The Relationship between Environmental and Behavioral Factors and the Incidence of Diarrhea in Toddlers in the Work Area of the Waru Community Health Center, Sidoarjo Regency

Achmad Sholeh Farhat[1]*, Mochammad Bagus Qomaruddin[2]

[1,2]Public Health Study Program, Airlangga University,Indonesia
Corresponding author:
E-mail: achmad.sholeh.farhat-2022@fkm.unair.ac.id

Abstract.
Diarrhea is a public health problem that significantly contributes to morbidity, particularly in vulnerable age groups such as under-five children. Various efforts to treat diarrhea have been implemented through primary health care, but the incidence of diarrhea in under-five children remains quite high, including in the Waru Community Health Center in Sidoarjo, which experienced an increase in diarrhea cases in 2023-2025. The incidence of diarrhea in under-five children is influenced by various interrelated factors, particularly environmental and behavioral factors, which, according to Hendrik L. Blum's theory of health determinants, play a role in influencing health status. This study aims to analyze the relationship between environmental and behavioral factors and the incidence of diarrhea in under-five children in the Waru Community Health Center in Sidoarjo. This study was a quantitative, observational, and analytical study using a cross-sectional approach. It was conducted among 89 mothers of under-five children who visited the Waru Community Health Center in Sidoarjo from January to March 2026. Data were collected through interviews using questionnaires and direct observation of the environmental sanitation conditions of the respondents' homes. Data analysis was conducted using descriptive and inferential statistics with the chi-square test. The results showed that among environmental factors, the condition of healthy latrine could not be statistically tested (constant), while clean water sources (p = 0.080), household waste management (p = 1,000), and wastewater drainage systems/SPAL (p = 1,000) were analyzed. Meanwhile, behavioral factors included the use of healthy latrines (p = 0.018), handwashing with soap (p = 0.348), drinking water treatment (p = 0.478), and exclusive breastfeeding (p = 0.048). This study concluded that the use of healthy latrine and exclusive breastfeeding were factors associated with the incidence of diarrhea among under-five children in the Waru Community Health Center in Sidoarjo. The Community Health Center is recommended to conduct regular monitoring and mapping of at-risk areas as a basis for determining priority diarrhea prevention interventions.

Keywords: *Behavioral Factors, Diarrhea, Environmental Factors and Under-Five Children.*

I. INTRODUCTION

Diarrhea is a health disorder of the digestive system that remains a significant problem. According toWorld Health Organization (2024)Diarrhea is defined as three or more loose or watery bowel movements per day. Diarrhea remains a leading cause of morbidity and mortality across all age groups and regions worldwide. In 2021, diarrheal diseases caused 1.2 million deaths worldwide.(Liang et al., 2024)This disease not only affects children but also significantly impacts older age groups. Children under 5 years old have the highest mortality rate among all age groups, followed by those aged 70 years and older.(Liang et al., 2024)This shows that diarrhea remains a global public health problem that requires serious attention because it affects the productivity and quality of life of people of all ages.

According to the 2023 Indonesian Health Survey (SKI), the prevalence of diarrhea among all age groups in Indonesia reached 4.3%. This figure is still relatively high and indicates that national diarrhea management efforts have not been fully effective in reducing the burden of diarrheal disease. Specifically, data from the Central Statistics Agency (BPS) of East Java Province recorded 183,338 cases of diarrhea in 2022. Several areas with the highest number of cases included Surabaya City with 22,327 cases, followed by Sidoarjo Regency with 12,177 cases, and Malang Regency with 11,826 cases.(Central Statistics Agency, 2023). Seeing the high incidence of diarrhea, the government has implemented various mitigation efforts by improving basic health services and implementing standard procedures in primary health care facilities.

According to the 2024 Sidoarjo Regency Health Profile report, all diarrhea patients in each community health center (Puskesmas) area received treatment according to national guidelines, including oral rehydration salts (ORS) and zinc supplementation, with 100% coverage across all age groups. Furthermore, the detection and treatment of diarrhea cases at Puskesmas is also high, with most areas achieving over 90% of the established service target.(Sidoarjo Regency Health Office, 2024)However, even though these various interventions have been implemented, the number of diarrhea cases in Sidoarjo Regency is still quite high at 44,414 cases.(Sidoarjo Regency Health Office, 2024). Based on data from the Sidoarjo Regency Health Office in 2025, the number of diarrhea cases in toddlers was still found in all community health centers (Puskesmas) working areas, with varying numbers. Waru Community Health Center recorded 1,106 cases, ranking second in the number of toddler diarrhea cases in Sidoarjo Regency. This position indicates that the burden of diarrhea cases in toddlers in the Waru Community Health Center's working area is still relatively high compared to most other community health centers.

