Jurnal Kesehatan Lingkungan
Journal of Environmental Health
Vol. 15 No. 2
DOI: 10.20473/jkl.v15i2.2023.120-126
ISSN: 1829 - 7285 | E-ISSN: 2040 - 881X
Journal Home Page: https://e-journal.unair.ac.id/JKL
ORIGINAL RESEARCH Open Access

DRINKING WATER QUALITY OF WATER REFILL STATION IN GEBANG RAYA TANGGERANG

Veza Azteria[1]*, Ernalinda Rosya[2]

[1]Department of Public Health, Faculty of Health, Universitas Esa Unggul, Jakarta 11510, Indonesia
[2]Department of Nursing, Faculty of Health, Universitas Esa Unggul, Jakarta 11510, Indonesia

Corresponding Author:
*) veza.azteria@esaunggul.ac.id

Article Info

Submitted	: 4 January 2023
In reviewed	: 6 February 2023
Accepted	: 28 March 2023
Available Online	: 30 April 2023

Keywords : *Drinking water station, Microbiology, Personal hygiene, Sanitary hygiene*

Published by *Faculty of Public Health Universitas Airlangga*

Abstract

Introduction: *As a drinking water provider, refill drinking water station must comply with hygiene and sanitation standards for water quality, including the microbiological value standard for clean water. This study was conducted to determine the microbial levels in refill drinking water station and analyze the drinking water quality based on sanitation hygiene observations.* ***Methods:*** *The study included laboratory test methods, cross-sectional analysis tests, and a descriptive analysis. Drinking water sampling and sanitation observations were performed using the total sampling technique on 17 water station. As much as 100 ml of drinking water samples were taken directly from the faucet to refill water with a sterile bottle container. Sanitary hygiene was studied through interviews using an observation sheet.* ***Results and Discussion:*** *The most bacteria were found at 108 per 100ml in Escherichia coli parameters and 866 per 100ml in coliform parameters in the station water samples with the Station 8 (SK) code. The interviews showed that seven station did not meet the criteria for good sanitation hygiene.* ***Conclusion:*** *Sanitary hygiene is carried out to reduce or eliminate bacterial contamination in drinking water. Observations and laboratory tests show that good sanitation is related to drinking water quality.*

INTRODUCTION

Drinking water is one of the primary needs for all living things, and one of its purposes is to fulfill body fluids (1). The Sustainable Development Goals (SDGs) state that people must have access to clean water and good sanitation (2). Clean water is a good quality resource and is used for consumption in daily activities (3). One of the SDG goals is that, by 2030, all people can have proper drinking water in their yards, water that is accessible when needed, and water that meets the health standards set by the government (4). Each country's condition and developments in science and technology influence drinking water requirements. When a water crisis hit the world due to decreasing water quality as a result of pollution, standards for drinking water quality requirements were issued (5).

Based on data from Central Bureau of Statistics in 2020, clean water production amounted to 5,262.1 million/m^3 with social needs taking up 97.9 million/m^3, special needs taking up 163.6 million/m^3, commercial and industrial needs taking up 456.3 million/m^3, non-commercial needs taking up 2,917.7 million/m^3, and other needs taking up 715.2 million/m^3 (6). Drinking water demands are currently very high, especially in urban communities. People consume bottled drinking water because it is more practical than cooking it first. However, the more people that need drinking water, the more expensive it is. This applies to both raw water and ready-to-drink water. As a result of this phenomenon, another method for procuring drinking water is simple drinking water production using UV light (7).

The refill water station industry is a medium-sized industry whose purpose is to distribute raw water that has been treated with a sterilizer and sell it directly for consumption (8). Increased consumer needs have resulted in refill drinking water station not having their quality and safety guaranteed (9). Based on the

Cite this as :
Azteria V, Rosya E. Drinking Water Quality of Water Refill Station in Gebang Raya Tanggerang. *Jurnal Kesehatan Lingkungan*. 2023;15(2):120–126. https://doi.org/10.20473/jkl.v15i1.2023.120-126

regulation of the Indonesian Ministry of Health number 492 of 2010, the quality of drinking water produced still needs to follow the standards set. The ideal drinking water should be clear, colorless, tasteless, and odorless. In addition, it should not contain pathogenic germs or chemicals that can interfere with bodily functions. It should be aesthetically acceptable and not economically detrimental. Based on this, it is necessary to develop regulatory standards regarding which types of drinking water are allowed for direct consumption by the community. The setting of these standards differs from one country to another depending on their socio-cultural factors, including technological advances. A country's standards should be adapted according to local socio-economic and cultural conditions. For developing countries like Indonesia, it is necessary to have relatively inexpensive water treatment methods that allow drinking water to meet the quality requirements (10).

