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Original Article

The Relationship Between Mothers' Knowledge of Clean and Healthy Living Behaviour and the Incidence of Diarrhea Among Toddlers at Kamonji Health Center, Palu City, Indonesia

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Abstract

Background: Diarrhea is one of the main causes of death in children under five, especially in developing countries like Indonesia. Central Sulawesi province ranks 7th in Indonesia for the highest number of diarrhea cases based on symptoms and diagnoses made by health workers according to the province. Puskesmas Kamonji has the highest number of diarrhea cases in toddlers, with a total of 305 cases in 2024 based on data from the Health Office.The high incidence of diarrhea in toddlers is greatly influenced by clean and healthy living behaviors, particularly by mothers as the primary caregivers..
Aim: This study aims to determine the relationship between the level of mothers' knowledge about Clean and healthy living behavior and the occurrence of diarrhea in toddlers in the area of Puskesmas Kamonji, Palu City..
Method: This research uses a quantitative observational analytical method with a cross-sectional approach with a sample of 96 mothers who have toddlers, using the Slovin formula. The data were analyzed using the chi-square test with SPSS software.
Results: The results show a significant relationship between the level of mothers' knowledge about Clean and healthy living behavior and the incidence of diarrhea in toddlers (p-value < 0.001). The majority of mothers with good knowledge have toddlers who do not experience diarrhea.
Conclusion: The findings of this research emphasize the importance of enhancing education about Clean and Healthy Living Behavior to prevent diarrhea in toddlers, especially education for mothers to prevent diarrhea cases in their children.

INTRODUCTION

Diarrhea, with the Latin name *diarrhea*, originates from the Greek word *diarroia*, which means "to flow through continuously". Diarrhea is defined as a condition in which a person experiences an increased frequency of bowel movements (defecation) three or more times a day, accompanied by a change in stool consistency to softer or watery forms. Diarrhea causes sudden loss of fluids and electrolytes, which can lead to complications such as dehydration. To this day, diarrhea remains a global issue with high morbidity and mortality rates in many countries, especially in developing ones. It continues to be a leading cause of death worldwide, with an estimated 5–10 million deaths per year. It is also one of the main causes of high morbidity and mortality among children globally (Iqbal et al, 2022; Fitriani et al, 2021; Kholil et al, 2023).

Diarrhea is caused by microbial infections and can affect all age groups. It may be accompanied by mucus or blood. Although diarrhea is often short-term, it should not be taken lightly, as it can last for several days or, in some cases, even weeks. Long-lasting and recurrent diarrhea may lead to intestinal tissue damage, which disrupts nutrient absorption in the intestines. The disruption in nutrient absorption can lead to impaired growth in children. Diarrhea can also be seen as a natural defense mechanism of the body. It functions as a cleansing effect

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in the gastrointestinal lumen, where fluids flush out pathogenic substances from the digestive tract. Once these pathogens are expelled, diarrhea can resolve on its own (Annisa 2022; Wasliah 2020).

According to the World Health Organization (WHO), approximately 1.7 billion cases of diarrhea occur each year, resulting in 760,000 deaths among children under the age of five. In Indonesia, diarrhea often occurs in the form of outbreaks (KLB). One of the major contributing factors to such outbreaks is poor hygiene and sanitation. Central Sulawesi Province continues to report a yearly increase in diarrhea cases. It ranks seventh among Indonesian provinces with the highest number of diarrhea cases based on symptoms and diagnoses confirmed by health professionals. According to data from the Palu City Health Office, Kamonji Health Center reported the highest number of diarrhea cases among children under five, totaling 305 cases in 2024 (Fitriani et al, 2021; Hutagaol et al, 2022; Dinkes Sulawesi Tengah 2024).

Infants and children under five are generally more vulnerable to diarrhea due to their weaker immune systems, making them more susceptible to bacterial and viral infections. Diarrhea, along with persistent vomiting, can cause dehydration in toddlers, which can be fatal if not treated promptly. Factors contributing to diarrhea in toddlers include the mother's level of knowledge about the disease, the use of exclusive breastfeeding, and the implementation of clean and healthy living behavior. Clean and Healthy Living Behavior encompasses all health behaviors practiced so that each family member can take care of their own health and actively participate in public health initiatives (Firenza and Syafridah 2022).

