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Equipment Relationship And Supervision Of Refill Drinking Water Depot Processingwith The Presence Of E-Coli In Muko-Muko District

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ABSTRACT
WHO data shows that around 13 million people were infected from drinking water refills infected with E-Coli bacteria. The data in Indonesia shows that 19.7% of drinking water depots do not meet the requirements contain E-Coli. In Bengkulu Province, there were 48 depots that did not meet the requirements containing E-Coli. In Muko-Muko Regency, E-Coli bacteria were found in 24 depots. The aim of the research is to know the relationship between the equipment and monitoring of refill drinking water depot processing and the existence of E-coli in Mukomuko Regency. This research is a quantitative study using a cross sectional study design. The number of samples in the research were 64 respondents. The analysis used was univariate and bivariate analysis with chi-square test. The results showed that a small portion of the depot identified as E-Coli was 6.2%, a small portion of the depot that was not supervised was 6.2%, a small portion of the depot equipment did not meet the requirements of 9.4%. There is a significant relationship between depot equipment and the presence of E-Coli (p = 0.002), there is no significant relationship between the supervision of refill drinking water depot processing and the presence of E-Coli in Muko-Muko Regency (p = 0.233). It is hoped that the further research will be able to look at other risk factors using multivariate analysis.

INTRODUCTION

Humans need around 2 L or 8 - 12 glasses of drinking water every day. For drinking water sources, homes Households in Indonesia use tap water either from PDAM or buying retail, drilled or pumped wells, protected wells, springs and river water or irrigation (Ministry of Health of the Republic of Indonesia, 2022). In big cities, to meet people's drinking water needs also consume bottled drinking water, because practical and considered more hygienic, but society feel that bottled drinking water is getting more expensive, so people began to switch to drinking water produced by drinking water depots refill (Suprihatin and Adriyani, 2021).According to the World Health Organization (WHO), approximately one third of the world's population suffers from various diseases transmitted through drinking water refills contaminated by E-Coli bacteria. Every year around 13 million people die from infections originating from drinking water, 2 million of whom are babies and children. (WHO, 2022)

Data from the Ministry of Trade and Industry, in 2022 states that there has been a high increase in drinking water depots that do not meet the requirements containing E-Coli bacteria in Indonesia reaching 7.4%, and in 2022 there will be an increase reaching 19.7% of drinking water depots that do not qualify. (Deperindag, 2022). Data from the Indonesian Ministry of Health in 2022 states that water containing E-Coli has a negative impact on people, such as experiencing bloody diarrhea and even threatening human lives. Diarrhea is the fifth leading cause of child death and is responsible for the annual deaths of 446,000 children worldwide. The incidence of diarrhea in Bengkulu ranks first in Indonesia, namely 8.9%.

Based on data from the Bengkulu Provincial Health Service in 2022, 3,992 clean water inspections of 512,570 existing drinking water facilities were carried out, only 11% met the requirements.The quality of drinking water in Indonesia must be meet the requirements set by the government which is stated in the Regulation of the Minister of Health of the Republic of Indonesia No.492/MENKES/PER/IV/2010 where drinking water is safe if it meets physical, microbiological and chemical requirements (Wandrivel et al., 2021).According to the Decree of the Minister of Industry and Trade of the Republic of Indonesia, the ideal refill water production process consists of a prefilter unit in the form of a sand filter to filter coarse particles. Furthermore, a carbon filter unit as an absorber of odors, tastes, colors and organic materials as well as a disinfectant tool in the form of ozonation or UV light. Not all drinking water depots refill carries out processing appropriately and correctly, for example the quality of the raw water used, the type of equipment used, equipment maintenance and handling of the processed water (Nuria et al., 2019).The existence of a drinking water depot refillable make it easier for people to meet their water needs drink. Apart from people with economic levels small to medium, the influence of the presence of drinking water depots refill too really felt by the community...

Number of drinking water depots refillable increases as it grows Practical and affordable drinking water needs. (Sandra and Sulistyorini, 2022).According to Utami et al. In 2019, for example, biological parameters were often found that still did not meet quality standards, namely the high total value of E-Coli bacteria. The higher the level of E-Coli bacterial contamination, the higher the risk of the presence of other pathogenic bacteria that usually live in human and animal waste. The low quality of refill water can cause various diseases such as typhus, dysentery and cholera which are detrimental to the community as consumers of refill water. For the above problems, it is necessary to know the causes of failure in processing refillable drinking water which does not meet quality standards.

