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THE RELATIONSHIP BETWEEN KNOWLEDGE LEVEL AND ENVIRONMENTAL SANITATION ON THE INCIDENCE OF DIARRHEA IN TODDLERS AT SAWIT SEBERANG HEALTH CENTER, LANGKAT, NORTH SUMATRA, 2023-2024

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ABSTRACT

Diarrhea remains a global health issue, including in Indonesia. According to the 2020 Indonesian nutrition status survey, the prevalence of diarrhea was recorded at 9.8%. Various factors influence the occurrence of diarrhea in toddlers, with mothers playing a crucial role in prevention and treatment. Mothers with knowledge of the causes, symptoms, and prevention of diarrhea are key in maintaining hygiene and preventing disease. The mother's education level also plays a significant role, as higher-educated mothers tend to more easily receive information and apply preventive measures. With adequate knowledge, mothers can be more careful in caring for their children, from providing clean water to managing waste, thereby reducing the incidence of diarrhea in toddlers. Conclusion: there is a significant relationship between the mother's knowledge and environmental sanitation quality with the incidence of diarrhea in toddlers at Puskesmas Sawit Sebrang, Langkat, North Sumatra..

Keywords: Toddler Diarrhea, Maternal Knowledge Level, Environmental Sanitation, Clean Water Provision, Solid Waste Management, Liquid Waste Management

INTRODUCTION

In developing countries such as Indonesia, diarrhea remains a common public health problem and is a leading cause of mortality, particularly among children under five years of age. It ranks as the second leading cause of death among children under five, the third among infants, and the fifth across all age groups. According to the 2022 Indonesia Health Profile published by the Ministry of Health of the Republic of Indonesia, 174,199 diarrhea cases were reported in North Sumatra across all age groups, of which 42.7% received appropriate management. Among these cases, 52,672

(23.2%) occurred in children under five years of age.¹

According to the 2019 North Sumatra Provincial Health Profile, Langkat Regency reported 28,128 diarrhea cases, including 17,063 cases among children under five years of age. Of the diarrhea cases managed at healthcare facilities, 5,655 cases (20.10%) occurred across all age groups, while 2,387 cases (13.99%) involved children under five. Furthermore, a medical record review conducted by the researchers at Sawit Seberang Community Health Center (Puskesmas Sawit Seberang) identified 182

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diarrhea cases among children under five in 2023.²

Diarrhea is one of the most common infectious diseases affecting the gastrointestinal tract and continues to pose a major global health challenge, including in Indonesia. According to the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), approximately 2 billion diarrhea cases occur annually worldwide, resulting in approximately 1.9 million deaths among children under five years of age. Of these deaths, 78% occur in developing countries, particularly in Africa and Southeast Asia. The 2020 Indonesian Nutritional Status Survey reported a diarrhea prevalence of 9.8%. Furthermore, the 2020 Indonesia Health Profile identified diarrhea as one of the leading causes of mortality among infants aged 29 days to 11 months.³

Multiple factors contribute to the occurrence of diarrhea in children, including environmental, sociodemographic, and behavioral determinants. Environmental factors, particularly sanitation and drinking water quality, play a central role in diarrhea transmission. Poor fecal disposal practices and unsafe drinking water are strongly associated with the spread of diarrheal diseases, which are predominantly infectious and closely related to environmental conditions.⁴

Sociodemographic factors also play an important role in childhood diarrhea. Parental education, parental occupation, and the child's age have all been shown to influence diarrhea incidence. Higher educational attainment enables parents to better understand health information and improves their knowledge regarding diarrhea prevention and management, whereas household income affects access to healthcare services. Younger children are particularly vulnerable because their immune systems are not yet fully developed. Understanding these factors is

essential for developing effective diarrhea prevention strategies. In addition, appropriate health-related behaviors, such as exclusive breastfeeding, regular handwashing, and proper washing of fruits and vegetables, can reduce the transmission of enteric pathogens and consequently decrease the risk of diarrhea among children.⁴

