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Bacteriological Quality of Water and the Occurrence of Diarrhea in Household in the Work Area of Karya Jaya Public Health Center in Palembang

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Abstract - Globally, there are about 2 billion cases of diarrhea with a mortality rate of 1.5 million per year. The limited access to clean water and the poor personal hygiene in the households are the major causes of diarrheal disease through water transmission. The aim of this study is to analyse the relationship between the bacteriological quality of water and the use of clean water with the occurrence of diarrhea in households in the work area of Karya Jaya Public Health Center in Palembang. This research used quantitative approaches with cross sectional study design. There were 157 people chosen as the samples who met the inclusion and exclusion criteria. They were taken by proportional random sampling in 40 RTs (Households). The results showed a significant relationship between the bacteriological quality of clean water (p=0.006), bacteriological quality of drinking water (p=0,000), clean water sources (p=0,000), drinking water sources (p=0,000), distance of clean water sources with pollution sources (p=0,001), food and beverage sanitation hygiene (p=0.016), and hand washing behavior (p=0,001). The results of multivariate analysis showed that the most dominant variable affecting the occurrence of diarrhea was the bacteriological quality of drinking water (p= 0,000; PR=24,668).

Keywords: nutritional status, personal hygiene, environmental sanitation, toddler

I. INTRODUCTION

Diarrhea is a symptom of infection by various microorganisms such as bacteria, viruses, and parasites that are mostly transmitted through water contaminated by feces (World Health Organization (WHO), 2017). This theory is supported by the results of the study of Luby, et al (Luby et al., 2015) which states that E.coli contamination from water samples is associated with an increased prevalence of diarrhea (PR = 1.14, 95% CI = 1.05, 1, 23). Utilization of water that is not suitable for use or polluted water for daily activities can cause illness for those water users. Pollutants in water that can endanger water users are heavy metal pollutants and pollutants of pathogenic microorganisms. Pathogenic microorganisms have long been known to pollute water. Pathogens in water have in many cases caused pandemics of waterborne diseases.

Kakalu's research results (2012) stated that determinants of diarrhea in households include non-standard drinking water management (OR = 20.64), water storage without cover (OR = 5.4), lack of formal education (OR = 1.9). Hand washing with soap, good drinking water management can reduce diarrhea in Mkuranga, Tanzania (Kakalu, 2012). Oloruntoba (2014) states the distance of the source of pollution from water sources (OR = 4.3), poor sanitation of household water storage, increases the risk of diarrhea (Oloruntoba, Folarin, & Ayede, 2014). According to Permenkes No. 416 of 1990 concerning the requirements and supervision of water quality, the distance of the source of clean water from the source of pollution that meets the requirements is more than 10 meters. The more pollutant sources are within <10 meters meters, the greater the effect on the deterioration of the microbiological quality of water. Pollutant sources can come from latrines, sewerage systems, landfills, and animal pens.

Data from the Health Profile of Palembang City in 2018 shows that the Puskesmas Karya Jaya Palembang has the highest diarrhea morbidity rate, which is 606 cases in 2018 or 69 cases per 1000 population. Based on the Health Profile of Palembang City in 2018 the access to clean water in Karya Jaya Village is at the lowest rate of 86.24%. Of the 11,563 residents, 12% use dug wells that do not meet the requirements, 8% of dug wells that meet the requirements, 74% use PAM, and another 6%. This means that as many as 20% of the population still uses water sources that do not meet the requirements for daily needs. Under microbiological requirements, water should not contain E. coli in units per 100 ml of sample. This supports the need for research into the bacteriological quality of water and the use of community clean water in cases of diarrhea.

II. METHOD

Participant

The population of this study was all households living in the work area of Karya Jaya Health Center in Palembang totalling 2,631

households. The research sample was calculated using the Lemeshow formula with a total sample of 157 people.

Method of collecting data

Data collection is carried out by means of laboratory examinations, interviews, and document review. Laboratory tests were carried out with biological parameters (E. coli) to obtain bacteriological quality data for clean water and drinking water. Interviews were conducted to obtain data for the variable sources of clean water from sources of pollution, hygiene sanitation of food and beverages, and hand washing behavior. A document review was carried out to obtain diarrhea and sanitation data in the Puskesmas Karya Jaya Palembang area.

Methode of Analysis Data

Data analysis was carried out quantitatively, namely univariate (descriptive) analysis, then proceed with bivariate analysis using Chi Square. Furthermore, variables with p<0.25 were analyzed multivariately using logistic regression.

III. RESULTS

Following are the results of the variable frequency distribution of household diarrhea:

Table 1
Distribution Of The Occurance Of Diarrhea In The Work Area Of Karya Jaya Health Center

Category	Frequency (N)	Percentage
3 months Diarrhea		
Diarrhea	59	37,6
No Diarrhea	98	62,4
Total	157	100

Based on the data above, it is known that at the location of the study the community had experienced diarrhea 3 months by 37 percent, 62 percent had no diarrhea. The following independent variable frequency distribution studied.