The quality of refillable drinking water products is currently still in doubt, especially since consumers often pay little attention to safety and hygiene. Choose drinking water depot product water refills as a substitute for drinking water can be dangerous to health. One of the causes of bacterial contamination of drinking water can be contamination of processing equipment and maintenance of processing equipment. This problem requires additional testing of drinking water quality by checking the performance and maintenance of the equipment. Thus, this concept can help provide information about the quality of additional drinking water consumed by the public. (Andi et al., 2021)Rahmadyan's research in 2020 found that the quality of drinking water had deviations as evidenced by the discovery of E. Coli bacteria in many samples with an average content of 0.669874 MPN and a tolerance limit of 0 MPN per 100 ml. Then, in research conducted by Dharmawan in 2017, it was found that there were deviations in the quality of drinking water in the quality control category variable. As many as 50% of the drinking water depots used as research samples were contaminated with E. Coli bacteria, with an average of 9.6 MPN per 100 ml. This exceeds the control limit for E.Coli content in accordance with Minister of Health Regulation Number 907/Menkes/SKA/II/2002 concerning Requirements and Supervision of Drinking Water Quality, namely 0 MPN per 100 ml.Research conducted by Vidyabsari and Yusuf, 2018, explained that there was a relationship between sanitary hygiene of refill drinking water management equipment in DAM facilities and in households with the presence of E. coli in refill drinking water and diarrhea in toddlers in Berbas Pantai Subdistrict. The research results showed that the physical equipment and processing supervision did not meet the requirements for e.coli bacteria found in drinking water depots.

Based on the results of the initial survey, the Refillable Drinking Water Depots in Mukomuko Regency generally source raw water from drilled wells and dug wells. E. Coli bacteria are found in Refillable Drinking Water because most water depot businesses do not meet the health requirements for good Refill Drinking Water Depots, because based on the results of the Environmental Health Inspection there is a lack of maintenance of equipment production facilities and personal hygiene of handlers. Maintenance of equipment production facilities that are of little concern to Refill Drinking Water Depot owners are cleaning filter media tubes, replacing filter cartridges, cleaning drinking water filling taps and using sterilization/disinfection equipment. Apart from that, there is still a lack of awareness among handlers of hygienic behavior such as washing their hands with soap and running water every time they serve customers.The results of the initial survey show that the Muko-Muko Regency drinking water refill depot management system is thatRaw water usedrefill drinking water depotnamely drilled well or dug well water. Raw water is channeled using a suction pump (sanyo) to a raw water tank which is useful for storing raw water.Based on these problems, researchers are interested in conducting researchconnectionequipment and supervision of refill drinking water depot processing with the presence of E-Coli in Muko-Muko Regency in 2023

RESEARCH METHODS

This research is a quantitative research using a cross sectional design, namelyresearch by measuring the independent and dependent variables at the same time and in one measurement. In accordance with the research objective, namely to determine the relationshipEquipment Maintenance and Supervision of Drinking Water Refill Management on the Quality of E-Coli Bacteria in Muko-Muko Regency

RESULTS

Table 1 Frequency Distribution of E-Coli Presence in Muko-Muko Regency in 2023

Presence of E-Coli	Frequency (n)	Percentage (%)
E-Coli identified	4	6.2
Unidentified E-Coli	60	93.8
Amount	64	100.0

Table 2 Frequency Distribution of Drinking Water Treatment Monitoring in Muko-Muko Regency in 2023

Drinking Water Treatment Supervision	Frequency (n)	Percentage (%)
No supervision is carried out	4	6.2
Supervision is carried out	60	93.8
Amount	64	100.0

Table 3. Frequency Distribution of Depot Equipment in Muko-Muko Regency in 2023

Depot Equipment	Frequency (n)	Percentage (%)
Not eligible	6	9.4
Qualify	58	90.6
Amount	64	100.0

Table 4. ConnectionDepot Equipment with the Presence of E-Coli in Muko-Muko Regency in 2023

