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The Relationship Between Environmental Sanitation Risk Factors And The Incidence Of Diarrhea In Children Under Five In Pauh District, Padang City

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Abstract

Diarrhea is an environmental-based disease with the dominant factors being clean water facilities and a place for excreta disposal. This study was to analyze the relationship between environmental sanitation risk factors and the incidence of diarrhea in children under five in Pauh District, Padang City. Cross sectional research with observational methods and spatial analysis. There were 100 toddlers as the sample and the research instruments were observation sheets and fly grills. Data were analyzed by univariate andbivariate. Under-five diarrhea was related to the type of clean water facility (p = 0.000), clean water quality (presence of E. coli) (p = 0.000), final household waste treatment (p = 0.000), condition of waste water channels (p = 0.000), quality of garbage bins (p = 0.001), quality of sewerage (p = 0.000), density of flies in trash cans (p = 0.017), and density of flies in sewerage (p = 0.089). There is an effect of environmental sanitation, especially the type and quality of clean water facilities, the storage and final processing of waste, the quality of the sewerage, and the density of flies in the household trash with the incidence of diarrhea in children under five. It is hoped that the sanitation workers of the Pauh Health Center will often carry out inspections and interventions to the community's home environment in order to pay attention to environmental health and prevent the occurrence of environmental-based diseases, especially diarrhea.

Keywords : diarrhea, toddlers, sanitation

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The International Journal of Health, Education and Social
(IJHES)

Introduction

Diarrhea is a disease related to the environment with the dominant factor being clean water facilities and a place to dispose of feces. In developing countries, there are still many people who practice open defecation with low socioeconomic factors, lack of knowledge about environmental health, and culture from generation to generation. The impacts that will occur in this situation are contamination of soil and water, contamination of food, and breeding of flies(Saputri & Astuti, 2019).

In 2019 in the city of Padang, the number of diarrhea cases was 9,452 people, including 2,248 children under five. In Pauh District, diarrhea increased from the previous year with the number of cases of 413 people with diarrhea under five as many as 110 people. There was a twofold increase compared to the previous year. Pauh sub-district is the sub-district with the worst sanitation in the city of Padang because it has a score of 64% in the category of families who have access to proper sanitation facilities(Pandang City Health Office, 2019).

The risk caused by diarrhea is dehydration. Patients will lose five liters of water in a day along with the main electrons in the body. The loss of these electrons will cause the baby to be restless, the occurrence of heart rhythm disturbances, and brain bleeding. Dehydration in toddlers is more dangerous than that experienced by children and adults(Wijoyo, 2013).

In addition to the intrinsic factor of toddlers, environmental sanitation factors are also the main factor causing diarrhea. Factors that influence include facilities and quality of clean water (presence of E. coli), facilities and quality of waste water disposal, waste management, and density of flies in the yard.(Ariani, 2016; Ministry of Health, 2017).

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

Prevention of diarrheal disease that can be done by the community is to improve household environmental sanitation, improve hygiene, and the availability of clean water. A healthy environment will minimize the causes of the risk of environmental-based diseases, especially diarrhea.

Based on the data that has been obtained in the preliminary study, environmental sanitation is still said to be poor as a risk factor for the incidence of diarrhea in children under five. By using a spatial approach, we can find out the distribution of diarrhea cases and risk factors for environmental sanitation in Pauh District. Therefore, the purpose of this study is to analyze the spatial pattern of environmental sanitation factors as a determinant of toddler diarrhea in Pauh District, Padang City in 2021.

Results

The results showed that the frequency of diarrhea among children under five in Pauh District was 71 children with diarrhea and 29 children who did not have diarrhea with the highest incidence in Limau Manis Selatan Village 12 children (16.9%), Cupak Tangah Village 10 children (14.08%), and Koto Lua Village 10 toddlers (14-08%). The frequency of the dominant types of clean water facilities that the community uses is dug wells in 72 houses and at least 1 house uses drilled wells. The results of the statistical test (p=0.000) explained the relationship between types of clean water facilities and diarrhea in children under five (Table 1).

On the water quality variable (presence of E. coli). it was found that 57 houses had clean water facilities containing E. coli with 51 toddlers having diarrhea, while 43 houses had clean water facilities that did not contain E. coli with 20 toddlers having diarrhea. The results of the

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

statistical test (p=0.000) explained that there was a correlation between clean water quality (presence of E. coli) and diarrhea in children under five (Table 1).

