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Exploring resident perspectives and practical approaches to water quality maintenance in communal boarding facilities: Implications for public health and hygiene

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ABSTRACT

Background: Water is a fundamental human resource, and ensuring its safety is essential for public health, especially in residential settings such as boarding houses. Water contamination can pose significant risks to residents' well-being. This study focuses on exploring the water quality at a boarding house located on Bangka Street, South Jakarta, considering the importance of water clarity, taste, odor, and the infrastructure that supports water distribution. **Methods:** This research uses a descriptive qualitative approach, using semi-structured interviews and field observations. Data were collected directly from the boarding house owner and several residents to understand their perspectives and experiences regarding water usage and quality. Observations focused on water clarity, smell, taste, and the physical condition of the water infrastructure. **Findings:** The results show that the boarding house's water quality is generally clean, clear, and odorless—meeting national standards for safe water. However, an incident was reported in which excessive water use by a resident led to flooding and temporarily murky water. In response, the owner promptly drained the water tank and replaced outdated water pumps to restore water quality. These actions demonstrate the owner's proactive maintenance and strong hygiene awareness. **Conclusion:** This study emphasizes the importance of regular water system monitoring, immediate responsiveness to water-related issues, and the collaboration between property managers and residents in maintaining water quality. Subjective perspectives reveal that a sense of shared responsibility and consistent maintenance are vital in ensuring access to clean and safe water in communal residential settings. **Novelty/Originality of this article**: This research contributes original insights into water quality management in small-scale residential environments. It highlights the value of community-level engagement and practical hygiene practices, combining lived experiences with public health standards to promote safe water access in boarding houses—a relatively underexplored area in academic literature.

KEYWORDS: hygiene practices; qualitative research; water quality.

1. Introduction

Water is a primary need for human life and must be of good quality to be safe for consumption, yet 70% of Indonesia's 20,000 household drinking water sources including Jakarta are still polluted with community domestic waste (feces). Poor water quality can cause various health problems, including waterborne diseases such as diarrhea, cholera,

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and other bacterial infections (UNICEF, 2022). In 2021 alone the coverage for basic water, sanitation and hygiene in Indonesia was around 55% and 56% for drinking water and sanitation services (Satriani et al., 2022). The Jakarta provincial government stated that drinking water in DKI Jakarta is suspected to be contaminated by domestic waste, as water is often consumed directly from its source. According to the Head of the Sub-Coordinator for Clean Water Supply Affairs in Jakarta, only around 65 percent of the city is currently served by a piped water network. This leaves room for possible contamination by *E. coli* bacteria, especially in drinking water sourced from groundwater (Chalid & Nastiti, 2025).

In areas experiencing clean water shortages, such as North Jakarta, residents are served through water kiosks and master meters. Meanwhile, in South Jakarta, many people still rely on groundwater for daily consumption. The use of contaminated groundwater undoubtedly poses a serious health risk to the surrounding population, especially since many residents remain unaware of the consequences of their actions, such as littering in rivers and other water sources (Khairunnisa et al., 2025). Therefore, the Provincial Government of DKI Jakarta continuously improves clean water services to the public in order to provide and supply 100% of the community's clean water needs. The community no longer needs to rely on groundwater sources and will instead use the Drinking Water Supply System (SPAM), ensuring that clean water sources are guaranteed and safe. By implementing programs for the development and management of domestic wastewater, promoting the use of environmentally friendly materials, and enforcing regulations against dumping waste into rivers or other water sources, the government aims to ensure that the public can breathe unpolluted air (Ashillah et al., 2025).

Some areas in DKI Jakarta still face water pollution, so a water quality analysis was carried out at the Cendana boarding house, to ensure that the water used meets hygiene standards or not. From the results of interviews with boarding house owners and residents, there was a problem with water caused by one of the borders, because he used excessive water and forgot to turn off the water, eventually affecting other boarders and causing flooding and cloudy water. However, the boarding house owner took precautions by draining the water tank and replacing the old pump machine. After that, there was no problem anymore. The water was safe, clean, and suitable for use by anyone. To obtain good and safe water free from various types of bacterial contamination, special attention is required during the water filtration process. This includes maintaining the cleanliness of the water source as well as the filtration equipment used. Good water is clear, not cloudy, and free from *E.coli* bacteria, fungi, or algae. Toxic water containing nitrate and nitrite is extremely dangerous, especially for young children. If not handled carefully, it can threaten the lives of many people.

