

Water Analysis of Drinking Water in San Antonio, Northern Samar

LADY DARYL ALANDINO BERBON

Senior High School Department
San Policarpo National High School
Calbayog City Division, Calbayog City, Samar, 6710
ladydaryl@gmail.com

Abstract — Water is arguably the most basic and most important part of everyday life. Yet, for billions of people worldwide, clean and safe drinking water remains a dream. “Philippine Clean Water Act of 2004” envisions providing safe and accessible drinking water. The study aimed to conduct an analysis of the drinking water in San Antonio, Northern Samar. In the analysis of the drinking water, it used the following parameters which include physical (color and turbidity); chemical (pH, total suspended solids, total dissolved solids, salinity, chloride, and total alkalinity); and microbiological (fecal coliform count, heterotrophic form count, E. coli form and coliform count) parameters of the source of drinking water. It employed descriptive-assessment research with the laboratory analysis of the water samples. Three Barangays from San Antonio, Northern Samar passed the criteria where their main source of drinking water is coming from a publicly owned Jet Matic pump located in the vicinity of their barangay, and most of the residents are using this Jet Matic pump as their main source for drinking water. The identified barangays were Brgy. Vinisitahan, Brgy. Pilar, and Brgy. Manraya.

It was found out that a high concentration of suspended particles, which results in a high-level color compound, does not affect the quality of the drinking water. Water samples coming from Brgy. Pilar and Brgy. Manraya have a pH level that indicates that the water samples are acidic, which is not suitable for human consumption. The same barangay was revealed to have a high total alkalinity level that indicates water contamination, while other parameters were undetectable and show nonsignificant factors to any water-related issues. All water samples from the identified Barangay submitted for microbiological components show that all water sources are contaminated with different coliform and bacteria, suggesting a potential risk for any waterborne diseases.

The quality of drinking water sources is also affected by the environmental structure of the Jet Matic pump. Most of them are not in good structure, and the surrounding area also affects the quality of the water.

Keywords — *Water Analysis, water quality, drinking water, physical property of water, chemical property of water, microbial property*

I. Introduction

Water, an essential element for human survival, is arguably the most critical resource on the planet. It sustains life, supports ecosystems, and is a fundamental economic and social development driver. Despite its abundance, however, access to clean and safe drinking water remains an elusive goal for billions worldwide. This global disparity is not only a humanitarian

crisis but also presents a significant challenge to governments, communities, and industries that manage water resources effectively. As populations grow, urban areas expand, and climate change alters weather patterns, the water demand continues to rise, straining already limited resources.

San Antonio, an island municipality in the Province of Northern Samar, faces many of these water-related challenges. The municipality, which is surrounded by seawater, has all its barangays situated along the coastal regions. As someone who has lived in San Antonio, the researcher has personally experienced the challenges posed by the current water supply. Drinking water is typically collected from the common sources available in each barangay, yet the water is often visibly contaminated. Sediment settles at the bottom of bottles, giving the water a rusty taste and indicating the presence of impurities. Furthermore, when used for bathing, the water tends to leave the skin dry, suggesting a chemical imbalance or contamination. Boiling the water results in the formation of lime scale deposits inside kettles, further indicating the water's poor quality. These personal observations, combined with the broader health implications for the community, have driven the researcher to undertake this study in the hope of identifying solutions that can improve access to safe drinking water for the people of San Antonio.

The urgency of this situation cannot be overstated. Access to clean water is not only a basic human right but also a key determinant of public health and economic development. The findings of this study are intended to inform efforts to develop and implement improved water resources for the island's population, ultimately contributing to the well-being and quality of life for the residents of San Antonio, Northern Samar.