Table 2.
Frequency Distribution of Household Diarrhea Risk Factors

Category	Frequency (N)	Percentage
Bacteriological Quality Of Clean Water		
Qualified	39	24,8
Not Qualified	118	75,2
Bacteriological Quality Of Drinking Water		
Qualified	105	67
Not Qualified	52	33
Clean Water Sources		
PDAM	25	15,9
Non PDAM	132	84,1
Drinking Water Sources		
Boiled water	63	40,1
Raw water	94	59,9
Distance Of Clean Water Sources With Pollution Sources		
Qualified	57	36,3
Not Qualified	100	63,7
Food And Beverage Sanitation Hygiene		
Good	82	47.1
Bad	75	52.9
Handwashing Behaviour		
Good	82	52.2
Bad	75	47.8

The results of bivariate analysis can be seen in the following table:

Table 3
Bivariate Analysis

Variable	*P Value*	Prevalence Ratio 95%CI
Bacteriological Quality Of Clean Water	0,006	3,602 (1,402-8,814)
Bacteriological Quality Of Drinking Water	0,000	54,938 (20,481-147,370)
Clean Water Sources	0,000	15,210 (4,455-51,923)
Drinking Water Sources	0,000	15,660 (5,756-42,604)
Distance Of Clean Water Sources With Pollution Sources	0,001	3,860 (1,795-8,303)
Food And Beverage Sanitation Hygiene	0,010	2,393 (1,225-4,677)
Handwashing Behaviour	0,001	3,358 (1,705-6,614)

After bivariate selection, p value<0.25 will be included in multivariate analysis using logistic regression. The final logistic regression modeling results can be seen in table 4 as follows:

Table 4
Final Logistic Regression Modelling Results

Variable	SE	Sig	Exp (B)	95% CI Exp (B)
Bacteriological Quality Of Clean Water	0,678	0,029	4,415	1,168-16,679
Bacteriological Quality Of Drinking Water	0,610	0,000	24,442	7,401-80,720
Clean Water Sources	0,836	0,021	6,934	1,347-35,700
Drinking Water Sources	0,774	0,002	10,476	2,297-47,777
Distance Of Clean Water Sources With Pollution Sources	0,739	0,349	1,999	0,470-8,504
Food And Beverage Sanitation Hygiene	0,657	0,816	1,165	0,322-4,220
Handwashing Behaviour	0,654	0,038	3,879	1,077-13,970
Constant	1,376	0,000	0,001	

From the multivariate analysis, the p value = 0,000 in the bacteriological quality variable of drinking water with an OR value of 24.444 (95% CI:7.401-80.720) means that households that have bacteriological quality of drinking water that do not meet the requirements 24 times are at greater risk of experiencing diarrhea compared to quality bacteriological drinking water that meets the requirements.

IV. DISCUSSION

The results of this study are there is a relationship between the bacteriological quality of clean water, the bacteriological quality of drinking water, sources of clean water, sources of drinking water, distance of clean water sources with sources of and handwashing behavior of diarrhea in households in the region Karya Jaya Health Center work. The most dominant variable affecting the incidence of diarrhea is the bacteriological quality of drinking water.

The availability of clean water that meets the requirements is very important. Efforts to improve water quality require modern technological innovation using surface water (river water, wastewater, or sea production solutions that can be applied in urban areas. Modern technology such as gray water bio rotation which consists of a bio filter system and a recirculated sanitation garden that can process domestic wastewater for reuse into clean water. This kind of technology is expected to be an appropriate technology solution for clean water supply considering 60-85% of the use of clean water, 75% of which is grey water.

Efforts to improve the quality of drinking water in addition to maintaining the source is maintained, maintaining clean drinking water in the household is very important. The dispenser is cleaned at least once a month starting from the tube, tap, until the outside of the dispenser. Dispenser taps have an important role as a medium for developing bacteria becaue the position of the tap is connected to the air outside which is susceptible to germs and bacteria. For this reason, puskesmas health promotion plays an important role in delivery of information to the community to maintain clean drinking water at home.

The results of this study revealed that food and beverage sanitation hygiene was related to the incidence of household diarrhea. Low education and ignorance lead to errors in handling and preparing food and drinks. Children who live in the home who are better in the practice of food hygiene have a lower risk of diarrhea (Agustina et al., 2013).

The distance of pollution sources such as trash cans, sewage drains, drums of livestock with clean water sources of less than 10 meters, causes the occurrence of diarrhea. Oloruntoba (2014) states the distance of the source of pollution from the source of water (OR = 4.3). Surface water and ground water contaminated with feces are consumed by humans through food and drinking water so that diarrhea can occur (Prüss, Kay, Fewtrell, & Bartram, 2002).

Research conducted by Luby, et al (2009), says that washing hands with soap consistently can reduce diarrhea and respiratory disease. Washing hands with soap (CTPS) can reduce diarrhea by 31% and reduce upper respiratory tract infections (ARI) by 21% (Luby et al., 2009). Rabbi and Dey (2013), said that the gap between the knowledge of washing hands therefore a long-term initiative is needed to make the community aware especially of children the importance of hand washing with soap (CTPS) (Rabbi & Dey, 2013) .

Good hand washing practices must continue to be socialized, especially to children, so activities to promote CTPS need to be carried out as an effort to raise awareness in the community.

VI. CONCLUSION

It is suggested to the Puskesmas Karya Jaya to increase public health efforts to supervise environmental sanitation in the use of clean water in households. Increase health promotion to the community to build public awareness in protecting the

environment and personal hygiene through social media or electronics that are currently more attractive to the community. The development of the availability of clean water needs to be carried out by the Palembang City Government in a sustainable manner so that it can be distributed to all levels of society and distribute it evenly. Modern technology such as gray water bio rotation is expected to be an appropriate technology solution for the supply of clean water considering that 60-85% of the use of clean water, 75% of it becomes gray water.

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