1.1 Concept of clean and safe water

Water is vital and a fundamental resource for human life. In the context of public health, clean and safe water is defined as water that does not contain any physical, chemical or biological contaminants that are or can be harmful to humans and meet the quality standards set by health institutions (WHO, 2022). Good water quality is crucial not only for drinking but also for basic daily hygiene and sanitation needs such as bathing, washing and others. Water that does not meet the cleanliness standards can increase the risk of disease contamination (WHO, 2023). The right to clean water and proper sanitation stated in Article 25(1) of the Declaration of Human Rights, the rights to safe drinking water as well as sanitation has been reaffirmed by the United Nations in recent years, especially through the 2023 report of Special Rapporteur on the Human Rights to Water and Sanitation (Arrojo, 2023).

In Indonesia, the recognition of the right to clean water and sanitation is reflected in the efforts of SDG 6, which emphasizes the idea that water and sanitation are fundamental for all people. It includes elements such as availability, quality, accessibility, and others as part of fulfilling the right to an adequate standard of living (National Human Rights Commission of Indonesia, 2015).

1.2 Clean water standards based on SNI and Ministry of Health Regulations

According to SNI 01-3553-2006 drinking water standards are categorized into physical, chemical, and bacteriological parameters (Pramesti & Puspikawati, 2020). The physical test includes color, odor, taste, temperature, and turbidity (Singh & Yadav, 2022). Water turbidity originates from organic and inorganic materials present in the water, such as mud and waste-derived substances. The chemical standards relate to compounds or hazardous metal ions such as Hg, Pb, Ag, Cu, dan Zn. According to the Regulation of the Minister of Health of the Republic of Indonesia No. 32 of 2017 concerning environmental health quality standards and water health requirements, the first indicator is temperature (Ministry of Health of the Republic of Indonesia, 2017). Water temperature can affect the organisms living in it. Ideally, the optimal temperature for clean water is 3°C however, water supplied by PDAM (Regional Water Companies) in Indonesia has not yet met this standard. Although the government has set 3°C as a benchmark.

Water temperatures ranging from 10°C to 25°C are still considered cool and suitable for use. Second, the pH indicator. The pH value in water testing is used to measure the acidity and alkalinity of the water. Water or solutions with excessively high pH levels may promote the growth of organisms due to their ability to absorb nutrients. The lower the pH, the safer the water is for use or consumption (Adams et al., 2022). Third, the color, odor, and taste indicators. Clean water should be clear, odorless, and tasteless. If the water has a distinct color, smell, or taste, it indicates that the water is no longer clean and may be contaminated with metallic substances (Water Quality Association, 2022).

1.3 Theory of water distribution and storage systems

With population growth, the demand for water has expanded on a large scale, and to meet this demand, structures such as high-rise buildings, hospitals, and water parks have been constructed. However, these buildings require complex piping systems, which make maintaining water quality more difficult, as the pipes can become breeding grounds for bacteria, germs, and other contaminants (CDC, 2024b). The condition of internal infrastructure such as aging, corroded iron pipes and lack of sufficient filtration or disinfections can impact the water quality. According to Kimbell et al. (2021) cast iron water harbor high concentrations of *antibiotic resistance genes (ARGs)* as well as *metal resistance genes (MRGs)* this reveals that older iron pipes infrastructures serve for both microbial and chemical contaminations.

To maintain water quality, several types of pipes suitable for clean water include HDPE, galvanized, copper, PP-R, PVC, CPVC, and uPVC pipes, each one offering different advantages regarding corrosion resistance, microbial adhesion, thermal stability and longevity. HDPE and PVC provide flexible and a non-toxic pathway for water, while copper and galvanized steel driver durability and microbial protection (Świetlik & Magnucka, 2023). Meanwhile, for storage, vertical stainless steel water tanks or reservoirs, such as those from Grand, are also considered a good option (Utama & Ariyadi, 2022).