Mothers play a pivotal role in the prevention and management of diarrhea among children under five years of age. Maternal decisions and practices during diarrheal episodes have a substantial impact on childhood morbidity. However, mothers' knowledge regarding the identification, management, and prevention of diarrhea remains inadequate. Adequate maternal knowledge is therefore essential for promoting healthy lifestyles, maintaining child health, and preventing morbidity and mortality associated with diarrhea. Such knowledge encourages appropriate preventive and healthcare-seeking behaviors. Diarrhea is less likely to become a serious threat to children under five when parents understand their roles in its prevention and management. Improving hygienic practices within the household is one of the most effective measures for preventing diarrhea in young children.⁵ Therefore, this study was conducted to determine the association between maternal knowledge and environmental sanitation with the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center, Langkat Regency, North Sumatra.

MATERIALS AND METHODS

This study aimed to determine the association between maternal knowledge level and environmental sanitation and the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center, Langkat Regency, North Sumatra. An observational analytic study with a cross-

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sectional design was conducted. Data were collected using a structured questionnaire.

The required sample size was calculated using the Slovin formula, resulting in a total of 100 respondents. The study population consisted of mothers residing in the working area of Sawit Seberang Community Health Center who were willing to participate and complete the questionnaire. The independent variables were maternal knowledge level and environmental sanitation, while the dependent variable was the incidence of diarrhea among children under five years of age.

Samples were selected using a simple random sampling technique. The variables were measured on an ordinal scale. Data analysis was performed using the *Chi-square test*, with statistical significance determined at $p < 0.05$.

RESULTS

Table 1. Frequency Distribution of Respondents According to Maternal Knowledge Level

Maternal Knowledge Level	N	%
Low	41	41
Moderate	34	34
High	25	25
Total	100	100

As shown in Table 1, 41 respondents (41.0%) had a low level of maternal knowledge, 34 (34.0%) had a moderate level of knowledge, and 25 (25.0%) had a high level of knowledge.

Table 2. Frequency Distribution of Respondents According to Environmental Sanitation (Clean Water Supply)

Clean Water Supply	N	%
Meets the standard	86	86

Does not meet the standard	14	14
Total	100	100

As presented in Table 2, 86 respondents (86.0%) had access to a clean water supply that met the required standards, whereas 14 respondents (14.0%) did not.

Table 3. Frequency Distribution of Respondents According to Environmental Sanitation (Solid Waste Management)

Solid Waste Management	N	%
Meets the standard	46	46
Does not meet the standard	54	54
Total	100	100

As shown in Table 3, 46 respondents (46.0%) had solid waste management that met the required standards, while 54 respondents (54.0%) did not.

Table 4. Frequency Distribution of Respondents According to Environmental Sanitation (Liquid Waste Management)

Liquid Waste Management	N	%
Meets the standard	44	44
Does not meet the standard	56	56
Total	100	100

As shown in Table 4, 44 respondents (44.0%) had liquid waste management that met the required standards, whereas 56 respondents (56.0%) did not.

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Table 5. Frequency Distribution of Diarrhea Incidence Among Children Under Five Years of Age

Diarrhea Incidence	N	%
Diarrhea	44	44
No Diarrhea	56	56
Total	100	100

As presented in Table 5, 59 children (59.0%) experienced diarrhea, whereas 41 children (41.0%) did not

Table 6. Association Between Maternal Knowledge Level and Diarrhea Incidence

Maternal Knowledge Level	Diarrhea Incidence		N	P
	Diarrhea	No Diarrhea		
Low	38	3	41	0,000
Moderate	19	15	34	
High	2	23	25	
Total	59	34	100	

The Chi-square analysis demonstrated a statistically significant association between maternal knowledge level and the incidence of diarrhea among children under five years of age ($p < 0.001$). Children whose mothers had lower levels of knowledge were more likely to experience diarrhea than those whose mothers had moderate or high levels of knowledge.

