Description of Microbiological Parameters of Dug Well Water with Diarrhea Incidence in Padang Subur Village, Luwu Regency

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ABSTRACT
(Capital, Times New Roman 8, Italic, One Space)

Dug wells are one of the water sources commonly used by people at the household level. Dug wells as a water source must be supported by construction requirements and location requirements so that the quality of the dug well water is safe.Purpose of the study To determine the description of the microbiological parameters of dug well water with the incidence of diarrhea in the Ponrang Health Center work area, Luwu Regency. This type of research is analytical observational. The population in this study was the number of families in Padang Subur Village, a peaceful environment with a total of 199 families.The results of this study obtained 21 (63.6%) dug wells that met the requirements with the MPN method and did not meet the requirements for total coliform found in dug well water samples, 12 (36.4%). The relationship between total coliform of dug wells and the incidence of diarrhea obtained a p-value of 0.044 (p<0.05) and the relationship between the construction of dug wells and the incidence of diarrhea was obtained with a p-value of 0.046 (p<0.05). The conclusion of this study is that the total coliform parameter of dug wells is related to the incidence of diarrhea and the construction of dug wells is related to the between the incidence of diarrhea.

Keywords : Dug wells, Microbiology parameters, Well construction

INTRODUCTION

Based on data from the Ponrang Community Health Center, the results of the observation show that the coverage of services and handling of diarrhea cases, namely the highest number of diarrhea cases, are in Padang Subur Village (66.29%) and Tumale Village (49.15%). Water is a basic need for every living creature. Humans need the most water, both for daily needs and for all activities such as drinking water, irrigation, industry, offices, hotels and others. According to WHO calculations in developed countries, each person needs between 60-120 liters of water per day. Meanwhile, in developing countries, including Indonesia, each person needs between 30-60 liters of water per day. Clean water used must be free from germs and not contain toxic materials (Yustani Leluno et al., 2020).

Dug wells are a common water source used by households. Dug wells, as a water source, must meet construction and location requirements to ensure safe water quality. Research conducted in Tateli Weru Village, Mandolang District, Minahasa Regency, examined the physical and bacteriological quality of water and the physical condition of dug wells (Hontomole, 2015).

Contaminated water sources can be a major cause of the spread of diarrhea-causing pathogens, such as bacteria, viruses, and parasites. Water contaminated with human or animal feces can contain diarrhea-causing pathogens, such as E. coli, Salmonella, and Rotavirus. Untreated or unclean water sources can lead to gastrointestinal infections. This is common in areas with poor sanitation. Poor sanitation systems and improper waste disposal can contaminate water sources, increasing the risk of diarrhea in the community. Diarrhea is a medical condition characterized by abnormal changes in the frequency and consistency of bowel movements. In general, diarrhea is defined as a condition where a person experiences bowel movements more than three times a day with very runny or even liquid stools (Muthmainnah, 2024).

One factor that can affect the quality of dug wells is seepage from animal waste disposal sites, and the condition of well construction that does not pay attention to the distance between the well and the source of pollution. Distance is one factor that can affect the distribution pattern of microbiological growth and reproduction. The distance between the well and the enclosure must be at least 10 meters and higher than the source of pollution. Indicators of contamination of water sources or water bodies are indicated by changes in water quality caused by an increase in the number of certain element parameters above the established standards. An indicator of bacterial contamination is indicated by the presence of Coliform bacteria. A well is considered to have a good level of sanitation protection if there is no direct contact between the source of pollution and the water in

the well. The parameters used in these bacteriological requirements are measured by the content of E. coli bacteria. Diseases caused by these organisms include diarrhea, gastroenteritis, and dysentery. (Riski Wais, 2022).

The prevalence of diarrhea by symptoms is calculated by combining both diagnosed and symptomatic diarrhea cases. Based on 2018 Riskesda data, the prevalence of diarrhea cases in South Sulawesi Province was 7.03%, and the prevalence of diarrhea cases in Luwu Regency was 6.66%. The highest prevalence of diarrhea cases was in Takalar Regency at 10.14% and Sidenreng Rappang Regency at 8.83%. Data on the prevalence of diarrhea cases by age group showed the highest number of cases in the 1-4 year age group at 9.75% and <1 year at 7.92%. (Ministry of Health, 2018).

Unprotected water sources can be contaminated by human activities, including wastewater and fecal matter. Therefore, water sources must meet health requirements in both quality and quantity. Improperly managed wastewater can pollute surface water and groundwater. Furthermore, improperly managed waste can also become a breeding ground for various disease-transmitting vectors, including diarrhea. Research conducted by Iswan in 2018 found that water sources associated with diarrhea incidence had a p-value of 0.000 ($p<0.05$).

