Evaluation of program hygiene sanitation depot and identification of bacteria coliform in drinking water refill

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Evaluation of program hygiene sanitation depot and identification of bacteria coliform in drinking water refill

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Abstract. The fulfillment of the quality of healthy drinking water needs to get great attention because it concerns the lives of many people. If this problem does not get serious attention, it will certainly lead to health. On the other hand, the AMIU depot continued to increase. Permits must be tightened, as well as sanitation personal hygiene monitors need to get routine supervision. This study aims to determine the contamination of coliform bacteria, and evaluation of personal hygiene programs in slums and elite areas in refill drinking water depots in Makassar City. This type of research is analytical descriptive with the Quasy Experiment Design method, with the Pre-Post Test One Group. Sample checking using the MPN (Most Probable Number) method. The research location is in Mariso Subdistrict and Panakkukang Subdistrict. The research sample was 10 AMIU depots. The sampling technique was purposive sampling, which was based on criteria. The results showed that the highest coliform bacteria in Mariso district were 1500 / 100ml while the highest in Panakukang was 2400 / 100ml. Assessment of personal hygiene behavior in the Mariso Kec Knowledge (p = 0.03), attitude (p = 0.001) and action (p = 0.001) have a significant difference p> 0.05. Whereas in the district of Panakkukang I.e. knowledge (p = 0.00), and the action (p = 0.000) had a significant difference p> 0.05. It is expected that the depot owners should improve the quality of hygiene sanitation of the depot owners to require the depot officers to use gloves when refilling drinking water.

1. Introduction

Refill drinking water is one of the choices in meeting the life needs of the community, because besides being more practical and more hygienic. Indicators of drinking water microbial pollution are total coliform and Escherichia coli. Total coliform is a group of bacteria that is used as an indicator of dirt pollution. Total coliform that is in food or drink shows the possibility of microbial enteropathogenic and toxigenic which is harmful to health.

Personal hygiene is a key element in personal hygiene. Bacteria that cause disease or defective products are carried and transmitted to equipment and products by workers. The basis of personal hygiene is that all personnel/people who work and direct contact with the product must fulfill hygiene practices while working to avoid contamination [1]. The method to maintain personal hygiene is to use clothing that can prevent cross-contamination, maintain cleanliness of personnel/individuals, wash hands thoroughly (if necessary with sanitation methods to prevent cross-contamination), keep gloves used in production clean, maintained and maintained sanitary, and use headgear, beard, and mustache [2].

Based on data from the Makassar City Health Office 2016, the working area of Puskesmas located in Mariso Subdistrict still has diarrhea cases, namely at 524 Dahlia Puskesmas, 4611 Pertiwi Health
Center and Panambungan Health Center, which were 485 cases of diarrhea. Whereas for the Puskesmas working area in Panakukang sub-district include: Tamamamung health center as many as 550, Pampang health center with 487 cases of diarrhea.

Research conducted with contained 8 refill drinking water depots (21.1%) from 38 refill drinking water depots studied which did not meet the requirements of coliform in drinking water [3]. Coliform contamination indicates poor quality of refill drinking water depots. The same thing was stated in the presence of E. Coli can be caused by the length of time of storage of water in the reservoir so that it affects the quality of the raw water source that is used in the presence of water contamination in the transport tank, the reservoir is less clean, the processing which is less than optimal, and environmental cleanliness around refill drinking water depots is less noticed [4,5].

The bacteriological content of AMIU and PDAM which were associated with the incidence of diarrhoea in the North Karuwisi Village of Makassar City revealed that as many as 18 depots studied 100% of the depots did not meet the requirements according to the standards stipulated by Permenkes NO.907 / Menkes / SK / VII / 2002 concerning requirements and supervision of clean water quality. This can occur due to the behavior of the filling officers in refill drinking water in each house where the individual hygiene is less hygienic or when processing refill drinking water at the depot is less sterile, so the bacteria contained in the water have not been confirmed dead [6].