Table 7. Association Between Clean Water Supply and Diarrhea Incidence

Clean Water Supply	Diarrhea Incidence		N	P
	Diarrhea	No Diarrhea		
Does not meet the standard	12	2	14	0,028

Meets the standard	47	39	86
Total	59	41	100

The Chi-square test revealed a statistically significant association between clean water supply and the incidence of diarrhea ($p = 0.028$). Children living in households with clean water supplies that did not meet the required standards had a higher incidence of diarrhea than those living in households with adequate clean water supplies.

Table 8. Association Between Solid Waste Management and Diarrhea Incidence

Solid Waste Management	Diarrhea Incidence		N	P
	Diarrhea	No Diarrhea		
Does not meet the standard	46	8	54	0,000
Meets the standard	13	33	46	
Total	59	41	100	

The Chi-square analysis showed a statistically significant association between solid waste management and diarrhea incidence ($p < 0.001$). Children from households with inadequate solid waste management were significantly more likely to experience diarrhea than those from households with proper waste management.

Table 9. Association Between Liquid Waste Management and Diarrhea Incidence

Liquid Waste Management	Diarrhea Incidence		N	P
	Diarrhea	No Diarrhea		
Does not	46	8	54	0,00

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meet the standard			0
Meets the standard	13	33	46
Total	59	41	100

The Chi-square analysis also demonstrated a statistically significant association between liquid waste management and diarrhea incidence ($p < 0.001$). Inadequate liquid waste management was associated with a higher occurrence of diarrhea among children under five years of age.

DISCUSSION

The Chi-square statistical test was used to analyze the association between maternal knowledge level and the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center, Langkat Regency. The analysis yielded a p-value of 0.000 ($p < 0.05$), leading to the rejection of the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). This finding indicates a statistically significant association between maternal knowledge level and the incidence of diarrhea. The results of this study are consistent with the study entitled *"The Relationship Between Maternal Knowledge and the Incidence of Diarrhea Among Children Aged 1–5 Years"* conducted by Amallia Dwi Mega in 2021. Using the Chi-square statistical test, the study reported a p-value of 0.002 ($p < 0.05$), indicating a statistically significant association between maternal knowledge and the incidence of diarrhea.⁶

The findings of the present study are also consistent with those reported by Made DK, Emy K, and Raihanan S. in 2023 in a study entitled *"The Relationship Between Maternal Knowledge Level and the Incidence of Diarrhea Among Children Under Five at Putri Ayu Community Health Center, Jambi City,*

2022." Using the Chi-square statistical test, the researchers obtained a p-value of 0.01 ($p < 0.05$), demonstrating a statistically significant association between maternal knowledge and the incidence of diarrhea among children under five years of age.⁷

The findings are further supported by a study conducted by Luh S. and I Made BM (2020) entitled *"The Relationship Between Maternal Knowledge Level and Attitudes Toward Diarrhea Incidence Among Children Under Five at Busungbiu II Community Health Center, Buleleng Regency."* Using the Chi-square statistical test, the study reported a p-value of 0.000 ($p < 0.05$), indicating a statistically significant association between maternal knowledge and the incidence of diarrhea. The study concluded that the better a mother's knowledge regarding diarrhea management, the lower the incidence of diarrhea among children under five years of age.⁸

A p-value of 0.000 ($p < 0.05$) was obtained from the analysis of the association between clean water supply and the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center using the Chi-square statistical test. Therefore, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted, indicating a statistically significant association between clean water supply and the incidence of diarrhea. These findings are consistent with the study conducted by Waode AA, Nur H., and Ardi in 2021 entitled *"The Relationship Between Basic Sanitation and the Incidence of Diarrhea Among Children Under Five in Sandi Village, South Kaledupa District, Wakatobi Regency."* Using the Chi-square statistical test, the study reported a p-value of 0.026 ($p < 0.05$), indicating a statistically significant association between clean water supply and the incidence of diarrhea in Sandi Village, South Kaledupa District, Wakatobi Regency.⁴