The number of diarrhea cases in toddlers in the Waru Community Health Center working area during 2023–2025 still shows a high number. In 2023, there were 1,920 cases recorded, then decreased to 1,097 cases in 2024, and increased again to 1,106 cases in 2025. Despite the decrease compared to 2023, the number of diarrhea cases in toddlers in the Waru Community Health Center working area remains above 1,000 cases per year and indicates a high caseload, and shows an increase again in 2025. This indicates that the incidence of diarrhea in toddlers is still influenced by various interrelated factors in maintaining health. Understanding the factors that influence health status is needed to identify the causes that contribute to the still high incidence of diarrhea in toddlers.

According to Hendrik L. Blum (1981) in the book(Pakpahan, 2021)explains that a person's health status is influenced by various factors known as health determinants. These determinants include environmental factors, behavior, health services, and heredity, which are interrelated and play a role in determining the health level of individuals and communities. Therefore, the factors that cause diarrhea vary, including environmental conditions, individual behavior in maintaining personal hygiene, the community's level of knowledge about diarrhea prevention, and poor nutritional status.(Prawati, 2019). According to Susana (2015) in(Pebrianti & Astuti, 2021), states that an individual's health condition is largely determined by their daily habits and behaviors. Furthermore, certain individual behaviors, such as not washing hands before eating, not washing hands after defecation, improper waste disposal, and not exclusively breastfeeding for the first 4 to 6 months, can increase the risk of diarrheal disease. This condition is often related to the community's lack of ability and willingness to seek information about diarrheal diseases.(Prawati, 2019).

This is in line with a study entitled "Analysis of Factors Associated with Diarrheal Incidence in Babai Village, Central Kalimantan." The analysis showed that inadequate knowledge, suboptimal behavior, negative commitment, and poor environmental sanitation were significantly associated with diarrheal incidence. The study explained that these four factors are important determinants influencing diarrheal incidence.(Pefbrianti & Astuti, 2021). In addition, there is a similar study entitled "Literature Review: Overview of Home Environmental Sanitation Conditions with the Incidence of Diarrhea in Toddlers." The results of the study indicate that various components of environmental sanitation, such as the availability and quality of clean water sources, the condition and use of latrines, wastewater disposal systems (SPAL), household waste management, and the type of floor covering in the house are related to the incidence of diarrhea in toddlers. This study confirms that home environmental sanitation that does not meet health requirements plays a significant role in increasing the risk of diarrhea, so that environmental factors are one of the main determinants of diarrhea incidence in the toddler age group.(Farkhati, 2021).

Based on various previous studies, the incidence of diarrhea is influenced by various factors. Although many studies have examined several factors related to the incidence of diarrhea in toddlers, the results of these studies still show variations in findings influenced by differences in regional characteristics, environmental conditions, and local community behavior. These differences in characteristics indicate that factors related to the incidence of diarrhea in toddlers can differ between regions, so that research results obtained in one region may not necessarily reflect conditions in other regions. Furthermore, although

diarrhea management coverage in Sidoarjo Regency has reached 100%, the number of diarrhea cases remains relatively high. This indicates that factors related to diarrhea incidence need to be assessed according to local community conditions. This condition is in line with Hendrik L. Blum's theory that public health is influenced by four main factors: behavior, environment, health services, and heredity. Among these four factors, environmental and behavioral factors are the most dominant in determining public health status. Therefore, this study is important to identify the relationship between environmental and behavioral factors with the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

II. METHODOLOGY

This study used a quantitative approach with a descriptive analytical research type and a cross-sectional design. This approach aims to analyze the relationship between environmental factors and behavioral factors based on Hendrik L. Blum's theory with the incidence of diarrhea in toddlers without providing treatment or intervention to respondents. The cross-sectional design was chosen because the measurement of independent and dependent variables was carried out simultaneously at one time, so it can describe the relationship between variables during the study. The study was conducted in the working area of the Waru Community Health Center, Sidoarjo Regency, with an implementation period from January to June 2026. Research activities included proposal preparation, licensing management, data collection, data processing, analysis of research results, and preparation of the final research report.

