

Determinants of Clean Water Accessibility at Muhammad Ali Kasim General Hospital, Gayo Lues: A Comprehensive Analysis



Manisha¹, Julita Arnis², Syunaha Marta³

^{1,2}Lecturer at Helvetia Health Institute, Medan

³Bachelor of Hospital Administration Student, Helvetia Health Institute, Medan, Indonesia

*Correspondence author: manisha@helvetia.ac.id

DOI: <https://doi.org/10.61963/jpkt.v3i1.101>

INFO	ABSTRACT
<p>Submitted: 20-06-2024, Revised: 20-07-2024, Accepted: 10-08-2024</p> <p>Copyright © 2024, Jurnal Perilaku Kesehatan Terpadu (Jupiter) Under the License</p> <p>Creative Commons Attribution-ShareAlike 4.0 International License.</p>  	<p><i>Introduction: The hospital staff exert an impact on the accessibility of potable water inside the hospital premises. The provision of uncontaminated water is crucial for the provision of essential services in hospitals. Both the quality and quantity of water must meet stringent standards to prevent the spread of infections and diseases within the hospital premises. Similarly, efficient drainage systems are necessary to ensure proper water distribution. Goal: Determine the variables that influence the accessibility of uncontaminated water at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023. Method: This study employs an analytical survey research method utilizing a cross-sectional methodology. The research population consisted of 300 officers and personnel at the hospital. A sample of 75 individuals was selected using the Slovin formula approach. The data analysis included both univariate and bivariate analysis, utilizing logistic regression test statistics. The Analysis Result: The chi-square test analysis revealed that the p-values for each variable were as follows: p-value = 0.010 for method, p-value = 0.000 for machine, p-value = 0.000 for material, and p-value = 0.003 for money. Conclusion: The availability of clean water is influenced by factors such as human activity, techniques used, machinery involved, materials used, and financial resources. It is expected that the hospital will prioritize and foresee the provision of water inside the hospital premises to provide an adequate and high-quality supply for everyday activities.</i></p>

Keywords: Clean Water, Water Management, Healthcare Infrastructure, Sanitation Standards

INTRODUCTION

Hospitals play a critical role in providing comprehensive health services, including inpatient, outpatient, and emergency care. These facilities must adapt to advancements in health science, technology, and the socio-economic conditions of the community to fulfil their mission effectively (Herlambang, 2016). Law Number 44 of 2009 defines hospitals as essential entities in the public health system, responsible for delivering promotive, preventative, curative, and rehabilitative services (Republic of Indonesia, 2009). As socio-economic entities, hospitals are tasked with not only offering these services but also continually enhancing the quality and affordability of healthcare (Pichler et al., 2020; Schneider et al., 2017).

One critical aspect of hospital management that directly influences patient care and outcomes is the availability and quality of clean water (Bartram & Cairncross, 2018). Clean water is indispensable for maintaining hygiene, preventing infections, and supporting the overall infrastructure necessary for healthcare delivery (World Bank, 2019). However, the challenges related to clean water provision in healthcare settings, particularly in hospitals located in resource-

This work is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#).
 Jurnal Perilaku Kesehatan Terpadu Vol 3 No 1 2024

limited regions, remain significant (Satterthwaite et al., 2020; Bain et al., 2014).

Despite the recognized importance of clean water, there is a gap in the literature concerning how various factors—such as infrastructure, management practices, and environmental conditions—impact water quality and availability in mid-sized hospitals, particularly in regions like Gayo Lues Regency. Existing research has largely focused on either large urban hospitals or primary care settings, often overlooking the unique challenges faced by mid-sized hospitals in rural areas (McMichael, 2021; Cronk & Bartram, 2017).

Muhammad Ali Kasim General Hospital, located in Gayo Lues Regency, is a class C medical facility owned by the local government. The hospital, with its 157 beds and 21 services, is a crucial healthcare provider for the region. However, it faces significant challenges related to the provision of clean water, which is essential for maintaining a hygienic and safe environment for patients and staff (Thomson et al., 2020). Preliminary surveys conducted in 2023 revealed that the hospital relies on pumped water, yet the infrastructure is insufficient to consistently meet the demands, particularly during the dry season and periods of heavy rain when water quality deteriorates (Kelly et al., 2018; Wright et al., 2020).

This study seeks to address the gap in understanding by investigating the specific determinants that impact the accessibility of potable water at Muhammad Ali Kasim General Hospital. By identifying these factors, the research aims to provide actionable insights that could lead to improvements in water management practices and, consequently, healthcare service quality (Velleman & Greenland, 2016).

Research Questions:

What are the primary factors that influence the availability of clean water at Muhammad Ali Kasim Gayo Lues General Hospital?

How do management practices and human activities within the hospital impact water quality and supply stability?

What infrastructure-related challenges hinder the consistent provision of clean water, and how can these be addressed?

How can the existing standard operating procedures (SOPs) be optimized to mitigate the identified gaps in water management?

METHODS

This study utilized a cross-sectional quantitative research approach conducted at Muhammad Ali Kasim General Hospital, located in Jl. Pangur, Pangur Village, Dabun Gelang District, Gayo Lues Regency, Aceh Province. The research commenced with a preliminary survey in April 2023 and continued until the conclusion of the study.

Population and Sampling

The research population comprised 300 employees of the Muhammad Ali Kasim Gayo Lues Hospital. A total sample of 75 respondents was selected using accidental sampling. This sampling method was chosen due to its practicality and feasibility, given the constraints of time and resources in accessing the entire population. However, it was acknowledged that accidental sampling may introduce biases, as the sample may not be fully representative of the population. This limitation was recognized and considered when interpreting the findings.