Based on the epidemiological triangle, both host and environmental factors influence the incidence of diarrhea. The disease is largely caused by poor personal hygiene, especially hand hygiene, and by unfavorable environmental conditions, such as inadequate waste disposal and poor sewage systems. One key preventive behavior is proper handwashing (Syadat et al, 2022).

Clean and healthy living behavior is essentially an effort to promote healthy lifestyle habits through individual, group, or community engagement. It starts with personal willingness and is spread through communication, information sharing, and education to improve healthy attitudes, knowledge, and behaviors. With the use of communication media, various types of educational materials can be distributed to raise awareness and promote hygienic living practices (Tutu et al, 2022; Qalbi et al, 2023).

The primary focus of Clean and Healthy Living Behavior is at the household level. It aims to empower family members to be aware of, willing to adopt, and capable of implementing clean and healthy living behaviors, as well as to actively participate in health-related activities at the community level. The main objective of household-based clean and healthy living behavior implementation is to establish a healthy household. Clean and Healthy Living Behavior plays a vital role in maintaining health and preventing disease. By washing hands, disposing of waste properly, and consuming nutritious food, individuals can protect themselves and others from illnesses such as diarrhea, respiratory infections, and dengue fever (Addin et al, 2021; Mulasari et al, 2021).

Clean and healthy living habits at home can significantly reduce diarrhea cases among toddlers, particularly those cared for by their mothers. One of the leading causes of high diarrhea rates is the lack of clean and healthy living behavior implementation in the environment. A mother's low knowledge about diarrhea and how to manage it is another contributing factor. Limited knowledge leads to varied attitudes toward the illness. Some unhealthy behaviors that contribute to diarrhea in toddlers include early cessation of breastfeeding and its replacement with bottle-feeding, use of contaminated water, poor food storage, improper handwashing, and unsanitary conditions (Firenza and Syafridah, 2022).

In general, there are three main factors influencing clean and healthy living behavior: predisposing factors, enabling factors, and reinforcing factors. First, predisposing factors include knowledge and perception about clean and healthy living behavior in society. A person's habits and motivation are influenced by cultural traditions, beliefs, and socio-economic education. Enabling factors are behavioral drivers that facilitate certain actions, such as the availability of clean water, healthy housing, waste disposal facilities, and toilets. Reinforcing factors arise from the behavior and attitudes of healthcare workers, religious leaders, and community figures (Wati and Ridlo, 2020).

Mothers play a vital role in diarrhea incidence among toddlers, as they are the closest caregivers. A mother's knowledge level and hygiene practices significantly impact the prevention and management of diarrhea. Mothers with adequate knowledge are more likely to understand the importance of hygiene and health, as well as triggers of diarrhea. Conversely, mothers with limited knowledge tend to lack awareness about clean and healthy living behavior. In other words, knowledge is essential in preventing and addressing infectious diseases like

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diarrhea in children. Preventive actions include regular handwashing before and after meals, before feeding children, before cooking, after using the toilet, after changing diapers, maintaining home and environmental sanitation, and keeping toilets clean (Komara et al, 2020; Wahyuni, 2021; Utami et al, 2022).

A research conducted by Kamil and Fujiyanti (2021) with the titled *"The Relationship Between Mothers' Knowledge of Clean and healthy living behavior and the Incidence of Diarrhea Among Toddlers at Kluwut Health Center, Bulakamba Sub-district, Brebes Regency in 2018,"* showed a statistically significant result using the chi-square test, with a p-value = 0.003 ($p < 0.005$). It was found that 42 mothers with low knowledge had toddlers who experienced diarrhea (35.6%), while 33 mothers with good knowledge had toddlers who did not (28%). This indicates a significant relationship between maternal knowledge of Clean and healthy living and the incidence of diarrhea in toddlers—the better the mother's knowledge, the lower the likelihood of diarrhea.