1.4 Water quality parameters

Water quality can be assessed through three main parameters: physical, chemical, and microbiological. Physical parameters include temperature, turbidity, color, odor, and total dissolved solids (TDS) (Manga et al., 2021). These aspects are crucial as they affect the aesthetic appeal of water and can serve as early indicators of contamination. For example, high turbidity may indicate the presence of suspended particles that can potentially shield harmful microorganisms from the disinfection process. Chemical parameters cover pH value, water hardness, and the presence of hazardous substances such as nitrates, nitrites, chlorides, and heavy metals including lead, mercury, and arsenic. Chemical content exceeding the permissible limits can be toxic and pose long-term health risks. The WHO

emphasizes the importance of monitoring these parameters to ensure that consumed water remains safe (WHO, 2022).

According to the U.S. EPA, microbiological parameters are among the primary indicators in evaluating water safety (U.S. EPA, 2018). The presence of bacteria such as total coliforms and Escherichia coli (E. coli) is used as an indicator of fecal contamination. In particular, E. coli signals recent fecal contamination, which indicates a potential risk of waterborne diseases such as diarrhea, cholera, and typhoid. The EPA also states that physical parameters such as turbidity, if too high, can hinder the effectiveness of the disinfection process and provide shelter for pathogenic microorganisms. Therefore, regular monitoring of all parameters is essential to maintain water quality within safe consumption limits (U.S. EPA, 2021).

1.5 Efforts to preserve clean water in boarding house areas

Household water storage maintenance is important and is fraught with many challenges which can compromise the quality of water. Water storage tanks harbor several pathogens that can cause different diseases and illnesses. Some smaller areas use containers to hold water that can easily be transported from one place to another, while urban communities have pipe water therefore use storage tanks to reserve the water (Manga et al., 2021). Regular cleaning is important to prevent the growth of algae, bacteria, and other impurities that can reduce water quality as biofilm-like substances could easily build up inside the tank which could contribute to hazardous microbiological contaminations. Tanks cleaned three or more times per year can lower *E. coli* and turbidity (Manga et al., 2021).

Water quality testing is highly recommended when there are environmental changes around the water source, such as flooding, infrastructure development, or changes in land use. Such significant changes can affect the water composition, for example by increasing turbidity or introducing pollutants from human activities or natural processes. Testing the water after these events is important to ensure that it remains safe for consumption and does not pose health risks (CDC, 2024a).

1.6 The impact of contaminated water on health

Pollutants have garnered growing attention in recent years, this due to their persistence in the environment and resistance to conventional wastewater treatment methods. The pollutants can come for many different sources such as pharmaceuticals, hospital waste, industrial chemicals, as well as household products. Among these pollutants phthalates or phthalic acid esters (PAEs) used to improve the flexibility and durability of plastic have been detected in significant concentrations in various water samples, raising concerns for health impacts (Chalid & Nastiti, 2025).

Poor water quality can have serious effects on human health. Contaminated water is a source of various diseases, such as diarrhea, cholera, skin infections, heavy metal poisoning, and internal organ disorders (Shah et al., 2023). This contamination usually comes from pathogens such as bacteria, viruses, parasites, as well as harmful chemicals like pesticides and heavy metals. Communities that rely on water from wells, rivers, or other natural sources are at greater risk because this water may not be safe or tested. If consumed over the long term, contaminated water can lead to the buildup of toxins in the body, which is hazardous to health (CDC, 2024a).

Vulnerable groups such as boarding house residents who may have limited access to healthcare services. Common health impacts include acute waterborne diseases such as diarrhea, cholera, dysentery, and typhoid, which are caused by microbial contamination and can result in dehydration, malnutrition, and even death in severe cases (WHO, 2023). In addition, skin problems such as irritation, itching, rashes, and infections may arise from contact with water contaminated by bacteria or certain chemicals (Centers for Disease Control and Prevention (CDC, 2024a). Moreover, long-term exposure to heavy metals—such as lead, which affects neurological development; mercury, which damages the kidneys

and nervous system; and arsenic, which is carcinogenic—can lead to chronic diseases, organ dysfunction, and increased cancer risk (WHO, 2022). In addition to affecting humans, water pollution also harms environmental ecosystems. Aquatic life, including fish and water plants, is highly vulnerable to waste from industrial, domestic, and agricultural sources. This pollution can disrupt the ecological balance, reduce biodiversity, and lower the population of certain species. Furthermore, the agriculture and fisheries sectors may also be affected, ultimately impacting the economy of surrounding communities. Therefore, regular water quality testing is crucial so that preventive and management measures can be implemented to protect both health and environmental sustainability (Baballe, 2023).