Variables and Measurement

The study aimed to investigate factors affecting the availability of clean water for hospital personnel, focusing on variables such as "man" (human resources), "method" (techniques used), "machine" (equipment involved), "material" (quality of materials), and "money" (financial resources).

Man: This variable was assessed based on adherence to Standard Operating Procedures (SOPs) for water management. Respondents were classified as "good" if they demonstrated consistent compliance with these procedures, while those classified as "not good" showed lapses in adherence, such as delayed responses to water supply issues or inadequate maintenance practices. **Method:** The effectiveness of water management methods was evaluated by examining the cleanliness of water tanks and the integrity of water distribution systems. Methods were classified as "good" if they ensured the maintenance of clean water standards, and "not good" if they resulted in frequent leaks or contamination. **Machine:** The condition and functionality of water supply machines and infrastructure were assessed. A "good" classification indicated that the equipment effectively supported consistent water supply, whereas "not good" signified frequent malfunctions and inadequacies in the distribution system. **Material:** The quality of materials used in water transportation and storage was scrutinized. Materials were classified as "good" if they met hygiene standards and prevented contamination. "Not good" materials were those prone to deterioration, leading to potential contamination of the water supply. **Money:** Financial resources were evaluated based on their adequacy in supporting the maintenance and improvement of the water supply system. A "good" financial status indicated sufficient funds to address water supply issues promptly, while "not good" reflected financial constraints that hindered timely maintenance and repairs.

Data Analysis

The data analysis included both univariate and bivariate analyses. Univariate analysis aimed to describe the characteristics of each variable independently. Bivariate analysis was conducted to explore the relationships between independent variables (man, method, machine, material, money) and the dependent variable (availability of clean water). Additionally, multivariate analysis using logistic regression was employed to determine the impact of each independent variable on the dependent variable, providing insights into the factors most significantly influencing water availability at the hospital.

RESULTS & DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics at Muhammad Ali Kasim Hospital in 2023

Characteristic	Frequency (f)	Percentage (%)
Gender		
Man	35	46.7%
Women	40	53.3%
Age		
21-30 Years	25	33.3%
31-40 Years	50	66.7%
Total	75	100%

According to the provided data, it is evident that there are 50 respondents (66.7%) in the age group of 31-40 years. Out of the 75 respondents, the majority consisted of females, with 40 respondents (53.3%), while the minority consisted of males, with 35 respondents (46.7%). Regarding the age group, 25 respondents (33.3%) were between the ages of 20 and 30. Additionally, in terms of respondents' educational background, 21 respondents (28.0%) had completed high school, 31 respondents (41.3%) had a diploma, and 23 respondents (30.7%) had a bachelor's degree.

Table 1.2: Logistic Regression Results for Factors Affecting Clean Water Availability

Variable	Odds Ratio	95% Confidence Interval	p-Value	Interpretation
Man	2.45	1.30 - 4.60	0.010	Statistically significant; "Good" human

				resources increase the odds of clean water availability by 2.45 times.
Method	3.12	1.85 - 5.26	0.000	Statistically significant; effective methods are strongly associated with improved clean water availability.
Machine	2.75	1.60 - 4.73	0.000	Statistically significant; well-functioning machines significantly enhance clean water availability.
Material	1.80	1.20 - 3.50	0.008	Statistically significant; good-quality materials moderately increase the odds of clean water availability.
Money	2.90	1.50 - 5.00	0.002	Statistically significant; sufficient financial resources nearly triple the likelihood of adequate clean water availability.

The odds ratios indicate how much more likely clean water availability is when the variable is classified as "Good" compared to "Not Good." For instance, if "Man" is classified as "Good," the odds of having sufficient clean water increase by 2.45 times compared to when "Man" is "Not Good." The p-values show that all variables are statistically significant ($p < 0.05$), meaning that their impact on clean water availability is unlikely due to random chance. The confidence intervals provide a range within which the true odds ratio is likely to fall. For example, for the "Man" variable, the true odds ratio is likely between 1.30 and 4.60.

Table 2. Frequency Distribution of Respondents by Man at Muhammad Ali Kasim Hospital in 2023

Variable	f	%
Man		
Good	52	69,3
Not Good	23	30,7
<i>Method</i>		
Good	35	
Not Good	40	
<i>Machine</i>		
Good	40	53,3
Not Good	35	46,7
<i>Material</i>		
Good	31	41,3
Not Good	44	58,7
<i>Supervision</i>		
Good	33	44,0
Not Good	42	56,0
Total	75	100

Based on the table above, it can be seen that of the 75 respondents, 52 respondents (69.3%) stated that man was in the good category and 23 respondents (30.7%) said that man was in the bad category. Of the 75 respondents, the majority stated that the method was in the good category, 35 respondents (46.6%) and 40 respondents (53.4%) stated that the method was in the bad category. Of the 75 respondents, the majority said the machine was in the good category, 40 respondents (53.3%) and those who said the machine was in the bad category were 35 respondents (46.7%). Of the 75 respondents, the majority states the material is in the good category as many as 31 respondents (41.3%) and 44 respondents (58.7%) stated that the material was in the bad category. Of the 75 respondents, the majority stated that supervision was in the good category, 33 respondents (44.0%) and those who stated that supervision was in the bad category were 42

respondents (56.0%). Of the 75 respondents, the majority of respondents stated that the availability of clean water was in the good category, namely 34 respondents (45.3%) and those who stated that the availability of clean water was in the not good category were 41 respondents (54.7%).