Refilled drinking water tends to be cheaper than bottled drinking water, though it only has up to a quarter of bottled water's nutrients (11). In general, people choose refilled drinking water to fulfill their needs because it is cheap and practical. Inadequate supervision of refill water station causes the water's physical, chemical, and biological qualities to not meet established standards (3). The Indonesian Ministry of Health has a regulation concerning water requirements for consumption. Water for consumption should have a standard pH of 6.5-8.5, be odorless, be tasteless, have a nitrite content of 3 mg/l, and have a nitrate content of 50 mg/l (4). Indonesian National Standard No. 01-3553 states that bottled drinking water should not contain pathogenic bacteria, including *Salmonella* and *Pseudomonas aeruginosa* (12). Standards for drinking water quality state that several chemical and microbiological variables directly affect health. If certain chemical levels do not meet the requirements, then the water is not suitable for drinking (13). Refill water businesses are generally still on a small scale. In terms of infrastructure, station owners still have insufficient knowledge (14).

The quality of drinking water consumed can affect health (15). In 2020, Gebang Raya Kota Tangerang had the highest number of people (12,000) exposed to diarrhea caused by oral-fecal transmission from clean water and drinking water, as well as a lack of clean and healthy lifestyles (16).

Based on environmental health inspection data for Tangerang in 2021, it was found that 17 refilled drinking water station were still operating. The preliminary study stated that six station did not meet the requirements, four met the requirements, and seven needed further laboratory testing. Preliminary studies were carried out using the observation method on four refill water station in the Gebang Raya area with Indonesian Ministry of Health Regulation No. 429/2010 for reference. According to Indonesian Ministry of Health Regulation No. 492/2010, drinking water is safe for consumption when it meets microbiological, physical, and chemical standards. The microbiology standard states that drinking water cannot contain *Escherichia coli* or coliform bacteria.

Escherichia coli is a group of coliform bacteria. Coliform bacteria consist of *Escherichia*, *Citrobacter*, *Enterobacter*, and *Klebsiella*. The high content of pathogens causes an increased risk of other pathogenic bacteria (17). Bacterial content is caused by contact from workers infected with *Escherichia coli* through their fingers and nails during drinking water and food production. It is also caused by a lack of awareness regarding clean lifestyles. Many refilled drinking water station need a certificate indicating that the water sold is suitable for consumption in addition to using healthy water for production. There are still wells less than 10 meters from the septic tank, which are Escherichia coli bacteria contamination sources (18). Coliform bacteria and *Escherichia coli* have a dangerous impact on bodily health, such as causing diarrheal disease. Water contamination is caused by a lack of supervision or routine inspection of operating drinking water station.

The current community water needs, especially in urban communities, are very high. This is especially true when coupled with the community's increased mobility, which requires them to consume safe and practical drinking water. However, as time goes by, bottled water prices are becoming more expensive due to higher production costs (19). The increase in refilled drinking water use currently needs to be supported by good hygiene and sanitation, especially at refill drinking water station, to mitigate risks causing health problems.

Health problems are caused by drinking water station that do not meet sanitary hygiene requirements; ignorance of the importance of sanitation and personal hygiene in serving consumers, especially in food and beverage processing facilities; and refill water station entrepreneurs' lack of awareness in carrying out their obligation to monitor the water they produce. There are even some station that do not have a business license. Supervision of drinking water station can be a solution to reduce pollution. According to the regulations, the purpose of monitoring drinking water station is to prevent and reduce health risks from drinking water produced in line with the provisions of laws and regulations.

The preliminary study results found that there was one station that was contaminated with *Escherichia coli*, while the other three station were not free of vectors.

In terms of sanitary hygiene, four station operators were found to not have washed their hands before serving consumers, there was no sanitation hygiene certificate, and there was no UV sterilization and disinfection equipment (13). This study was conducted to identify microbiological content and analyze the relationship between sanitation, hygiene, and refill drinking water in Gebang Raya Tangerang.

