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ALTERNATIVE MODIFICATION OF WASTEWATER (SPAL) CONTENT OF E.COLI CONTENT IN DUG WELLS IN PUSKESMAS WORKING AREA DARUL IMARAH DISTRICT ACEH BESAR

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ABSTRACT

The presence of Colifaecal bacteria in clean water indicates contamination caused by dirt. The discovery of E. Coli in water is thought to endanger human health, because the water is suspected of containing pathogenic microorganisms, which include viruses, bacteria, protozoa, and parasites which are transmitted through fecal material.. The research objective is tofind out the bacteriological content of E. Coli in dug well water by modifying the sewerage channel in the Darul Imarah Health Center Work Area, Aceh Besar District in 2019. This type of research is a Quasi-Experimental research method, non-equivalent control group design with analytical tests (chi square test). The subject of this study was the number of E. Coli in dug wells before and after alternative modifications of wastewater disposal channels. Data collection was carried out by interviews and surveys as well as conducting interventions. The results of this study were the presence of e.coli bacteria in the dug wells from the three samples examined an average of 5 MPN E.Coli/100 ml before the SPAL modification, whereas after the SPAL modification had an effect on reducing the number of E.Coli bacteria in the wells, where the value of p < 0.05 is 0,

Keywords:SPAL, E. Coli, Dug Wells.

Introdaction

SHousehold waste is waste originating from kitchens, bathrooms, laundry, former household industrial waste and human waste. Waste is waste or something that is not used in the form of liquid, gas and solid. In wastewater there are chemicals that are difficult to remove and dangerous. These chemicals can give life to germs that cause dysentery, typhoid, cholera and other diseases. The waste water must be treated so that it does not pollute and does not endanger the health of the environment. Wastewater must be managed to reduce pollution.

Diarrheal disease is a disease with high morbidity and mortality to date, so that this disease is still considered a health problem that cannot be overcome by developing countries such as Indonesia. In developing countries, children under 3 years of age experience an average of 3 episodes of diarrhea per year. Diarrhea can cause loss of nutrients that children need during their growth period. Diarrhea is still the biggest cause of death for toddlers in Indonesia. Because diarrhea itself in Indonesia is the number two killer of toddlers after ARI (Acute Respiratory Infection) and every year 100,000 toddlers die from diarrhea.

One of the causes of diarrheal disease is improper management both at home and in health facilities. Meanwhile, from the results of the household health survey (SKRT) in Indonesia in the Ministry of Health of the Republic of Indonesia, diarrhea is the number two cause of death in toddlers, number three in infants and number five for all ages. Cases of finding diarrhea handled in Indonesia in 2017 were 4,274,790 (60.4%) cases. (Directorate General of P2P, Ministry of Health RI, 2018).

Diarrhea cases in Aceh Province in 2017 amounted to 83,914 cases and are expected to increase in 2018. Data recorded at the Aceh Besar District Health Office, the number of diarrhea cases in 2015 was 15,808 cases, 8,907 men and 7,711 cases of women. The coverage of cases of diarrhea found and handled in 2015 was 1,289 men (16%) less than the case detection of diarrhea in women 1,641 (21%)

while the morbidity rate of diarrhea per 1000 population was 411. The percentage of diarrhea cases found and treated was 2010-2015 increased in 2013 (108%) and decreased again in 2015 (19%).

Waste water is a medium for nesting and transmission of dangerous diseases for humans. Dirty water is a comfortable place to breed various bacteria and viruses that cause disease. One of the germs of infectious diseases that reproduce through water intermediaries is diarrhea (Achmadi, 2011).

Microbiologically water quality that does not meet health requirements can cause health problems. The presence of Colifaecal bacteria in clean water indicates contamination caused by human feces. The discovery of E. Coli in water is thought to pose a threat to human health, because the water is suspected of containing pathogenic microorganisms which include viruses, bacteria, protozoa, and parasites which are transmitted through fecal material (Connel and Miller, 1997).

One of the most common facilities used by small communities to collect water from shallow wells and use them as a source of drinking water is dug wells. Meanwhile, shallow well water is the water most easily contaminated by seepage originating from sewage facilities, latrines, livestock pens, and animal waste. Pollution of dug wells is especially common in densely populated residential areas, for example in slum areas (Connel and Miller, 2008).

