

**RELATIONSHIP BETWEEN THE PHYSICAL CONDITIONS OF DUG
WELLS AND THE EXISTENCE OF ESCHERICHIA COLI BACTERIA IN
THE VILLAGE OF CORAL MUNCANG CIGANDAMEKAR DISTRICT
BRASS DISTRICT**

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Abstract

Dug wells are the most common and widespread well construction used to collect groundwater for the community, including residents in Karangmuncang Village, Cigandamekar District, Kuningan Regency. There are 1,552 residents who use dug wells as a means of clean water, there are 137 dug wells that have a high risk of contamination and the Escherichia Coli (E.coli) bacteria content of 2 MPN/100 ml was found. The purpose of this study is to determine whether there is a relationship between the physical condition of dug wells and the presence of Escherichia coli bacteria in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022. This type of inferential research with cross sectional design, a sample of 68 dug wells. This research was conducted using a checklist sheet and the MPN laboratory test. The analysis was carried out using univariate and bivariate analysis in the form of Spearman Rank analysis. The results of the univariate analysis showed that most of the physical conditions of dug wells had a high risk of pollution as many as 46 dug wells, most of the water did not meet the quality standards of Permenkes 32 of 2017 as many as 61 samples. Bivariate analysis of the two variables studied showed $p = 0.086$ ($p > 0.05$) which means that there is no significant relationship between the physical condition of dug wells and the presence of Escherichia coli bacteria in Karangmuncang Village, Cigandamekar District, Kuningan Regency, $r = 0.21$. and the direction of the correlation is positive. Based on the results of the Rank Spearman test there is no significant relationship, the nature of the relationship is weak and the direction of the correlation is positive. It is ensured that the community boils clean water until it boils, the village government is encouraged to participate in monitoring and monitoring the quality of dug well water, the Cigandamekar health center conducts periodic checks of the water quality of the dug wells.

Keywords: Dug well, Escherichia coli, bacteria

INTRODUCTION

Water is the main need of living things to meet all their daily needs, water used for daily needs such as drinking, cooking, washing and others must meet health requirements (Meylani, 2019). Safe drinking water, sanitation and hygiene are essential to human health and well-being. Safe WASH (Water, Sanitation, Hygiene) is not only a prerequisite for health, it also contributes to livelihoods, school attendance and dignity and helps create resilient communities living in healthy environments. Drinking unsafe water harms health through diarrheal diseases and untreated sewage contaminates ground water and surface water used for drinking, irrigation, bathing and household purposes. This poses a heavy burden on society (WHO, 2018). Dug wells are one of the means of providing clean water for people in rural and urban areas. Dug wells provide water that comes from a layer of soil that is relatively close to the ground surface, so that it is easily exposed to contamination through seepage from human, animal waste, and domestic household needs. Dug wells as a source of clean water must be supported by construction and site requirements (Zulfikar, 2019).

Dug wells are the most common and widespread well construction used to collect groundwater for the community, including residents in Karangmuncang Village, Cigandamekar District, Kuningan Regency. There are 1,552 residents who use dug wells as a means of clean water (Puskesmas Cigandamekar, 2021). Dug well water is very easily contaminated by bacteria originating from sewage or human waste. This happens because dug well water can come from shallow soil layers, causing waste or garbage dumped above the surface to seep into the ground and pollute groundwater (Syafarida et al., 2022).

Previous research conducted in the Gampong Daroy Kameu area, Darul Imarah District, Aceh Besar District, showed that there was a relationship between the physical condition of dug wells and the presence of E.coli bacteria in dug well water (Zulfikar, 2019). The distance between the septic tank and the dug well is related to the presence of Escherichia Coli bacteria. The distance between the septic tank and the well that does not meet the requirements is 2,264 greater risk than the dug well that has the distance that meets the requirements with the septic tank (Mandasari, 2019). In addition to the distance between the septic tank and the dug well, the walls of the dug well, the height of the dug well, the floor of the dug well are related to the presence of Escherichia Coli bacteria (Zulfikar, 2019)

Based on data on clean water supply facilities, dug wells in Karangmuncang Village, Cigandamekar District, Kuningan Regency, in 2021 there were 137 dug wells that did not meet the requirements and were included in the high pollutant risk category. The results of testing the quality of clean water carried out by Cigandamekar Health Center officers in 2021 also found the presence of Escherichia Coli (E.coli) bacteria in dug well water in Karangmuncang village, Cigandamekar District, Kuningan Regency of 2 MPN/100 ml (Cigandamekar Health Center, 2021).