Based on this background data, this study was conducted with the title: "Description of Microbiological Parameters of Dug Well Water Sources and Diarrhea Incidence in Padang Subur Village, Luwu Regency".

MATERIALS AND METHODS

This research is quantitative with a cross-sectional approach. This approach is a research method that studies the causal factors and effects simultaneously by measuring them at a single point in time on the research subjects. The independent variable (dependent) is a variable that is considered to influence the dependent variable. The independent variables studied are microbiological parameters and water sources. Meanwhile, the dependent variable (independent) is a variable influenced by the independent variable. The dependent variable studied is diarrhea.

The population in this study was the number of families in Padang Subur Village, a peaceful environment with a total of 199 families. The number of samples was 33 and the number of dug wells was 33. The sampling technique used was purposive sampling, by observing locations related to diarrhea incidents. The sampling criteria were having a dug well, having experienced diarrhea, and being willing to be interviewed.

RESULTS

The research was conducted through home visits to residents in Padang Subur, a dream neighborhood. Thirty-three homes were visited. Water samples were collected from dug wells and collected in sterile bottles for laboratory testing to determine the total coliform count in water used at the household level.

Univariate Analysis

a. Overview of Microbiological Parameters of Dug Wells

Table 5.2
Distribution of Microbiological Parameters of Dug Wells in Padang Subur Subdistrict in 2025

Number of families	N	Total coliforms
21	21	0
3	3	2
2	2	5
1	1	10
1	1	22
1	1	38
1	1	58
3	3	101
Total	33	

Source: Primary Data, 2025

Based on the data in Table 5.2 above, of the 33 well water samples examined microbiologically for total coliform, 21 samples, or approximately 63.6%, did not contain total coliform bacteria. This indicates that most well water sources in Padang Subur Village are still relatively safe from total coliform bacteria contamination, which is an important indicator of water quality and potential health risks. However, 12 samples still showed the presence of total coliform, requiring further attention in water quality management and monitoring to optimally maintain public health.

Table 5.3
Distribution of Total Coliform Parameter Quality in Padang Subur Village in 2025

Criteria	Frequency	Percentage
Not eligible	12	63.6
qualify	21	36.4
Total	33	100

Source: Primary Data, 2025

Based on the data in table 5.3, it shows that of the 33 water samples examined, there were 21 (63.6%) water samples that did not contain total coliform or met the requirements and there were 12 (36.4%) water samples that contained total coliform or did not meet the requirements.

Table 5.4
Distribution of Diarrhea Incidents in Padang Subur Village in 2025

Occurrence of diarrhea	Frequency	Percentage
Yes	12	36.4
No	21	63.6
Total	33	100

Source: Primary Data, 2025

Based on the data in table 5.10, it shows that the number of cases of diarrhea in the last six months was 12 people or 36.4%, respondents who did not experience diarrhea were 21 people or 63.6%.

b. Dug Well Construction Overview

(a) Image of the well lip

Table 5.5
Distribution of Dug Well Lips in Padang Subur Village in 2025

Criteria	Frequency / well	Percentage
Not eligible	13	39.4
Qualify	20	60.6
Total	33	100

Source: Primary Data, 2025

Based on the data in table 5.5, it shows that there are 13 dug wells or 39.4% that have well lips in accordance with the provisions of SNI 03-2916-1992 and there are 20 dug wells or 60.6% that have dug wells that do not comply with SNI criteria.

(b) Description of the distance of the dug well from the pollution source

Table 5.6
Distribution of Dug Well Distances in Padang Subur Village in 2025

Criteria	Frequency/well	Percentage
Qualify	19	57.6
Not Qualfy	14	42.4
Total	33	100

Source: Primary Data, 2025

The minimum distance requirement for a well from a pollution source is 10 meters. Based on the data above, it shows that there are 19 dug wells from respondents or 57.6% that are 10 meters from a pollution source, one of which is a septic tank.

(c) Picture of the dug well wall

Table 5.7
Distribution of dug well walls in Padang Subur Village in 2025

Criteria	Frequency / well	Percentage
Qualify	12	36.4
Not eligible	21	63.6
Total	33	100

Source: Primary Data 2025

The table above shows that 12 dug wells, or 36.4% of the wells, had walls made of uncracked brick. There were 21 dug wells, or 63.4% of the respondents' wells, whose walls were not made of brick.

