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# Knowledge, attitudes and practices on water, sanitation and hygiene among residents in selected barangays of the Maguindanao del Norte and del Sur

Maeda Langguyuan Kadtong[1*], Musa A. Unos[2], Ansare K. Unos[3], Badrudin K. Abdul[4], Abdulnasser T. Omar[5]
[1,2,3,4,5]Mindanao State University – Maguindanao, Philippines; mlkadtong@msumaguindanao.edu.ph; maedakadtong_12@yahoo.com (M.L.K.) maunos@msumaguindanao.edu.ph (M.A.U.) unosansare@gmail.com (A.K.U.) badrudinabdul@gmail.com (B.K.A.) nasser15@gmail.com (A.T.O.).

**Abstract:** This study examined the knowledge, attitudes, and practices related to water, sanitation, and hygiene (WASH) among residents in selected barangays of Maguindanao. It specifically explored sources of household water for domestic and drinking purposes, water treatment practices, toilet facilities, awareness of open defecation, waste disposal methods, and hygiene practices such as handwashing and tooth brushing. Using a descriptive research design, data were gathered from 60 household members across six barangays in Maguindanao del Sur and Maguindanao del Norte through purposive sampling. Findings revealed that most households (55%) obtained drinking water from piped yard/plot sources, while 31.66% used improvised filters such as cloth or sponge to make water safer for consumption. A significant number of households (63.33%) lacked toilet facilities, leading to open defecation in bushes, fields, or rivers, although most respondents demonstrated awareness of its negative health effects. In terms of waste management, 36.66% practiced direct disposal without storage, and 61.66% discarded garbage near their homes. The majority of household waste consisted of paper (83.33%), with 78.33% of households lacking trash bins. Hygiene practices were also found to be inadequate, with respondents primarily washing hands in kitchen-built lavatories but brushing their teeth rarely, as reflected in a low mean score of 1.661. In conclusion, while residents showed awareness of sanitation-related health risks, gaps remained in toilet availability, water treatment, waste management, and personal hygiene practices. These findings highlight the urgent need for improved facilities, community education, and strengthened WASH interventions in the studied barangays.

***Keywords:*** *Garbage disposal, Hygiene, Open defecation, Sanitation, Water.*

## 1. Introduction

The second leading cause of death among children under five worldwide is diarrhea. With over 1.7 billion cases and 600,000 child deaths annually, diarrheal illnesses have a significant negative impact on society and are associated with an increased risk of stunting, which is defined as low weight for age and developmental delay [1]. Additionally, every day, about 1,400 children under the age of five pass away from diarrheal illnesses that are connected to inadequate access to clean water, sanitary conditions, and basic hygiene. According to WHO & UNICEF [1], this equates to more than half a million children annually.

Over 20 million people in the Philippines lack access to sewage and sanitation services, and waterborne illnesses claim the lives of over 55 people every day. Sewer systems only cover 10% of the population. The Department of Health documented 5,344 occurrences of acute bloody diarrhea between January and May 2017, including 41 fatalities in ARMM. 614 instances of dengue and other food- and waterborne illnesses were reported in Maguindanao in 2016. Since feces contaminate homes,


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* Correspondence: mlkadtong@msumaguindanao.edu.ph

waterways, and fields, open defecation continues to be a serious sanitation problem that poses health hazards to the general public.

Approximately 2.6 billion people worldwide lack access to toilets, and 1 billion of them defecate in the open in places such as fields, by the side of the road, or next to railroad tracks [2]. With 490 million people, or roughly one-third of the population, India has the largest number. Prevalence is 52 percent in rural areas and 7.5 percent in urban areas. Other nations with sizable populations who engage in open defecation include Sudan (17 million), Ethiopia (34 million), Nigeria (39 million), Pakistan (41 million), and Indonesia (54 million). According to the World Bank [3], 31% of rural communities in the Philippines continue to defecate in the open. At least 26% of Filipinos still lack access to clean and hygienic restrooms, despite the fact that around 92 million people have access to improved water sources [4].