1.7 Sources of water contamination in boarding house environments

Boarding house environments have unique characteristics that make them vulnerable to water quality issues. Generally, water sources in boarding houses come from groundwater (bore wells), connections to the local water utility company (PDAM), or water storage tanks. While groundwater is often considered safe, in reality it remains susceptible to contamination from septic tank seepage, industrial waste, and pesticide or fertilizer residues from agricultural activities. The quality of bore well water is highly influenced by well depth, geological characteristics, and proximity to pollution sources. (Ardhianie et al., 2022). A study in Ghana showed that groundwater quality can improve at certain depths but is still influenced by geological factors and human activities nearby (Ofosu et al., 2024). Although PDAM water has undergone treatment processes, its quality may deteriorate during distribution. This is caused by factors such as pipe leaks, corrosion, and infiltration of groundwater or waste through damaged pipeline networks. Pipe corrosion, for example, can lead to the release of heavy metals like lead and copper into the water and reduce the effectiveness of disinfectants, thereby increasing the risk of pathogenic microorganism growth. Factors such as water pH, temperature, and the type of pipe material also influence the rate of corrosion and water quality during distribution (U.S. EPA, 2018). In addition, water storage tanks—used to stabilize water supply and pressure—can become sources of contamination if not regularly maintained. Unclean tanks tend to foster the growth of biofilms containing pathogenic bacteria.

A study in Madagascar found that biofilms on tank walls can cause contamination by bacteria such as *Enterococcus* and total coliforms. Cleaning with hypochlorite solution was shown to be effective in reducing this risk (Judah et al., 2024; Maskun et al., 2025). The condition of internal infrastructure, such as old and rusty pipes, and the absence of adequate filtration or disinfection systems, can further degrade water quality at the point of use. Recent research shows that old iron pipes can leach metals into the water and support biofilm growth, which then protects microorganisms from disinfection processes, thus increasing the potential for microbiological contamination (Zhu et al., 2023).

1.8 The urgency of research and community service in boarding house environments

Considering that the majority of boarding house residents are individuals pursuing education or employment-often coming from outside the region-they may lack access to information or resources to independently assess and maintain water quality. Therefore, research and community service programs focusing on water safety in boarding house environments are highly relevant. Programs such as PAMSIMAS (Community-Based Drinking Water and Sanitation Provision Program), which were implemented to improve access to water services and facilities for underprivileged communities, successfully increased access to safe and usable water from 2008 to 2021. Additionally, this initiative also promoted awareness and the adoption of clean and healthy living behaviors among the public (La Ibal & Abubakar, 2023; Farhany et al., 2023)

Empowerment through education as well as participatory approaches increases not only awareness but also accountability among water users (Genter et al., 2023), this leads to better maintenance of water systems and education in health risk. Integrating community

service activities with student research provides benefits such as improving local health outcomes while promoting civic engagement and practical learning for students (Kasri et al., 2017). Other examples of this shows that according to Alvia et al. (2023) that documented how both the owner and residents contribute to maintaining sanitation and implementing clean and healthy living behaviours in the community.

1.9 Awareness and water hygiene practices

Contaminated water can cause diseases such as diarrhea, cholera, polio, and others, which may result from inadequate or improper water treatment and sanitation (WHO, 2023). Based on the data collected at (Khairunnisa et al., 2024) diarrhea cases in toddlers in North Jakarta have fluctuated over a 5-year period with more than 15,000 cases each year.

Water is a fundamental necessity essential to human life. The availability of clean and safe water for consumption is one of the key indicators in determining public health quality. However, in many regions—especially in developing countries like Indonesia—access to clean and safe water remains a significant challenge. In 2022, there were 35.3 million people in Indonesia without access to clean and proper water (UNICEF, 2022). A study by Ardhianie et al. (2022) highlighted the limited infrastructure, rapid urbanization and groundwater overexploitation contributing to deteriorating water access and quality.