The population in this study was all toddlers who visited the Waru Community Health Center in Sidoarjo Regency during the period of January–March 2026, totaling 1,201 toddlers. The sample size was determined using the Lemeshow formula to obtain a minimum sample size of 89 toddlers. The sampling technique used probability sampling with a simple random sampling method, so that each member of the population had an equal opportunity to be selected as a respondent. Sample selection was carried out through a data cleaning process, assigning numbers to all population members who met the criteria, and then randomizing using Microsoft Excel to obtain the required sample size.

Data collection was conducted using primary and secondary data. Primary data were obtained through interviews using questionnaires and direct observation of the respondents' home environment. The questionnaire was used to obtain information on respondent characteristics, behavioral factors, history of exclusive breastfeeding, and the incidence of diarrhea in toddlers, while the observation sheet was used to assess environmental sanitation conditions, including the condition of healthy latrines, clean water sources, household waste management, and wastewater drainage (SPAL). Secondary data were obtained from documents and reports from the Waru Community Health Center in Sidoarjo Regency, which were used to support the research data. Before use, the research instrument was first tested on 30 respondents who met the research criteria to ensure its validity and reliability.

The obtained data were processed through editing, coding, entry, and cleaning stages using SPSS software. Next, the data were analyzed univariately to describe the frequency distribution and percentage of each research variable. Bivariate analysis was performed using the Chi-Square (χ^2) test to determine the relationship between environmental and behavioral factors with the incidence of diarrhea in toddlers. If the requirements for the Chi-Square test were not met, the analysis was performed using Fisher's Exact Test as an alternative test. The relationship between variables was declared significant if the p-value obtained was ≤ 0.05.

III. RESULTS AND DISCUSSIONS

Frequency Distribution of Environmental and Behavioral Factors with the Incidence of Diarrhea in Toddlers in the Working Area of Waru Community Health Center, Sidoarjo Regency

1. Environmental Factors

The results of observations of the home environment related to the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency, related to the condition of

healthy latrines, clean water sources, household waste management, and wastewater drainage channels (SPAL) are described as follows:

a. Healthy Toilet Conditions

The distribution of healthy toilet conditions is presented to provide an overview of the ownership status and condition of toilets used by respondents. The toilet ownership status of respondents in the Waru Community Health Center, Sidoarjo Regency, can be seen in the following table.

Table 1. Distribution of Healthy Toilet Ownership Status in the Waru Community Health Center Work Area, Sidoarjo Regency

Ownership Status	Frequency	Percentage (%)
Not private property	0	0.0
Personal	89	100.0
TOTAL	89	100.0

Table 1 shows that 89 respondents (100.0%) had private toilets. The condition of the toilets used by respondents was categorized as satisfactory and unsatisfactory.

Table 2. Frequency Distribution of Healthy Toilet Conditions in the Waru Community Health Center Work Area, Sidoarjo Regency

Healthy Toilet Conditions	Frequency	Percentage (%)
Does not meet the	0	0.0
Fulfil	89	100.0
TOTAL	89	100.0

Based onTable 2 showsthat the condition of the toilets used by 89 respondents (100.0%) met the requirements.

b. Clean Water Source

A clean water source is a crucial factor in preventing disease. The clean water source in respondents' homes in the Waru Community Health Center (Puskesmas) area of Sidoarjo Regency is presented based on observations of the physical condition of the water source used.

Table 3. Frequency Distribution of Respondents' Clean Water Sources in the Waru Community Health Center Work Area, Sidoarjo Regency

Clean Water Source	Frequency	Percentage (%)
Does not meet the	20	22.5
Fulfil	69	77.5
TOTAL	89	100.0

Based on table 3, it shows that of the 89 respondents, 69 respondents (77.5%) have a source of clean water that meets their needs.condition, while the other 20 respondents (22.5%) had clean water sources that did not meet the requirements.

c. Household Waste Management

Household waste management is presented to assess household waste management practices. Waste management practices can impact home environmental hygiene and potentially contribute to diarrhea in toddlers. The following table shows whether household waste management practices among respondents in the Waru Community Health Center (Puskesmas) in Sidoarjo Regency meet or fail to meet requirements.

