

Analysis of Hygiene and Sanitation at Drinking Water Depots in the Tuntungan Subdistrict of Medan City

Anggina Zahra Salsabilla¹, Aisha Nurul Azkia¹, Sindy Nurhaliza¹, Nur Azizah Chairuna Balqis Tanjung¹, Shaiecka Radya Ruslan¹, Juan Syakir Haziq¹

¹ Faculty of Public Health, State Islamic University of North Sumatra, Indonesia;

*Correspondence: angginazahrasalsabilla@gmail.com

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Abstract

Background: Refillable Drinking Water Stations (DAMIU) are a widely used source of drinking water because they are easily accessible and relatively affordable. However, the quality of the drinking water produced is greatly influenced by hygiene and sanitation practices regarding the facility, equipment, and handlers/operators. This study aims to analyze the hygiene and sanitation conditions of DAMIUs in Medan Tuntungan Subdistrict, Medan City, based on the aspects of premises, equipment, and handlers/operators in accordance with Regulation of the Minister of Health of the Republic of Indonesia No. 43 of 2014.

Method: This study employs a descriptive design with a qualitative approach. The study sample consisted of seven DAMIUs selected using purposive sampling. Data were collected through direct observation using a DAMIU hygiene and sanitation inspection checklist and analyzed descriptively.

Result: The results showed that scores for the facility aspect ranged from 16 to 26; the equipment aspect scored 29 across all depots; and the handler/operator aspect scored between 15 and 18. Based on the cumulative assessment results, only one depot (14.3%) met the hygiene and sanitation requirements with a score of ≥ 70 , while six depots (85.7%) did not meet the requirements. Non-compliance was most frequently found in the facility aspect, particularly regarding environmental conditions, ventilation, lighting, waste management, and disease vector control. All depots have met the equipment requirements; however, some operators were found to lack hygiene and sanitation certificates.

Conclusion: It was concluded that most DAMIUs in Medan Tuntungan Subdistrict have not yet met hygiene and sanitation requirements; therefore, enhanced guidance, supervision, and training for managers and operators are needed to ensure the safety of the drinking water consumed by the community.

1. Introduction

Water is a basic human need that plays a vital role in sustaining life, health, and the well-being of communities. The availability of safe drinking water that meets health standards is one of the key indicators of environmental health development. Drinking water contaminated with pathogenic microorganisms or hazardous chemicals can serve as a vehicle for the transmission of various environment-related diseases, such as diarrhea, cholera, dysentery, typhoid, and hepatitis A. The World Health Organization (WHO) reports that drinking water quality that does not meet health standards remains one of the primary risk factors for the occurrence of infectious diseases in many developing countries.^{1,2}

Population growth, urbanization, and changes in people's lifestyles have led to an increasing need for drinking water sources that are convenient, easily accessible, and affordable. One rapidly growing alternative for drinking water supply in Indonesia is the Refillable Drinking Water Depot (DAMIU). DAMIUs have become a popular choice among the public because they are relatively cheaper than bottled drinking water and are generally located near residential areas.³ However, the quality of drinking water produced by DAMIUs is greatly influenced by hygiene and sanitation practices throughout the processing, storage, and filling processes.⁴

Hygiene and sanitation are two important aspects of efforts to prevent drinking water contamination. Hygiene relates to individual behavior in maintaining personal cleanliness to prevent contamination, while sanitation relates to the control of environmental factors that can affect human health.^{5,6} The implementation of good hygiene and sanitation practices at DAMIU aims to ensure that the drinking water produced is safe for consumption and does not pose a health risk to the community. Conversely, poor hygiene and sanitation practices can increase the likelihood of physical, chemical, or microbiological contamination, which has the potential to cause waterborne diseases.^{1,2}

The Indonesian government has established various regulations regarding the operation of DAMIUs, one of which is Regulation of the Minister of Health of the Republic of Indonesia No. 43 of 2014 on Hygiene and Sanitation of Drinking Water Depots. This regulation sets forth various requirements that must be met by DAMIU operators, covering aspects such as facilities, equipment, handlers/operators, raw water quality,

and treated water quality.⁷ Compliance with all these requirements is a crucial measure to ensure the safety of the drinking water consumed by the public.