Depot Equipment	Presence of E-Coli						p
	Identified		Not identified		Total		
	n	%	n	%	n	%	
Not eligible	3	50.0	3	50.0	6	100.0	
Qualify	1	1.7	57	98.3	58	100.0	0.002
Total	4	6.2	60	93.8	64	100.0	

Table 5. ConnectionSupervision of Depot Processing with the Presence of E-Coli in Muko-Muko Regency in 2023

Processing Supervision	Presence of E-Coli						p
	Identified		Not identified		Total		
	n	%	n	%	n	%	
No Supervision	1	25.0	3	75.0	4	100.0	
Supervision is carried out	3	5.0	57	95.0	60	100.0	0.233
Total	4	6.2	60	93.8	64	100.0	

DISCUSSION

Univariate Analysis

1. Frequency Distribution of E-Coli Presence

The results of this study showed that of the 64 depots, a small portion of the depots were identified as E-Coli, as many as 4 depots (6.2%).The results of this research are in line with research by Ester Saripati H., in 2022, which found that 5 DAMIU were contaminated with Escherichia coli (33.3%) which did not meet the requirements. The results of the examination of the E. coli bacteria content showed that 5 (20%) refill drinking water depots (DAMIU) did not meet the requirements. (Albina BT, et al, 2015)Laboratory test results showed that 9 out of 21 drinking water refills in Akabiluru District, Regency 50 Kota were contaminated with Escherchia Coli bacteria. Escherchia Coli bacteria are found in refill drinking water because most water depot businesses do not meet the requirements for good refill drinking water depots, both in terms of bacteriological examination and human resources. Apart from that, Escherichia Coli found in refillable drinking water is also caused by a lack of maintenance of production facilities and equipment and not carrying out regular sanitation and hygiene measures. (Della H., 2022)

If the results mentioned above are referred to the Regulation of the Minister of Health of the Republic of Indonesia regarding the quality of drinking water, safe drinking water must be protected from the possibility of total contamination of fecal Coliform Bacteria and Escherichia Coli with a standard of 0 in 100 ml of drinking water, meaning that there are still some DAMIU whose bacteriological quality is not yet meet health requirements. The presence of E. coli in drinking water indicates that there has been fecal contamination of humans or warm-blooded mammals, which can mean that there are other pathogenic microorganisms in the drinking water in the form of viruses, bacteria or protozoa. (Indonesian Ministry of Health, 2020)

2. Frequency DistributionDepot Equipment

The results of this research show that of the 64 depots, a small portion of the depot equipment does not meet the requirements, as many as 4 depots (6.2%).The results of this research are in line with research by Ester Saripati H., in 2022, that there were 8 respondents who had DAMIU with equipment maintenance that met the requirements and 7 (46.7%) who did not meet the requirements.The results of Della H.'s research, 2022, showed that 4 DAM without supervision from the Health Department were contaminated with Escherchia Coli bacteria (44.4%). Bacteria, viruses and other fine particles can be filtered well and have indicators for monitoring and improvement purposes using a micro filter tool. Disinfection does not cause radioactive impacts that are harmful to public health and must be able to kill pathogenic germs in drinking water, but not cause structural changes to drinking water. Pumps and distribution pipes are made of materials that cannot release toxic substances into water such as food grade. stainless steel and polycarbonate or poly-vinyl-carbonate coated containers and it is recommended to use transparent equipment so that monitoring is easy. (Della H., 2022)

3. Frequency Distribution of Drinking Water Treatment Monitoring

The results of this study show that of the 64 depots, a small portion of the depots were not monitored, as many as 4 depots (6.2%). The results of this research are in line with research by Della H., 2022 which shows that dThere are more drinking water epots that are not monitored by the Health Service than those that are supervised, namely 16 DAMs, a percentage of 76.2%.The results of Ester Saripati H.'s research, in 2022, showed that there were 10 (66.7%) good aspects of monitoring DAMIU management and 5 (33.3%) which were not good. Based on research, most of the DAMs do not have regular supervision from the health service, bacteriological checks are only carried out in 5 DAMs, this makes DAMs that do not have supervision have poor sanitation hygiene and the quality of the water produced does not meet health requirements (Della H., 2022)