The high incidence of diarrhea is understandably due to poor environmental sanitation conditions, especially in densely populated areas, where poor environmental sanitation is an important factor in the transmission of diarrheal disease in addition to other factors such as nutritional status, socio-economic status, education, community behavior and so on. Improving environmental sanitation is an effort to improve the human environment so that it becomes a good medium for the realization of optimal health for humans in it. Law no. 23 of 1992 concerning health stated that "Environmental health is held to realize the degree of public health which can be done, among others, through environmental sanitation". (Notoadmodjo, 2000).

After identifying the number of E.Coli based on the shape of the Wastewater Disposal Facility (SPAL) with community wells, then a laboratory examination was carried out to determine whether the community dug wells were contaminated with E.Coli and to what extent the spread of E.Coli had an impact on public health, for the next stage a SPAL design model is carried out that is appropriate for efforts to prevent the spread of E. Coli in the dug wells of the surrounding community.

RESEARCH METHODOLOGY

This type of research is a Quasi Experiment type research method with non equivalent control group design, Quasi Experiment, namely a method to determine the effect of the relationship between cattle barn spacing and certain treatment on the quality of dug well water with bacteriological content and an appropriate SPAL and Septic Tank design model in the Work Area of the Health Center Darul Imarah, Aceh Besar District, 2019.

The experimental design in this study is shown in the table as follows;

Table 3.1. Design Matching Pretest-Posttest Control Group Design

Group	Pre-test	Treat (X)	Post test
P1	O1	X1	O2

Information ;
P1 ; Experiment Group
O1 ; Number of E. Coli before the SPAL modification treatment
X1 ; SPAL Modification Model
O2 ; Number of E. Coli after SPAL modification treatment

The subjects in this study were the number of E.Coli in 3 dug wells, namely dug well 1 at the location of SPAL making with a distance of less than 5 meters from the source of pollution, dug well 2 is a well that is 15 meters away from the source of pollution and dug well 3 is a well which is 50 meters away from the source of pollution, sampling of dug well water is carried out before and after the development of the SPAL modification model in the Working Area of the Darul Imarah Health Center, Aceh Besar District.

While repetition of sampling is carried out every seven days for 4 repetitions to see the amount of E.coli contained in each dug well.

RESULTS AND DISCUSSION

Table 1.1
The number of Coliform and E. Coli Before And Before The Construction Of Alternative Sewers Waste Water In Gampong Denong in the working area of the Darul Imarah Health Center Aceh Besar District in 2019

No	Sample	Distance	Before		After							
			MPN Coliform/100 ml	MPN E. coli/100 ml	MPN Coliform/100 ml				MPN E. coli/100 ml			
					1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1	A1	5	9	5	8	8	7	5	5	3	3	1
2	A2	15	22	8	20	18	15	10	5	5	5	4
3	A3	30	5	1	5	5	4	2	1	1	0	0

Source: Primary Data (processed) 2019

Based on Table 5.1, the data from the inspection of the Dug Well Water Sample averaged 12 MPN coliform numbers/100 ml of dug well water and the average number was 4.67 => 5 MPN E.Coli numbers/100 ml of dug well water, Based on Permenkes no.416 /Menkes/Per/IX/1990 that the maximum amount of Coliform = 50 per 100 ml of water. For the examination of water samples after the intervention for making alternative modifications to the sewerage, repeat sampling 4 times with each time interval of a week or 7 working days. For sample A1 as the location for the SPAL and Septic Tank production points, the average number of E.Coli from the first collection to the 4th repetition was 3 MPN E.Coli numbers/100 ml of dug well water. Based on Permenkes no.416/Menkes/Per/IX/1990 that for E.

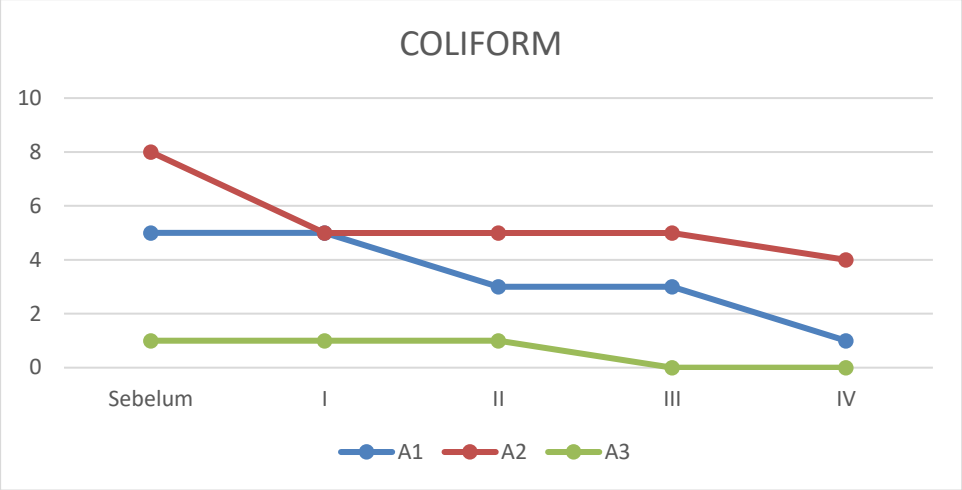
Table 2.1 Percentage of Coliform and E. Coli Before And After Construction Of Alternative Wastewater Sewers In Denong Village, Darul Imarah Health Center work area Aceh Besar District in 2019