Various studies indicate that there are still DAMIUs that do not meet the applicable hygiene and sanitation requirements. A study by Zulfa and Mulyawati found that non-compliance with hygiene and sanitation standards is associated with an increased risk of microbiological contamination in refillable drinking water.⁸ Another study conducted by Umayyah et al. reported that facility conditions and operator behavior are the aspects most frequently found to fall short of hygiene and sanitation standards.⁹ Similar findings were also reported by Rizkiani et al., who showed that the physical condition of the building, environmental sanitation, and operator competence influence the quality of drinking water produced by DAMIU facilities.¹⁰

The Medan Tuntungan subdistrict is one of the areas in the city of Medan that has a significant number of DAMIUs and serves as the primary source of drinking water for the local community. Based on the results of preliminary observations conducted at seven refillable drinking water depots in the area, variations were found in the level of compliance with hygiene and sanitation requirements regarding premises, equipment, and handlers/operators. The assessment results indicate that the majority of stations do not yet meet the hygiene and sanitation standards established by the drinking water station sanitation inspection instrument. These conditions suggest the need for further evaluation of hygiene and sanitation practices at DAMIU stations in the area.

This study aims to analyze the hygiene and sanitation conditions of Refillable Drinking Water Depots (DAMIU) in Medan Tuntungan Subdistrict, Medan City, based on the aspects of facilities, equipment, and handlers/operators in accordance with Regulation of the Minister of Health of the Republic of Indonesia No. 43 of 2014. The results of this study are expected to serve as a basis for evaluation by DAMIU managers, health agencies, and relevant parties in their efforts to improve the hygiene and sanitation quality of drinking water depots to ensure the safety of the drinking water consumed by the public.

2. Materials and Methods

Study Design

This study employs a descriptive research design with a qualitative approach. Descriptive research aims to describe conditions or phenomena based on facts discovered in the field without applying any treatment or intervention to the research subjects.¹¹ The qualitative approach was used to obtain an overview of the hygiene and sanitation conditions at drinking water refill stations based on direct field observations.

Study Area and Period

The study was conducted at seven Refillable Drinking Water Depots (DAMIU) located in the Medan Tuntungan subdistrict, Medan City, North Sumatra. Data collection took place on May 11, 2026.

Population and Sample

The study population consisted of all refillable drinking water depots operating in the Medan Tuntungan subdistrict. The study sample comprised seven DAMIUs selected using purposive sampling. Sample selection was based on several criteria: the depots were still actively operating, were easily accessible to the researchers, and were willing to participate in the study.^{11,12}

Data Collection

Primary data were collected through direct observation using a hygiene and sanitation inspection checklist for refillable drinking water depots based on the Regulation of the Minister of Health of the Republic of Indonesia No. 43 of 2014 concerning Hygiene and Sanitation of Drinking Water Refill Depots. The observations focused on facility conditions, equipment conditions, and handler/operator conditions. In addition, brief interviews were conducted with depot owners or operators to obtain supporting information regarding raw water sources, water treatment processes, equipment maintenance, and the implementation of hygiene and sanitation practices in daily operations.

Variables and Assessment

The hygiene and sanitation assessment was conducted using a scoring system contained in the DAMIU sanitation inspection instrument. Each component that met the established requirements was assigned a score according to its predetermined weight, while components that did not meet the requirements received no score. The hygiene and sanitation assessment was conducted using a checklist with a weighted scoring system. For the facility aspect, each item was assigned a score of 2. For the equipment aspect, item scores varied 2, 3, and 5 according to the assessment weights. For the handler/operator aspect, item scores vary between 2 and 3, depending on the weighting. A checkmark (✓) indicates that the requirement has been met, while a dash (-) indicates that the requirement has not been met. The total score is calculated by summing the scores of all items that meet the requirements. Based on the total score obtained, the assessment results were categorized as Meets Requirements (MR) for scores of 70 or higher and Does Not Meet Requirements (DNMR) for scores below 70.