Literature Review

Maintaining proper hydration is essential for overall health and well-being, yet many individuals fail to consume adequate amounts of water daily. Water comprises approximately 60 percent of the human body and covers around 71 percent of the Earth's surface (McIntosh, 2023). Despite its abundance, the necessity of sufficient daily water intake is often overlooked. McIntosh (2023) highlighted several physiological functions that water supports, including joint lubrication, oxygen transport, skin health, temperature regulation, and waste elimination. These points underscore the significance of water consumption for maintaining bodily functions and overall health. This understanding aligns with the focus of the current study, which aims to ensure the quality of drinking water through standardized laboratory testing.

The literature reviewed primarily focuses on the various factors influencing water quality and the diverse methods used to ensure its potability. This literature provided valuable insights that guided the researcher in assessing the drinking water quality in San Antonio, Northern Samar, which is the central focus of this study. Understanding the importance of different water quality parameters, such as chemical contaminants, microbial content, and physical properties, allowed the researcher to develop a comprehensive approach to water quality assessment.

While the literature provides a wealth of information on water quality assessment methods and treatment technologies, significant gaps remain in understanding how these approaches can be effectively implemented in rural and low-income communities like San Antonio, Northern Samar. Most studies reviewed focus on either global or urban contexts, where infrastructure and resources for water quality management are more readily available (Shah, 2017; Clement & Omuterema, 2023). However, little attention has been given to the unique challenges faced by rural communities in the Philippines, where access to advanced water treatment technologies is often limited, and where natural water sources are more susceptible to contamination from agricultural runoff, mining activities, and inadequate sanitation systems.

The present study aims to address these gaps by focusing on the specific water quality issues faced by the community in San Antonio, Northern Samar. It will assess not only the chemical and microbial contaminants in the local water supply but also evaluate the effectiveness of locally accessible water treatment methods. Furthermore, this study will explore the socio-economic factors that influence water quality management in the region, such as access to resources, education on water sanitation, and local governance structures. By doing so, the research will contribute to a more nuanced understanding of water quality challenges in rural Philippine communities and provide practical recommendations for improving drinking water safety in similar settings.

II. Methodology

Design. This study on the water quality analysis of drinking water in San Antonio, Northern Samar, employed a descriptive-assessment research design. As noted by Inderson (2017), this research design is particularly suitable for describing the characteristics of a population or phenomenon through systematic observation, interviews, or the distribution of questionnaires. It also facilitates the assessment of respondents' perceptions regarding a specific issue or topic. In the context of this study, the descriptive-assessment method was utilized to evaluate the physical, chemical, and microbial quality of drinking water resources in selected barangays of San Antonio.

The quality of the drinking water was measured using three key parameters: (1) physical characteristics, such as temperature, turbidity, and color; (2) chemical characteristics, including pH levels, dissolved oxygen, and the presence of contaminants like nitrates and heavy metals; and (3) microbial components, particularly the presence of coliform bacteria, which serve as indicators of potential contamination by pathogenic microorganisms.

To gather the necessary data for water quality analysis, water samples were collected from various sources across the selected barangays of San Antonio. These samples were carefully handled and transported to the Department of Science and Technology (DOST) Water Testing Laboratory in Tacloban City. This laboratory, accredited by the relevant authorities, conducted a comprehensive analysis of the samples in accordance with established national standards for

drinking water quality. The results of the laboratory analyses provided the empirical foundation for evaluating the safety of drinking water in the area.

III. Results and Discussion

Physical Properties of the Selected Drinking Water Sources

The physical properties of drinking water, including turbidity and color, serve as fundamental indicators of water quality and clarity. Turbidity measures the cloudiness of the water caused by suspended particles, while color assessment reflects the presence of dissolved or suspended substances that may affect the water's appearance and acceptability

1.1. Turbidity

In Table 1.1, the elevated turbidity at V#1 is concerning as it could signify the presence of suspended particles, such as silt and microorganisms, which can pose health risks if left untreated. High turbidity can inhibit effective disinfection and lead to waterborne diseases, aligning with findings by Bansilay et al. (2017) and Oyekale (2017), who stressed the association between turbidity and waterborne illnesses, particularly in vulnerable populations. Given that the other sources in the P and M Sites meet the turbidity standard, V#1 presents an outlier that may require further investigation and remediation to safeguard public health.