2. Methods

The research method for carrying out this research will use descriptive qualitative research methods. Descriptive qualitative method research is used to obtain a clear and in-depth picture of the quality of water used in the sandalwood boarding house, qualitative research can be interpreted as a research method that uses data taken orally or in writing from the person or actor observed and the results of data collection are not guided by theory but guided by facts that have been found when researching in the field. The researchers will collect data by conducting oral interviews with one the owner and 2 residents of Cendana Boarding House topics to obtain data or responses on these topics and construct the results of the data into hypotheses or theories. We chose the main owner of the building to hear the situation from his perspective, what he has seen and done to maintain the building's clean water quality, we also chose 2 residents from the building to hear from the perspective of the residents themselves.

A semi-structured interview method will be used to explore in depth the experiences and perceptions of boarding house owners and residents regarding water quality, the researchers have provided five questions to ask each individual. Questions include "*How is the water quality provided?*", "*Have there been any issues related to unclean water in the boarding house?*", "*Had the boarding house owner taken any preventive measures to ensure water safety? If so, what action has been taken?*", "*Have there been any changes in water safety after the implementation of these preventive measures?",* and finally "*How does the boarding house owner respond to complaints or issues related to water safety?".* This research also uses a descriptive approach to provide a comprehensive explanation of water quality conditions and the factors that influence them.

One of the means by which researchers collect data is through interviews, which will be conducted face-to-face at the boarding house location to create a comfortable atmosphere and allow direct observation of environmental conditions. The list of interview questions will cover topics such as water source, daily water use, complaints related to water quality (e.g., odor, color, taste), and knowledge about water treatment. The interviews will be recorded with the consent of the respondents to ensure the accuracy of transcription and data analysis. The researcher will also conduct a field survey where the physical condition of the water in the sandalwood boarding house is directly observed, which can be seen from the water channels, pumps, water tanks, and others. In addition to the interview, the researcher will provide education on how to get access to clean water and the impact of

misuse. The main goal of conducting educational activities for the community on how to access clean water and the impact of improper usage is to improve overall quality of life and public health. The researchers also conducted field surveys by directly observing the physical condition of water facilities, such as water pumps, pipelines, water tanks, and others. This observation was carried out to verify the data obtained from the interview results.

3. Results and Discussion

This study involved three respondents, namely the boarding house owner and two residents, who were interviewed to obtain their opinions and perceptions regarding the water quality at Kos Cendana. The following section presents the questions asked, along with a summary and discussion of the interview results.

Table 1. Question 1: How is the quality of the water used?

No.	Respondent	Answer
1	Boarding house owner	The water quality at Cendana Boarding House is reported to be very clean and clear, with no evident sources of contamination
2	Resident 1	The water quality is quite good, it always flows consistently and is definitely clean. It has never appeared black or brown, just normal, clear, and clean
3	Resident 2	The water quality here has been quite good during my time using it. The water is very clean, clear, and odorless. It often feels very cold at night or in the morning, which makes me feel more refreshed.

Based on the interview results as well as the visual evidence, it can be concluded that the water quality at boarding house Cendana is generally good and meets basic health and safety standards. From the image, we can observe a clean red bucket filled with clear water and a ladle (gayung) used for bathing purposes. The absence of visible dirt, sediment, or discoloration in the water indicates that the water is not physically contaminated.

Fig. 1. Water container and dipper use in boarding house bathrooms

Additionally, there is no sign of algae growth or unpleasant substances on the container's surface, suggesting that the water is also free from common biological contaminants. Data from the interview further supports this conclusion. The boarding

house owner affirmed that the water is very clean and clear, with no visible sources of contamination. Resident 1 also reported that the water quality is consistently good, always clear and clean, with no instances of discoloration such as black or brown water. Resident 2 added that the water is not only clear and odorless but also refreshing, especially during colder times of the day, which suggests that the water source is well-maintained and has good circulation. These observations align with the requirements outlined in SNI 01-3553-2006 regarding water quality for hygiene and sanitation, as well as the standards established by the World Health Organization (WHO, 2022). According to these standards, water used for daily hygiene purposes must be colorless, odorless, and free from physical, chemical, and biological contaminants. Based on both subjective experiences of residents and visible inspection, the water at Kos Cendana fulfills these conditions and can be considered safe for daily use such as bathing and washing.