Based on this background, the current study aims to examine the relationship between maternal knowledge regarding Clean and healthy living and the incidence of diarrhea among toddlers in the working area of Kamonji Health Center, Palu City. The results of this research are expected to enhance understanding of how maternal knowledge of Clean and living health behavior influences diarrhea cases and to serve as a reference for more effective health education and outreach efforts by healthcare workers, particularly in Palu City, where toddler diarrhea prevalence is high.

METHOD

This is a quantitative analytic observational study using a cross-sectional approach. The research was conducted in June–July 2025 at the Kamonji Health Center, Palu City, utilizing primary data collected via questionnaires. The population in the working area of Kamonji Health Center totaled 2,555, with a sample size of 96 determined using Slovin's formula. Sampling in this study used a consecutive sampling technique, where the samples used had met the inclusion and exclusion criteria, allowing for sampling until reaching the predetermined minimum sample size. The inclusion criteria for this study are mothers with toddlers residing in the area of the Kamonji Community Health Center, having a minimum formal education of elementary school graduation, being able to communicate well, and being willing to participate, while the exclusion criteria are mothers who are health workers or hold positions. Data was manually recorded in Microsoft Excel based on completed questionnaires and analyzed using the Chi-square test via SPSS to determine the influence of the independent variable (maternal knowledge) on the dependent variable (diarrhea incidence).

RESULTS

Univariate Analysis

Table 1. The frequency distribution of mothers' knowledge levels about clean and healthy living behavior

Clean and healthy living behavior knowledge level	Frequency (n)	Percentage (%)
Good	44	45,9
Fair	20	20,8
Poor	32	33,3
Total	**96**	**100**

Table 1. shows the distribution of mothers' knowledge about Clean and Healthy Living Behavior. Out of a total of 96 respondents, the majority of mothers had good knowledge, totaling 44 individuals (45.9%), followed by those with poor knowledge at 32 individuals (33.3%), and those with fair knowledge at 20 individuals (20.8%).

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Table 2. Frequency Distribution of Diarrhea Incidence in Toddlers

Incidence of diarrhea	Frequency (n)	Percentage (%)
Diarrhea	57	59,3
Without diarrhea	39	40,7
Total	**96**	**100**

Table 2. shows the frequency distribution of diarrhea incidence in toddlers. Out of a total of 96 toddlers, the majority experienced diarrhea, totaling 57 individuals (59.3%), while 39 toddlers (40.7%) did not experience diarrhea.

Bivariate Analysis

Table 3. Bivariate Test Results of the Relationship Between Mothers' Knowledge of Clean and Healthy Living Behavior and the Incidence of Diarrhea in Toddlers

		Category			*Chi-Square Test*
		Diarrhea	Without Diarrhea	Total	*P-value*
Clean and healthy living behavior knowledge level	Poor	30	2	32	**<0.001**
	Fair	14	6	20	
	Good	13	31	44	
Total		**57**	**39**	**96**	

Based on Table 3. statistical analysis using the Chi-Square test showed a p-value of <0.001, which means p-value <0.05. This result indicates that there is a significant relationship between the two variables tested, namely mothers' knowledge of Clean and Healthy Living Behavior and the incidence of diarrhea in toddlers. Therefore, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted.

DISCUSSIONS

The Relationship Between Mothers' Knowledge of Clean and Healthy Living Behavior and the Incidence of Diarrhea in Toddlers

Data from the bivariate test table show that out of 32 mothers with low levels of knowledge, 30 toddlers (93.75%) experienced diarrhea. Among 20 mothers with moderate knowledge, 14 toddlers (70%) had diarrhea, and of the 44 mothers with good knowledge, only 13 toddlers (29.5%) were reported to have diarrhea. These findings indicate a significant result: the higher the mother's knowledge level, the lower the risk of diarrhea in toddlers; conversely, the lower the mother's knowledge, the higher the risk. The research results prove a significant correlation between mothers knowledge level about clean and healthy living behavior and the incidence of diarrhea in toddlers, indicated by a *p-value* of <0.001 (<0.05), thus hypothesis one (H1) can be accepted and the null hypothesis (H_0) is rejected.