Table 1.1. Turbidity of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Turbidity*	V#1	V#2	V#3	5 NTU**
	22.00 FAU	<1.00 FAU+	<1.00 FAU+	
P Site				
Turbidity*	P#1	P#2	P#3	5 NTU**
	<1.00 FAU+	<1.00 FAU+	<1.00 FAU+	
M Site				
Turbidity*	M#1	M#2	M#3	5 NTU**
	<1.00 FAU+	<1.00 FAU+	<1.00 FAU+	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

The data also emphasizes the importance of consistent turbidity monitoring across all water sources, as variations like those seen at the V Site can go undetected without regular testing. The extremely low levels at the P and M Sites indicate proper water management and potential natural filtration or treatment processes that are effective in maintaining water clarity. However, the significant deviation at V#1 may be due to environmental factors, poor management, or contamination that could compromise water safety if not addressed promptly.

1.2. Color

In Table 1.2, the contrast between the high color values at the V Site and the low values at the P and M Sites underscores the variability in water quality across different locations. While the P and M Sites demonstrate well-managed or naturally filtered water, the elevated levels at the V Site point to localized contamination. Addressing the color issues in Brgy. Vinitahan is critical, as prolonged exposure to such levels could further degrade water quality and potentially harm public health. Immediate corrective measures, such as source remediation or treatment, should be prioritized to bring the water quality at V#1 back to safe levels.

Table 1.2. Apparent Color of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Color (Apparent)*	V#1	V#2	V#3	10 CU**
	311.00 CU	22.00 CU	17.00 CU	
P Site				
Color (Apparent)*	P#1	P#2	P#3	10 CU**
	<1.00 CU+	<1.00 CU+	<1.00 CU+	
M Site				
Color (Apparent)*	M#1	M#2	M#3	10 CU**
	<1.00 CU+	<1.00 CU+	<1.00 CU+	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

2. Chemical Properties of the Selected Drinking Water Sources

Chemical properties provide critical insights into the composition and overall quality of drinking water. This section evaluates pH, total suspended solids, total dissolved solids, salinity, chloride, and total alkalinity, each contributing to the understanding of water's suitability for consumption and its impact on both human health and the environment.

2.1. pH

The pH level of drinking water is a crucial factor affecting its quality, influencing both the safety and palatability of the water.

Table 2.1. pH Level of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
pH*	V#1	V#2	V#3	6.5-8.5**
	6.18	5.98	6.24	
P Site				
pH*	P#1	P#2	P#3	6.5-8.5**
	7.3	7.33	7.26	
M Site				
pH*	M#1	M#2	M#3	6.5-8.5**
	7.17	6.96	6.9	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

Table 2.1 shows the pH levels at the P and M Sites are well within the recommended range, indicating well-balanced water chemistry. The compliance of these sites with the pH standards suggests that the water is safe for consumption and less likely to cause any corrosion or leaching issues. As Aryal et al. (2012) highlighted, maintaining pH levels within safe limits is crucial to ensuring water safety and protecting infrastructure. The water sources at Brgy. Pilar and Brgy. Manraya show stable water quality, while corrective measures should be considered for Brgy. Vinisitahan to bring the pH levels within the ideal range and prevent potential health hazards.

2.2 Total solids suspended

Total suspended solids (TSS) in drinking water are a key indicator of water quality, representing particles that can harbor harmful microorganisms and reduce water clarity.

In Table 2.2, the relatively high TSS level at V#1 (4.00 mg/L) compared to other sources could indicate localized contamination, possibly from organic matter or other particulates suspended in the water. As Rahmanian et al. (2015) emphasized, controlling TSS is crucial to prevent potential microbial growth, as these particles can serve as carriers for harmful microorganisms. While the TSS level at V#1 is not excessively high, it signals the need for further assessment to ensure that the source remains safe for consumption over time. Additionally, the presence of suspended solids may affect the water's appearance and lead to reduced consumer confidence in its safety, particularly when compared to the much lower TSS levels at the other sites.