(d) Picture of the well floor

Table 5.8
Distribution of Dug Well Floors in Padang Subur Village in 2025

Criteria	Frequency	Percentage
Qualify	12	36.4
Not eligible	21	63.6
Total	33	100

Source: Primary Data 2025

The data in the table above shows that 12 dug wells, or 36.4%, have watertight floors, no standing water, and non-slippery floors. Twenty-one dug wells, or 63.6%, have floors that do not meet SNI criteria.

(e) Picture of dug well water channel

Table 5.9
Distribution of wastewater channels in Padang Subur Village in 2025

Criteria	Frequency	Percentage
Qualify	19	57.6
Not eligible	14	42.4
Total	33	100

Source: Primary Data 2025

The data in the table above shows that 19 dug wells, or 57.6%, meet the criteria for having drainage channels to prevent water from pooling. There are 14 dug wells, or 42.4%, that do not meet the criteria for drainage channels.

Brivat Analysis

a. Relationship between Total Coliform and Diarrhea Incidence

Table 5.10
The Relationship between Total Coli from Dug Wells and the Incidence of Diarrhea in Padang Subur Village in 2025

Total coliforms	Diarrhea Occurrence						P
	Diarrhea	%	No diarrhea	%	Total	%	
TMS	10	83,3	2	16,6	12	100	0,044
MS	10	47,6	11	52,3	21	100	

Source: Primary Data 2025

Information
*MS: meets the requirements
*TMS: does not meet the requirements

Based on the data in Table 5.10 above, the results of the analysis test of the relationship between total coliform content and the incidence of diarrhea in the ideal environmental area of Padang Subur Village at a p-value of 0.044 ($p < 0.05$) means that the incidence of diarrhea in respondents is related to the total coliform microbiological content in the water source used by residents..

b. The Relationship between Well Construction and the Incidence of Diarrhea

Table 5.11
The Relationship Between Dug Well Construction and Diarrheal Incidence in Padang Subur Village in 2025

Dug well construction	Diarrhea Occurrence						P
	Diarrhea	%	No Diarrhea	%	Total	%	
TMS	11	78,6	3	21,4	14	100	0,046
MS	10	52,6	9	47,4	19	100	

Source: Primary Data 2025

Based on the data in Table 5.11 above, the results of the analysis test of the relationship between total coliform content and the incidence of diarrhea in the ideal environmental area of Padang Subur Village at a p-value of 0.046 ($p < 0.05$) means that the incidence of diarrhea in respondents is related to the construction of dug wells with the incidence of diarrhea in the water sources used by residents.

DISCUSSION

Overview of Microbiological Parameter Quality of Dug Wells Diarrhea Incidence

Based on research results in the Idaman Environment of Padang Subur Village, laboratory tests using the MPN (Most Probable Number) method on dug wells showed a significant relationship between total coliform content in water and the incidence of diarrhea in the area. A p-value of 0.044 ($p < 0.05$) indicates that microbiological contamination of water sources plays a significant role in increasing cases of diarrhea in the community. This finding is consistent with various previous studies stating that the presence of coliform bacteria, especially those originating from human or animal feces in drinking water, can be an indicator of fecal pollution and potentially carry pathogens that cause digestive disorders, namely total coliform. This condition is exacerbated if the well construction does not meet SNI 03-2916-1992 standards (such as poor watertightness or too close to the septic tank), allowing contaminants to easily enter the water source. The resulting health impacts, such as dehydration due to diarrhea, can even be fatal in children if not treated properly.

One of the health problems caused by water contamination by E. coli is diarrhea. Some strains that cause this condition are enterohemorrhagic E. coli (EHEC) and enteropathogenic E. coli (EPEC). E. coli bacterial infections are often accompanied by common symptoms such as pain, nausea, vomiting, fever, and dehydration (Ministry of Health, 2024).

One cause of water pollution is contamination with coliform bacteria, which can be found in soil, plants, and the digestive tracts of animals and humans. Water contaminated with coliform bacteria cannot be detected with the naked eye because there are no specific changes in appearance, taste, or odor. In general, household drinking water is suspected to be contaminated if it does not cause health impacts, such as diarrhea (Ministry of Health, 2024).

One cause of water pollution is contamination with coliform bacteria, which can be found in soil, plants, and the digestive tracts of animals and humans. Water contaminated with coliform bacteria cannot be detected with the naked eye because there are no specific changes in appearance, taste, or odor. Generally, the quality of household drinking water is suspected to be contaminated, causing health impacts such as diarrhea (Ministry of Health, 2024).

Research conducted by Rahmawati (2024) aligns with this research, conducted in Puncangsawit Village, Jebres District, Surakarta City, Central Java Province. Ten water samples were assessed. Laboratory tests showed that all samples contained coliform bacteria, but no Escherichia coli contamination was found.