METHODS

This study was conducted in several stages. First, laboratory tests were done to measure the microbiological content (*E. coli* and coliform), pH, color, odor, and temperature of refilled drinking water. Second, observations and interviews were conducted to determine the relationship between microbiology and sanitation at station, drinking water treatment facilities, completeness of sanitation facilities, handlers, and raw water administration. Laboratory tests for microbiological parameters (*Escherichia coli* and coliform) used a Quantity Tray 2000 with Colilert-18 reagent using the Most Probable Number (MPN) analysis method. Additional parameters (pH, odor, and color) were tested using a pH meter, spectrophotometer, and thermometer. Drinking water samples from refilled drinking water faucets were taken in amounts of 100 ml in a sterile bottle. The samples were then sent to the regional health laboratory in Tangerang for laboratory tests. The parameters of sanitation, completeness of facilities, handlers, and raw water were observed using a total sampling technique on 17 drinking water station. The method used was observation, from which the results went through a descriptive and cross-sectional analysis. This study was conducted from June to December 2022.

Escherichia coli and coliform bacteria were examined using the following methods: Add one colilert-18 medium (2.8 g) into a sterile glass bottle, then add 100 ml of drinking water sample into the bottle, and then homogenize; Pour aseptically into the Quanty Tray 2000 container; Put into the container seal machine.

Incubate at 36°C for 18-22 hours for *Escherichia coli* and coliform bacteria; Check results after 18-22 hours of incubation; To read the *Escherichia coli* results, it must be observed under UV light (365 nm) in a dark room or a room that obscures ambient light. Positive results for *Escherichia coli* are indicated by the presence of fluorescence (blue glow); If results are equivocal after 18 hours, incubate again for up to 22 hours.

The number of positive *Escherichia coli* bacteria in the Quanty Tray 2000 MPN/ 100 ml can be calculated by referring to the statistical table or using the MPN computer generator program. See tables B1 and B2 attached for the Quanty Tray 2000.

The drinking water quality standard used is Indonesian Ministry of Health Regulation No. 492 of 2010, which states that there should be no bacterial content in drinking water (the amount of *Escherichia coli* and coliform bacteria: 0/100ml)

RESULTS

The bacterial content was obtained through a laboratory test using the MPN. The maximum allowable bacterial content in drinking water is 0 per 100 ml (16). The analysis showed that eight station in the Gebang Raya Urban Village area met the microbiological requirements, while nine other station did not meet the microbiological requirements. The most abundant bacteria presence was found in concentrations of 108 per 100 ml in *Escherichia coli* parameters and 866 per 100 ml in coliform parameters in station water samples with Station code 8 (SK). The parameters of temperature, color, and pH as additional parameters all met quality standards.

Table 1. Laboratory Test Results for Drinking Water Examination

Stasion Code	*E. coli (MPN)*	*Coliform (MPN)*	Temp	Color	Odor	pH	Remarks
1 (HR)	4	35	26.1	1 NTU	Odorless	7.17	Not Eligible
2 (AR)	0	0	28	1 NTU	Odorless	7.75	Eligible
3 (AL)	0	1	28	5 NTU	Odorless	7.67	Not Eligible
4 (BN)	0	0	27	2 NTU	Odorless	7.1	Eligible
5 (FW)	0	0	28	1 NTU	Odorless	6.73	Eligible
6 (NN)	0	0	28	0 NTU	Odorless	7.3	Eligible
7 (NR)	5	16	28	2 NTU	Odorless	6.96	Not Eligible
8 (SK)	108	866	25.2	1 NTU	Odorless	7.67	Not Eligible
9 (TJ)	1	56	28.5	1 NTU	Odorless	7.51	Not Eligible
10 (ZR)	0	1	28	5 NTU	Odorless	7.44	Not Eligible
11 (AS)	8	66	27.1	1 NTU	Odorless	7.3	Not Eligible
12 (KZ)	0	145	26.5	1 NTU	Odorless	7	Not Eligible
13 (AI)	0	0	26.3	1 NTU	Odorless	7.11	Eligible
14 (FJ)	0	0	25.4	1 NTU	Odorless	6.89	Eligible
15 (IL)	1	10	27	2 NTU	Odorless	6.67	Not Eligible
16 (YT)	0	0	25.6	1 NTU	Odorless	7.28	Eligible
17 (MD)	0	0	26.2	1 NTU	Odorless	7.05	Eligible

Laboratory tests were conducted on 17 refill drinking water samples from 17 refill drinking water station in the Gebang Raya Village area. The results showed that nine stasion (52.94%) met the requirements outlined by Indonesian Ministry of Health Regulation No. 492 of 2010. This is in line with previous research (17) in the Sukmajaya District, Depok City, which found 16 ouf of 31 station met government regulations (51.6%).