Table 2.2. Total Solids Suspended of the Selected Drinking Water Sources

Parameters		Location			Standard/ Regulation
V Site					
Total Solids	Suspended	V#1	V#2	V#3	N/A
		4.00 mg/L	<1.00 mg/L+	<1.00 mg/L+	
P Site					
Total Solids	Suspended	P#1	P#2	P#3	N/A
		<1.00 mg/L+	<1.00 mg/L+	<1.00 mg/L+	
M Site					
Total Solids	Suspended	M#1	M#2	M#3	N/A
		<1.00 mg/L+	<1.00 mg/L+	<1.00 mg/L+	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5					

In contrast, the water at the P and M Sites appears to be well-managed, with TSS levels consistently below 1.00 mg/L, indicating minimal particulate matter and a reduced likelihood of microbial contamination. These findings align with the conclusions drawn by Bansilay et al. (2017), who emphasized the importance of environmental monitoring to assess and mitigate contamination risks in water sources. Maintaining such low levels of TSS is vital for ensuring water clarity and preventing potential health hazards. However, the elevated TSS at V#1 should prompt immediate action, such as filtration or further testing, to mitigate any risks posed by suspended solids.

2.3 Total dissolved solids

Total Dissolved Solids (TDS) measure the combined content of all inorganic and organic substances dissolved in water, which include minerals, salts, and metals.

Table 2.3. Total Dissolved Solids of the Selected Drinking Water Sources

Parameters		Location			Standard/ Regulation
V Site					
Total Solids	Dissolved	V#1	V#2	V#3	600 mg/L**
		150.00 mg/L	144.50 mg/L	145.50 mg/L	
P Site					
Total Solids	Dissolved	P#1	P#2	P#3	600 mg/L**
		437.00 mg/L	417.00 mg/L	400.00 mg/L	
M Site					
Total Solids	Dissolved	M#1	M#2	M#3	600 mg/L**
		387.00 mg/L	387.00 mg/L	383.00 mg/L	

*Test which are not included in the laboratory's scope of accreditation
 + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity
 NC – No Computation
 N/A – Not applicable/ not included in the PNSDW 2017, Table A-5
 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5

In Table 2.3, the TDS levels at the V Site, particularly between 144.50 mg/L and 150.00 mg/L, reflect a low concentration of dissolved solids, contributing to better water taste and quality. According to Alambatin et al. (2017), maintaining TDS within safe limits ensures the palatability of drinking water and reduces potential health risks. The low TDS in the V Site suggests minimal contamination from inorganic or organic substances, implying good overall water quality. This makes the water from Brgy. Vinisitahan is not only safe for consumption but also aesthetically appealing in terms of taste, odor, and clarity.

On the other hand, the higher TDS values at the P and M Sites, while still compliant with the 600 mg/L standard, suggest a higher concentration of dissolved minerals and salts, possibly from geological sources or human activities such as agriculture or urban runoff. While these levels do not pose immediate health risks, they could affect the taste of the water, potentially making it less palatable compared to the V Site.

2.4 Salinity

Salinity is a measure of the concentration of dissolved salts in water, which can influence the suitability of water for drinking, agriculture, and industrial use.

Table 2.4. Salinity of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Salinity	V#1	V#2	V#3	N/A
	10.00 %	1.00 %	1.00 %	
P Site				
Salinity	P#1	P#2	P#3	N/A
	2.00%	2.00%	2.00%	
M Site				
Salinity	M#1	M#2	M#3	N/A
	2.00%	1.00%	2.00%	

*Test which are not included in the laboratory's scope of accreditation
 + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity
 NC – No Computation
 N/A – Not applicable/ not included in the PNSDW 2017, Table A-5
 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5

Table 2.4 presents the exceptionally high salinity level of 10.00% at V#3 is a major concern. Such elevated salinity could indicate a significant presence of dissolved salts, potentially resulting from saltwater intrusion, contamination, or inadequate water management practices. This condition could adversely affect both the safety of drinking water and the integrity of plumbing systems, as high salinity can cause corrosion and degrade infrastructure over time.