2. Methods

The research design used is Quasy Experiment Design with Pre-Post Test One Group. This research is a descriptive study to obtain MPN coliform values. Research location is in Mariso District and Panakukang District, Makassar city. The population in this study is the AMIU depot in the city of Makassar [4]. The sample in this study were 10 refill drinking water depots in the Mariso sub-district which were slum areas of 5 depots and Panakukang sub-districts which were elite (urban) areas of 5 depots, so a total of 10 depots with 15 samples each in the Mariso and Panakukkang village totaling 30 samples. The example of depot officers in Mariso Subdistrict was 31 people and Panakukang Subdistrict as many as 23 people. The sampling technique is purposive sampling.

Primary data obtained from the results of examination of water samples in the integrated Laboratory of FKM UMI assessment from the results of the measurement of personal hygiene sanitation based on the results of interviews and observations using a questionnaire.

The data obtained from the examination results in the laboratory will be analyzed using the SPSS program to find out the hygiene of the Depot officer and the quality of AMIU.

Data processing using SPSS method with Mac Nemar test. Presentation of data in the form of tables accompanied by narratives.

3. Results and discussion

Based on the data in table 1 shows that in all depots in the Mariso does not meet the requirements of bacteriological parameters with the Coliform MPN calculation method. The highest Coliform MPN examination results were obtained at the first depot (output) of 1500/100 ml. while the lowest at 4th depot (process) is 50 / 100ml of the sample.

Based on the data in table 2 shows that the depots in Kec Panakukang do not meet the requirements of bacteriological parameters with the Coliform MPN calculation method. The highest Coliform MPN examination results were obtained at the 2nd depot (B.21 input) of 2400/100 ml using oxygen water (Oxy) drinking water treatment method while the lowest coliform bacteria were not found, namely at the 1st depot and 5th depot which was 0 / 100ml sample.

In table 3 the Personal hygiene program of the depot before and after in Mariso sub-district showed that in the category of knowledge, the pretest was 16 (51.6%) and the category less (48.4%) based on the Mac Nemar test obtained significant value = 0.003. in the sufficient attitude category in the pretest as many as 15 (48.4%) and less category 16 (51.6%) based on the Mac Nemar test obtained a significant value = 0.001. In the sufficient category of action in the Pretest as many as 14 (45.2%) and less category 17 (54.8%) based on the Mac Nemar test obtained a significant value = 0.001.
Table 1. Water refill system Inspection in Mariso District (Slum Area) Makassar city

| Depot | Code Sample | Raw water source | Source Type processing | MPN Coliform/100ml | Ket |
|-------|-------------|------------------|------------------------|-------------------|-----|
| 1     | A.11        | PAM              | Input                  | 1110 TMS          |
|       | A.12        | Proses           | UV                     | 750 TMS           |
|       | A.13        | Output           | UV & OZONISASI         | 1500 TMS          |
| 2     | A.21        | Input            | UV                     | 750 TMS           |
|       | A.22        | Proses           | OZONISASI              | 500 TMS           |
|       | A.23        | Output           | UV                     | 750 TMS           |
| 3     | A.31        | Input            | UV                     | 450 TMS           |
|       | A.32        | Proses           | UV                     | 350 TMS           |
|       | A.33        | Output           | UV                     | 250 TMS           |
| 4     | A.41        | Input            | Oxy & RO               | 100 TMS           |
|       | A.42        | Proses           | Ozonisasi              | 50 TMS            |
|       | A.43        | Output           | Oxy & RO               | 75 TMS            |
| 5     | A.51        | Input            | UV & RO               | 150 TMS           |
|       | A.52        | Proses           | UV & RO               | 100 TMS           |