In the final waste processing variable, it was found that 89 houses did that by burning or throwing garbage into a ravine with a total of 70 children with diarrhea, while 11 houses dumping their waste into a TPS/TPA with 1 toddler with diarrhea. The results of the statistical test (p=0.000) explained the relationship between the final waste processing and toddler's diarrhea (Table 1).

Variable conditions of sewerage conditions, it was found that 78 houses did not meet the requirements with the number of toddlers with diarrhea 67 toddlers, while 22 houses met the requirements with the number of toddlers with diarrhea 4 toddlers. The results of the statistical test (p=0.000) explained the relationship between the condition of the waste water disposal facilities and the incidence of diarrhea in children under five (Table 1).

In the variable quality of waste container, it was found that 63 houses did not meet the requirements with the number of toddlers having diarrhea 52 toddlers, while 37 houses met the requirements with the number of toddlers having diarrhea 19 toddlers. The results of the statistical test (p=0.001) explained the relationship between the quality of the waste container and the diarrhea of children under five (Table 1).

Variable quality of sewerage channel, it was found that 82 houses did not meet the requirements with the number of toddlers with diarrhea 67 toddlers, while 18 houses met the requirements with the number of toddlers with diarrhea 4 toddlers. The results of the statistical test (p=0.000) explained the relationship between the quality of the sewerage and diarrhea in children under five (Table 1).

In the variable density of flies in the household waste bins, it was found that 88 houses had a high fly density category (> 2) with 66 children under five with diarrhea, while 12 houses had a low fly

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

density category (0-2) with 5 diarrhea under five. The results of the statistical test (p=0.017) explained the relationship between fly density in household waste bins with toddler diarrhea (Table 1).

In the variable density of flies in the sewerage, it was found that 7 houses had a high fly density category (>2) with 3 toddlers having diarrhea, while 93 houses had a low fly density category (0-2) with 68 diarrhea toddlers. The results of the statistical test (p=0.089) explained that there was no relationship between the density of flies in the household trash and diarrhea in children under five (Table 1).

Table 1. Cross Tabulation of Environmental Sanitation Variables with Toddler Diarrhea

Variable	Status				Amount		P value
	Diarrhea		No Diarrhea				
	f	%	f	%	f	%	
Clean water facility type							
Local water company	0	0	4	100	4	100	0.000
Boreholes	1	100	0	0	1	100	
Dug well	61	84.7	11	15.3	72	100	
Other sources	9	39.1	14	60.9	23	100	
Presence of E. coli							
There is not any	20	28.2	23	79.3	43	100	0.000
There is	51	71.8	6	20.7	57	100	
Sewerage Condition							
Qualify	4	18.1	18	81.9	22	100	0.000
Not eligible	67	85.9	11	14.1	78	100	
Waste Final Process							
Dumped to landfills	1	9	10	90	11	100	0.000
Burned or thrown into a ravine/river	70	78.7	19	21.3	89	100	
Garbage Container Quality							
Well	19	51.4	18	48.6	39	100	0.001
Bad	52	82.5	11	17.5	61	100	
Sewerage quality							0.000

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

Qualify	4	22.2	14	77.8	18	100	
Not eligible	67	81.7	15	18.3	82	100	
Flies Density in House Trash							0.017
Low (0-2)	5	41.7	7	58.3	12	100	
Height (>2)	66	75	22	25	88	100	
Flies Density in sewerage							
Low (0-2)	68	73.1	25	26.9	93	100	0.089
Height (>2)	3	42.9	4	57.1	7	100	
Total	71	71.0	29	29.0	100		

Discussion

1. The Relationship between Types of Clean Water Facilities and the Incidence of Toddler Diarrhea

The research conducted found that more than half (71%) of children under five experienced diarrhea in Pauh District, Padang City. A similar study was conducted in Pauh District, Padang City in 2018 which resulted in more than half (61.6%) of the incidence of diarrhea in children under five.(Irfan & Delima, 2018). This is in line with research in Tanah Laut Regency in 2020 which obtained results of more than half (61.1%) of children under five with diarrhea in the working area of the Bati-bati Health Center, Tanah Laut Regency.(Dewi et al., 2020).