The purpose of this study was to describe the risk of contamination from dug wells, describe the presence of Escherichia coli bacteria and analyze the relationship between the physical condition of dug wells and the presence of Escherichia coli bacteria in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022.

RESEARCH METHODS

This type of research is inferential, the research design is cross sectional. The variables in this study were the physical condition of the dug wells and the presence of Escherichia coli bacteria. The population in this study were 288 dug wells and a sample of 68 dug wells using random sampling technique with the sample size using the proportion formula. The instruments in this study were the checklist sheet adopted from the dug well sanitation inspection sheet of the Kuningan District Health Office and laboratory equipment to test the presence of Escherichia coli bacteria using the MPN test.

RESULT AND DISCUSSION

Univariate analysis aims to determine the distribution of each variable, both independent and dependent variables. The independent variable in this study is the physical condition of the dug well and the dependent variable is the presence of Escherichia coli bacteria

- a. Description of the physical condition of the dug well in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022

The description of the physical condition of dug wells was obtained from observations using a checklist sheet that adopted the sanitary inspection form of dug wells from the Kuningan District Health Office.

Table 1 Results of Univariate Physical Conditions

No	Physical condition of the dug well	n	Persentase (%)
1	Very High	3	4,4
2	Tall	46	67,6
3	Currently	17	25
4	Low	2	3
Total		68	100

Based on table 1 of the 68 dug wells, most of the physical conditions have a high risk of pollution as many as 46 dug wells (67.6%), 17 dug wells (25%), very high 3 dug wells (4.4%) and low as many as 2 dug wells (3%).

- b. Overview of the Presence of Escherichia Coli . Bacteria

The presence of Escherichia Coli bacteria in dug well water was obtained from the results of laboratory testing using the MPN (Most Probable Number) test by the Kuningan Regency Regional Health Laboratory with the standard of the Minister of Health Regulation No. 32 of 2017.

Table 2 Univariate Results Presence of Escherichia coli

No	The Presence of Escherichia Coli Bakteri	n	Persentase (%)
1	Not Meeting Standard	61	89,7
2	Meet the standards	7	10,3
Total		68	100
Mean		838,63	
Standar Deviasi		999,67	
Min-Max		0-2.400	

Source: Primary Data for 2022

Based on table 2, it was found that from 68 water samples, most of them did not meet the standard as many as 61 samples (89.7%), with an average presence of 838.63 MPN/100 ml of water with a range of 0-2,400 MPN/100 ml of water.

Bivariate analysis was conducted to determine the relationship between the independent variable and the dependent variable. The hypothesis test in this research is using the Spearman Rank test. The results of statistical tests are in the form of a relationship between the physical condition of dug wells and the presence of Escherichia coli bacteria in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022.

Table 3 The Relationship Between the Physical Condition of the Dug Well and the Presence of Escherichia Coli Bacteria in 2022

No	Kondisi fisik Sumur Gali	Presence of Escherichia coli Bakteri				Total		P value	R
		TMS		MS		n	%		
		n	%	n	%				
1.	Very High	3	100	0	0	3	100	0,086	0,21
2.	Tall	43	93,5	3	6,5	46	100		
3.	Currently	13	76,5	4	23,5	17	100		
4.	Low	2	100	0	0	2	100		
Total		61	89,7	7	10,3	68	100		