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Maternal factors play a crucial role in the occurrence of diarrhea among toddlers, as mothers are typically the primary caregivers. These factors include the mother's level of knowledge and hygiene practices. Mothers with good knowledge tend to have a better understanding of cleanliness, health, and the various triggers of diarrhea. In terms of hygiene, the mother's behavior in implementing clean and healthy living behavior within the family and herself is critical. If a mother consistently applies clean and healthy living habits, it can help prevent diarrhea in children and reduce its transmission in the surrounding environment (Hendriani and Ernawati 2023; Wahyuni, 2021).

The level of maternal knowledge about clean and healthy living behavior is significantly associated with the incidence of diarrhea in toddlers. Mothers who are well-informed about clean and healthy living behavior are generally more capable of preventing diarrhea in their children by implementing appropriate health practices. On the other hand, mothers with limited knowledge may not realize the importance of proper hygiene, which increases the risk of diarrhea. Knowledge about diarrhea serves as a foundation for achieving clean and healthy living and maintaining health. Furthermore, such knowledge can lead to awareness that drives individuals to behave and take actions aligned with what they understand (Dewi et al, 2022; Mulyani & Patimah, 2023).

Referring to Notoatmodjo's theory (2018), every individual has varying levels of knowledge. Knowledge begins at the level of knowing, followed by understanding, application, analysis, synthesis, and evaluation. The higher the level of knowledge, the better an individual is at making informed judgments, which in turn influences behavior. Aligned with this theory, the research findings show that most mothers with low knowledge levels had toddlers who experienced diarrhea, while those with high knowledge levels tended to have children who did not. Based on these results, it can be understood and connected that the higher the level of knowledge a mother has about clean and healthy living practices, the better understanding will be, thus reducing the risk of diarrhea in her child. Furthermore, the lower the mother's level of knowledge about clean and healthy living practices, the higher the risk of toddlers experiencing diarrhea.

The results obtained are in line with the study conducted by Kamil and Fujiyanti (2021) titled *"The Relationship Between Mothers' Knowledge About Clean and Healthy Living Behavior and the Incidence of Diarrhea in Toddlers at Kluwut Public Health Center, Bulakamba District, Brebes Regency in 2018."* The study showed statistical test results using the chi-square test with a p-value of 0.003 ($p < 0.005$). Based on these results, there is a significant relationship between the level of maternal knowledge about Clean and Healthy Living Behavior and the incidence of diarrhea in toddlers. It was found that 42 mothers (35.6%) with low knowledge had children who experienced diarrhea, while 33 mothers (28%) with good knowledge had children who did not experience diarrhea. This indicates that the better a mother's knowledge about Clean and Healthy Living Behavior, the lower the incidence of diarrhea in toddlers.

This is also in line with the study conducted by Pakpahan et al (2021) titled *"The Relationship Between Mothers' Knowledge About Clean and Healthy Living Behavior and the Incidence of Diarrhea in Toddlers in Lumban Panopa Hamlet, Siborong Borong I Village, Siborong Borong Subdistrict, North Tapanuli Regency."* The statistical test using the chi-square method yielded a p-value of 0.000 ($p < 0.005$), indicating a significant relationship between mothers' knowledge of Clean and Healthy Living Behavior and the incidence of diarrhea in toddlers. The better the mother's knowledge, the lower the incidence of diarrhea among toddlers.

The main finding of this study reveals a significant relationship between the level of mothers' knowledge about Clean and Healthy Living Behavior and the incidence of diarrhea in toddlers. However, this result is not consistent with a study conducted by Wahyuningsih (2023), entitled *"Analysis of the Implementation and Maternal Knowledge of Family* Clean and healthy living *and the Incidence of Diarrhea in Toddlers at Mitra Insani Clinic, Gandasari Subdistrict, Tangerang City in 2022."* Among 40 respondents whose toddlers experienced diarrhea, 23 mothers (41.1%) had good knowledge, while 17 mothers (30.4%) had poor knowledge. The chi-square statistical test showed a p-value of 0.773, which means $p > 0.05$, indicating that the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This suggests that there is no significant relationship between mothers' knowledge of Clean and healthy living and the incidence of diarrhea in toddlers.