Table 2. Question 2: Have there ever been any issues related to unclean water at the boarding house?

No.	Respondent	Answer
1	Boarding house owner	There was once a water-related issue at Cendana boarding house caused by one of the tenants who used excessive amounts of water and failed to turn off the faucet after use, resulting in cloudy water and flooding. This situation affected the other tenants in the boarding house.
2	Resident 1	Not really, during my time living in this boarding house, everything has been fine because it's clean.
3	Resident 2	I've never experienced it myself, but there was one time when the water pump broke down, and several other boarding house rooms had no water — but not mine.

Although the overall water quality at the boarding house is generally considered good, interview findings reveal that there have been occasional disruptions and issues that affect both water clarity and availability. One notable incident reported by the boarding house owner involved a residence who used an excessive amount of water and neglected to turn off the faucet, resulting in temporary flooding and cloudy water. This situation not only impacted the water's appearance—reducing its clarity—but also caused inconvenience to other residents due to localized overflow and poor drainage. Such flooding events, although isolated, highlight the impact of individual usage behavior on the collective living environment in shared boarding facilities.

Additionally, Resident 2 mentioned a separate incident involving a malfunction in the water pump system. While this issue did not affect all rooms uniformly, several residents experienced a complete loss of water supply during the breakdown. This indicates that the boarding house's internal infrastructure—specifically the water distribution system including pumps and piping—plays a critical role in ensuring consistent water availability for all tenants. Although Resident 1 did not report any issues personally, these incidents point to vulnerabilities in both water management and maintenance systems.

These problems, though not frequent, demonstrate that water quality and access are not solely dependent on the purity of the main source. Internal infrastructure—such as the condition of the water pipes, the reliability of water pumps, and the cleanliness of storage containers—also significantly influences water quality at the point of use. As referenced in the study Ofosu et al. (2024) even groundwater that meets quality standards at certain depths can still be compromised due to human activities and environmental factors, including unclean storage tanks, poorly maintained plumbing, and water system misuse by residents. Therefore, while the boarding house benefits from a relatively clean water source, maintaining water quality and ensuring equitable access for all tenants requires consistent infrastructure upkeep, routine maintenance of water storage systems, and user responsibility in water consumption practices. These findings emphasize the need for a more holistic water management strategy in boarding house environments, especially those that rely on shared water systems.

Table 3. Question 3: Has the boarding house owner taken any preventive measures to ensure water safety? If so, what actions have been taken?

No.	Respondent	Answer
1	Boarding house owner	The boarding house owner has taken preventive measures against water overflow or leakage by draining the water tanks. One example is the bathroom on the second floor, where the owner replaced the water pump because it had short-circuited due to prolonged use — the pump had been in use for 20 years and had become outdated.
2	Resident 1	I've never really noticed or known about it, but I think the water is probably checked regularly because sometimes when I'm about to take a shower, it's not available since the boarding house owner is checking the water.
3	Resident 2	That's correct. In that incident, the boarding house owner promptly took preventive measures to address the broken water pump. They called a technician, and the pump was repaired immediately. After a few hours, the water supply was restored.

To maintain consistent water quality and prevent infrastructure-related problems in boarding house environments like the boarding house, routine maintenance practices are essential. This includes regularly draining and cleaning water tanks to prevent spills, leaks, or the accumulation of contaminants. As highlighted in the theoretical review on efforts to maintain clean water in boarding house environments, it is recommended that water tanks be cleaned and drained at least twice a year—or ideally every 3 to 6 months—depending on the surrounding environmental conditions. This maintenance schedule is crucial to inhibit the growth of mold, bacteria, algae, and debris that can degrade water quality and pose health risks to residents.