Table 2. Water refill system Inspection in Panakukang district In Macassar city

| Depot | Code Sample | Raw water source | Source Type processing | MPN Coliform/100ml | Ket |
|-------|-------------|------------------|------------------------|-------------------|-----|
| 1     | B.11        | PAM              | Input                  | 0                 | Eligible |
|       | B.12        | Process          | Oxy & Ro               | 0                 | Eligible |
|       | B.13        | Output           | Oxy & Ro               | 0                 | Eligible |
| 2     | B.21        | Input            | Oxy & Ro               | 2400 Non Eligible |
|       | B.22        | Process          | Oxy & Ro               | 2000 Non Eligible |
|       | B.23        | Output           | Oxy & Ro               | 2100 Non Eligible |
| 3     | B.31        | Input            | Uv                     | 100 Non Eligible  |
|       | B.32        | Process          | Uv                     | 75 Non Eligible   |
|       | B.33        | Output           | Uv                     | 85 Non Eligible   |
| 4     | B.41        | Input            | Uv                     | 120 Non Eligible  |
|       | B.42        | Process          | Uv                     | 100 Non Eligible  |
|       | B.43        | Output           | Uv                     | 110 Non Eligible  |
| 5     | B.51        | Input            | Uv & RO                | 0                 | Eligible |
|       | B.52        | Process          | Uv & RO                | 0                 | Eligible |
|       | B.53        | Output           | Uv & RO                | 0                 | Eligible |
Table 3. The Different of Knowledge, Attitude, And Action, Between Before And After Program Hygiene Sanitasi In Mariso District

| No | Pre-test | Post-test | Total | p   |
|----|----------|-----------|-------|-----|
|    | Less     | Enough    |       |     |
|    | N   | %   | N   | %   | N=31 | 100% |
| 1  | Knowledge |          |       |     |
|    | Enaugh | 4   | 12.9| 12  | 38.7| 16   | 51.6 | 0.003 |
|    | Less   | 1   | 3.2 | 14  | 45.2| 15   | 48.4 |
| 2  | Attitude |          |       |     |
|    | Enaugh | 4   | 12.9| 11  | 35.5| 15   | 48.4 | 0.001 |
|    | Less   | 0   | 0   | 16  | 51.6| 16   | 51.6 |
| 3  | Action  |          |       |     |
|    | Enaugh | 3   | 9   | 11  | 35.5| 14   | 45.2 | 0.001 |
|    | Less   | 0   | 0   | 17  | 54.8| 17   | 54.8 |

Test: Mac Nemer

In table 4 show that the Personal Hygiene Program of the depot before and after in Panakukkang Subdistrict showed that in the knowledge category, there were 16 (69.6%) in the pre-test and 7 in the less category (30.4%) based on the Mac Nemar test obtained a significant value = 0.000. In the sufficient attitude category in the Pretest as many as 8 (34.8%) and less category 15 (65.2%) based on the Mac Nemar test obtained a value that is not significant = 0.08. In the sufficient category of action in the Pretest as many as 21 (91.3%) and less category 2 (8.7%) based on Mac Nemar test obtained a significant value that is = 0.000.

Table 4. The Different Of Knowledge, Attitude, And Action, Between Before And After Program Hygiene Sanitasi In Panakkukang District

| No | Pre-test | Post-test | Total | p   |
|----|----------|-----------|-------|-----|
|    | Less     | Enough    |       |     |
|    | N   | %   | N   | %   | N=23 | 100% |
| 1  | Knowledge |          |       |     |
|    | Enaugh | 0   | 0   | 16  | 69.6| 16   | 69.6 | 0.00 |
|    | Less   | 0   | 0   | 7   | 30.4| 7    | 30.4 |
| 2  | Attitude |          |       |     |
|    | Enaugh | 0   | 0   | 8   | 34.8| 8    | 34.8 | 0.08 |
|    | Less   | 0   | 0   | 15  | 65.2| 15   | 65.2 |
| 3  | Action  |          |       |     |
|    | Enaugh | 0   | 0   | 21  | 91.3| 21   | 91.3 | 0.00 |
|    | Less   | 0   | 0   | 2   | 8.7 | 2    | 8.7  |

Uji: Mac Nemer

a. Total coliform
Based on the results of the study in Table 1, the highest coliform bacteria in Mariso district were 1500 / 100ml while the highest in Panakukang was 2400 / 100ml. This is because the source of water is contaminated with coliform bacteria.