Diarrhea is an event when individuals who defecate watery/fluid and occur > 3 times a day. This disease includes diseases related to the environment with the dominant factor being clean water facilities and feces disposal facilities(Saputri & Astuti, 2019). Components related to unhealthy human behavior and causing diarrheal disease(Deni, 2021).

The high rate of diarrhea in children under five in Pauh District is influenced by unhealthy environmental sanitation factors (the dominant clean water facility uses dug wells),

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

poor waste water management facilities by dumping it directly into water bodies (not using septic tanks), and poor waste management. by burning and or throwing into the river. The community still depends on the number of river flows so that there is no concern for managing household waste properly.

2. The Relationship between Types of Clean Water Facilities and Toddler Diarrhea

The results of the statistical test showed p = 0.000 which explained the relationship between types of clean water facilities and diarrhea in children under five. This is in line with the 2015 study in Manganitu District, Sangihe Islands Regency which found that there was a relationship between clean water supply and toddler diarrhea.(Katiandagho & Darwel, 2019). In line with research in the working area of the Tamiyang Layang Health Center, East Barito Regency in 2020 which obtained the results of a link between the use of clean water facilities and toddler diarrhea.(Wahyudi et al., 2020).

Clean water facilities are an important need for human life. A building that must have equipment and supplies for the supply and distribution of water for the family's daily needs. Health requirements require that clean water facilities are not polluted which can interfere with human health. Clean water facilities must have water quality according to the quality standards of the Ministry of Health. This facility must meet several requirements consisting of the distance from the pollutant source, the facilities used, and the construction that meets the requirements. Clean water facility conditions that meet standards can reduce cases of diarrhea in toddlers and vice versa if SAB does not meet health standards, the frequency of toddlers experiencing diarrhea will increase(Main et al., 2019).

Dug wells are facilities for providing clean water to the community, sourced from ground water close to the surface. The use of dug wells is often polluted through seepage that

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

enters the soil and comes from human, animal, or household waste. Things that can be done to prevent contamination of dug wells are to pay attention to the distance between the well and the era, septic tanks, and other sources of pollution. The safe distance between the dug well and the septic tank latrine is not at least 11 meters and its position is above the pollutant source.

In this study, the majority of people found the use of dug wells as a means of daily clean water. This community facility does not use a ring, which means the water is in direct contact with the ground. This condition is very unfortunate because the majority of people directly dispose of their household waste water into water bodies or rivers. This condition can lead to contamination of community well water so that it becomes the main factor causing diarrhea due to Escherichia bacteria. coli contained in feces. The community also uses PAMSIMAS as a means of clean water to meet their daily needs. Pamsimas is sourced from mountain springs that are accommodated in a building and then channeled to people's homes using pipes.

3. The Relationship of Clean Water Quality (Presence of Escherichia coli) with Toddler Diarrhea

The results of the statistical test p = 0.000 explained the relationship between clean water quality (presence of Escherichia coli) with diarrhea in children under five. In line with research in Al-Najaf, Al-Ashraf City, Iraq in 2017, which found that there was a relationship between the presence of Escherichia coli in clean water and diarrhea in toddlers.(Al Mussawi & Al Yasseen, 2017).

Escherichia coli namely fecal coliform bacteria that are often found in the digestive tract of humans (small intestine) and animals (warm blood). The identification of *Escherichia coli* in water bodies indicates that the contamination comes from feces. Besides being used as drinking water, clean water is used to wash tableware so that it can be contaminated with

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

Escherichia coli. Cooking water until it boils can kill *Escherichia coli* so that it can prevent digestive tract diseases, especially diarrhea. Boiling water can kill all *Escherichia coli* bacteria, thus preventing digestive tract diseases including diarrhea. *Escherichia coli* can grow at temperatures between 7 - 440C and an optimal temperature of 370C. If the water temperature exceeds 440C, *Escherichia coli* will experience inactivation.(Kurniati et al., 2020).

Based on the Minister of Health Regulation Number 32 of 2017 concerning environmental health quality standards and water health requirements for sanitation hygiene, swimming pools, solus per aqua, and public baths, it is determined that the biological parameter of the *Escherichia coli* quality standard for sanitation hygiene is 0 CFU/100 ml. which means that there should be no bacteria in the water that people use daily (Ministry of Health RI, 2017).