2.5 Chloride

Chloride is commonly found in natural water sources and is often a byproduct of saltwater intrusion, agricultural runoff, or industrial effluents.

Table 2.5. Chloride of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Chloride*	V#1	V#2	V#3	250 mg/L**
	15.16 mg/L	14.31 mg/L	14.31 mg/L	
P Site				
Chloride*	P#1	P#2	P#3	250 mg/L**
	29.47 mg/L	27.11 mg/L	27.62mg/L	
M Site				
Chloride*	M#1	M#2	M#3	250 mg/L**
	19.37 mg/L	20.21 mg/L	19.62 mg/L	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

Table 2.5 details the results from the V Site are reassuring, as the chloride levels are substantially below the 250 mg/L threshold, reflecting good water quality and minimal contamination from saline sources. This aligns with Rahmanian et al. (2015), who emphasized that maintaining chloride levels within safe limits ensures water potability and minimizes potential health risks. Low chloride levels also reduce the risk of corrosion in plumbing systems, thereby protecting infrastructure and extending the lifespan of water distribution components.

The chloride levels at the P and M Sites, while still below the 250 mg/L limit, are higher than those at the V Site. The presence of higher chloride concentrations at these sites could indicate localized sources of contamination, such as agricultural runoff or minor saltwater intrusion, which should be monitored to prevent further increases. Regular monitoring and appropriate management practices are essential to maintain chloride levels within safe limits and ensure the continued safety and quality of drinking water. Overall, the data suggest that while the water at all sites is currently within acceptable chloride limits, ongoing vigilance is necessary to address any potential contamination issues and safeguard public health.

2.6 Total alkalinity

Total alkalinity measures the water's ability to neutralize acids, acting as a buffer against pH fluctuations that can affect water quality and safety. It is an important parameter that influences the stability of water and its impact on infrastructure and health.

Table 2.6 presents the total alkalinity at the V Site appears relatively low, particularly for V#1 (28.62 mg/L) and marginally higher for V#2 and V#3 (37.85 mg/L). Low alkalinity can lead to reduced buffering capacity, making the water more susceptible to pH fluctuations and potentially causing corrosive conditions. The high alkalinity levels at the P and M Sites, ranging from 20.31 mg/L to 302.77 mg/L, suggest a strong buffering capacity and stable water chemistry. The high alkalinity at P#1 and M Site readings are particularly beneficial in preventing pH imbalances and protecting against corrosive effects. However, the wide variation at the P Site, with a notably low value for P#2, indicates potential variability in water chemistry that could affect overall stability. Regular monitoring and management of alkalinity are essential to ensure consistent water quality across all sites, preventing potential issues related to pH fluctuations and infrastructure corrosion.

Table 2.6. Total Alkalinity of the Selected Drinking Water Sources

Parameters	Location				Standard/ Regulation
V Site					
Total Alkalinity*	V#1	V#2	V#3	N/A	
	28.62 mg/L	37.85 mg/L	37.85 mg/L		
P Site					
Total Alkalinity*	P#1	P#2	P#3	N/A	
	288.00 mg/L	20.31 mg/L	272.31 mg/L		
M Site					
Total Alkalinity*	M#1	M#2	M#3	N/A	
	297.23 mg/L	302.77 mg/L	268.62 mg/L		
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5					

Microbial Properties of the Selected Drinking Water Sources

Microbial properties are crucial for assessing the safety and potability of drinking water.

3.1 Fecal coliform count

Fecal coliform count is a critical indicator of water quality, as it measures the presence of bacteria commonly found in the intestines of warm-blooded animals, including humans. Table 3.1 presents the results from the V and P Sites show that while most of the water samples meet the safety standard for fecal coliforms, the elevated count at V#1 indicates a potential contamination issue that requires further investigation. More critically, the M Site presents a severe problem, as the fecal coliform counts are substantially above the acceptable limit, posing significant health risks. Omari and Manu (2012) highlight the importance of treating water to remove fecal contamination, and these results underscore the urgent need for improved water treatment and monitoring at the M Site to ensure safety and prevent potential health hazards.