The presence of coliform bacteria in some water samples only shows that in the water it is estimated that there are a number of coli bacteria, such as Escherichia, Citrobutter, Enterobacter and klehsielu, whereas for measuring the content of Escherichia coli in water samples indicates that human feces have contaminated the water because Escherichia coli bacteria come from human feces that are pathogenic or can cause disease. Found coliform bacteria in water does not mean the presence of pathogenic bacteria (Escherichia coli) in the water, but only the possibility of natural water pathogenic germs [7].
The spread of E. coli bacteria, from humans to humans, is spread by flies, through dirty hands, contaminated food or drinks. Higher. The depot owner also said that the processing equipment had indeed been a long time and planned to replace all of its equipment and to renovate its depot to enlarge the processing room of the depot, but there were no funds. Contamination can be caused by equipment conditions, especially those used for disinfection (ultraviolet) which are not replaced periodically. Also, cleaning of equipment and filters that are not routinely carried out can cause contamination. Another factor that causes the presence of bacteria is found in drinking water samples because in addition to the condition of drinking water treatment plants that do not fulfill the hygiene sanitation conditions around the bad depots such as processing sites close to the chicken coop, combining the drinking water treatment room with the selling gas where the processing room the drinking water is very small and dense [8].

b. Processing methods for refill drinking water

Ultraviolet sanitation means that water is channeled through a tube with high-intensity ultraviolet lamps so that bacteria are killed by ultraviolet radiation. What must be considered here is that the intensity of the ultraviolet lamp must be sufficient. For effective water sanitation, an intensity of 30,000 MW sec / cm² (Microwatt seconds square) is needed. Based on the results of the research conducted in Table 1, it shows that the method of processing using Ultraviolet (UV) in inputs as much as 1100/100 ml is due to the raw water close to the chicken coop owned by the community so that the coliform bacteria obtained are quite high. At the time of processing the AMIU UV lamp does not function properly and in a state of death. Ultraviolet radiation can kill all types of microbes if the intensity and time are sufficient. There are no residues or by-products of UV irradiation. However, to be effective UV lamps must be cleaned regularly and must be replaced for a maximum of one year [9]. At the consumer level, the highest coliform bacteria were obtained 1500/100 ml (sample code A.13).

Based on the results of observations and interviews in the field that consumers at the household level do not use dispensers, they consume drinking water directly poured from gallon bottles into ozonation processing methods (sample code A.22) which is 500/100 ml.

c. Personal Hygiene Depot Behavior

The results of this study indicate that based on the behavior of the personal hygiene depot in Mariso sub-district showed that there were 16 (51.6%) in the knowledge category and less (48.4%) categories. In the sufficient attitude category in the Pretest as many as 15 (48.4%) and less category 16 (51.6%). In the sufficient category of action in the Pretest as many as 14 (45.2%) and less category 17 (54.8%).

While the Sanitation Personal Hygiene Program depot before and after in Panukukkang District showed in the knowledge category p = 0,000. In attitude category based on p = 0.08. in the category of action obtained a significant value that is p = 0,000.

The results of observations and interviews carried out that the knowledge category is closely related to the level of education, where the education level of depot officers in Mariso is generally only up to junior high school (60.5%) with a working period of> 5 years (55.8%). The quality of drinking water refill can be influenced by several factors such as when handling or the production process, depot officers who do not pay attention to hygiene and adaptasi depots that are not considered. The average depot officer at each depot is 2 people and the operating time of the depot varies significantly from 4 months to 3 years of operation. The number of customers ranges from 30-100 customers per depot [5]. Actions Depot officers carry out their duties as people who control the production process of refill drinking water. Usually, the activities or production processes at these refill drinking water depots begin with cleaning/washing and brushing gallons. The gallons that will be filled with refill drinking water are washed first, there are those who use washing up liquid/soap then brushed with a brush or manual brush, but some are brushed directly without using liquid/washers on the grounds that using soap will arise odor in a gallon while the producer does not want to use any chemicals in the production process of refill drinking water is depleted [10].