Meanwhile, research in the Mondokan District, Sragen City, found that six of the 27 station examined did not meet the requirements because they were contaminated with bacteria (22.2%) (18). Research on 13 station drinking water samples uncovered that 10 did not meet the requirements (76.9%) (20).

Based on the inspection and observation results, there were six (35.3%) station whose *Escherichia coli* bacteria parameters exceeded the Indonesian Ministry of Health Quality Standards No. 492 of 2010. The highest *Escherichia coli* contamination rate was found in station with code 8 (SK) and MPN examination numbers 108/100ml. As for the coliform parameter, nine (52.9%) station exceeded regulatory quality standards set by the government. The station with the highest coliform contamination was the station with code 8 (SK) and an MPN check number of 866/100ml.

The surrounding area's sanitation and drinking water treatment facility variables showed the same results. Out of the seven station that had sanitation places, none met the microbiology requirements (100%). In comparison, 10 station met the requirements, namely 8 station (80%). Based on the Fisher analysis test results, a p-value of 0.002 (<0.05) was obtained. There was an influence on the drinking water treatment area from the presence of bacteria, There was also a relationship between bacteria and drinking water treatment facilities.

In terms of sanitation facility completeness, seven station (87.5%) did not meet the requirements. Meanwhile, seven out of nine station met the microbiology requirements (77.8%). The Fisher analysis test yielded a p-value of 0.015 (<0.05). This means that there was a significant relationship between the completeness of sanitation facilities with bacterial presence. If sanitation facility standards are not met, the number of bacteria will increase. Based on the analysis results, the 95% PRCI value was found to be 24,500 (0.963 – 40,223). This means that station sanitation facilities that do not meet the requirements have 24,500 times the chance of having microbiologically contaminated drinking water.

The handler variable shows that all eight station did not meet the requirements (100%). Meanwhile eight of the nine station met the requirements (88.9%). From the Fisher's test analysis, a p-value of 0.000 (<0.05) was obtained. This means that personal hygiene affected the number of bacteria in refilled drinking water station.

Table 2. Correlation Analysis Results of Various Variables

Variable	Microbiology				Total		*p-value*	PR (95% CI)
	Did Not Qualify		Qualified					
	n	%	n	%	n	%		
Water Treatment Facility								
Did Not Qualify	7	100	0	0	7	100	0.002	0.200 (0.058 – 0.691)
Qualified	2	20	8	80	10	100		
Completeness of Sanitation Facilities								
Did Not Qualify	7	87.5	1	12.5	8	100	0.015	24.500 (0.963 – 40.223)
Qualified	2	22.2	7	77.8	9	100		
Handler								
Did Not Qualify	8	100	0	0	8	100	0.000	0.111 (0.018 – 0.763)
Qualified	1	11.1	8	88.9	9	100		
Raw Water Administration								
Did Not Qualify	3	100	0	0	3	100	0.206	0.429 (0.234 – 0.785)
Qualified	6	42.9	8	57.1	14	1000		

Table 3. Drinking Water Quality and Hygiene Sanitation Test Results

Quality Standard	Frequency	Percentage (%)
Coliform		
Standard	8	47.1
Not Standard	9	52.9
E. coli		
Standard	11	64.7
Not Standard	6	35.3
Temperature		
Standard	17	100
Not Standard	0	0
pH		
Standard	17	100
Not Standard	0	0
Area Sanitation		
Standard	10	58.8
Not Standard	7	41.2
Infrastructure		
Standard	10	58.8
Not Standard	7	41.2
Complete Facilities		
Standard	9	52.9
Not Standard	8	47.1
Handlers		
Standard	9	52.9
Not Standard	8	47.1
Raw Water		
Standard	14	82.3
Not Standard	3	17.7

Table 2 shows that of the three station that had a standard water supply, none met the requirements (100%). Meanwhile, for the 14 station that were known to have standing water that met the requirements, eight of them met the criteria (57.1%). Fisher's Chi-square test analysis results yielded a p-value of 0.206 (<0.05), and thus, Ha was rejected. This means that there was no relationship between raw water and bacterial presence in refilled drinking water samples

DISCUSSION

Bottled water is one of the types of water that contain minerals needed by the body. Mineral water contains natural substances without additional substances or vitamins. There is also mineralized water, which goes through certain processing stages for direct consumption (18). Humans can directly consume water that meets several physical, chemical, and biological criteria. The requirements for drinking water suitable for direct consumption must be checked by laboratory tests first. These tests check whether the drinking water is free from bacterial content and in accordance with the quality standards set by the government (20). Turbidity in water is caused by the presence of solids containing organic and inorganic contents, such as sludge, as a result of the disposal.