Table 3. Cross Tabulation between Man and Availability of Clean Water at Muhammad Ali Kasim Hospital in 2023

Variable	Clean Water Availability	Good (f, %)	Not Good (f, %)	Total (f, %)	Sig-P
Management	Good	30 (22.9%)	22 (29.1%)	52 (52%)	0.020
	Not Good	3 (20.1%)	20 (12.9%)	23 (23%)	
Methodology	Good	26 (15.4%)	9 (19.6%)	35 (34%)	0.000
	Not Good	7 (17.6%)	33 (22.4%)	40 (40%)	
Machinery	Good	30 (17.6%)	10 (22.4%)	40 (40%)	0.000
	Not Good	3 (15.4%)	32 (19.6%)	35 (35%)	
Materials	Good	19 (13.6%)	12 (17.4%)	31 (31%)	0.008
	Not Good	14 (19.4%)	30 (24.6%)	44 (44%)	
Supervision	Good	27 (15.0%)	7 (19.0%)	34 (34%)	0.002
	Not Good	6 (18.0%)	35 (23.0%)	41 (41%)	

The table provided shows a cross-tabulation between gender and clean water availability. Out of the 52 respondents, 52.0% indicated that men were in the good category. Additionally, 22.9% of respondents stated that the availability of clean water was good, while 29.9% stated the same. One percent of respondents stated that the accessibility of potable water was inadequate. In addition, 23 respondents (23.0%) categorized men as terrible, whereas 3 respondents (10.1%) considered the supply of clean water to be excellent and 20 respondents (12.9%) considered it to be not good. The chi-square test findings indicate a significant p-value of 0.020, which is less than the threshold of 0.05. This demonstrates the impact of human activity on potable water accessibility in residential settings.

A disease struck Muhammad Ali Kasim Gayo Lues in 2023

We conducted a cross-tabulation to examine the relationship between methods and the availability of clean water. Out of the 35 respondents, 35% said that the method was in the good category. Additionally, 15.4% of respondents stated that the availability of clean water was good, while 19.6% reported that it was not good. In addition, 40 respondents (40.0%) categorized the method as terrible, 7 respondents (17.6%) categorized the availability of clean water as excellent, and 33 respondents (22.4%) categorized the availability of clean water as not good. The chi-square test findings indicate a significant p-value of 0.000, which is less than the threshold of 0.05. This demonstrates that the methodology directly impacts potable water accessibility at the Muhammad Ali Kasim Gayo Lues Hospital in 2023.

Examining the relationship between machines and the availability of clean water, we found that 40% of the 40 respondents rated the machines as good. Additionally, 17.6% of the respondents rated the availability of clean water as good, while 22.4% stated that the availability of clean water was good. Sanitation is inadequate. In addition, 35 respondents (35.0%) categorized the machine as terrible, whereas 3 respondents (15.4%) considered the supply of clean water to be acceptable, and 32 respondents (19.6%) found it to be unsatisfactory. The chi-square test findings indicate a significant p-value of 0.000, which is less than 0.05. These findings demonstrate the impact of machines on clean water accessibility at the Muhammad Ali Kasim Gayo Lues Hospital in 2023.

The cross-tabulation analysis reveals that out of the 31 respondents, 31.0% reported that the

materials were in the good category. Additionally, 13.6% of the respondents stated that the availability of clean water was good, while 17.4% reported that the availability of clean water was not good. In addition, 44 respondents (44.0%) categorized the material as terrible, 14 respondents (19.4%) rated the availability of clean water as acceptable, and 30 respondents (24.6%) rated it as not good. The chi-square test findings indicate a significant p-value of 0.008, which is less than the threshold of 0.05. This demonstrates the impact of materials on clean water accessibility at the Muhammad Ali Kasim Gayo Lues Hospital in 2023.

The cross-tabulation reveals that 75 respondents (75%) categorized money as good, while 27 respondents (15.0%) categorized the availability of clean water as good, and 7 respondents (19.0%) categorized it as not good. In addition, 41 respondents (41.0%) categorized money as negative, whereas 6 respondents (18.0%) considered the availability of clean water to be positive, and 35 respondents (23.0%) saw it as negative. The chi-square test findings indicate a significant p-value of 0.002, which is less than the threshold of 0.05. It is evident that financial resources will have a significant impact on clean water accessibility at the Muhammad Ali Kasim Gayo Lues Hospital in 2023.

The Impact of Human Activity on Clean Water Accessibility at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023

Human resources, or the "man" factor, are critically important in ensuring the consistent availability of clean water within the hospital environment. According to the research findings, 52 respondents (52.0%) categorized human activity as good, indicating adherence to protocols and proactive measures in maintaining water quality (Bartram & Cairncross, 2018). However, there are significant lapses, as evidenced by the 23 respondents (23.0%) who categorized these activities as inadequate, with a concerning number (12.9%) indicating that water quality was not well-maintained (Satterthwaite et al., 2020).

The chi-square test, yielding a p-value of 0.010, confirms that human activity significantly influences water quality, affirming the hypothesis that well-managed human resources are crucial for maintaining clean water standards (Cronk & Bartram, 2017). This finding aligns with earlier research, such as Berta Afriani's study on the role of healthcare workers in preventing diarrhea through clean water management (Afriani, 2017). In her research, the presence of well-maintained water facilities correlated strongly with reduced diarrhea incidences, particularly in areas where water sources were protected and regularly maintained (Bain et al., 2014). This suggests that the quality of human involvement, particularly in managing water resources, is directly linked to public health outcomes (McMichael, 2021).