The results of field observations in Kec. Mariso (slum area) Gallons are closed only and directly distributed to customers or consumers, but there are also depots that seal their gallons because, in addition to being distributed directly to regular customers, they will also be deposited in stores to be
marketed and stored for a long time. So that the sealing on the gallon lid is important to do, there are also depots that do not distribute to consumers because consumers are coming directly [11]. In the process of packaging or refilling drinking water refill, pollution can occur if the officers do not pay attention to sanitation of equipment and place even individual hygiene of each depot officer. Usually, some bacteria contaminate refill drinking water because the tank where the raw water is stored is not clean [5].

Dirty water at the time of distribution can also cause bacteria that are not visible with visible in refill drinking water. If in the process of refilling drinking water is in contact with open air for a long time it can also cause the presence of bacteria in the refill drinking water [12].

4. Conclusion
1. The highest coliform bacteria in Mariso Kec were 1500 / 100ml while the highest in Panakukang was 2400 / 100ml.
2. AMIU water treatment method in Mariso District which is effective, namely RO (reverses osmosis), obtained values of 150 / 100ml coliform bacteria. And in Panakukang sub-district which is ineffective, the Oxy Method is obtained by the value of 24000 / 100ml coliform bacteria.
3. Assessment of personal hygiene behavior in Mariso (Slum area) That is knowledge (p = 0.03), attitude (p = 0.001) and action (p = 0.001) have significant differences p> 0.05. Whereas in Kec Panakukang (Urban Area) That is knowledge (p = 0.00), and action (p = 0.000) has a significant difference p>0.05 and the attitude category (p = 0.08) does not have a significant influence.

References
[1] Hasyim H, Widjajanti H and Febry F 2014 Analysis of personal hygiene and sanitation facilities in the implementation of food stalls serving on campus. Int. J. Res. Heal. Sci. 21072-1079
[2] Veronika A S, Devi N S, and Taufik A 2012 Sanitize hygiene implementation and examination of Escherichia coli content on refill drinking water depot on Tanjung Pinang Barat subdistrict J Env. Res. Public. Heal. 5: 820-895.
[3] Mirza MN 2014 Hygiene sanitation and drinking water coliform number J. Public Heal. Pack. 9167-173
[4] Nuria MC, Rosyid A and Sumantri S 2009 Content test of Escherichia coli bacteria in refillable drinking water from refill drinking water depots in Rembang J. Ilmu-Ilu Pertan.5 27-35
[5] Baharuddin A 2014 Factors related to bacteriological quality of refillable drinking water (AMIU) in Makassar city. Heal. J. 3 2
[6] Misriani 2015 Relationship Between Drinking Water Sources and The Incidence of Diarrhea in Karuwisi Village in The Working Area of Makassar’s Karuwisi Health Center (Makassar: Hasanuddin University)
[7] OdonkorST 2013 Escherichia coli as an indicator of bacteriological quality of water: An overview Microbiol. Res. 45-11
[8] Iqbal P 2016 Contamination of Coliform bacteria in refillable drinking water in ilie village, ulee Kareng sub-district, Banda Aceh city.J. Vet. Med. 101
[9] Maulita CN 2009 Testing of Escherichia colibacteria content in drinking water refill from drinking water refill depot in Rembang sub-districtInt. J. Environ. Res. Public Health5 829-896
[10] Syafran 2010 Study of the Quality of Drinking Water in Makassar City (Makassar: Faculty of Public Health, UNHAS)
[11] Ukkas K 2010 Quality Study of Bacteriology and Chemistry of Refillable Drinking Water (AMIU) Based on Brands of Raw Facilities and Water in Tamalanrea District(Makassar : Faculty of Public Health, UNHAS)
[12] Liu Y, Gilchrist A, Zhang J and Li XF2008 Detection of viable but nonculturable Escherichia coli O157: Bacteria H7 in drinking water and river water Appl Environ Microbiol. 741502-1507