The quality standard for drinking water is MPN 0/100 ml (19). There were seven station (87.5%) that had incomplete sanitation facilities, did not pass the drinking water inspection, and did not meet the requirements. This is because there is still a lack of sanitation facilities, such as a handwashing station equipped with soap. There were also no closed trash cans (21).

Furthermore, it was found that eight (100%) handlers at the drinking water station did not meet the requirements, and their drinking water inspection results also did not meet the requirements. There were still many station handlers who did not wash their hands when serving consumers, did not wear clean and neat work clothes, and had never done a special health check at least once a year. As for area sanitation, seven station did not meet the requirements because of the amount of dust inside. The station areas did not have a waterproof floor and walls, had dirty and weak ceilings, and had an unorganized layout, making the station difficult to clean (22).

Drinking water safety is based on physical, chemical and biological parameters. As additional parameters, pH, temperature, odor, and color were included in testing the 17 drinking water station in the safe category or following established quality standards. After observing several drinking water station, they were discovered to be the wrong type. Assistance is required from the various stakeholders involved to improve the drinking water quality and allow it to be consumed properly by the community. The quality standard set for pH is 6.5-8.5, while for color, the maximum is 25 NTU. The results found that the water from 17 station was odorless, and the average standard temperature was 25.5^0C - 28^0C. The physical requirements for drinking water include it being colorless, at a normal temperature, tasteless, odorless, clear or not cloudy, and not containing solids. Based on the observations made at each station used by the community, the physical and chemical parameters between pH, odor, color, and temperature were still within the standards suitable for consumption (23).

Temperature is a quantitative measure of how hot or cold you feel. The temperature of the water in mineral water also affects drinking water standards, whether good drinking water should be cool or not hot. The temperature level allowed in drinking water is ± 3^0C to air temperature (normal air temperature is 25^0C) (4). Based on the laboratory test results, it is known that water that meets the consumption criteria is drinking water with no color. Good drinking water is water that has no color for aesthetic reasons and to prevent poisoning from various chemicals and bacteria that may cause the color to endanger consumers. Color in drinking water can be caused by several things, including tannins and humic acids, which are found naturally in swamp water. They have a light yellow color resembling urine, and the color can come from sewage or industrial waste (24).

The factors and conditions that cause high bacterial content in refilled drinking water include equipment contamination, the absence of UV light to kill bacterial content, the station owner's lack of knowledge on station cleanliness, and lack of sanitation management by the station manager in drinking water distribution. When taking drinking water samples, drinking water station are refilled in the water treatment process to prevent sedimentation. This can cause turbidity in drinking water, which will trigger bacteria growth. The storage temperature of drinking water can promote bacterial growth as well. Coliform bacteria need a maximum temperature of 35°C, while *Escherichia coli* bacteria need 37°C. Suboptimal disinfection/sterilization systems can cause changes in bacteria's molecular and biochemical components (25). Ultraviolet light can kill microorganisms at 254 nm ultraviolet energy. During operation, refill water station owners do not always pay attention to the device's effectiveness. The filtering process uses a cartridge filter with a diameter of 0.5 microns and ultraviolet irradiation. This should be able to remove the bacterial content from refilled drinking water.

The limitation of refill drinking water station data obtained during the sampling test is one of the areas in which this study can improve. It is hoped that there will be further research with a more significant amount of drinking water station data. This can provide input for the government in issuing regulations related to criteria and due diligence in establishing station.

ACKNOWLEDGMENTS

The authors would like to thank the Faculty of Health, Public Health Study Program, Universitas Esa Unggul for supporting this study.