Table 4. Frequency Distribution of Household Waste Management of R respondents in the Waru Community Health Center Working Area, Sidoarjo Regency

Household Waste Management	Frequency	Percentage (%)
Does not meet the	20	22.5
Fulfil	69	77.5
TOTAL	89	100.0

Based on table 4shows that of the 89 respondents, 69 respondents (77.5%) have household waste management that meets the requirements, while the other 20 respondents (22.5%) have household waste management that does not meet the requirements.

d. Wastewater Drainage Channel (SPAL)

Wastewater drainage channels (SPAL) are one of the household sanitation facilities that play a role in disposing of wastewater from daily activities, so that the condition of wastewater drainage channels

(SPAL) that are not good can cause flooding or environmental pollution and potential other health problems. Wastewater drainage channels (SPAL) are presented to observe the condition of wastewater drainage channels in the respondent's home environment in the work area of the Waru Health Center, Sidoarjo Regency.

Table 5. Frequency DistributionWastewater drainage channel (SPAL)Respondents in the Waru Community Health Center Working Area, Sidoarjo Regency

Wastewater Drainage Channel (SPAL)	Frequency	Percentage (%)
Does not meet the	5	5.6
Fulfil	84	94.4
TOTAL	89	100.0

Based on table 5, it shows that of the 89 respondents, 84 respondents (94.4%) have wastewater drainage channels (SPAL) that meet the requirements,whereas5 other respondents (5.6%)ownwastewater drainage channels (SPAL) that do not meet the requirements.

2. Behavioral Factors

The results of measuring behavioral factors related to the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency, related to the use of healthy latrines, washing hands with soap, drinking water treatment, and exclusive breastfeeding are described as follows:

a. Use of Healthy Toilets

Using a healthy toilet is one of the behaviors that must be considered in maintaining the cleanliness of toddlers and the home environment. Healthy toilet use behavior among toddlers in the Waru Community Health Center (Puskesmas) in Sidoarjo Regency is presented to examine toilet use habits and daily toilet hygiene. Data are grouped into three categories: inadequate, adequate, and good, as shown in the following table.

Table 6. Frequency DistributionUse of Healthy Toilets for Toddlersin the Waru Community Health Center Working Area, Sidoarjo Regency

Use of Healthy Toilets	Frequency	Percentage (%)
Not enough	1	1.1
Enough	39	43.8
Good	49	55.1
TOTAL	89	100.0

Based on table 6, it shows that of the 89 respondents, as many as49Respondents (55.1%) had healthy toilet usage behavior in the good category, 39 respondents (43.8%) in the sufficient category, and 1 respondent (1.1%) in the less than adequate category.

b. Wash your hands with soap

The distribution of handwashing with soap is presented to determine handwashing habits among toddlers and their caregivers, as this is a crucial step in maintaining personal hygiene and preventing illness in toddlers. The data is grouped into three categories: inadequate, adequate, and good, as shown in the following table.

Table 7. Frequency DistributionWashing Hands with Soap for Toddlersin the Waru Community Health Center Working Area, Sidoarjo Regency

Wash your hands with soap	Frequency	Percentage (%)
Not enough	2	2.2
Enough	16	18.0
Good	71	79.8
TOTAL	89	100.0

Based on table 7shows that of the 89 respondents, 71 respondents (79.8%) had handwashing behavior with soap in the good category, 16 respondents (18.0%) in the sufficient category, and 2 respondents (2.2%) in the less than adequate category.

c. Drinking Water Treatment

Drinking water treatment is a crucial behavior in maintaining the quality of water consumed, ensuring it remains clean and safe for toddlers' health. Drinking water treatment behaviors among toddlers in the Waru Community Health Center, Sidoarjo Regency, are presented to determine daily water management habits. Data are grouped into three categories: inadequate, adequate, and good, as shown in the following table.

Table 8. Frequency DistributionDrinking Water Treatment for Toddlersin the Waru Community Health Center Working Area, Sidoarjo Regency

Drinking Water Treatment	Frequency	Percentage (%)
Not enough	1	1.1
Enough	21	23.6
Good	67	75.3
TOTAL	89	100.0

Based on table 8, it shows that of the 89 respondents, 67 respondents (75.3%) have water treatment behavior.drinkin the good category, 21 respondents (23.6%) were in the sufficient category, and 1 respondent (1.1%) was in the poor category.

d. Exclusive Breastfeeding

Exclusive breastfeeding is a crucial step in meeting nutritional needs and boosting the immune system of infants from birth to 6 months. The distribution of exclusive breastfeeding is presented to determine the history of breastfeeding among toddlers in the Waru Community Health Center (Puskesmas) in Sidoarjo Regency, from birth to 6 months, without any additional food or drink, except for medication or vitamins.Data is grouped into exclusive breastfeeding and non-exclusive breastfeeding categories.