Table 3.1. Fecal coliform count of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Fecal Coliform (MPN) Count	V#1	V#2	V#3	DOH AO No. 2017-0010: Standard Value <1.1 MPN /100mL
	5.1 MPN /100mL	<1.1 MPN /100mL	<1.1 MPN /100mL	
P Site				
Fecal Coliform (MPN) Count	P#1	P#2	P#3	DOH AO No. 2017-0010: Standard Value <1.1 MPN /100mL
	<1.1 MPN /100mL	<1.1 MPN /100mL	<1.1 MPN /100mL	
M Site				
Fecal Coliform (MPN) Count	M#1	M#2	M#3	DOH AO No. 2017-0010: Standard Value <1.1 MPN /100mL
	>23MPN /100mL	>23MPN /100mL	>23MPN /100mL	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

3.2 Heterotrophic form count

The Heterotrophic Plate Count (HPC) assesses the number of heterotrophic bacteria in water, which are organisms that require organic carbon for growth. Regular monitoring of HPC is crucial for maintaining microbial water quality, as it helps detect the presence of bacteria that may impact the potability and overall safety of drinking water.

Table 3.2 provides the Heterotrophic Plate Count (HPC) results indicate that the water quality at the V and P Sites is generally within the acceptable range, suggesting that microbial contamination is relatively controlled at these locations. However, the M Site presents a concern, particularly with M#3, where the HPC exceeds the recommended limit. This elevated count indicates a potential issue with water quality, highlighting the need for improved monitoring and treatment to address the higher levels of heterotrophic bacteria. Omari and Manu (2012) underscore the importance of regular HPC monitoring to ensure drinking water safety, and these findings suggest that enhanced measures are necessary at the M Site to effectively manage and reduce microbial contamination.

Table 3.2. Heterotrophic Plate Count of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Heterotrophic Plate Count	V#1	V#2	V#3	DOH AO No. 2017-0010: Standard Value <500 CFU/mL
	320 CFU/mL	420 CFU/mL	400 CFU/mL	
P Site				
Heterotrophic Plate Count	P#1	P#2	P#3	DOH AO No. 2017-0010: Standard Value <500 CFU/mL
	120 CFU/mL	200CFU/mL	140 CFU/mL	
M Site				
Heterotrophic Plate Count	M#1	M#2	M#3	DOH AO No. 2017-0010: Standard Value <500 CFU/mL
	330 CFU/mL	480 CFU/mL	570 CFU/mL	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

3.3 *Escherichia coli* form

 Table 3.3. *Escherichia coli* (MPN) Count of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
<i>Escherichia coli</i> (MPN) Count	V#1	V#2	V#3	DOH AO No. 2017-0010: Standard Value <500 CFU/mL
	5.1 MPN /100mL	<1.1 MPN /100mL	<1.1 MPN /100mL	
P Site				
<i>Escherichia coli</i> (MPN) Count	P#1	P#2	P#3	DOH AO No. 2017-0010: Standard Value <500 CFU/mL
	<1.1 MPN /100mL	<1.1 MPN /100mL	<1.1 MPN /100mL	
M Site				
<i>Escherichia coli</i> (MPN) Count	M#1	M#2	M#3	DOH AO No. 2017-0010: Standard Value <500 CFU/mL
	>23MPN /100mL	>23MPN /100mL	>23MPN /100mL	
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5				

Escherichia coli (*E. coli*) is a specific type of fecal coliform that serves as a definitive indicator of fecal contamination in water. The detection of *E. coli* suggests the possible presence of pathogens that can cause gastrointestinal illnesses and other health problems. From the table, the

Escherichia coli (E. coli) counts for drinking water highlight a significant issue at the M Site, where the E. coli levels are substantially higher than the safety standard. This indicates severe fecal contamination, posing serious health risks due to potential pathogenic microorganisms associated with E. coli. Omari and Manu (2012) stress the importance of monitoring E. coli to prevent waterborne illnesses, and the findings underscore the critical need for enhanced water treatment and preventive measures at the M Site to ensure the safety and potability of the water.