Research findings indicate that many respondents still lack proper understanding and awareness regarding the importance of using clean water and appropriate sanitary facilities, specifically the use of health-standard goose-neck latrines. While most respondents were familiar with the term "latrine," their knowledge was generally limited to its basic form or general function, without understanding that a health-standard latrine—such as a goose-neck latrine—is essential in preventing the spread of disease. Field evidence showed that many respondents were unfamiliar with the concept, even asking, "What is a goose-neck latrine?" This suggests a gap in information and understanding within the community, particularly among mothers as respondents, regarding the principles of Clean and Healthy Living Behavior. In fact, the use of clean water and sanitary latrines is a crucial component of the family Clean and Healthy Living Behavior indicators, which play a direct role in

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maintaining environmental hygiene and preventing the transmission of water- and feces-borne diseases such as diarrhea, typhoid, and intestinal worms.

Challenges encountered during the research on the relationship between mothers' knowledge of Clean and Healthy Living Behavior and the incidence of diarrhea in toddlers at Kamonji Public Health Center included the extended duration required for data collection due to the relatively large sample size needed. At the beginning of the study, the researcher experienced difficulties in finding respondents, as data collection was initially focused only on times when patients visited the Kamonji Health Center. Several potential respondents declined to participate, stating that it was inconvenient and burdensome to take part while caring for their sick children. As a result, the number of respondents remained insufficient during the early phase of data collection. To overcome this, the researcher had to wait for the schedule of posyandu (integrated health service posts), which allowed for more effective sample collection. However, even during posyandu sessions, challenges persisted as some mothers did not attend as scheduled, thus requiring additional time to complete the sampling process.

The limitation of this study lies in the restricted range of variables measured. The research only examined the relationship between two variables which is mothers' knowledge of Clean and Healthy Living Behavior and the incidence of diarrhea, without considering other potential influencing factors. Additionally, this study did not include the assessment of mothers' attitudes toward Clean and Healthy Living Behavior, even though knowledge and attitudes are often interconnected. Measuring both simultaneously could have provided a more comprehensive picture of Clean and Healthy Living Behavior implementation within the household and its relationship to diarrhea cases among toddlers.

CONCLUSIONS

Based on the results of the study on The Relationship Between Mothers' Knowledge of Clean and Healthy Living Behavior and the Incidence of Diarrhea in Toddlers, the following conclusions can be drawn: The majority of mothers with good knowledge, totaling 31 respondents (32.3%), while 30 respondents (31.25%) with poor knowledge had toddlers who experienced diarrhea. Based on the research findings, the incidence of diarrhea among toddlers in the Kamonji Public Health Center area remains relatively high, with 57 toddlers experiencing diarrhea and 39 toddlers not experiencing diarrhea. There is a significant relationship between the two variables studied mothers' knowledge of Clean and healthy living behavior and the incidence of diarrhea in toddlers, with a p-value of <0.001.

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Author's Note

For local healthcare service institutions, it is recommended to provide more intensive education on Clean and Healthy Living Behavior within the community, particularly targeting mothers with toddlers. This education can be delivered through outreach and counseling programs, so that the community becomes more aware of and understands the importance of Clean and Healthy Living Behavior in daily life, as well as how to properly implement it.

For future researchers, it is suggested that subsequent studies explore in greater depth the various factors associated with the incidence of diarrhea in toddlers. In addition, it is important to assess mothers' attitudes toward Clean and Healthy Living Behavior in order to connect their knowledge with their attitudes. This would help provide a more comprehensive understanding of how Clean and Healthy Living Behavior is implemented within families.

Ethical Clearance

Tadulako University Faculty of Medicine Medical and Health Research Ethics Committee

Funding

This research was conducted with personal funds, there were no costs from any party outside of researcher herself.

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Declaration of Conflicting Interest

The authors declared no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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