The World Bank's Zero Open Defecation (ZOD) project and the Philippine Department of Health are working to end the aforementioned practices by mapping communities, identifying open spaces contaminated by human feces, and engaging families to identify homes without access to water or toilets. The ZOD project focuses on the poorest households in the provinces of Masbate, Negros Occidental, Negros Oriental, and Sarangani, as well as the Bangsamoro Autonomous Region in Muslim Mindanao.

The situation indicates that issues with enhancing water, sanitation, and hygiene, as well as eliminating open defecation, still exist despite the numerous programs and projects carried out by the Philippine government, especially by the Department of Health and other organizations. This issue is particularly noticeable in a few barangays across two Maguindanao provinces. Due to this concern, the researchers decided to explore the knowledge, attitudes, and practices of people in a few barangays in Maguindanao del Sur and Maguindanao del Norte regarding water, sanitation, and hygiene.

### *1.1. Statement of the Problem*

This study aimed to assess knowledge, attitudes, and practices regarding water, sanitation, and hygiene among residents in selected barangays in Maguindanao.

Specifically, this study sought answers to the following questions:

1. What are the types of water sources for domestic use and drinking water?
2. What do the respondents usually do to make the water safer to drink?
3. What is the type of toilets present in the households?
4. What is the level of residents' awareness of open defecation and its effects on health?
5. What are the garbage disposal practices among households in terms of;
   a. Water,
   b. Garbage disposal, and
   c. Defecation?
6. What are the households' hand washing and tooth brushing practices in;
   a. Hand washing,
   b. Areas where households wash their hands,
   c. The time or period for brushing their teeth.

## 2. Methods

The study employed a descriptive research design to examine the knowledge, attitudes, and practices regarding water, sanitation, and hygiene among residents of selected barangays in Maguindanao Province. It was conducted in six barangays, three from Maguindanao del Sur, namely Barangay Limpungo, Barangay Satan, and Barangay Labu-Labu, and three from Maguindanao del Norte, namely Barangay Kurintem, Barangay Makir, and Barangay Taviran, with ten (10) respondents per barangay, totaling sixty (60) households chosen through purposive sampling. A survey questionnaire with three parts: water and sanitation, waste disposal, and hygiene practices, served as the main instrument. Data were gathered with official permission and analyzed using descriptive statistics, including frequency, percentage, and weighted mean for interpretation.

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## 3. Results and Discussion

### 3.1. Households' Sources of Drinking Water

**Table 1.**
Frequency Distribution of the Households' Sources of Drinking Water

| Item | Frequency | Percentage |
|---|---|---|
| 1. Piped to yard/ plot | 33 | 55 |
| 2. Bottle/ mineral water | 6 | 10 |
| 3. Tube well or borehole | 21 | 35 |
| Total | 60 | 100 |

The table shows that 55% of households obtain drinking water from piped connections within their yards or plots, reflecting progress toward the SDG 6.1 goal of safe and affordable water for all. Piped water reduces time and effort, offering greater convenience and reliability [5]. However, studies caution that it does not always ensure safety. Clasen and Boisson [6] note risks from poor maintenance, intermittent supply, and unsafe storage, while Sima and Elimelech [7] highlight that households often still treat piped water. Research in African settlements [8, 9] shows contamination risks from leaks and aging systems. Despite challenges, piped water improves hygiene and reduces reliance on unsafe sources [10]. Ensuring quality remains essential.

The data indicate that 21 households (35%) obtain drinking water from tubewells or boreholes, which are considered improved sources as they tap into groundwater that is generally less exposed to contamination than surface water [5]. These sources are common in rural and peri-urban areas lacking piped water systems, offering affordable and accessible alternatives. However, their safety is not assured. Foster et al. [11] note that poor construction, inadequate sealing, or proximity to sanitation can cause microbial contamination. Ercumen et al. [12] similarly reported risks of *E. coli* and nitrate pollution in groundwater. Studies by Anthon et al. [13] and Rahman and Islam [14] revealed vulnerability to contamination from seasonal changes, flooding, and arsenic in South Asia. Despite these risks, boreholes remain vital. Okpara et al. [9] emphasize groundwater monitoring and household treatments such as boiling, chlorination, or filtration to ensure safety.