CONCLUSION

The hygiene conditions observed in this study were categorized as failing to meet the requirements. There were nine refilled drinking water station (52.9%) containing *Escherichia coli* and coliform bacteria above the quality standard threshold. The sanitary condition of the area, equipment, handlers, and raw water at the refill water station could be better. The sterilization and disinfection equipment at the drinking water station were mostly non-functioning and unfit for use. As a result, the bacteria in the water source could not die optimally. The application of sanitary hygiene variables (area, equipment, handlers, and raw water) is important in improving drinking water quality. Hygiene sanitation is one of the efforts that can be taken to reduce bacteria and contaminants in drinking water. The study results indicate that there was a significant relationship between the two variables. Managers should monitor the processing facilities by using a checklist for maintenance of UV lamps, microfilters, and gallon rinsing equipment, as well as a checklist for repairing equipment damage. Additionally, managers are required to check raw water's microbiological parameters once every three months, and chemical and physical parameters twice a year at the nearest regional health laboratory.

REFERENCES

1. Arlinda S, Suksmerri S, Mukhlis M. Risk Analysis of Community Water Quality in Alahan Panjang Agricultural Area, Solok Regency, West Sumatera, Indonesia. *J Kesehat Lingkung*. 2022;14(3):193–200. https://doi.org/10.20473/jkl.v14i3.2022.193-200
2. Iryanto AA, Firmansyah YW, Wahyu Widyantoro AZ. Spatial Patterns Of Environmental Sanitation Factors As Determinants of Toddlers Diarrhea in Pauh District, Padang CIty in 2021. *J Kesehat Lingkung*. 2022;14(2):71–81. https://doi.org/10.20473/jkl.v14i2.2022.71-81
3. Oktaviani T. Hygiene and Sanitation of Refill water Depo at PT X, Taman, Sidoarjo. *J Kesehat Lingkung*. 2018;10(4):376–384. https://doi.org/10.20473/jkl.v10i4.2018.376-384
4. Nurhayati L, Utami WS, Jauhani MA, Armiyanti Y, Hermansyah B. Physical Water Quality Contaminated By Soil-Transmitted Helminths in Sumbersari District, Jember Regency. *J Kesehat Lingkung*. 2022;14(4):282–288. https://doi.org/10.20473/jkl.v14i4.2022.282-288
5. Indasah I. Effect of Good Hygiene Sanitation and Personal Hygiene Stasion Management of Refill Water on the Quality of Drinking Water Reviewed from Most-Probable-Number Coliform in Kediri. *Fol Med Indones*. 2018;54(4):241-248. https://doi.org/10.20473/fmi.v54i4.10705
6. Central Beureu Statistic of Republic Indonesia. Statistic of Clean Water 2015 – 2020. Jakarta: Central Beureu Statistic of Republic Indonesia; 2020. https://www.bps.go.id/publication/2021/12/16/a641ca7512995e9d254ee194/statistik-air-bersih-2015-2020
7. Sumolang OD, Maddusa SS, Umboh JML. Gambaran Hygiene Sanitasi dan Kandungan Mikrobiologi pada Stasion Air Minum (DAM) di Wilayah Kerja Puskesmas Kolongan Kecamatan Kalawat Kabupaten Minahasa Utara. *J Kesehat Masy Univ Sam Ratulangi*. 2020;9(4):34–40. https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/29407
8. Ummah M. Hygiene and Sanitation of Drinking Water Stasion and Microbiology Quality of Drinking Water in Ngasem Primary Healthcare Area, Kediri, East Java. *J Kesehat Lingkung*. 2019;11(4):286-292. https://doi.org/10.20473/jkl.v11i4.2019.286-292
9. Marhamah A, Santoto B. Refill Water Quality at Drinking Water Stasion in South Manokwari Regency. *Cassowary*. 2020;3(1):61–71. https://doi.org/10.30862/casssowary.cs.v3.i1.39
10. Wyasena PNT, Sudaryati NLG, Sudiartawan IM, Adnyana IMD. Evaluation of Refillable Drinnking Water Quality Based on MPN Coliform and Escheria Coli in Sesetan Village, South Denpasar Bali. *J Vocat Heal Stud*. 2022;6(2):93–101. https://doi.org/10.20473/jvhs.V6.I2.2022.93-101
11. Trisna Y. Water Quality and Public Health Complaints in Surrounding Watoetoelis Sugar Mills. *J Kesehat Lingkung.* 2018;10(2):241–251. https://doi.org/10.20473/jkl.v10i2.2018.241-251
12. Novitasari D. Processing System and Evaluation Microbiological Quality of Drinking Water Fountain in Surabaya City. *J Kesehat Lingkung*. 2020;12(3):154–162. https://doi.org/10.20473/jkl.v12i3.2020.154-162
13. Rohmawati Y, Kustomo. Analisis Kualitas Air pada Reservoir PDAM Kota Semarang Menggunakan Uji Parameter Fisika, Kimia, dan Mikrobiologi, serta Dikombinasikan dengan Analisis Kemometri. *Walisongo J Chem*. 2020;3(2):100–107. https://doi.org/10.21580/wjc.v3i2.6603
14. Ravsanjanie MM, Pawitra AS, Diyanah KC, Zakaria ZA, Marmaya NHB. Utilization of Clean Water, Personal Hygiene of Toddler Caregivers,