In line with these recommendations, the boarding house owner has taken several preventive measures. According to the interview, the owner has routinely drained the water tanks to avoid overflow or leakage. One specific example occurred in the bathroom on the second floor, where the water pump had to be replaced due to a short circuit. The pump, which had been in use for over 20 years, had become outdated and inefficient. Recognizing the importance of functioning infrastructure, the owner proactively replaced the broken pump with the help of a technician. This swift response ensured that the water supply was restored within a few hours, minimizing inconvenience to the tenants. Although Resident 1 was not fully aware of the maintenance schedule, they acknowledged having experienced temporary water unavailability during what they assumed to be routine checks by the boarding house owner. Resident 2 confirmed that the owner responded quickly to a previous incident by calling a technician to address the pump issue, demonstrating a strong commitment to ensuring water reliability.

These infrastructure improvements, such as replacing old or damaged pumps, directly support the broader goal of ensuring access to safe and clean water. They also align with best practices discussed in the theoretical review on water piping and storage systems. For optimal water quality, the use of appropriate piping materials is recommended, including HDPE, galvanized iron, copper, PP-R, PVC, CPVC, and uPVC—each chosen for its durability, resistance to corrosion, and safety for potable water (Świetlik & Magnucka, 2023). In terms of storage, vertical stainless-steel water tanks, such as Grand-type reservoirs, are suggested for their resistance to rust, ease of cleaning, and ability to preserve water quality over time (Utama & Ariyadi, 2022).

In conclusion, although the water quality at the boarding house is generally reliable, sustained efforts in infrastructure maintenance—such as regular tank cleaning, pump replacement, and appropriate material use for pipes and storage—are key to ensuring long-term safety and functionality of the water system. These measures not only enhance the quality of life for current residents but also reflect good management practices in shared living environments.

Table 4. Question 4: Have there been any changes in water safety after the implementation of these preventive measures?

No.	Respondent	Answer
1	Boarding house owner	The change that occurred after replacing the water pump was that the water became usable and no longer clogged. Then, by cleaning up the dirty water, the boarding house owner filtered the water and replaced it with fresh water.
2	Resident 1	It stays clean, of course, but if it gets any cleaner, it's probably the same since the water was already clean from the start, so there's no specific change.
3	Resident 2	None, the water flow returned to normal without any changes at all; the water remained clear, clean, and odorless.

After the implementation of both preventive and corrective measures at the boarding house, the overall condition and quality of the water supply not only remained stable but continued to meet satisfactory standards. According to the boarding house owner, the most noticeable improvement was that the water flow became smooth and free from clogs after the replacement of the old, malfunctioning water pump. Additionally, efforts to manage water cleanliness—such as filtering dirty water and replacing it with fresh water—ensured that any previously stagnant or contaminated water did not remain in circulation. This hands-on response to maintenance reflects a proactive approach to water management within the boarding house environment. Resident feedback further validates the effectiveness of these interventions. Resident 1 mentioned that the water stayed clean throughout, and although they did not notice a significant change, this consistency itself is an indication that the water system continued to function well after the maintenance was completed. Resident 2 also reported no noticeable difference in water quality following the repairs, noting that the water remained clear, clean, and odorless—consistent with the conditions before the incident. This implies that the remedial measures were successful in restoring normal water distribution without compromising water quality.

These outcomes illustrate the effectiveness of the actions taken in upholding the physical parameters of water quality. According to the theoretical framework on the provision of clean and safe water, water must be free from harmful physical, chemical, or biological contaminants and must adhere to health and safety standards set by global authorities such as the World Health Organization (WHO, 2022). The fact that water remained odorless, visually clean, and free from turbidity or blockage after maintenance activities strongly aligns with these standards.

Table 5. Question 5: How does the boarding house owner respond to complaints or issues related to water safety?

No.	Respondent	Answer
1	Boarding house owner	The boarding house owner expressed the importance of taking immediate action so that tenants can have a safe and comfortable living experience. If there is any damage, it should be handled proactively and addressed right away, without any unnecessary delay.
2	Resident 1	Always responsive for sure. Even though there's never been any water problems, if there's ever any issue, they're always quick to respond and care about it. So, it can be concluded that if a water problem does occur, they'll definitely respond quickly and solve it right away.
3	Resident 2	They responded kindly, all complaints and problems are always heard and followed up by the boarding house. This makes us feel safe as residents in terms of water availability and safety.