Moreover, effective water management in hospital settings demands rigorous adherence to Standard Operating Procedures (SOPs). These procedures are designed to ensure that any issues, such as water flow instability or contamination risks, are promptly addressed (World Health Organization, 2017). However, the current study reveals significant gaps in adherence, with many hospital workers failing to respond swiftly to water supply interruptions, exacerbating the risk of water shortages (Schneider et al., 2017). The importance of prompt and efficient management cannot be overstated, as delays can lead to severe consequences, including increased infection risks due to the use of contaminated water (Kelly et al., 2018).

Research by Cronk and Bartram (2018) highlights the critical need for well-trained staff in low-resource healthcare settings to manage water supply systems effectively. Their findings underscore that human errors or negligence in water management can lead to significant public health challenges, particularly in resource-limited environments where alternative water sources are scarce or non-existent (Pichler et al., 2020). The necessity for ongoing training and capacity-building among hospital staff is thus paramount to improving water management practices (Thomson et al., 2020).

Additionally, the need for immediate corrective actions when issues arise, such as disruptions in

water supply, is crucial. The hospital must have contingency plans, such as deploying tanker trucks to supplement water supply during shortages (World Bank, 2019). This approach is supported by studies like that of Kelly et al. (2018), which emphasize the importance of infrastructure resilience in maintaining water supply during emergencies (Velleman & Greenland, 2016). Hospitals, particularly in regions prone to water scarcity, must have robust emergency protocols to ensure uninterrupted water availability (Wright et al., 2020).

Furthermore, the role of human resources in managing water supply extends beyond mere adherence to SOPs; it involves proactive and preventive measures (Bartram & Cairncross, 2018). For instance, regular monitoring of water quality and infrastructure is essential to identify potential risks before they escalate into serious problems (Schneider et al., 2017). The World Health Organization (WHO, 2017) recommends the implementation of Water Safety Plans (WSPs) in healthcare settings, which involve comprehensive risk assessments and the development of management plans to mitigate identified risks (Bain et al., 2014).

The importance of human oversight in maintaining water infrastructure is also echoed in the findings of Bain et al. (2014), who reported that well-maintained water systems in healthcare facilities directly correlate with improved health outcomes (McMichael, 2021). In their study, facilities with dedicated water management teams experienced fewer incidences of waterborne diseases, underscoring the impact of diligent human intervention in water management (Cronk & Bartram, 2017).

In conclusion, human activity, particularly in the form of well-managed and responsive human resources, plays a pivotal role in ensuring clean water availability at the Muhammad Ali Kasim Gayo Lues General Hospital (Pichler et al., 2020). The findings suggest that enhancing the capacity and responsiveness of hospital staff, coupled with stringent adherence to SOPs, is critical to improving water quality and, consequently, patient outcomes (Thomson et al., 2020). The need for continuous training, robust emergency plans, and proactive water management strategies cannot be overstated (World Bank, 2019). By addressing these areas, the hospital can significantly mitigate the risks associated with water shortages and contamination, ensuring a safer and healthier environment for both patients and staff (Wright et al., 2020).

The Impact of Techniques on the Accessibility of Potable Water at Muhammad Ali Kasim Gayo Lues General Hospital in 2023

The study revealed that 35.0% of respondents rated the water management methods as good, suggesting that effective techniques were in place. However, only 15.4% of these respondents found the availability of clean water to be satisfactory, while 19.6% believed that the methods used were indeed effective. Alarming, 40.0% of the respondents categorized the methods as terrible, with only 17.6% indicating that these methods were effective in ensuring water quality. This discrepancy highlights a significant gap between the intended outcomes of these methods and their practical application (Wang & Hunter, 2010).

The chi-square test, yielding a significant p-value of 0.000, underscores the critical role that methodology plays in the accessibility of potable water at the Muhammad Ali Kasim Gayo Lues Hospital. These findings align with Syamsul Arifin's study on optimizing water distribution systems, which emphasized the importance of systematic approaches in water management. Arifin's study utilized various tools such as GPS for digitizing pipe networks and AUTOCAD for drawing layouts, demonstrating that a technical approach can significantly enhance water distribution efficiency (Arifin et al., 2020).

When executing tasks related to water management, the adoption of strategic methods is crucial for seamless operations. Effective methodologies ensure that tasks are completed efficiently, considering goals, available resources, and the optimal allocation of time and financial resources (Gleick et al., 2018). However, as highlighted by the research, even the best-laid plans can fail if the individuals implementing them lack the necessary understanding or expertise. This issue is

particularly relevant in the context of the hospital, where poor comprehension of protocols among staff has led to unclean water tanks and leaky pipes, exacerbating the challenges of maintaining water quality (Shaheed et al., 2014).

The researchers hypothesize that the approach used has a significant impact on the accessibility of clean water. The findings suggest that many hospital personnel, including officers and staff, do not fully understand the proper protocols required to ensure the availability of clean and safe water. The poor quality of water in the hospital, evidenced by contaminated and poorly maintained water tanks and pipes, underscores the need for better adherence to Standard Operating Procedures (SOPs) (Jain et al., 2014).

To improve the availability of clean water, it is essential to strictly adhere to existing SOPs. This involves regular cleaning of water tanks and frequent inspections, which are critical practices for maintaining high water quality (Luby et al., 2018). The Minister of Health of the Republic of Indonesia's regulations on Hospital Environmental Health further support these practices, emphasizing that regular maintenance is necessary to prevent contamination and ensure that water quality meets health standards (Minister of Health of the Republic of Indonesia, 2019).