Source: Primary Data for 2022

Based on table 3, the results obtained from 46 dug wells whose physical condition has a high risk of pollution, most of the water does not meet the standards as many as 43 samples (93.5%), and water that meets the standards as many as 3 dug wells (6.5%), out of 17 dug wells whose physical condition has a moderate risk of pollution, most of the water does not meet the standard as many as 13 samples (76.5%) and water that meets the standard as many as 4 samples (23.5%), from 3 dug wells whose physical condition has a very high risk of pollution. the total water level does not meet the standard, from 2 dug wells whose physical condition has a low risk of pollution, all of the water does not meet the standard. Based on the results of the Rank Spearman test, it was found that the p value = 0.086, which means that there is no significant relationship between the physical condition of the dug well and the presence of Escherichia coli bacteria in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022.

1. Description of the physical condition of the dug well

Based on the results of observations made in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022, of the 68 dug wells, most of their physical conditions have a high risk of pollution as many as 46 dug wells (67.6%), while 17 dug wells (25%), very high as many as 3 dug wells (4.4%) and 2 dug wells (3%). These results were obtained from observations in the form of characteristics of dug wells in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022. Based on the environmental characteristics around the

well, namely, the distance between the latrine and the dug well, there are 59 dug wells (86.8%) which have a distance of < 10 meters where the dug wells have a risk of contamination caused by the distance of the latrine. The risk of contamination of dug wells by feces is due to the proximity of the latrines to the dug wells that seep into the ground so that the dug wells can become contaminated. other) as many as 50 dug wells (73.5%) which means the dug wells have the potential for pollution caused by other contaminants such as solokan, ponds and others where the closer the distance to other pollutant sources, the higher the possibility of the dug well being polluted.

Based on the presence of puddles around the wells, mostly there are puddles within 2 meters of the well floor as many as 37 dug wells (54.4%) which have puddles within 2 meters, which according to research conducted in the Jabungan village, Semarang city stated that the distance between dug wells and puddles around wells that do not meet the requirements has a risk of 1,800 times the bacterial quality of well water that does not meet the standards (Rahayu et al., 2019). Based on the presence of SPAL, most of the dug wells are equipped with SPAL as many as 41 dug wells (60.3%). Based on the characteristics of the condition of the dug well construction, namely, the condition of the well floor, most of the floors were cemented < 1 meter as many as 56 dug wells (82.4%) which means that the dug wells have the potential to be polluted because the floor of the well is at least given cement with a minimum size of 100 cm or 1 meter function. rather no seepage of water generated from outside the dug well. Based on the presence of inundation above the well floor, most of the 41 dug wells (61.3%) had no inundation on the floor. Based on well floor cracks, most of the 54 dug wells (79.4%) had cracked well floors, this has the potential to enter water from outside the well through the wells caused by cracks in the floor. Based on the use of buckets at any time, most of the 64 dug wells (94.1%) did not use buckets at any time.

Based on the location of the pump holder, the majority of the pumps have 54 dug wells (79.4%) whose pump holder conditions which are directly adjacent to the floor are not tight/loose so it is feared that water from outside is sucked which affects water quality. Based on the walls of the wells, most of the 45 dug wells (66.2%) have insufficiently cemented well walls 3 meters below the surface, which means that the wells are feared for water seepage by bacteria with the characteristics of living habitats at that distance. Based on the presence of well covers, most of them are 58 dug wells (85.3%) which have covers, which means that the wells are protected from pollution caused from outside the well.

2. Overview of the Presence of Escherichia Coli . Bacteria

Echerichia coli is one of the bacteria that can be used as an indicator of water pollution. These bacteria can be cultured at 37o and 44oC using Lactose Broth and EC Broth media. The water sample used was dug well water in Karangmuncang Village, Cigandamekar District, Kuningan Regency. Based on the results of laboratory tests, it was found that most of the 61 samples (89.7%) did not meet the standards in accordance with the Regulation of the Minister of Health No. 32 of 2017 with the presence of Escherichia coli bacteria on average as much as 838.63 MPN/100 ml of water, with a range of 0- 2,400 MPN/100 ml of water contained in dug well water in Karangmuncang Village, Cigandamekar District, Kuningan Regency in 2022. This is in line with research conducted in Tirak Village,

Kwadungan District, Ngawi Regency, which showed that from 36 dug well samples, 21 (58%) dug wells contained *Escherichia coli* bacteria (Insyiroh, 2018). Based on observations made in Karangmuncang Village, most of the distances between houses are too close so that there is no land that is in accordance with the standards to distance the pollutant source from the source of clean water.