Data Analysis

The data obtained were analyzed descriptively and presented in the form of tables and narratives. The analysis was conducted to describe the sanitation and hygiene conditions at DAMIU based on the premises aspect, the equipment aspect, and the handler/operator aspect, as well as to determine the level of compliance with sanitation and hygiene requirements at each depot.

3. Results

1. Hygiene and Sanitation Assessment of Drinking Water Depots

Based on the results of observations using a checklist for assessing sanitation and hygiene in terms of equipment at seven drinking water depots in the Medan Tuntungan subdistrict, Medan City, the findings are as follows:

Table 1. Hygiene and Sanitation Conditions of Refillable Drinking Water Depots.

No	Description	DAM Name, Score, and Assessment Results						
		FW	AR	IW	KW	SW.2	IF.W	PH
I. PREMISES								
1	Location is free from pollution and disease transmission sources	2 (-)	2 (✓)	2 (✓)	2 (-)	2 (✓)	2 (-)	2 (-)
2	Building is constructed of strong, safe, easy-to-clean, and well-maintained materials	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
3	Floor is waterproof, level, smooth, non-slippery, free from cracks, dust-resistant, and easy to clean	2 (-)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (-)	2 (-)
4	Walls are waterproof, level, smooth, non-slippery, free from cracks, dust-resistant, and easy to clean	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
5	Roof and ceiling are sturdy, rodent-proof, easy to clean, dust-resistant, and have sufficient height	2 (✓)	2 (✓)	2 (✓)	2 (-)	2 (-)	2 (-)	2 (✓)
6	The layout consists of a processing room, storage room, distribution room, and waiting area	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
7	Lighting is adequate for work activities	2 (-)	2 (✓)	2 (-)	2 (-)	2 (✓)	2 (✓)	2 (✓)
8	Ventilation ensures proper air circulation and air exchange	2 (-)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
9	Humidity levels provide a comfortable working environment	2 (✓)	2 (✓)	2 (✓)	2 (-)	2 (✓)	2 (✓)	2 (✓)
10	Access to toilet and bathroom facilities is available	2 (✓)	2 (-)	2 (✓)	2 (-)	2 (-)	2 (✓)	2 (✓)
11	A proper wastewater drainage system is available	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
12	Covered waste bins are available	2 (-)	2 (-)	2 (✓)	2 (✓)	2 (-)	2 (-)	2 (✓)
13	Handwashing facilities equipped with running water are available	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
14	Free from rats, flies, and cockroaches	2 (-)	2 (✓)	2 (✓)	2 (-)	2 (✓)	2 (✓)	2 (✓)

No	Description	DAM Name, Score, and Assessment Results						
		FW	AR	IW	KW	SW.2	IF.W	PH
	Average Score	16	24	26	16	22	20	24
II. EQUIPMENT								
15	Equipment used is made of food-grade materials	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)
16	Microfilters and disinfection equipment are still within their service life and have not expired	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)
17	Raw water storage tanks are covered and protected from direct sunlight	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
18	Gallons/bottles are cleaned by rinsing them with treated water for at least 10 seconds before filling	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
19	Filled gallons/bottles are directly handed to consumers and are not stored at the depot for more than 24 hours to prevent contamination	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
20	Backwashing is carried out regularly and macrofilter cartridges are replaced periodically	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)
21	More than one microfilter with graded pore sizes is available	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)
22	Sterilization equipment, such as ultraviolet (UV) and/or ozonation units or other disinfection equipment, is available, functioning properly, and used correctly	5 (✓)	5 (✓)	5 (✓)	5 (✓)	5 (✓)	5 (✓)	5 (✓)
23	Facilities for washing and rinsing gallons/bottles are available	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
24	Facilities for filling gallons/bottles are available in an enclosed room	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
25	Clean new bottle caps are available	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
	Average Score	29	29	29	29	29	29	29
26	The handler/operator is healthy and free from infectious diseases	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)