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The findings of this study are also in agreement with those reported by Nur HN, Nanang R., and Adi H. in 2021 in a study entitled *"The Relationship Between Environmental Sanitation and the Incidence of Diarrhea Among Children Under Five in the Working Area of Pertiwi Community Health Center, Makassar City."* Using the Chi-square statistical test, the study obtained a p-value of 0.014 ($p < 0.05$), demonstrating a statistically significant association between the physical quality of clean water and the incidence of diarrhea in the working area of Pertiwi Community Health Center, Makassar City.⁹

Similarly, the findings of the present study are consistent with those of Siti N., Akhmad DP, and Santi R. (2023) in a study entitled *"Analysis of Environmental Sanitation and the Incidence of Diarrhea Among Children Under Five in Sekar Jaya Village, Ogan Komering Ulu Regency."* Using the Chi-square statistical test, the researchers reported a p-value of 0.000 ($p < 0.05$), indicating a statistically significant association between the physical quality of clean water and the incidence of diarrhea among children under five years of age in Sekar Jaya Village, Ogan Komering Ulu Regency.¹⁰

A p-value of 0.000 ($p < 0.05$) was obtained from the analysis of the association between solid waste management and the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center using the Chi-square statistical test. Therefore, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted, indicating a statistically significant association between solid waste management and the incidence of diarrhea. These findings are consistent with the study conducted by Desta Widya Ayu Rhamawati in 2021 entitled *"The Relationship Between Environmental Sanitation and the Incidence of Diarrhea Among Children Aged 12–60 Months in*

Tanjungmas Village, Semarang." Using Somers' correlation test, the study reported a p-value of 0.005 ($p < 0.05$), indicating a statistically significant association between environmental sanitation and the incidence of diarrhea.¹¹

A p-value of 0.000 ($p < 0.05$) was obtained from the analysis of the association between liquid waste management and the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center using the Chi-square statistical test. Therefore, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted, indicating a statistically significant association between liquid waste management and the incidence of diarrhea. These findings are consistent with the study conducted by Yuni Harmila Siregar in 2021 entitled *"The Relationship Between Environmental Sanitation and the Incidence of Diarrhea Among Children Under Five in the Working Area of Belongkut Community Health Center."* Using the Chi-square statistical test, the study reported a p-value of 0.000 ($p < 0.05$), indicating a statistically significant association between the physical quality of clean water and the incidence of diarrhea among children under five years of age in the working area of Belongkut Community Health Center.¹²

The findings of the present study are also consistent with those reported by Desta Widya Ayu Rhamawati in 2021 in a study entitled *"The Relationship Between Environmental Sanitation and the Incidence of Diarrhea Among Children Aged 12–60 Months in Tanjungmas Village, Semarang."* Using Somers' correlation test, the study obtained a p-value of 0.003 ($p < 0.05$), indicating a statistically significant association between wastewater disposal and the incidence of diarrhea among children under five years of age.¹¹

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CONCLUSION AND RECOMMENDATIONS

Based on the data and findings obtained from this study on the association between maternal knowledge level and environmental sanitation and the incidence of diarrhea among children under five years of age at Sawit Seberang Community Health Center, Langkat Regency, North Sumatra, the following conclusions can be drawn:

1. There was a statistically significant association between maternal knowledge level and the incidence of diarrhea among children under five years of age. An increase in maternal knowledge regarding diarrhea was associated with a lower incidence of diarrhea among children under five.
2. There was a statistically significant association between the availability of clean water and the incidence of diarrhea. The provision of clean water that met the required standards was associated with a reduced risk of diarrhea among children under five years of age.
3. There was a statistically significant association between solid waste management and the incidence of diarrhea. Proper solid waste management that met the required standards was associated with a reduced risk of diarrhea among children under five years of age.
4. There was a statistically significant association between liquid waste management and the incidence of diarrhea. Proper liquid waste management that met the required standards was associated with a reduced risk of diarrhea among children under five years of age.