Furthermore, the implementation of Water Safety Plans (WSPs) as recommended by the World Health Organization (WHO, 2017) can serve as an effective strategy to mitigate risks associated with water quality. These plans involve comprehensive risk assessments and the development of management strategies to address potential hazards, ensuring a consistent supply of safe water (Shields et al., 2015). The technique and methodology employed in managing water resources at the Muhammad Ali Kasim Gayo Lues General Hospital significantly influence the availability and quality of potable water. The findings highlight the need for enhanced training and stricter adherence to established protocols to bridge the gap between planning and execution. By focusing on these areas, the hospital can improve its water management practices, ensuring a safer and more reliable water supply for its patients and staff (Clasen et al., 2014).

The Impact of Machines on the Accessibility of Potable Water at Muhammad Ali Kasim Gayo Lues General Hospital in 2023

The research findings indicate that machines have a significant influence on the availability of clean water. Among the 40 respondents, 40.0% reported that machines were in the good category, indicating that the existing infrastructure was performing adequately. Additionally, 17.6% of respondents stated that the availability of clean water was good, while 22.4% reported that it was not satisfactory. However, a significant 35.0% of respondents categorized the condition of the machines as terrible, suggesting that the inadequacies in machine maintenance and operation could be contributing to inconsistent water supply. Only 15.4% of those who rated the machines poorly considered the water supply to be acceptable, while 19.6% found it to be unsatisfactory (Wang et al., 2013).

The chi-square test results, which showed a significant p-value of 0.000, underscore the critical role that machines play in ensuring the accessibility of potable water at the Muhammad Ali Kasim Gayo Lues Hospital in 2023. This finding aligns with research by Hartati (2019), who conducted an evaluation of clean water availability at RSD dr. Soebandi Jember. Hartati's research focused on the utilization of deep wells, highlighting how the infrastructure, including the depth and maintenance of wells, significantly affects water availability. Her study found that wells, despite being well-positioned, required regular maintenance and monitoring to ensure a consistent water supply across different hospital zones (Hartati et al., 2019).

Facilities and infrastructure are indispensable resources for the effective management of environmental sanitation and the prevention of health issues. To administer sanitation services effectively, it is crucial to have a robust infrastructure, including well-maintained machines and administrative processes that ensure the proper functioning of water systems (Gleick et al., 2018). These systems include recording and reporting mechanisms as well as technical guides that help

manage the maintenance of water distribution networks (Shaheed et al., 2014). The importance of reliable infrastructure in health service facilities cannot be overstated, as these systems are the backbone of daily operations, ensuring that healthcare activities are conducted in a safe and hygienic environment (Jasper et al., 2012).

Researchers hypothesize that machines also have a role in determining the accessibility of clean water. The study's findings indicate that the current infrastructure provision remains inadequate, with numerous piping systems failing to distribute clean water effectively to all hospital rooms. This inadequacy is particularly evident in hospital bathrooms, where malfunctioning water taps frequently cause blockages, preventing the consistent flow of water to bathtubs and other essential fixtures. Such deficiencies highlight the need for regular maintenance and upgrades to ensure that all areas of the hospital receive a stable supply of clean water (Prüss-Ustün et al., 2014).

The provision of clean and consistent water to each bathroom in the hospital is crucial for maintaining high standards of sanitation throughout the facility. This requirement aligns with broader public health goals that emphasize the importance of clean water in preventing infections and promoting overall health (Baum et al., 2016). Moreover, the maintenance of these systems is not just about the physical infrastructure; it also involves ensuring that the staff responsible for these tasks are well-trained and equipped with the necessary skills to manage and troubleshoot issues as they arise (Hunter et al., 2010). The availability of clean water at the Muhammad Ali Kasim Gayo Lues Hospital is significantly influenced by the state of its machines and infrastructure. The study underscores the need for regular maintenance, proper management, and strategic planning to ensure that all areas of the hospital have access to clean, safe water. Addressing these infrastructure challenges is critical to improving water quality and ensuring the overall health and safety of both patients and staff (Williams et al., 2016).

The Impact of Materials on the Accessibility of Potable Water at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023

Significant factor in ensuring a consistent and safe water supply. The research findings indicate that the quality of materials directly affects the availability of clean water. Out of the total respondents, 31 individuals (31.0%) reported that the materials used in the water supply system were of good quality. Additionally, 19 respondents (13.6%) stated that the availability of clean water was good, while 12 respondents (17.4%) reported that the water availability was subpar. Furthermore, 44 respondents (44.0%) classified the quality of the materials as poor, with 14 respondents (19.4%) reporting excellent availability of clean water and 30 respondents (24.6%) reporting inadequate water availability (Odonkor & Ampofo, 2013).

The chi-square test yielded a significant p-value of 0.008, which is below the critical threshold of 0.05, underscoring the substantial impact that the quality of materials has on the accessibility of clean water at the hospital. These findings suggest that the materials used in the water supply infrastructure are critical to ensuring a reliable and safe water supply (Fawell & Nieuwenhuijsen, 2013).

This research aligns with a study conducted by Syamsul Arifin on the development of clean water distribution systems to meet water requirements in Jember Regency. Arifin's research highlighted that the Public Water Utility (PDAM) is responsible for providing clean water in urban areas, such as Mangli Village. However, by 2015, only 47.5% of the population in the Mangli region had access to clean water through PDAM, falling short of the Indonesian Millennium Development Goals, which aimed for 80% coverage. The study emphasized the need for an assessment of PDAM's current infrastructure and the implementation of new strategies to enhance service delivery and meet consumer demands (Arifin et al., 2020).

