completeness</b>								
Incomplete	19	20,3	24	22,7	48	43	0,731	0,792
Complete	24	22,7	24	25,3	43	48		
<b>Stool Removal</b>								
Non-standard	19	16,1	15	17,9	34	34	0,291	0,742
Compliant with standards	24	26,9	33	30,1	57	57		
<b>Waste Disposal</b>								
Appropriate	14	14,2	16	15,8	30	30	1,000	0,966
Inappropriate	29	28,8	32	32,2	61	61		

## DISCUSSION

### a. The Relationship of Knowledge with the Incidence of Diarrhea in Toddlers

Based on the results of the study, 48 respondents were poorly informed, 28 were toddlers (22.7%) with diarrhea and 43 respondents with good knowledge, there were 15 toddlers (20.3%) suffering from diarrhea. Based on the test results, the results of  $p= 0.043$  ( $< 0.05$ ) were accepted, so it was proven that there was a relationship. The results of the Odds Ratio (OR) of knowledge were obtained with a value of 2.613 (OR >1) with a Confidence Interval (CI) of 95% which can be concluded that knowledge is a risk factor for the occurrence of diarrhea in toddlers, so that poor maternal knowledge is a risk factor for diarrhea in toddlers.

This shows the suitability of Lawrence Green's theory in 1980 in Notoadmodjo (2010), that there are many things that affect a person's behavior including knowledge. For example, if the mother does not know about diarrhea, it can affect how they perceive the diarrheal disease. This study is the same as Argarini, Fajariyah & Sabrina (2023) about what has the potential to cause toddlers in Uwul Parung Village, Bogor, to experience diarrhea. It was found that there was a relationship between knowledge and diarrhea for toddlers in Uwul Parung Village, Bogor, where 230 respondents were knowledgeable, less than 192 toddlers (83.5%) had diarrhea while 8 respondents were knowledgeable, 4 (50%) did not have diarrhea. Based on



the study, one of the factors causing the high incidence of diarrhea is a lack of knowledge.

This is the same as the theory that says knowledge is the main and most important aspect in providing services, especially health. Knowledge can be obtained from many efforts, intentionally or unintentionally. Intentional efforts include through the educational process and can be obtained from experience. Everyone has different knowledge because it depends on what they are trying to learn it. There are many kinds of levels of knowledge that state that the knowledge they have is influenced by many factors such as experience, then education level, then information and facilities and even socio-culture. A society with better and higher education will have an impact on critical thinking and courage to make decisions that can better sort between right and wrong, including increasing knowledge related to children's health so as to avoid diarrheal diseases (Rahmawati et al., 2018).

The results of the study show that there are still many respondents, namely mothers of toddlers who do not know the right course of action if their toddlers have diarrhea. Based on the results of the research, the majority of his education is junior high school. Thus, the results show that a small number of mothers whose last education is high school, strata 1 and strata 2, coupled with the majority age of 27-30 years, causes most mothers under five to forget their knowledge, especially about diarrhea health. As we age, a person's ability to make decisions and movements or actions decreases, resulting in difficulty remembering or forgetting. It is recommended to mothers of toddlers to improve their information by participating in counseling or socialization held by health workers from the Kartasura Health Center to find out what are the triggers, actions and prevention of diarrhea, especially in today's era that cannot be separated from electronic media such as smartphones, where these tools can easily provide information about diarrheal diseases, especially since the majority of mothers' work is housewives, Where by spending a long time caring for children, mothers can learn from the experience of children when experiencing diarrhea (Safitri et al., 2018).

#### b. Immunization Completeness with the Incidence of Diarrhea in Toddlers

Based on the results of the study, 48 toddlers who have received complete immunization, there are 24 toddlers with diarrhea (22.7%) and 43 toddlers who have not received complete immunization, there are 19 toddlers who have diarrhea (20.3%). Based on the test, a value of 0.731 ( $>0.05$ ) was obtained, which was said to be rejected so that there was no relationship. The results of the Odds Ratio (OR) of immunization completeness were obtained with a value of 0.792 ( $OR < 1$  or  $OR = 1$ ) with a Confidence Interval (CI) of 95% which can be concluded that immunization completeness is not a risk factor for the occurrence of diarrhea in toddlers.

Basic immunization in toddlers is a series of vaccinations given to children from an early age that function to protect against various infectious diseases that have the potential to be dangerous (Zukhrina et al., 2020). If one of the vaccinations is not given, the child is classified as incomplete (Lekew et al., 2024).

The results of this study are the same as Latifah Susilowati (2019) related to the relationship between measles vaccination and the occurrence of diarrhea under five which shows that most of them have been fully immunized, namely 43 toddlers (97.7%). It is also known that the results in this study have a value of 0.110 ( $>0.05$ ) which can be concluded that there is no relationship. Completeness of immunization is not a direct cause factor for diarrhea in toddlers, but the history of the disease in toddlers is associated with immunity. Toddlers who do not have strong immunity are more susceptible to diseases, including diarrhea.