No	Description	DAM Name, Score, and Assessment Results						
		FW	AR	IW	KW	SW.2	IF.W	PH
27	The handler/operator is not a carrier of disease-causing microorganisms	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)
28	The handler/operator maintains personal hygiene and cleanliness	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
29	The handler/operator does not smoke while serving consumers	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
30	The handler/operator washes hands with soap and running water before serving consumers	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)	2 (✓)
31	The handler/operator wears clean and neat work clothing	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (✓)
32	The operator/person in charge/owner possesses a certificate of participation in a Drinking Water Refill Depot Hygiene and Sanitation training course	3 (-)	3 (-)	3 (✓)	3 (✓)	3 (✓)	3 (✓)	3 (-)
Average Score		15	15	18	18	18	18	15

The accumulated results of the hygiene and sanitation assessment checklist for seven refillable drinking water depots in Medan Tuntungan Subdistrict, Medan City, are shown below :

Table 2. Cumulative DAMIU Sanitation and Hygiene Assessment Scores

No	Description	DAM Name and Total Score						
		FW	AR	IW	KW	SW.2	IF.W	PH
1	Premises	16	24	26	16	22	20	24
2	Equipment	29	29	29	29	29	29	29
3	Handlers/Operators	15	15	18	18	18	18	15
Total Score		60	68	73	63	69	67	68
Assessment Result		DNMR	DNMR	MR	DNMR	DNMR	DNMR	DNMR

Notes : MR (Meets Requirements): If the test score is 70 or higher, the candidate is deemed to meet the physical fitness requirements. DNMR (Does Not Meet Requirements): If the test score is below 70, the candidate is deemed not to meet the physical fitness requirements.

The research results show that scores for the facility aspect ranged from 16 to 26. The IW depot received the highest score (26), while the FW and KW depots received the lowest scores (16). In terms of equipment, all depots received the same score of 29. These results indicate that all DAMIUs met the hygiene and sanitation indicators for the equipment aspect. For the handler/operator aspect, scores ranged from 15 to 18. The highest scores were achieved by the IW, KW, SW2, and IF.W depots, while the FW, AR, and PH depots received lower scores because they did not yet have hygiene and sanitation course certificates.

Based on the cumulative assessment results, only one depot—IW—scored ≥ 70 and was therefore categorized as “Compliant” (MR). The other six depots scored below 70 and were categorized as “Non-Compliant” (DNMR). Overall, 85.7% of DAMIUs do not yet meet the applicable hygiene and sanitation standards, while only 14.3% do.

4. Discussions

Hygiene and Sanitation Based on Premises

Facility aspects were the component most frequently found to be noncompliant with hygiene and sanitation requirements at the DAMIUs studied. Noncompliance was primarily found in the conditions of the depot’s surroundings, ventilation, lighting, waste management, availability of covered trash bins, and disease vector control.

Depot environments that do not meet standards have the potential to become sources of contamination that can affect the quality of treated drinking water. According to the WHO, poor environmental sanitation can increase the risk of microbiological contamination and the spread of environment-borne diseases.^{1,2} The availability of adequate sanitation facilities is a key component in maintaining the quality of the depot environment. Environmental health guidelines published by the Ministry of Health emphasize that building cleanliness, ventilation, lighting, waste management, and vector control must be primary concerns in the operation of drinking water supply facilities.¹⁸ Furthermore, Regulation of the Minister of Health of the Republic of Indonesia No. 2 of 2023 also underscores the importance of controlling environmental risk factors as part of efforts to protect public health.¹⁹

The results of this study are consistent with the research by Umayyah et al.⁹, which found that the facility aspect was the component with the highest level of non-compliance at

DAMIUs. A study by Rizkiani et al.¹⁰ also reported that substandard building and environmental conditions can increase the risk of drinking water contamination.