No	Sample	Distance	Before		After							
			MPN Coliform/100 ml	MPN E. coli/100 ml	MPN Coliform/100 ml				MPN E. coli/100 ml			
					1	2	3	4	1	2	3	4
1	A1	5	9	5	11,11	11,11	22,22	44,44	0.00	40.00	40.00	80.00
2	A2	15	22	8	9.09	18,18	31,82	54.55	37.50	37.50	37.50	50.00
3	A3	30	5	1	0.00	0.00	20.00	60.00	0.00	0.00	100.00	100.00

Source: Primary Data (processed) 2019

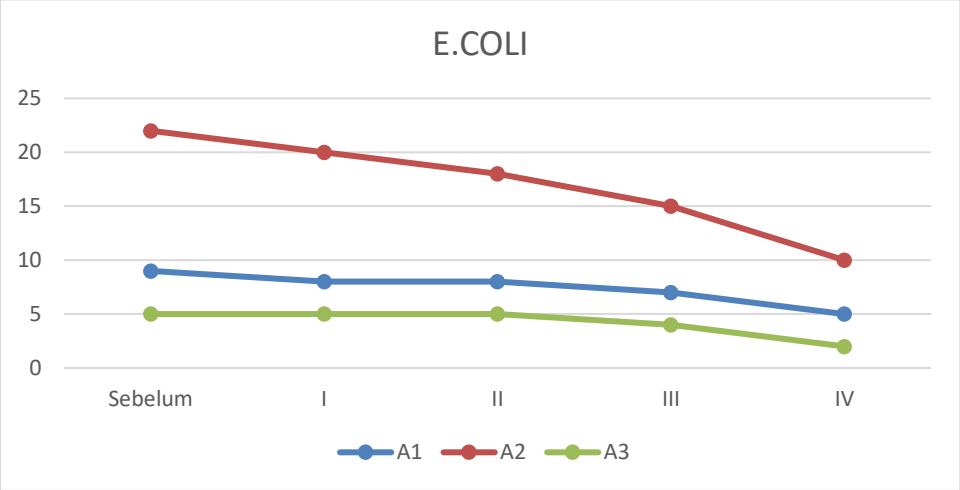
Based on the percentage data above, it can be explained that there is a tendency for the loss of coliform and E.coli numbers to increase, so that on the 4th sampling repetition, where sample A1 had lost 80% of the number of E.coli, sample A2 only reached 50% lost the number of E.Coli, while sample A3 has increased 100% lost the number of E.Coli, for more details can also be seen in graphs 5.1 and graphs 5.2 below;

Graph 1.1
Percentage of Coliform Amount after and before the making of Alternative Wastewater Sewerage in Denong Gampong, work area of Darul Imarah Health Center, Aceh Besar District, 2019



Source: Primary Data (processed) 2019

Graph 1.2
Percentage of the number of E. Coli After And Before The Construction of Alternative Wastewater Sewers in Denong Village in the working area of the Darul Imarah Health Center, Aceh Besar District, 2019



Source: Primary Data (processed) 2019

Table 2.3
Statistical test results for the reduction of E.Coli content in dug wells after the construction of an alternative sewerage channel in Denong village, work area Darul Imarah Health Center, Aceh Besar District, 2019

	Average	std.	std.	95% Confidence Interval	P value

		Deviation	Error	for Mean		
				Lower Bound	Upper bound	
Distance 5 meters	3,0000	1.63299	,81650	,4015	5.5985	0.012
distance of 15 meters	6,0000	2.70801	1.35401	1.6909	10.3091	
30 meters distance	,7500	,95743	,47871	-,7735	2.2735	
Total	3,2500	2.83244	,81766	1.4504	5.0496	

Source: Primary Data (processed) 2019

Based on the data above, based on the ANOVA statistical test, a p value <0.05 was obtained, namely 0.012, so H0 was rejected so that there was an effect of the SPAL modification on the decrease in the number of E.Coli bacteria in dug wells in Gampong Denong, working area of the Darul Imarah Health Center, Aceh Besar District in 2019.