The results of the study show that most of the toddlers in Kartasura District, Sukoharjo Regency have received complete immunization according to their age. The health services provided to toddlers in this area are quite good, in addition to the health center, immunization services for toddlers are provided at the toddler posyandu, where the posyandu is a health service that is close to the community so that mothers do not need to go far to the health center or hospital. In addition, the adequacy of health workers in each posyandu and always reminding mothers of toddlers to routinely immunize according to their schedule can also be the influence of the majority of toddlers in the Kartasura District area who have received complete immunizations.

c. The Relationship between Fecal Defecation and the Incidence of Diarrhea in Toddlers

The results of the research that has been carried out show that there are 34 ineligible respondents, there are 19 toddlers with diarrhea (16.1%) while 57 respondents whose feces are eligible there are 24 toddlers who have diarrhea (26.9%). Based on the statistical test,  $p = 0.291$  ( $p > 0.05$ ) was obtained, meaning that it was rejected, then there was no relationship. The results of the Odds Ratio (OR) of fecal removal were obtained with a value of 0.742 ( $OR < 1$  or  $OR = 1$ ) with a Confidence Interval (CI) of 95% which can be concluded that fecal removal is not included in the risk factors for the occurrence of diarrhea in toddlers.

The problem that is often faced by the community is the use of available latrines. The low behavior of the community regarding the importance of using available latrines can cause problems, especially health. Increasing the availability of soap and detergent to improve hygiene can reduce the risk of diarrhea (Adamu et al., 2022). Latrine facilities that are said to be healthy need to meet the requirements that include families having their own latrines/toilets/toilets, clean and odorless latrines and the availability of soap and cleaning tools near the latrines. Latrines should be cleaned regularly with special tools and use special liquids to clean latrines so that they do not smell, there are no flies, cockroaches, and others that can interfere with health and cause diseases, especially diarrhea. This study is the same as Kasmara & Sarli (2023) about what factors are related to the presence of diarrhea in toddlers, namely there is no relationship between family toilet facilities and the incidence of diarrhea.

The results of the study found that there was no relationship between fecal defecation and the incidence of diarrhea in toddlers in the Kartasura District area, Sukoharjo Regency, although the majority of mothers, namely 91 mothers (100%), already had latrines, but there were still many mothers whose latrines smelled, namely 65 mothers (71%) and there were no soap and cleaning tools near the latrines as many as 84 mothers (92.3%). Smelly latrines can invite flies and cockroaches, so these animals will land. This can increase the risk of diarrhea because dirty latrines can be a breeding ground for various diseases caused by poor fecal disposal (Sengkey et al., 2022). Thus, to overcome the onset of diseases due to latrines, latrines must meet the requirements.

The availability of family toilets has a big impact on reducing the risk of diarrhea. Sanitarian officers at the Kartasura Health Center are expected to collaborate with several parties to increase knowledge through education such as counseling and socialization and conduct quality checks of latrines used by the community in Kartasura District, Sukoharjo Regency.

d. The Relationship between Waste Disposal and the Incidence of Diarrhea in Toddlers

The results showed that 30 respondents did not meet the requirements, there were 14 toddlers who experienced diarrhea (14.2%) while 61 respondents whose feces



were eligible, there were 29 toddlers who experienced diarrhea (28.8%). Based on the statistical test,  $p = 1,000$  ( $p > 0.05$ ) was obtained, meaning that it was rejected, then there was no meaningful relationship. The results of the Odds Ratio (OR) of waste disposal were obtained with a value of 0.966 ( $OR < 1$  or  $OR = 1$ ) with a Confidence Interval (CI) of 95% which can be concluded that waste disposal is not a risk factor for the occurrence of diarrhea in toddlers.

The research conducted is the same as Oktora (2018) about the relationship between household waste, namely there is no relationship between waste management and diarrhea, the majority of mothers already have a garbage can, a watertight garbage can with a closed position so it is said that waste management is good. This can reduce disease spreading vectors such as rats and flies that land in garbage cans and decrease diarrhea cases.

Based on the results of the research on the garbage cans owned by mothers, the majority of the conditions are closed, as many as 62 mothers (68.1%) and there are many mothers who have thrown garbage in their places, namely as many as 89 mothers (97.8%) and mothers, namely 91 mothers (100%), have garbage cans so that they can reduce environmental pollution by reducing scattered garbage. A garbage can in a closed condition can reduce disease vectors such as flies, rats, and insects that carry diarrheal diseases. Garbage can increase the risk of diarrhea if it is not managed properly and flies or insects appear. The spread of disease vectors such as flies will be reduced, reducing the incidence of diarrhea (Aprianto et al., 2018). Nevertheless, the local authorities are expected to continue to provide education and create environmental health programs to prevent diarrhea for toddlers.

## CONCLUSION

Based on research on factors related to the incidence of diarrhea in toddlers in the Kartasura District area, Sukoharjo Regency, it can be concluded that there is a meaningful relationship between knowledge and the incidence of diarrhea in the Kartasura District area, Sukoharjo Regency with a p-value of 0.043 ( $p\text{-value} < 0.05$ ) with an Odds Ratio value of 2.613 ( $OR > 1$ ) Confident Interval 95% of what can be said to be a mother's knowledge is a risk factor for diarrhea in toddlers.

Counseling and socialization activities held by health workers from health centers or posyandu can help increase knowledge about diarrhea in toddlers such as the causes of diarrhea, actions taken if toddlers are affected by diarrhea, and prevention of diarrhea in toddlers. Researchers are further expected to conduct further research by adding interview and observation methods to support questionnaire data on factors related to maternal knowledge about diarrheal diseases in toddlers and further develop effective educational interventions to increase maternal knowledge about diarrheal diseases in toddlers and can add more respondents to describe the actual situation.

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