3. Analysis of the Relationship Between the Physical Condition of the Dug Well and the Presence of *Escherichia Coli* . Bacteria

Based on the research that has been done, table 5.3 shows the results of 46 dug wells that have high physical conditions, most of the water does not meet the standards as many as 43 dug wells (93.5%), and water that meets the standard as many as 3 dug wells (6.5 %), of the 17 dug wells that had moderate physical conditions, most of the water did not meet the standards as many as 13 dug wells (76.5%) and 4 dug wells (23.5%). the physical condition is very high, all of the water does not meet the standard, from 2 dug wells that have low physical condition all the water does not meet the standard. Based on the Rank Spearman test, the results obtained $R = 0.21$ which means the strength of the relationship is weak and the value of $p = 0.086$ which means that there is no significant relationship between the physical condition of the dug wells and the presence of *Escherichia coli* bacteria in dug well water in Karangmuncang Village, Cigandamekar District, Kuningan Regency. The direction of this relationship is positive, which means that the higher the physical condition of the dug well, the more *E.coli* bacteria will be present, and conversely, the lower the risk of contamination from the dug well, the less *E.coli* bacteria will be present. This study is not in line with research conducted in Gampong Daroy Kameu, Darul Imarah District, Aceh Besar District which stated that there was a significant relationship between the risk of being exposed to dug wells and the presence of *Escherichia Coli* bacteria.

Based on the results of the above test, the researcher assumes that this can occur because of other factors in the form of rain, because at the time the research took place, it was faced with the rainy season with a high enough intensity. *Escherichia coli* in dug wells between the rainy season and dry season where in the rainy season the content of *Escherichia coli* bacteria is higher than the dry season (Leifels et al., 2019).

Water is a good medium for spreading bacteria, so that during the rainy season, the spread of bacteria is faster. Rainwater can be contaminated through the air in the form of pollutants. Rainwater that falls to the soil surface is absorbed through the pores of the soil called infiltration, then the water undergoes percolation which is the process of moving water through the soil layer due to gravity in this process, there is also a high possibility of bacterial contamination from the soil to the water. Contaminated water moves into the ground through cracks and pores in the soil and rocks towards the groundwater table, then forms ground water resources, then the contaminated water moves from a high place to a low place, in this case the process occurs below the earth's surface in a layer of porous soil called an aquifer, where there is an underground water flow called aquifer flow (Darwis, 2018). Based on observations, the soil conditions in Karangmuncang Village are mostly uneven or tilted causing the flow of

groundwater that carries *Escherichia coli* bacteria occurs faster and dug wells are shallow wells so that rainwater is easily absorbed into the well.

CONCLUSION

Based on the conclusions obtained, namely the physical condition of the 68 dug wells, most of the physical conditions have a high risk of pollution as many as 46 dug wells (67.6%), while 17 dug wells (25%), very high as many as 3 dug wells (4.4%) and low as much as 2 dug wells (3%), the presence of *Escherichia coli* bacteria from 68 water samples mostly did not meet the standards as many as 61 samples (89.7%) and met the standards as many as 7 samples (10.3%) and Based on the Spearman Rank test, the results obtained $R = 0.21$ which means the strength of the relationship is weak and the p value = 0.086 ($p > 0.05$) which means that there is no significant relationship between the physical condition of the dug wells and the presence of *Escherichia coli* bacteria in the dug well water. Karangmuncang Village, Cigandamekar District, Kuningan Regency. The direction of this relationship is positive.

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