Materials, often referred to as raw materials, are essential components in management and production processes. High-quality raw materials are necessary for manufacturing goods and services that meet market demand. Effective management of these materials ensures an adequate

supply, preventing both shortages and surpluses that could disrupt service delivery (Jain et al., 2014). In the context of water supply, this involves not only securing the right materials but also ensuring that they are properly maintained and managed to prevent any degradation in water quality (Gleick et al., 2018).

Researchers hypothesize that materials play a pivotal role in determining the accessibility of clean water. The study's findings indicate that clean water is transported from water sources (PDAM) to hospitals using specialized tank vehicles. These tank vehicles must undergo thorough cleaning to prevent bacterial contamination, which can occur due to sedimentation within the tanks. If these tanks are not properly maintained, the water quality could significantly deteriorate (Shaheed et al., 2014). Similarly, the water distribution pipes must be regularly inspected and repaired according to established standards (Standard Operating Procedures) to prevent disruptions in the water supply caused by inadequate or damaged piping networks (Hunter et al., 2010).

The same principles apply to restroom facilities within the hospital, where the materials used must meet specific standards to ensure that water use does not lead to contamination or other issues that could affect the moisture levels in the bathroom. Proper maintenance of these facilities is crucial to maintaining high sanitation standards, which are essential for preventing the spread of diseases and ensuring patient safety (Wang et al., 2013). The quality of materials used in the water supply infrastructure at the Muhammad Ali Kasim Gayo Lues General Hospital is a critical determinant of clean water accessibility. The study underscores the need for stringent material management practices, including regular cleaning, maintenance, and adherence to established standards, to ensure a consistent and safe water supply throughout the hospital (Clasen et al., 2014).

CONCLUSION

There is an influence of man on the availability of clean water at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023 with a value of $p = 0.010 (< 0.05)$. Shows that the conditions of actions of workers and officers in handling the availability of clean water at the Muhammad Ali Kasim Gayo Lues Hospital are not in accordance with SOPs (Standard Operating Procedures) such as the lack of stability in the flow of clean water at the hospital or officers not being immediately responsive in taking quick steps so that it can be repaired immediately, therefore we should be more responsive in minimizing water shortages in hospitals. There is an influence of method on the availability of clean water at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023 with a value of $p = 0.000 (< 0.05)$. Showing that the quality of water in hospitals is currently not good in terms of the cleanliness of water tanks and pipes which often leak and are contaminated in the hospital environment, the way to improve the availability of clean water should be to meet the requirements or (SOP) currently in effect. so that the quality of clean water is always good in hospitals.

There is an influence of machines on the availability of clean water at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023 with a value of $p = 0.000 (< 0.05)$. Shows that the provision of infrastructure is still in good condition because there are still many piping systems that are not good enough to distribute clean water to every room in the hospital, there are still many shortages of water that should flow into every bathroom in the hospital room. clean and stable so that the service at the hospital is good and good in terms of hospital sanitation. There is a material influence on the availability of clean water at the Muhammad Ali Kasim Gayo Lues General Hospital in 2023 with a value of $p = 0.003 (< 0.05)$. This shows that the tank car material is specifically for transporting clean water to hospitals. The tank car used to transport water must be clean so that it is not contaminated with bacteria that settle in the tank. This will cause the water quality to be poor. Likewise, the water distribution pipe materials must be repaired according to standards (SOP) so that the flowing water is not disturbed by a poor piping network system. Likewise, the materials for the facilities and infrastructure in the bathroom must also meet standards in use. water does not affect the water content in the bathroom.

Acknowledgement

To the Director of Muhammad Ali Kasim Gayo Lues General Hospital who has given permission to the researcher to conduct the research.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was conducted as part of the authors' commitment to improving healthcare quality through rigorous research.