Some people still consume clean water from wells. People prefer water that is treated by themselves rather than using depot water. They assume that the depot water is still raw which contains bacteria. However, some people still consume drinking water refilled daily and use well water for other purposes.

4. The Relationship between Waste Final Processing and Toddler Diarrhea

The results of the statistical test (p=0.000) explained the relationship between final waste processing and the incidence of diarrhea in children under five. Similar research in the working area of the Bambaira Health Center, Pasangkayu Regency in 2018 there is a link between waste disposal facilities and toddler diarrhea(Azmi et al., 2018). In line with what was done in Sindang Barang Village, Bogor City in 2018, it was explained that there was a link between household waste management and toddler diarrhea (strong and not in the same direction)(Oktora, 2018).

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

Waste management aims to manage household waste so that it does not interfere with human health and the beauty of the environment. Management starts from waste collection to final waste management. Garbage collection is the responsibility of the family who must provide temporary trash cans according to quality standards. Separation of organic and inorganic waste is very necessary in order to facilitate its management(Notoatmodjo, 2011). It is concluded that healthy waste management has an impact on reducing diarrhea in children under five. Waste management that does not meet the requirements has the potential to increase the occurrence of diarrhea, especially for toddlers, compared to waste management that meets the requirements (disposal to landfill).

People are very lucky to live near rivers because the majority of people manage household waste by burning and/or throwing it into rivers or ravines. They think that if the garbage is burned or thrown into the river, their waste problem will be solved. Meanwhile, this behavior will cause new problems such as flooding, contaminated rivers, disturbing the aesthetics of the environment, and disturbing human health and aquatic biota.

5. The Relationship between Wastewater Sewer Conditions and Toddler Diarrhea

The results of statistical tests (p = 0.000) explained that there was a relationship between the condition of the sewerage and diarrhea in children under five. Similar research in the working area of the Rembang 2 Health Center, Rembang Regency in 2016 which obtained the results of a link between the sewerage and diarrhea of toddlers.(Sky, 2016).

The waste water in question is waste water that is processed by households such as water used for bathing, used laundry and food ingredients, urine, and human feces. Good waste water management has an impact on human health and the environment. Poor disposal of

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social
(IJHES)

wastewater will contaminate water and soil sources which will become the cause of diarrheal disease transmission. Domestic waste is managed properly using closed channels and ends up in septic tanks. If the sewer is open, it will be used as a vector breeding ground. Waste water management must meet quality standards so as not to cause health impacts(Sky, 2016).

In the management of house waste water in Pauh Subdistrict, most of the people already have closed channels, but these drains lead to rivers. Rivers are highly utilized by the community as the final destination for waste water and community household waste. This behavior will result in river pollution so that it will have an impact on sanitation and people's lives themselves.

6. The Relationship between the Quality of Garbage Containers and Toddler Diarrhea

The results of the statistical test (p=0.001) explained the relationship between the quality of the container and the diarrhea of children under five. Research in the work area of Mangkang Health Center, Semarang City in 2016 showed a relationship between trash bins and toddler diarrhea. A similar study in the work area of the Tasikmadu Health Center, Karanganyar Regency in 2017 found that there was a relationship between the quality of waste disposal and diarrhea in children under five.(Murtadla, 2016; Putra et al., 2017).

The condition of the waste container must meet the requirements to avoid the growth of germs that will nest in the trash. The criteria for a good waste container include waterproof, affordable price, aesthetic shape and color, has a lid, is easy to clean, and is lightweight for easy transportation. Unsanitary containers have the potential to invite the arrival of vectors carrying bacteria so that they can interfere with human health such as diarrhea(Sidhi et al., 2016).

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

The habit of people who use trash baskets that do not have lids is very common. What's more, people use plastic bags as temporary trash containers at home. They assumed that if the bag was full, they would easily throw it into a ravine or river. This behavior is not good because it will pollute the surrounding environment. Plastic waste takes years to decompose.

7. The Relationship between Wastewater Sewer Quality and Toddler Diarrhea

The results of the statistical test (p=0.000) explained the relationship between the quality of sewerage and diarrhea in children under five. A similar study in the working area of the West Martapura Health Center, Banjar Regency in 2018 explained the link between the use of healthy latrines and diarrhea in toddlers. Similar to the research conducted in the work area of the Tasikmadu Health Center, Karanganyar Regency in 2017 it showed the relationship between the quality of wastewater disposal facilities and toddler diarrhea.(Irianty et al., 2018; Putra et al., 2017).