3.4 Coliform count

Total coliform count is a broad measure of water quality, capturing the presence of coliform bacteria from both fecal and non-fecal sources. High total coliform levels in water can indicate contamination and the potential for pathogenic organisms. Aryal et al. (2012) found that total coliform levels in drinking water sources were generally within national and WHO standards, although variations existed between seasons and water types. Total coliform monitoring is important in assessing the overall microbial quality of water, as it provides an early warning of possible contamination and helps guide further water quality management efforts.

Table 3.4 counts for the drinking water sources results indicate that the V Site has mixed water quality, with one sample showing contamination while others meet the standard. However, the P and M Sites present significant concerns as both have consistently high levels of total coliforms, indicating substantial contamination. Aryal et al. (2012) highlight the importance of total coliform monitoring to detect potential microbial contamination early. The high counts at the P and M Sites suggest a need for immediate intervention to improve water treatment and ensure the safety of drinking water, as elevated total coliform levels can indicate the presence of pathogens and potential health risks.

Table 3.4. Total Coliform (MPN) Count of the Selected Drinking Water Sources

Parameters	Location			Standard/ Regulation
V Site				
Total Coliform (MPN) Count	V#1	V#2	V#3	DOH AO No. 2017-0010: Standard Value <1.1 MPN /100mL
	5.1 MPN /100mL	23 MPN /100mL	<1.1 MPN /100mL	
P Site				
Total Coliform (MPN) Count	P#1	P#2	P#3	DOH AO No. 2017-0010: Standard Value <1.1 MPN /100mL
	>23MPN /100mL	>23MPN /100mL	>23MPN /100mL	
M Site				
Total Coliform (MPN) Count	M#1	M#2	M#3	DOH AO No. 2017-0010: Standard Value
	>23MPN /100mL	>23MPN /100mL	>23MPN /100mL	

				<1.1 /100mL	MPN
*Test which are not included in the laboratory's scope of accreditation + Value acquired below detection limit, 1 FAU = 1 NTU for turbidity NC – No Computation N/A – Not applicable/ not included in the PNSDW 2017, Table A-5 ** Maximum Allowable Limit (MAL) based on PNSDW 2017, Table A-5					

IV. Conclusion

Based on the study's findings, it is concluded that significant variations exist in drinking water quality among the barangays examined, with Barangay Vinisitahan and Barangay Manraya facing critical water quality issues, while Barangay Pilar generally exhibited safer water conditions. In Vinisitahan, particularly site V#1, turbidity (22.00 FAU) and color (up to 311 CU) far exceeded the Philippine National Standards for Drinking Water (PNSDW 2017), indicating poor water clarity and high suspended particles that can harbor harmful microorganisms; Pilar and Manraya had turbidity and color within safe limits. Vinisitahan's water was slightly acidic (pH 5.98–6.24), below the recommended range, raising concerns about corrosion and metal leaching, and showed high salinity (10%) at one site, suggesting saltwater intrusion, while Pilar and Manraya had acceptable pH and salinity levels. Fecal coliform counts were above safety limits in Vinisitahan (5.1 MPN/100 mL) and alarmingly high in Manraya (over 23 MPN/100 mL), with *Escherichia coli* detected in Manraya, confirming fecal contamination and immediate health risks; elevated heterotrophic bacteria counts, especially in Manraya (570 CFU/mL), further indicated microbial degradation and compromised safety. These findings highlight an urgent need for water treatment and quality improvement in Vinisitahan and Manraya to protect public health, while Pilar's water quality, though comparatively better, still requires regular monitoring.

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