and Smoking Behavior of Family Members as Risk Factors for Cases of Stunting Toddlers. *J Kesehat Lingkung*. 2021;13(1):48-56. https://doi.org/10.20473/jkl.v13i1.2021.48-56

15. Raksanagara A. Aspek Internal dan Eksternal Kualitas Produksi Stasion Air Minum Isi Ulang: Studi Kualitatif di Kota Bandung. *Majalah Kedokteran Bandung*. 2018;50(1):53–60. https://doi.org/10.15395/mkb.v50n1.1143
16. Putra CMM. The Physical and Microbiological Quality of Clean Water In Nanas Sub Village Kediri District Post Natural Phenomena Sinking Wells. *J Kesehat Lingkung*. 2018;10(4):360–367. https://doi.org/10.20473/jkl.v10i4.2018.36-367
17. Putri A. Identifkasi Keberadaan Bakteri Coliform dan Total Mikroba Dalam Es Dung Dung di Sekitar Kampus Universitas Muhamadiyah Surakarta. *J Media Gizi Indones*. 2018;13(1):41-48. https://doi.org/10.20473/mgi.v13i1.41-48
18. Arumsari F, Joko T, Darundiati YH. Hubungan Higiene Sanitasi Stasion Air Minum dengan Keberadaan Bakteri Escherichia Coli pada Air Minum Isi Ulang di Kecamatan Mondokan Kabupaten Sragen. *Media Kesehat Masy Indones*. 2021;20(2):75–80. https://doi.org/10.14710/mkmi.20.2.75-82
19. Ministry of Health Republic of Indonesia. Regulation of Ministry of Health Republic Indonesia No. 492/MENKES/2010 about Quality Requirements of Drinking Water. Jakarta: Ministry of Health Republic of Indonesia; 2010
20. Zarifah DA. Hygiene Sanitasi Stasion Air Minum Isi Ulang dan Kualitas Mikrobiologis Air Minum Isi Ulang di Wilayah Kerja Puskesmas Bukitsangkal Kota Palembang. *J Sanitasi Lingkung*. 2022;2(2):92-99. https://jurnal.poltekkespalembang.ac.id/index.php/SJKL/article/view/1304/868
21. Celesta AG. Overview Basic Sanitation In Payaman Village, Bojonegoro District 2016. *J Kesehat Lingkung*. 2019;11(2):83–90. https://doi.org/10.20473/jkl.v11i2.2019.83-90
22. Yuasadam NZ. Sanitation and Personal Hygiene on Canteen Dharma Wanita Persatuan Airlangga University. *J Kesehat Lingkung*. 2018;10(2):175–180. https://doi.org/10.20473/jkl.v10i2.2018.175-180
23. Hasrianti. Analisis Warna, Suhu, pH, dan Salinitas Air Sumur BOR di Kota Palopo. *Prosiding Seminar Nasional*. 2016;2(1):747–896. https://journal.uncp.ac.id/index.php/proceding/article/view/520
24. Konstantin T. The Correlation Between Water, Sanitation, and Hygiene With Soil-Transmitted Helminths Infection among Elementary School Children of Aru Islands District, Maluku. *Indones J Public Heal*. 2021;16(2):273–284. https://doi.org/10.20473/ijph.v16i2.2021.273-284
25. Assegaf F. Uji Kandungan Bakteriologi Air Minum Isi Ulang pada Stasion Air Minum isi Ulang (DAMIU) di Desa Wayame Kecamatan Teluk Ambon Kota Ambon. *Glob Heal Sci*. 2018;3(4):318–321. http://dx.doi.org/10.33846/ghs.v3i4.298