Dug Well Construction Relationship Overview

The results of the study showed a significant relationship between dug well construction and the incidence of diarrhea in the Idaman Environment area of Padang Subur Village, as indicated by a p-value

of 0.046 ($p < 0.05$). This indicates that the quality and physical condition of dug wells significantly influence microbiological contamination, particularly the total coliform content in the water source used by residents. Dug wells that do not meet construction standards, such as the lack of waterproof protection, inadequate depth, or being too close to pollution sources such as septic tanks, allow total coliform bacteria to enter the water. This contamination then contributes to an increased risk of diarrhea in the community, because coliform bacteria are an indicator of fecal contamination that can carry pathogens that cause gastrointestinal diseases. Therefore, improving the construction of dug wells is an important step in efforts to prevent diarrhea and improve the quality of public health in the area.

The location of the dug well must be easily accessible, at least 10 meters away from any pollution source. These sources include pits, septic tanks, garbage dumps, etc. The dug well must not be flooded. If the soil is not prone to cracking or collapsing, the wall construction should be made of brick/cinder block/split stone plastered externally and 80 cm above the floor surface. If the soil is cracking or collapsing, the upper wall construction should be made of brick/cinder block/split stone plastered externally and internally to a height of 80 cm above the floor surface. The lower wall to the depth of the well should be made of a concrete pipe 300 cm below the floor surface and must be watertight, with the remainder perforated. The drainage channel must be watertight and slope 2% towards the wastewater treatment facility, and the well must be equipped with a bucket hoist (PUPR, 2016).

One of the clean water infrastructure facilities is a dug well, a means of tapping and storing groundwater for subsequent use as a clean water source. Dug well planning refers to SNI 03-2916-1992, Specifications for Dug Wells for Clean Water Sources. The general requirements for dug wells are a circular diameter of 0.80 and a minimum depth of 2.00 meters from the water surface during the dry season (PUPR, 2016).

Research conducted by Syarifida (2022) is in line with this research in Pal IX village, Sungai Kakap sub-district, Kubu Raya district. The number of well samples observed and laboratory tests were 10 dug wells. The results of the bivariate analysis obtained data including well walls that meet the requirements with the number of coliforms obtained a p-value of 0.016 (p-value <0.05) meaning there is a relationship between the well walls and coliforms in dug well water. The well lip that meets the requirements with coliforms obtained a p-value of 0.016 (p-value <0.05) meaning there is a significant relationship. The well floor that meets the requirements with coliforms obtained a p-value of 0.035 (p-value <0.035) meaning there is a significant relationship. The distance of the septic tank that meets the requirements with coliforms in water obtained a p-value of 0.016 (p-value <0.05) meaning there is a significant relationship.

Based on the results of research on dug wells in the Idaman neighborhood of Padang Subur Village, the total coliform parameters in the water did not meet water quality requirements. This condition is closely related to the incidence of diarrhea in the community, as confirmed by a p-value of 0.044 ($p < 0.05$), indicating a significant relationship between total coliform contamination and diarrhea incidence. Furthermore, the study also found that the construction of dug wells had a significant influence on the incidence of diarrhea, with a p-value of 0.046 ($p < 0.05$). This indicates that the physical quality and construction techniques of dug wells significantly influence the level of microbiological contamination, particularly the presence of total coliform in the water. Poorly constructed dug wells allow the entry of contaminating bacteria, thereby increasing the risk of diarrhea in the environment. Therefore, improving well construction is an important step to improve water quality and reduce the incidence of diarrhea in the community.

CONCLUSIONS AND SUGGESTIONS

This study concludes that 1) The microbiological description of total coliform of dug well water with the incidence of diarrhea in the Damai neighborhood of Padang Subur Village is related with a p-value of 0.044 (p <0.05). 2) The description of dug well construction with the incidence of diarrhea in the Damai neighborhood of Padang Subur Village is related with a p-value of 0.046 (p-value <0.05). It is recommended that 1) Dug wells that do not meet microbiological requirements should be tested in the laboratory to further confirm the presence or absence of Escherichia coli content in the dug well water, this is important to maintain the safety of the water consumed. 2) Dug wells that have constructions that do not meet the requirements of SNI 03-2916-1992 need to be educated to the owners of dug wells to make efforts to improve the wells to maintain the quality of the water used. 3) Diarrhea experienced by residents in the Damai neighborhood is not only caused by other factors, so residents in the neighborhood should adopt clean and healthy living behaviors.

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