Furthermore, the sustained quality of the water supply post-repair emphasizes the importance of consistent water infrastructure maintenance in boarding house environments. This includes regular inspection and replacement of critical components

such as pumps, pipes, and tanks. As the findings show, even though the water quality was already considered good before the incident, the preventive and corrective actions taken—such as water filtration, replacing outdated equipment, and regular cleaning—were crucial in preventing any decline in quality. The owner of Kos Cendana has shown a highly responsive and caring attitude toward complaints or issues related to water. They believe that every problem should be addressed immediately to ensure that residents have a safe and comfortable living experience. Complaints are always heard and followed up properly, in line with an understanding of the importance of maintaining water quality, personal hygiene, and proper water storage methods, as improper handling can increase the risk of contamination and disease transmission (WHO, 2022).

This positive response helps residents feel secure regarding the availability and safety of water. The proactive approach taken by the kos owner supports the urgency of research and community service within the boarding house environment, aiming to identify issues and provide practical solutions and direct education to both residents and kos owners. This emphasizes water hygiene awareness as well as clean and healthy living behaviour as fundamental to maintain health especially in a shared residential setting, from Alvia et al. (2023) documents emphasizes the role of owners and occupants in maintaining cleanliness and implementing healthy behaviours, this point is also further supported by Kasri et al. (2017) which highlights how effective community based health interventions in promoting clean and healthy living behaviour in residential environments.

Based on interviews with the owner and residents of Kos Cendana, it can be concluded that the water quality in the boarding house is generally good and safe for daily use. The water is clear and odorless, meeting the criteria of SNI 01-3553-2006. Good water quality is vital as water is a basic necessity for residents for activities such as bathing, laundry, cooking, and direct consumption. In the context of public health, clean and safe water is defined as water free from physical, chemical, or biological contaminants harmful to humans, and that meets the quality standards set by health institutions (WHO, 2022). Regular monitoring of all parameters is essential to ensure that water remains within safe consumption limits *(*U.S. EPA, 2021). Although the water quality is generally good, there has been an incident of murky water and flooding caused by excessive use by one of the residents. This issue not only affected the individual responsible but also impacted the comfort of other residents. Such problems, if not addressed properly, can worsen the risk of contamination and disease transmission. The kos owner has taken effective preventive and corrective actions. These include draining water storage tanks, replacing a damaged water pump due to long-term use, and filtering and replacing dirty water with clean water. After these measures were implemented, the water could be used again without clogging issues, remaining clear, clean, and odorless. The consistent quality of water following these repairs highlights the importance of regular water tank cleaning and overall water maintenance in preventing deterioration in water quality.

The owner's quick and proactive response to complaints or concerns about water safety demonstrates their commitment to resident well-being. The owner believes that any damage or water-related issue must be addressed immediately to provide residents with a safe and comfortable living environment. Residents confirmed that their complaints are always heard and addressed well, making them feel secure about the availability and safety of their water. This proactive response aligns with the urgency of research and community service within boarding house environments, emphasizing the importance of providing practical solutions and direct education to both residents and kos owners in order to sustainably improve their quality of life and health. Moreover, this action also reflects the significance of awareness and practice of water hygiene, where health education and promotion are crucial elements to raise awareness, encourage behavioral change, and empower residents to actively participate in maintaining water quality in their environment, as outlined in the theoretical review on the urgency of research and service in boarding house environments.

4. Conclusions

The water quality at the Boarding House meets the acceptable standards by being clear, odorless and suitable for daily use. Although a brief incident of water disruption due to excessive usage and failure of infrastructure occurred, the preventive and quick response from the boarding house owner effectively restored and maintained the water quality. These results emphasize the critical role of residents' awareness, regular maintenance as well as responsive management in ensuring safe water access within boarding house environments. The study further highlights the value of incorporating user perspective in assessing water hygiene practices, contributing to a more deeper view of community-level water safety practices.

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Author Contribution
All contributors designed the study, collected and analyzed data, interpreted results, and drafted the manuscript. They reviewed and approved the final version, taking shared responsibility for the accuracy and integrity of the work.

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