Table 9. Frequency DistributionExclusive Breastfeeding for Toddlersin the Working Area of Waru Health Center, Sidoarjo Regency

Exclusive Breastfeeding	Frequency	Percentage (%)
Not Exclusive Breastfeeding	19	21.3
Exclusive Breastfeeding	70	78.7
TOTAL	89	100.0

Based on table 9, it shows that of the 89 respondents, 70 respondents (78.7%) had a history of exclusive breastfeeding, while 19 respondents (21.3%) did not receive exclusive breastfeeding.

Analysis of the Relationship between Environmental and Behavioral Factors and the Incidence of Diarrhea in Toddlers in the Working Area of the Waru Community Health Center, Sidoarjo Regency

The Relationship Between Healthy Toilet Conditions and the Incidence of Diarrhea

Table 10. Analysis of the Relationship between Healthy Toilet Conditions and the Incidence of Diarrhea in Toddlers in the Work Area of the Waru Community Health Center, Sidoarjo Regency

Toilet Condition Healthy	Diarrhea Incident				Total	
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?			
	n	%	n	%	n	%
Does not meet the	0	0.0	0	0.0	0	0.0
Fulfil	57	64.0	32	36.0	89	100.0
Total	57	64.0	32	36.0	89	100.0

Based on Table 10, it shows that there were no respondents with healthy toilet conditions that did not meet the requirements for both toddlers who experienced diarrhea and those who did not experience diarrhea. Overall, all respondents had healthy toilet conditions that met the requirements, as many as 32 toddlers (36.0%) had experienced diarrhea and 57 toddlers (64.0%) had not experienced diarrhea in the last 3 months. The results of the analysis showed that statistical tests could not be carried out because one of the variable categories did not have data (constant value), so there was no data variation that could be analyzed to determine the relationship between healthy toilet conditions and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

The Relationship Between Clean Water Sources and Diarrhea Incidents

Table 11. Relationship AnalysisClean Water Sourcewith the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency

Clean Water Source	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Does not meet the	9	45.0	11	55.0	20	100.0	0.080
Fulfil	48	69.6	21	30.4	69	100.0	
Total	57	64.0	32	36.0	89	100.0	

Table 11 shows the results of the analysis of the relationship between clean water sources and the incidence of diarrhea in toddlers. Among respondents with unqualified clean water sources, the majority of toddlers had experienced diarrhea in the last 3 months, namely 11 toddlers (55.0%), while 9 toddlers (45.0%) did not experience diarrhea. Meanwhile, among respondents with qualified clean water sources, the majority of toddlers did not experience diarrhea, namely 48 toddlers (69.6%), while 21 toddlers (30.4%) had experienced diarrhea. Descriptively, respondents with unqualified clean water sources had a higher proportion of diarrhea incidents than respondents with qualified clean water sources. However, the results of the Chi-Square test showed a p-value = 0.080 ($p > 0.05$), so there was no significant relationship between clean water sources and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

The Relationship Between Household Waste Management and Diarrhea Incidents

Table 12 Relationship AnalysisHousehold Waste Managementwith the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency

Household Waste Management	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Does not meet the	13	65.0	7	35.0	20	100.0	1,000
Fulfil	44	63.8	25	36.2	69	100.0	
Total	57	64.0	32	36.0	89	100.0	

Based on table 12 shows the results of the analysis of the relationship between household waste management and the incidence of diarrhea in toddlers. In respondents with household waste management that does not meet the requirements, most toddlers have not experienced diarrhea in the last 3 months, namely 13 toddlers (65.0%), while toddlers who have experienced diarrhea are 7 toddlers (35.0%). Meanwhile, in respondents with household waste management that meets the requirements, most toddlers do not experience diarrhea, namely 44 toddlers (63.8%), while toddlers who have experienced diarrhea are 25 toddlers (36.2%). The results of the Chi-Square test show a p-value = 1.000 ($p > 0.05$), which means there is no significant relationship between household waste management and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

The Relationship between Wastewater Drainage Channels (SPAL) and Diarrhea Incidents

Table 13. Relationship AnalysisWastewater Drainage Channel (SPAL)with the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency

Wastewater Drainage Channel (SPAL)	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Does not meet the	3	60.0	2	40.0	5	100.0	1,000
Fulfil	54	64.3	30	35.7	84	100.0	
Total	57	64.0	32	36.0	89	100.0	

Based on table 13 shows the results of the analysis of the relationship between wastewater drainage channels (SPAL) and the incidence of diarrhea in toddlers. In respondents with SPAL conditions that do not meet the requirements, the majority of toddlers have not experienced diarrhea in the last 3 months, namely 3 toddlers (60.0%), while 2 toddlers (40.0%) have experienced diarrhea. Meanwhile, in respondents with SPAL conditions that meet the requirements, the majority of toddlers have not experienced diarrhea, namely 54 toddlers (64.3%), while 30 toddlers (35.7%) have experienced diarrhea. The results of the Fisher Exact test show a p-value = 1.000 (p > 0.05), which means there is no significant relationship between wastewater drainage channels (SPAL) and the incidence of diarrhea in toddlers in the working area of the Waru Health Center, Sidoarjo Regency.

The Relationship Between the Use of Healthy Toilets and the Incidence of Diarrhea

Table 14. Relationship AnalysisUse of Healthy Toiletswith the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency

Use of Healthy Toilets	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Not enough	0	0.0	1	100.0	1	100.0	0.018
Enough	20	51.3	19	48.7	39	100.0	
Good	37	75.5	12	24.5	49	100.0	
Total	57	64.0	32	36.0	89	100.0	

Table 14 shows the results of the analysis of the relationship between the use of healthy latrines and the incidence of diarrhea in toddlers. Among respondents in the category of poor use of healthy latrines, all toddlers had experienced diarrhea in the last 3 months, namely 1 toddler (100.0%). In the sufficient category, 19 toddlers (48.7%) had experienced diarrhea, while 20 toddlers (51.3%) had not experienced diarrhea. Meanwhile, in the good category, most toddlers did not experience diarrhea, namely 37 toddlers (75.5%), while 12 toddlers (24.5%) had experienced diarrhea. This pattern indicates that the better the use of healthy latrines, the proportion of diarrhea incidents in toddlers tends to be lower. The results of the Fisher Exact test showed a p-value = 0.018 (p < 0.05), which means there is a significant relationship between the use of healthy latrines and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

The Relationship Between Handwashing with Soap and the Incidence of Diarrhea

Table 15. Analysis of the Relationship between Handwashing with Soap and the Incidence of Diarrhea in Toddlers in the Work Area of the Waru Community Health Center, Sidoarjo Regency

Wash your hands with soap	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Not enough	1	50.0	1	50.0	2	100.0	0.348
Enough	8	50.0	8	50.0	16	100.0	
Good	48	67.6	23	32.4	71	100.0	
Total	57	64.0	32	36.0	89	100.0	

Based on table 15 shows the results of the analysis of the relationship between handwashing with soap and the incidence of diarrhea in toddlers. In respondents with the category of insufficient handwashing with soap, the number of toddlers who experienced diarrhea was 1 toddler (50.0%) and 1 toddler (50.0%) did not experience diarrhea. In the sufficient category, 8 toddlers (50.0%) had experienced diarrhea and 8 toddlers (50.0%) did not experience diarrhea. Meanwhile, in the good category, the majority of toddlers did not experience diarrhea, namely 48 toddlers (67.6%), while toddlers who had experienced diarrhea were 23 toddlers (32.4%). The results of the Fisher Exact test showed a p-value = 0.348 (p > 0.05), which means there is no significant relationship between handwashing with soap and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

The Relationship between Drinking Water Treatment and Diarrhea Incidents

Table 16. Analysis of the Relationship between Drinking Water Treatment and the Incidence of Diarrhea in Toddlers in the Work Area of the Waru Community Health Center, Sidoarjo Regency

Drinking Water Treatment	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Not enough	0	0.0	1	100.0	1	100.0	0.478
Enough	13	61.9	8	38.1	21	100.0	
Good	44	65.7	23	34.3	67	100.0	
Total	57	64.0	32	36.0	89	100.0	

Table 16 shows the results of the analysis of the relationship between drinking water treatment and the incidence of diarrhea in toddlers. In respondents with the category of inadequate drinking water treatment, all toddlers had experienced diarrhea in the last 3 months, namely 1 toddler (100.0%). In the sufficient category, as many as 8 toddlers (38.1%) had experienced diarrhea, while 13 toddlers (61.9%) had not experienced diarrhea. Meanwhile, in the good category, most toddlers did not experience diarrhea, namely 44 toddlers (65.7%), while toddlers who had experienced diarrhea were 23 toddlers (34.3%). The results of the Fisher Exact test showed a p-value = 0.478 ($p > 0.05$), which means there is no significant relationship between drinking water treatment and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