The low score for the facility aspect indicates that there is still a need for improved supervision and guidance for DAMIU managers, particularly regarding the maintenance of the depot environment and the provision of adequate sanitation facilities.

Hygiene and Sanitation Based on Equipment

The research results show that all depots received the maximum score in the equipment category. This indicates that the managers have been maintaining the equipment properly and regularly.

All depots have functional microfilters, active disinfection equipment, closed storage tanks, gallon-washing facilities, and backwashing systems for cleaning filters. These conditions support a safe and hygienic drinking water treatment process.

This finding is consistent with the study by Aisyah et al.¹³, which states that good equipment condition is associated with drinking water quality that meets health standards. Research by Putra and Yuliana¹⁴ also shows that regular equipment maintenance is a key factor in preventing contamination during the drinking water production process. The findings of Pratama and Dewi's study also show that well-maintained equipment is associated with a lower risk of drinking water contamination during the production and distribution processes.²⁰

Although all depots have met the standards regarding equipment, filter replacement, maintenance of sterilization equipment, and periodic inspections of the water treatment system, these measures must be carried out on an ongoing basis to maintain the quality of the drinking water produced.

Hygiene and Sanitation Based on Handler/Operator Aspects

With regard to handlers/operators, most indicators have been met. All operators are in good health, wash their hands before work, wear clean work clothes, and undergo regular health checkups.

However, there are still operators who do not hold hygiene and sanitation course certificates. This situation has caused some depots to receive lower scores than others.

Operators' knowledge and behavior are critical factors in maintaining drinking water quality, as they are directly involved in the water treatment and bottling processes.¹⁵ A study by Rahmawati and Syafitri¹⁵ showed that operators who had received sanitation and hygiene training exhibited higher compliance rates than those who had not undergone such training.

Similar findings were reported by Wulandari et al.¹⁶, who stated that possession of a sanitation and hygiene certificate is associated with better implementation of hygiene standards in DAMIU operations. In addition to formal training, the role of handlers in maintaining hygiene during the processes of washing, filling, and sealing water gallons is also critical to the quality of the drinking water produced. Handlers who consistently practice clean and healthy living habits can reduce the risk of cross-contamination during the production process. This finding is supported by research by Sari and Putri, which states that handlers' behavior is one of the key factors in the successful implementation of hygiene and sanitation practices at refillable drinking water depots.¹⁷

Overview of Hygiene and Sanitation at DAMIU

Research findings indicate that only one out of seven water depots meets hygiene and sanitation requirements overall. These findings suggest that there remains a gap between the regulatory standards set by the government and their implementation on the ground. This situation warrants attention from relevant health agencies, as drinking water depots are one of the primary sources of drinking water for the community. If hygiene and sanitation are not optimally implemented, the risk of waterborne diseases may increase, with widespread implications for public health.^{1,2}

DAMIU's efforts to improve sanitation and hygiene are also in line with the global strategy developed by the World Health Organization through its Water, Sanitation, and Hygiene (WASH) program. The program emphasizes the importance of providing safe drinking water, strengthening monitoring systems, and building the capacity of drinking water facility managers to prevent waterborne diseases.²¹

5. Conclusions

A study on hygiene and sanitation at Refillable Drinking Water Depots (DAMIU) in the Medan Tuntungan subdistrict shows that most depots do not yet meet the hygiene and

sanitation requirements set forth in Regulation of the Minister of Health of the Republic of Indonesia No. 43 of 2014.

Regarding facility conditions, various non-compliances were still found related to the environmental conditions, ventilation, lighting, sanitation facilities, and disease vector control. In terms of equipment, all depots met the hygiene and sanitation requirements. Meanwhile, regarding handlers/operators, most indicators were met; however, some operators were still found to lack hygiene and sanitation certificates.

Of the seven depots studied, only one (14.3%) met the hygiene and sanitation requirements, while the other six (85.7%) did not yet meet them. Therefore, there is a need to enhance guidance, supervision, and hygiene and sanitation training for drinking water depot managers and operators to ensure the safety of the drinking water consumed by the public.

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