Existence of Waste Water Sewer/SPAL

The results showed that there was a relationship between the presence of SPAL and a decrease in the number of E.Coli in Denong Village in the working area of the Darul Imarah Health Center, Aceh Besar District in 2019 with the percentage value of increasing the loss of E.Coli Sample A1 (80%), Sample A2 (50%), Sample A3 (100%), the results of research on Gampong Denong in the working area of the Darul Imarah Aceh Besar Health Center can be seen that cases where there is no SPAL will be dug well water contamination by E. Coli bacteria. The results of Samiyati's research (2016) show that there is a relationship between home environmental sanitation and the incidence of diarrhea in toddlers in the working area of the Karanganyar Health Center, Pekalongan Regency. Another factor that causes a significant relationship between SPAL conditions and the incidence of diarrhea is due to environmental conditions that often cause tidal floods, so that SPAL often overflows and puddles arise due to high tidal water and the water flow is obstructed and cannot flow into water bodies. Poor SPAL conditions or open sewerage according to Mardiana, et al (2007), have a greater risk of getting diarrhea 2.56 times compared to closed channels. The existence of an open sewage channel has an effect on the incidence of diarrhea in the last 12 months.

Existence of puddles of waste water in SPAL

The results showed that there was a relationship between the presence of stagnant wastewater in the SPAL and the occurrence of E. Coli bacteria in Denong Village in the working area of the Darul Imarah Health Center, Aceh Besar District. Sample A1 (the number of MPN coliform 9 and the number of MPN E.Coli 5). Sample A2 (the number of MPN coliforms is 22 and the number of MPN E.Coli is 8). Sample A3 (number of MPN coliform 5 and MPN E.Coli 1).

Intervention models carried out

The intervention carried out is to modify the SPAL model that meets the standards so that the existing SPAL in Gampong Denong does not contaminate the surrounding environment, especially water pollution from dug wells, including;

1. Piping Construction
   The piping connects from the bathroom and toilet with a length of 15 M each, made of PVC pipe with a size of 4 inches. The toilet pipe is connected to a septic tank in the form of a ring or ring 1, with a depth of 3 m. The water pipe from the bathroom is connected to the ring 2 reservoir. with a depth of 3 M. see attachment-1
2. Ring-shaped storage well construction

The holding well consists of the 1st well to collect human waste which is 12 from the Dug Well, while the 2nd well is to collect wastewater from the bathroom and also overflow water from the septic tank. See attachment-2

3. Construction of Septic Tank storage tanks or absorption tanks
   The septic tank is made of size L x W x T = 2.5 x 1.5 x 2.0, filled with mountain stone, palm fiber and gravel, then connected with a pipe from ring 2, then at the end of the building a drainage pipe is installed to The main canal or irrigation canal. See attachment-3

CONCLUSION

Based on the results of research that has been carried out on Alternative SPAL Modifications to the content of E.Coli in dug wells in Gampong Denong in the work area of the Darul Imarah Health Center in Aceh Besar District in 2019, it can be concluded:

1. There isthe effect of the number of E. coli in dug wells due to SPAL conditions that do not meet the requirements for an average of 5 E. coli MPN numbers/100 ml,Based on Permenkes No.416/ Menkes/ Per/IX/1990 that there should not be E. Coli in 100 ml of drinking water.
2. There is an effect of increasing the percentage of the loss in the number of E.Coli numbers after the 4th repetition of the examination where Sample A3 was 100% gone, sample A1 had reached 80%, and sample A2 had 50% remaining.
3. There is an effect of SPAL modification on reducing the number of E.Coli bacteria in wells, where the p value is <0.05, namely 0.012.

SUGGESTION

Based on the results of these studies, some suggestions can be given as follows:

1. The community is expected to be able to make SPAL so that dug wells are not polluted by E.coli bacteria
2. It is hoped that health agencies (Puskesmas) will be able to improve supervision and also promote health of sanitation facilities in the community.
3. The writer is expected to be able to apply and develop appropriate science and technology in order to create a clean and healthy environment.
4. To housing developers/developers to be able to develop this SPAL model to be implemented as part of creating a clean and healthy living environment in a residential or residential area.

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