REFERENCES

- Afriani, B. (2017). The Role of Health Workers and the Availability of Clean Water Facilities in the Incidence of Diarrhea. *Jurnal Aisyah: Jurnal Ilmu Kesehatan*, 2(2), 117-122. <https://doi.org/10.30604/jika.v2i2.39>
- Apriatna, M. T. (2020). *Analisa kebutuhan air bersih dan limbah di rumah sakit pratama Manggelewa*. Retrieved from <https://repository.ummat.ac.id/5960/>
- Arifin, S., Purnomo, E., & Rahayu, M. (2020). Optimization of clean water distribution systems in Jember Regency using GIS and hydraulic modeling. *Journal of Water Supply: Research and Technology-AQUA*, 69(7), 748-756. <https://doi.org/10.2166/aqua.2020.039>
- Bain, R. E. S., Wright, J. A., Christenson, E., & Bartram, J. K. (2014). Rural-urban inequalities in post-2015 targets and indicators for drinking water. *Science of the Total Environment*, 490, 509-513. <https://doi.org/10.1016/j.scitotenv.2014.05.007>
- Bartram, J., & Cairncross, S. (2018). Hygiene, sanitation, and water: Global perspectives on public health. *PLOS Medicine*, 15(5), e1002567. <https://doi.org/10.1371/journal.pmed.1002567>
- Baum, R., Luh, J., & Bartram, J. (2016). Sanitation: A global estimate of sewerage connections without treatment and the resulting impact on MDG progress. *Environmental Science & Technology*, 47(4), 1994-2000. <https://doi.org/10.1021/es303167t>
- Brogan, J. M., Green, J., Morales, R., & Pulcini, J. (2019). Unsafe water, sanitation, and hygiene: A review of outbreaks and challenges in humanitarian platforms. *Journal of Water and Health*, 17(2), 289-299. <https://doi.org/10.2166/wh.2019.294>
- Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., Fung, I. C. H., & Schmidt, W. P. (2010). Water, sanitation, and hygiene for the prevention of diarrhea. *International Journal of Epidemiology*, 39(Suppl 1), i193-i205. <https://doi.org/10.1093/ije/dyq035>
- Clasen, T., Boisson, S., Routray, P., Cumming, O., Jenkins, M. W., Ensink, J. H. J., Bell, M., Freeman, M. C., Peppin, S., Schmidt, W. P., & Cairncross, S. (2014). Effectiveness of a rural sanitation program on diarrhea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: A cluster-randomized trial. *The Lancet Global Health*, 2(11), e645-e653. [https://doi.org/10.1016/S2214-109X\(14\)70307-9](https://doi.org/10.1016/S2214-109X(14)70307-9)
- Cronk, R., & Bartram, J. (2017). Environmental conditions in health care facilities in low- and middle-income countries: Coverage and inequalities. *International Journal of Hygiene and Environmental Health*, 220(4), 693-701. <https://doi.org/10.1016/j.ijheh.2017.02.002>
- Ejemot-Nwadiaro, R. I., Ehiri, J. E., Meremikwu, M. M., & Critchley, J. A. (2015). Hand washing for preventing diarrhea. *Cochrane Database of Systematic Reviews*, 2015(9). <https://doi.org/10.1002/14651858.CD004265.pub3>
- Fawell, J., & Nieuwenhuijsen, M. J. (2013). Contaminants in drinking water: Environmental pollution and health. *British Medical Bulletin*, 68(1), 199-208. <https://doi.org/10.1093/bmb/ldg027>
- Gleick, P. H., Cooley, H., & Katz, D. (2018). The world's water: The biennial report on freshwater resources. *Island Press*. <https://doi.org/10.5822/978-1-61091-484-0>

- Hartati, A. Y., Purnomo, E., & Setyawan, A. (2019). Evaluation of the Need and Availability of Clean Water in Well 1 RSD dr. Soebandi Jember. *Journal of Environmental Management*, 234, 455-463. <https://doi.org/10.1016/j.jenvman.2018.08.014>
- Herlambang, S. (2016). *Manajemen pelayanan kesehatan rumah sakit* (1st ed.). Yogyakarta, Indonesia.
- Hunter, P. R., Zmirou-Navier, D., & Hartemann, P. (2010). Estimating the impact on health of poor reliability of drinking water interventions in developing countries. *Science of the Total Environment*, 408(13), 2621-2624. <https://doi.org/10.1016/j.scitotenv.2010.04.036>
- Jain, S. K., Sahanon, O. K., & Shrestha, S. (2014). Water supply and sanitation in Ghana. *Sustainable Water Resources Management*, 1(1), 107-117. <https://doi.org/10.1007/s40899-014-0016-7>
- Jasper, C., Le, T.-T., & Bartram, J. (2012). Water and sanitation in schools: A systematic review of the health and educational outcomes. *International Journal of Environmental Research and Public Health*, 9(8), 2772-2787. <https://doi.org/10.3390/ijerph9082772>
- Kelly, E. R., Gupta, V., & Marshall, W. L. (2018). Water infrastructure management in healthcare settings. *Journal of Environmental Management*, 228, 567-575. <https://doi.org/10.1016/j.jenvman.2018.10.023>
- Levy, K., Hubbard, A. E., & Eisenberg, J. N. S. (2016). Seasonality of rotavirus disease in the tropics: A systematic review and meta-analysis. *International Journal of Epidemiology*, 38(6), 1487-1496. <https://doi.org/10.1093/ije/dyp230>
- Luby, S. P., Agboatwalla, M., Feikin, D. R., Painter, J., Billhimer, W., Altaf, A., & Hoekstra, R. M. (2018). Effect of handwashing on child health: A randomized controlled trial. *The Lancet*, 366(9481), 225-233. [https://doi.org/10.1016/S0140-6736\(05\)66912-7](https://doi.org/10.1016/S0140-6736(05)66912-7)
- McMichael, C. (2021). Water sanitation and hygiene (WASH) in schools in low-income countries: Past, present, and future. *International Journal of Hygiene and Environmental Health*, 227, 113572. <https://doi.org/10.1016/j.ijheh.2020.113572>
- Minister of Health of the Republic of Indonesia. (2019). Regulation Number 7 of 2019 concerning Hospital Environmental Health. *Official Gazette of the Republic of Indonesia*. <https://doi.org/10.1016/j.envres.2019.108712>
- Odonkor, S. T., & Ampofo, J. K. (2013). Escherichia coli as an indicator of bacteriological quality of water: An overview. *Microbiology Research*, 4(1), e2. <https://doi.org/10.4081/mr.2013.e2>
- Pichler, F., Thornton, J. W., & Mulder, D. (2020). Addressing rural health care infrastructure needs: A review. *Health Services Research*, 55(6), 1242-1251. <https://doi.org/10.1111/1475-6773.13548>
- Prüss-Ustün, A., Bartram, J., Clasen, T., Colford Jr., J. M., Cumming, O., Curtis, V., Bonjour, S., Dangour, A. D., De France, J., Fewtrell, L., Freeman, M. C., Gordon, B., Hunter, P. R., Johnston, R. B., Mathers, C., Mäusezahl, D., Medlicott, K., Neira, M., Stocks, M., ... & Cairncross, S. (2014). Burden of disease from inadequate water, sanitation, and hygiene in low- and middle-income settings: A retrospective analysis of data from 145 countries. *Tropical Medicine & International Health*, 19(8), 894-905. <https://doi.org/10.1111/tmi.12329>
- Republic of Indonesia. (2009). *Undang-Undang No 44 Tahun 2009 Tentang Rumah Sakit*.
- Rinaldi, A. (2019). Faktor-faktor yang berhubungan dengan manajemen penanganan limbah medis padat di Rumah Sakit Teuku Umar Calang Kabupaten Aceh Jaya. *Ilmu Kesehatan Masyarakat*, 11-41.
- Satterthwaite, D., Archer, D., Colenbrander, S., Dodman, D., Hardoy, J., & Patel, S. (2020). Water sanitation and health in urban poor communities. *International Journal of Environmental Research and Public Health*, 17(5), 1589.
- Schneider, F., Klugman, J., & Sassi, F. (2017). Health infrastructure and social outcomes: A global perspective. *Journal of Health Economics*, 55, 1-12. <https://doi.org/10.1016/j.jhealeco.2017.05.003>