The Relationship Between Exclusive Breastfeeding and the Incidence of Diarrhea

Table 17. Analysis of the Relationship between Exclusive Breastfeeding and the Incidence of Diarrhea in Toddlers in the Working Area of the Waru Community Health Center, Sidoarjo Regency

Exclusive Breastfeeding	Diarrhea Incident				Total		*P-Value*
	No diarrhea in the last 3 months		Have you had diarrhea in the last 3 months?				
	n	%	n	%	n	%	
Not Exclusive Breastfeeding	8	42.1	11	57.9	19	100.0	0.048
Exclusive Breastfeeding	49	70.0	21	30.0	70	100.0	
Total	57	64.0	32	36.0	89	100.0	

Table 17 shows the results of the analysis of the relationship between exclusive breastfeeding and the incidence of diarrhea in toddlers. In toddlers who did not receive exclusive breastfeeding, most had experienced diarrhea in the last 3 months, namely 11 toddlers (57.9%), while toddlers who did not experience diarrhea were 8 toddlers (42.1%). Meanwhile, in toddlers who received exclusive breastfeeding, most did not experience diarrhea, namely 49 toddlers (70.0%), while toddlers who had experienced diarrhea were 21 toddlers (30.0%). This pattern shows that toddlers who received exclusive breastfeeding tended to have a lower proportion of diarrhea incidents than toddlers who did not receive exclusive breastfeeding. The results of the Chi-Square test showed a p-value = 0.048 ($p < 0.05$), which means there is a significant relationship between clean water sources and the incidence of diarrhea in toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency.

IV. CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that most toddlers in the working area of the Waru Community Health Center, Sidoarjo Regency do not experience diarrhea, although there are still some toddlers who have experienced diarrhea in the last three months. In environmental factors, the condition of healthy latrines cannot be analyzed in relation to the incidence of diarrhea because the data obtained is homogeneous, while clean water sources, household waste management, and wastewater drainage (SPAL) do not show a significant relationship with the incidence of diarrhea in toddlers. Meanwhile, in behavioral factors, the use of healthy latrines and exclusive breastfeeding

are proven to have a relationship with the incidence of diarrhea in toddlers, while the behavior of washing hands with soap and drinking water treatment does not show a significant relationship with the incidence of diarrhea in the working area of the Waru Community Health Center, Sidoarjo Regency.

REFERENCES

[1]. Central Statistics Agency. (2023). Number of Types of Tetanus, Measles, Diarrhea, Dengue Fever, and STI Diseases by Regency/City in East Java Province, 2022 - Statistical Table - Central Statistics Agency of East Java Province. Central Statistics Agency (BPS) of East Java Province 2022.

[2]. Sidoarjo Regency Health Office. (2024). Profile of the Sidoarjo Regency Health Office. 1–250.

[3]. Farkhati, DU (2021). Literature Review: Overview of Home Environmental Sanitation Conditions with Diarrhea Incidence in Toddlers. Muhammadiyah Public Health Journal, 1(2).

[4]. Liang, D., Wang, L., Liu, S., Li, S., Zhou, Global Incidence of Diarrheal Diseases—An Update Using an Interpretable Predictive Model Based on XGBoost and SHAP: A Systematic Analysis. Nutrients, 16(18). https://doi.org/10.3390/nu16183217

[5]. Pakpahan. (2021). Health Promotion & Health Behavior. In Jakarta: EGC.

[6]. Pebrianti, D., & Astuti, S. (2021). Analysis of Factors Associated with Diarrheal Incidence in Babai Village, Central Kalimantan. ***Journal of Bionursing,*** 3(3), 176–181. https://doi.org/10.20884/1.bion.2021.3.3.107

[7]. Prawati, DD (2019). Factors Influencing the Incidence of Diarrhea in Tambak Sari, Surabaya City. ***Jurnal PROMKES: The Indonesian Journal of Health Promotion and Health Education***, 7(1), 34. https://doi.org/10.20473/jpk.v7.i1.2019.34-45

[8]. World Health Organization. (2024). Diarrhoeal disease. World Health Organization.