Based on the findings of this study, it is recommended that future researchers conduct further investigations by including additional variables that may influence or be associated with the incidence of diarrhea among children

under five years of age, such as nutritional status, behavioral factors, diarrhea prevention practices, and other potential risk factors.

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REFERENCES

1. Kunta Wibawa Dasa Nugraha, dkk. 2023. *Profil Kesehatan Indonesia Tahun 2022*. Kementerian Kesehatan Republik Indonesia. Jalan HR. Rasuna Said Blok X-5 Kav 4- 9, Jakarta 12950
2. Alwi M.H, *Profil Kesehatan Provinsi Sumatera Utara Tahun 2019*. Dinas Kesehatan Provinsi Sumatera Utara. 2019. Hlm 356
3. Maxi Rein Rondonuwu. 2020. *Keputusan Direktur Jenderal Pencegahan Dan Pengendalian Penyakit Nomor: Hk.02.02/C/2934 /2022 Tentang Rencana Aksi Program Pencegahan Dan Pengendalian Penyakit Tahun 2020-2024*.
4. Waode Azfari Azis, dkk. 2021. *Hubungan Sanitasi Dasar Dengan Kejadian Diare Pada Balita Di Desa Sandi Kecamatan Kaledupa Selatan Kabupaten Wakatobi*. Jurnal Medika Hutama Vol 02 3 april 2021. Studi Kesehatan Masyarakat, Universitas Dayanu Ikhsanuddin Baubau, Indonesia.
5. Seli Dela Sufiati, dkk. 2019. *Gambaran Pengetahuan Dan Sikap Ibu Dalam Pencegahan Diare Pada Balita Di Puskesmas Kalumata Kota Ternate*. Program Studi

RESEARCH ARTICLE

Pendidikan Dokter; Fakultas Kedokteran
Universitas Khairun. Indonesia

6. Amallia Dwi Mega A.P. Hubungan Pengetahuan Ibu dengan Kejadian Diare Pada Balita Usia 1-5 Tahun. Universitas Islam Sultan Agung. 2021. Hlm 31
7. Made DK, Emy K, Raihanah S. Hubungan Tingkat Pengetahuan Ibu terhadap Kejadian Diare pada Balita di Puskesmas Putri Ayu Kota Jambi Tahun 2022. JOMS. 2023. Volume 3, Nomor 2
8. Luh S, I Made BM. Hubungan Tingkat Pengetahuan Dan Sikap Ibu Balita Dengan Kejadian Diare Di Puskesmas Busungbiu Ii Kabupaten Buleleng. Jurnal Kesehatan Lingkungan. 2020. Volume 10 No.2 ; Hlm 79-87
9. . Nur HN, Nanang R, Adi H. Hubungan Sanitasi Lingkungan dengan Kejadian Diare pada Balita di Wilayah Kerja Puskesmas Pertiwi Kota Makassar. MPPKI Media Publikasi Promosi Kesehatan Indonesia. 2022. Vol 5 No.3 ; hlm 298-303
10. Siti N, Akhmad DP, Santi R. Analisis Sanitasi Lingkungan terhadap Kejadian Diare pada Balita di Kelurahan Sekar Jaya Kabupaten OK. Jurnal Kesehatan Saelmakers PERDANA. 2023. Volume 6 No.1 hlm 89-98
11. Desta Widya Ayu Rhamawati. Hubungan Antara Sanitasi Lingkungan Dengan Kejadian Diare Pada Balita Usia 12-60 Bulan Di Kelurahan Tanjungmas Semarang. Universitas Islam Sultan Agung Semarang. 2022; Hlm 55-83
12. Rafika Ulfa. 2021. Variabel Penelitian Dalam Penelitian Pendidikan. Al-Fathonah : Jurnal Pendidikan dan Keislaman ISSN : 2685-6115 (Online) 2685-2853 (Cetak). Sekolah Tinggi Ilmu Tarbiyah Batu Bara (STIT BB), Sumatera Utara.