The role of the government and related parties, namely the health service, in this case is very important. Apart from that, it is also important to play the role of community health centers as the community's closest health service in supervising refill drinking water depots. (Indonesian Ministry of Health, 2020)

Bivariate Analysis

1. ConnectionDepot Equipment with the Presence of E-Coli

The results of the Chi Square Test on Fisher's Exact Test showed that there was a significant relationship between depot equipment and the presence of E-Coli in Muko-Muko Regency (p= 0.002) < (α= 0.005).The research results of Della H., 2022 show that there is a p-value of 0.004 <0.05, meaning there is no relationship between the presence of Escherchia Coli bacteria and equipment in refillable drinking water in Akabiluru District.The results of research by Ester Saripati H., in 2022, show that there is a significant relationship between equipment maintenance and Escherichia coli contamination with p-value = 0.007 and OR = 17.5 (95% CI, 1,223 - 250,357). This means that DAMIU with equipment maintenance that does not meet the requirements has a 17.5 times greater risk of being contaminated with Escherichia coli than DAMIU with equipment maintenance that meets the requirements.The statistical test results show a value of p = 0.000 (p < 0.05), this shows that there is a significant relationship between production equipment and the quality of drinking water bacteriologically, thus the hypothesis stating that there is a relationship between production equipment and the quality of drinking water bacteriologically is supported by data. (Iis Rosyiah, 2017)There is a significant relationship between equipment maintenance and Escherichia coli contamination in drinking water refills. DAMIU entrepreneurs or managers must carry out maintenance of production facilities and sanitation programs to avoid contamination of drinking water by bacteria, namely by means of buildings and their parts must be maintained and cleaned regularly. Prevent the entry of rodents, insects and other small animals into buildings and filling areas. Apart from that, machine equipment must also be maintained regularly, for example, if the machine has reached the end of its useful life, it must be replaced in accordance with technical provisions. Equipment surfaces that come into contact with raw materials and drinking water must also be clean and cleaned every day, and surfaces that come into contact with drinking water must be free of scale and other residues. The filling and closing process is carried out in a hygienic room so that the drinking water produced truly meets health requirements. Likewise with DAMIU workers who provide services to consumers, they must behave hygienically, such as not smoking, always washing their hands with running water and soap before filling gallons, and wearing special clothes that are clean and neat when working. (Casmitun, Yani Kamasturyani LA, 2020). (Andi AA, Ulfa Sulaeman AG, 2022).

DAMIU who meet the requirements should have access to sanitation facilities, such as closed rubbish bins, wastewater drainage and a hand washing place equipped with running water with cleaning soap, and free from vectors and disease-carrying animals, such as flies, mice and cockroaches. No That's all, the container/gallon of drinking water must be cleaned before filling rinse first using production water for at least 10 seconds, and After filling, give it a clean lid. Filled containers/gallons must be given directly to consumers and may not be stored in DAM for more than 1x24 hours. (Indonesian Ministry of Health, 2020)Refill drinking water that meets health requirements is necessary pay attention to the sanitary hygiene of the depot. If hygiene requirements depots are not met, especially regarding drinking water processing personnel and requirements sanitation, it will produce refillable drinking water products that do not comply health requirements, especially from bacteriological quality. (Casmitun, Yani Kamasturyani LA., 2020). (Andi AA, Ulfa Sulaeman AG., 2022).In theory, there is a relationship between equipment maintenance and Escherichia coli contamination. Machines and equipment that are directly related to raw materials or the final product must be cleaned and maintained regularly. Machine and DAMIU equipment is maintained regularly according to the type of equipment and if If its useful life has expired, it must be replaced in accordance with technical provisions. DAMIU who meet the requirements should have access to sanitation facilities, such as closed trash cans, waste water drainage channels, hand washing places equipped with running water with cleaning soap, depot buildings made of strong, safe materials, easy to clean and easy to maintain. Apart from that, the place must also be free from mice, flies and cockroaches because these animals can contaminate and damage equipment. Toilet access and smooth drainage flow as well as closed rubbish bin facilities, also to ensure the hygiene of the DAMIU premises. DAMIU is also expected to have lighting that is bright enough, not dazzling and distributed evenly. (RI Ministry of Health. 2020)

The results of this research show that the majority of depots use unlicensed filters (ISO or SNI) and the filter tube container material is not made of food grade stainless steel, while most of the disinfection (Ultra violet or Ozone) is not always on (standby) only when When operating, disinfection should be on standby with the indicator light always on. With this assumption, it can be concluded that production equipment that meets the requirements will influence the bacteriological quality that meets the requirements as well.In order to prevent bacterial contamination, machines and equipment that are in direct contact with raw materials or final products must be cleaned and maintained regularly. Equipment plays a very important role in processing raw water into drinking water, equipment that is not in good condition will cause processing that is not optimal. Processing that is not optimal can cause bacterial contamination.