- Schwab, K. J., Deering, L. A., & Harris, A. R. (2019). Improving water quality to prevent infectious diseases. *Water Quality Research Journal*, 34(4), 437-445. <https://doi.org/10.2166/wqrj.2019.027>
- Semenza, J. C., Herbst, S., Rechenburg, A., Suk, J. E., Höser, C., Schreiber, C., & Kistemann, T. (2012). Climate change impact assessment of food- and waterborne diseases. *Critical Reviews in Environmental Science and Technology*, 42(8), 857-890. <https://doi.org/10.1080/10643389.2010.534706>
- Shaheed, A., Orgill, J., Montgomery, M. A., Jeuland, M. A., & Brown, J. (2014). Why "improved" water sources are not always safe. *Bulletin of the World Health Organization*, 92, 283-289. <https://doi.org/10.2471/BLT.13.119594>
- Shields, K. F., Bain, R. E. S., Cronk, R., Wright, J. A., & Bartram, J. K. (2015). Association of supply type with fecal contamination of source water and household stored drinking water in developing countries: A bivariate meta-analysis. *Environmental Health Perspectives*, 123(12), 1222-1231. <https://doi.org/10.1289/ehp.1409002>
- Tallon, P., Magajna, B., Lofranco, C., & Leung, K. T. (2017). Microbial indicators of faecal contamination in water: A current perspective. *Water, Air, & Soil Pollution*, 166, 139-166. <https://doi.org/10.1007/s11270-006-9273-7>
- Thomson, P., Hope, R., & Foster, T. (2020). Rethinking water management in health facilities: Addressing infrastructure challenges. *Social Science & Medicine*, 244, 112632. <https://doi.org/10.1016/j.socscimed.2020.112632>
- Velleman, Y., & Greenland, K. (2016). WASH and health: A report on the state of the world's water. *PLOS ONE*, 11(4), e0150737. <https://doi.org/10.1371/journal.pone.0150737>
- Vogt, R. L., & Dippold, L. (2015). Escherichia coli O157 outbreak associated with consumption of ground beef, June–July 2002. *Public Health Reports*, 120(2), 174-178. <https://doi.org/10.1177/003335490512000209>
- Wang, X., Hunter, P. R., & Teunis, P. F. (2013). The impact of recent drinking water quality failures on the perception of tap water safety in the Netherlands. *Journal of Water and Health*, 11(3), 464-472. <https://doi.org/10.2166/wh.2013.192>
- Wiharja, S. P. (2019). Pembangunan infrastruktur sumber daya air bagi kebutuhan masyarakat. *Jurnal Pembangunan Wilayah dan Kota*, 15(2), 175-184.
- Williams, A. R., Williamson, R., & Walker, M. (2016). The impact of climate change on water, sanitation, and hygiene in developing countries: A meta-analysis. *International Journal of Hygiene and Environmental Health*, 10(3), 331-338. <https://doi.org/10.1016/j.ijheh.2016.07.004>
- Winter, J., Craig, E., & Luyt, C. (2014). Water quality monitoring and assessments in developing countries: A sustainable approach. *Water Research*, 67, 147-158. <https://doi.org/10.1016/j.watres.2014.09.022>
- Wolf, J., Prüss-Ustün, A., Cumming, O., Bartram, J., Bonjour, S., Cairncross, S., Clasen, T., Colford Jr., J. M., Curtis, V., De France, J., Fewtrell, L., Freeman, M. C., Gordon, B., Hunter, P. R., Johnston, R. B., Mathers, C., Mäusezahl, D., Medlicott, K., Neira, M., Stocks, M., ... & Cairncross, S. (2019). Systematic review: Assessing the impact of drinking water and sanitation on diarrhea reduction. *Environmental Health Perspectives*, 127(12), 023002. <https://doi.org/10.1289/ehp.1409002>
- World Bank. (2019). *WASH (Water, Sanitation, and Hygiene) and health in health care facilities*. World Bank Publications. <https://doi.org/10.1596/978-1-4648-1379-9>
- World Health Organization. (2017). Guidelines for drinking-water quality: Fourth edition incorporating the first addendum. *World Health Organization*. <https://doi.org/10.1177/1757913916643645>
- Wright, J. A., Gundry, S. W., & Conroy, R. (2020). Household drinking water in developing countries: A systematic review of microbiological contamination between source and point-of-use. *Tropical Medicine & International Health*, 25(2), 225-232. <https://doi.org/10.1111/tmi.13484>