Waste water disposal facilities must meet health requirements so as not to cause the spread of diseases such as diarrhea. The habit of people who do not care about the management of feces and wastewater accelerates the spread of diseases caused by feces. The principles that must be applied in securing household waste include kitchen and bathroom waste that cannot be mixed with latrine water, not vector breeding sites, odorless, no puddles that cause slippery and accident-prone, and is connected to absorption wells.(Beautiful et al., 2021). The requirements for healthy latrines include having a septic tank and air pipe >10 meters from a water source, adequate water and cleaning equipment, buildings having waterproof roofs, walls and floors, adequate lighting and ventilation, not polluting the surrounding soil, and watertight septic tank.

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

Unsanitary and clean latrines will become a place for the spread of Escherichia coli as diarrheal bacteria. The non-fulfillment of sanitation requirements for waste water disposal sites results in an increase in the risk of toddler diarrhea by 2 times compared to families who have the habit of disposing of waste water that meets the requirements. Technically the building, the community already has a latrine in the house, but does not have a septic tank so that the waste water drains into the river. The argument of people who do not have a septic tank is because of limited funds and location to build a septic tank.

8. The Relationship between Flies Density in House Trash and Toddler Diarrhea

The results of the statistical test (p=0.017) explained the relationship between the density of flies in the household trash and diarrhea in children under five. A similar study in the working area of Abeli Public Health Center in the coastal part of Kendari City in 2017 explained the relationship between fly density in toddlers' homes and toddler's diarrhea(Nurnaningsi et al., 2017). Similar to research in the work area of Siko Health Center, Ternate City in 2017 that there is a relationship between the density of flies in toddlers' homes and the incidence of diarrhea in toddlers.(Soamole, 2018).

Flies are related to human health as vectors of disease transmission, especially digestive tract diseases. The development of flies often occurs in landfills ranging from laying eggs to becoming flies and as a place to find food. Flies are very fond of damp and dirty places so that unmanaged feces and garbage will be favored by flies to breed(Safira et al., 2016). The density of flies is an important factor in the incidence of diarrhea in infants. The high density of flies in the trash or house, it can be said that flies will land anywhere including food and drinks that are not covered and will be consumed by the family. Contaminated food will cause toddlers to have diarrhea. One way to prevent this is to eliminate places that have the potential to become

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social (IJHES)

breeding grounds for flies. The importance of maintaining contact with flies is to install wire netting and cover food with a serving hood or store it in the refrigerator or cupboard.

9. The Relationship of Density of Flies in Sewerage Channels with the Incidence of Toddler Diarrhea

The results of statistical tests (p = 0.089) explained that there was no relationship between the density of flies in the sewerage and the incidence of diarrhea in children under five. In line with research in Tanjung Pinang Village, Jambi City in 2017, it was explained that there was no relationship between fly density and the incidence of toddler diarrhea(Listautin, 2018).

A high density of flies will affect diarrhea, as in a study in Tanjung Karang District, Bandar Lampung City Center in 2019 explaining the relationship between fly density and the condition of sewerage.(Andriani, 2021).

Unmanaged feces will pollute the soil, water, and trigger the development of flies. The high density of flies in the sewerage channel is caused by the open and not impermeable channels, the water flowing not smoothly, and causing odors. The sewerage channel must meet health quality standards so that it does not cause health and environmental problems and also invites the nesting of disease vectors.

In this study, it was found that the density of flies is low in sewerage because the majority of people use pipelines as a place for waste water to flow directly into the river. This incident caused the flies to not be able to use the sewerage as a place to lay eggs and breed.

[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social
(IJHES)

Conclusions

There are several variables related to the incidence of diarrhea in children under five in Pauh Subdistrict, Padang City, including types of clean water facilities, clean water quality (presence of *Escherichia coli*), final waste processing and waste storage, condition and quality of sewerage, and fly density. in the trash. While the variable that is not related to diarrhea in toddlers is the density of flies in the sewerage.

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[Vol : 4 Issue : 11 | November 2021] E-ISSN : 2410-5171 | P-ISSN 2415-1246

The International Journal of Health, Education and Social
(IJHES)

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