2.ConnectionSupervision of Refill Drinking Water Depot Processing with the Presence of E-Coli

The results of the Chi Square Test on Fisher's Exact Test showed that there was no significant relationship between monitoring the processing of refill drinking water depots and the presence of E-Coli in Muko-Muko Regency (p= 0.233) > (α=0.005).The results of Ester Saripati H.'s research, in 2022, show that there is no significant relationship betweenSupervision of Refill Drinking Water Depot Processingwith Escherichia coli contamination with p-value = 0.017.

The research results of Della H., 2022 show that the p-value is 0.006 < 0.05, meaning there is a relationship between the presence of Escherchia Coli bacteria and the health office's supervision of drinking water refills in Akabiluru District, 50 City Regency. The Prevalence Ratio (PR) is 0.250 (PR <1), which means that a Confidence Interval value of 95% states that DAM that is not monitored has a risk of 0.250 times being contaminated with Escherchia Coli bacteria.This is caused by several factors, including the raw water source used still containing Escherichia coli and the disinfection process used already meets applicable regulations, for example by using ozonation or using UV (Ultra Violet), but in reality Escherichia coli is still not able to removed from the water source. Factors that must be considered when using a UV light lamp are the wavelength of the UV light and the lifetime of the UV lamp. UV light lamps will be effective if during the period of use the UV light produces a wavelength of 254 nm and the UV lamp's lifespan is 9000 hours over a 3 year usage period. If before 3 years the lamp's lifespan exceeds 9000 hours, the wavelength produced will be low so that the ability of the UV lamp to kill bacteria will also be reduced. On the other hand, if it is more than 3 years but the UV lamp's lifespan is less than 9000 hours, the lamp is still effective in killing bacteria. (Sustika Navratinova, Nurjazuli TJ., 2019)

There is a significant relationship between processing supervision and Escherichia coli contamination in drinking water refills. In the regulations, every DAMIU owner is required to carry out internal supervision in an effort to produce drinking water products that are healthy and safe for consumption. (Aris Winandar, Riski Muhammad II., 2020)Monitoring the quality of refilled drinking water on a regular basis is also carried out by the government through community health centers and

health services to ensure product safety for consumers. The main targets of this monitoring are water sources, production technology, and processing and maintenance of facilities. The quality of drinking water is one of the most important things to pay attention to, so that it is safe and suitable for consumption by the public. (Ardini SR, et al. 2018)The government has set drinking water quality standards, and every business actor that produces drinking water, including drinking water depot businesses, is obliged to comply government regulations. This means that there are clear standards that must be met achieved, namely the quality of drinking water produced must meet the physical, chemical, microbiology and radiology. In this case, the big task that must be done is what efforts must be made by drinking water depot business owners and government to achieve drinking water quality standards. This is where it matters A serious supervisory function is needed, both by business actors and (more so) by the government as a regulator. (Germauli L., 2015)

DAMIU which does not meet the requirements may be caused by several things, namely the raw water source used still contains Escherichia coli and the disinfection process used complies with applicable regulations, for example by using ozonation or using UV (Ultra Violet) but deep In fact, Escherichia coli still cannot be eliminated from the water source. The effectiveness of ultraviolet light in killing bacteria is influenced by several factors factors, including room area, wavelength, lamp life, length lights, length of exposure time, distance from the light source to bacteria, and also type the bacteria itself. Ultraviolet radiation can kill all types of microbes with sufficient intensity and time. In addition, due to the practice of filling water into in gallons using a hose and not closing the glass door on the unit filling, the longer it takes to fill the water, the more water will be contaminated in the gallon. Microorganisms are easily blown into the air and spread everywhere because the cell size is small and light. (Sustika N., Nurjazuli TJ, 2019)Management of drinking water quality, both internally and externally, is regulated in Minister of Health Regulation No. 736. There it is stated that externally Supervision is carried out by the Health Service, namely by carrying out examinations laboratories (Balai POM, and BTKL). The role of the government and related parties, namely the agencies Health, in this case is very important. Apart from that, participation is also important Puskesmas is the closest health service to the community. However, supervision of DAMIU business operators is still ongoing must be improved because there are still many depots that are not running procedures for checking the quality of DAMIU with the health service. (Indonesian Ministry of Health, 2020)Besides that, Another problem also exists in the internal aspect of DAMIU, namely the human resources factor, both human resources for owners and workers. This HR issue is related to lack of knowledge and awareness of DAMIU owners/workers regarding regular inspection of the quality of refill drinking water depots with the Health Service, namely once every 6 months. Likewise with external aspects, namely related to problems of supervision by the government that are less effective, there are no strict sanctions, there is no DAMIU association, and there is a lack of cooperation between government agencies. (Ardini SR, et al. 2018)Another factor that can cause supervision by the Serdang Bedagai Health Service to not be optimal is the lack of education and a Certificate of Sanitation Hygiene Appropriateness which is not shown from the Serdang Bedagai Health Service. (Indonesian Ministry of Health, 2020)

The quality of drinking water from DAMIU which does not meet standards indicates weak supervision in the operation of drinking water depots. Because of that, It is important to apply a management system approach in carrying out supervision towards the implementation of DAMIU by depot entrepreneurs and the government so that supervision can run effectively and efficiently. (Germauli L., 2015)Drinking water is wrong one dominant source that influences public health so Selective attitude in choosing drinking water is very necessary. This is to make sure that the drinking water consumed is free from Escherichia bacteria coli. Escherichia coli bacteria are bacteria that can cause several cases diseases caused through poor water quality, such as diarrhea, cholera, and typhus. (Raja NR, Yuyun PH, 2021) (Wahyu Z., Arni A., 2018)

Drinking water depots must carry out continuous internal monitoring from the sanitation aspect. Places must have access to sanitation facilities, namely locations in the DAM must be free from pollution originating from dust around the DAM, areas where sewage/garbage is dumped, places where used goods are accumulated, places hiding/breeding insects, small animals, rodents, etc., places where the drainage system is not good and other places that are thought to cause pollution. The production process room provides sufficient space for placing production process equipment. Production areas must be accessible for inspection and cleaning at all times. The construction of floors, walls and ceilings in production areas must be good and always clean. The walls of the filling room must be made of a smooth, light-colored and non-absorbent material so that it is easy to clean. Cleaning is carried out regularly and scheduled. Walls and ceilings must be tight without any cracks. The filling area must be designed only for the purpose of filling finished products and must use a door that closes tightly

CONCLUSIONS AND RECOMMENDATIONS

1. SA small portion of the identified E-Coli depots were 4 depots (6.3%) in Muko-Muko Regency.
2. A small portion of the depot equipment does not meet the requirements, namely 4 depots (6.2%) in Muko-Muko Regency.
3. A small number of depots are not monitored, namely 4 depots (6.2%) in Muko-Muko Regency.
4. AThere is a significant relationship between depot equipment and the presence of E-Coli in Muko-Muko Regency (p= 0.002).
5. There is no significant relationship between monitoring the processing of refill drinking water depots and the presence of E-Coli in Muko-Muko Regency (p= 0.233)

Recommendations

Based on the research results, researchers would like to provide suggestions to several related parties, including:

1. For the Health Service
   The Health Service should continuously identify E-Coli bacteria and check depot equipment in Muko-Muko Regency so that the people of Muko-Muko feel safe consuming refilled drinking water, and give sanctions to depot owners if E-Coli bacteria are found in drinking water. refillable.
2. For the UniversityDehasen
   Universities should carry out follow-up activities from the results of this research, such as carrying out community service in Muko-Muko Regency.
3. For Further Researchers
   Suggestions for future researchers are to be able to research other factors that influence the presence of E-Coli bacteria by using more in-depth research methods and analysis such as using multivariate analysis.

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