The findings show that six households (10%) rely on bottled or mineral water as their main drinking water source. Bottled water is often perceived as safer, especially where tap or groundwater quality is uncertain. WHO & UNICEF [5] note that bottled water use is increasing in both rural and urban settings due to safety concerns. However, researchers caution about affordability, environmental sustainability, and inconsistent safety. Gleick and Cooley [15] argue that bottled water is not always safer than regulated tap water, while Wardrop et al. [16] found risks of recontamination when bottles are refilled or stored improperly. Van Derslice [17] emphasized its high cost, limiting access for poorer households. Hu et al. [18] also raised concerns about plastic pollution. While bottled water offers convenience, regulation, recycling, and stronger public water systems are needed to ensure safer, sustainable alternatives.

### 3.2. To Make the Water Safer to Drink

**Table 2.**
Frequency Distribution of Respondents to Make the Water Safer to Drink.

| Item | Frequency | Percentage |
|---|---|---|
| 1. Boil it | 7 | 11.66 |
| 2. Add bleach or chlorine | 7 | 11.66 |
| 3. Improvised filter (cloth, sponge) | 19 | 31.66 |
| 4. Use a water filter (ceramic, sand) | 16 | 26.66 |
| 5. Let it stand and settle | 4 | 6.66 |
| 6. Others (From source to drinking containers) | 9 | 15 |
| Total | 60 | 100 |

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In this study, nineteen households (31.66%) reported using homemade filters, such as cloths or sponges, to make water safer for drinking. This low-cost method is common in resource-limited settings, as it reduces turbidity and removes larger particles. However, its effectiveness against microbial contamination is limited. Harris et al. [19] noted that filter performance depends on type and pathogen removal capacity, with ceramic or biosand filters being more effective than cloth. Colwell et al. [20] demonstrated that sari cloth filtration reduced cholera by straining plankton carrying *Vibrio cholerae*, a finding supported by Islam et al. [21]. Yet, Latif et al. [22] warned that cloth filtration without disinfection does not ensure microbiological safety. Similarly, Mebrahtu and Zerabruk [8] found such filters ineffective against *E. coli*, though widely used due to affordability.

To make the drinking water safer, sixteen (16) or 26.66 percent use water filters (sand, ceramic, etc.). This approach aligns with worldwide trends in domestic water treatment, where ceramic and biosand filters are extensively used because of their low cost, ease of use, and efficiency. According to Harris et al. [19], ceramic filters, particularly those enriched with silver impregnation, significantly outperform conventional filters in terms of antibacterial performance, providing a sustainable home solution. Similar to this, Ameta et al. [10] stressed that ceramic and biosand filters can effectively lower turbidity and microbiological contamination, but regular use and upkeep are necessary for their effectiveness.

There were seven households (11.66%) that treated their drinking water by boiling or adding bleach/chlorine, while four households (6.66%) left water to stand and settle. Sedimentation, or settling, can reduce turbidity but is ineffective against microbial pathogens, making it more suitable as a pre-treatment before filtration or disinfection [9, 10]. By contrast, the WHO endorses boiling and chlorination as effective point-of-use (POU) treatments. Boiling is highly effective against bacteria, viruses, and protozoa, though it consumes fuel and may cause indoor pollution [6]. Chlorination provides residual protection but is sometimes rejected due to taste and odor [22]. Empirical studies show boiling is widely adopted in resource-limited communities [8] while chlorination's effectiveness depends on affordability, availability, and proper dosing [7].

In this study, nine households (15%) reported taking no action to make their drinking water safer or to ensure safe transport. This is concerning, as untreated and poorly stored water exposes families to waterborne diseases. Clasen and Boisson [6] noted that many low- and middle-income households consume untreated water due to limited treatment options, lack of awareness, or perceptions of safety. WHO & UNICEF [5] stressed the importance of household water treatment and safe storage (HWTS) to reduce diarrheal illnesses. Sima and Elimelech [7] emphasized that cost, convenience, and social norms strongly influence treatment practices, with many families avoiding methods seen as unnecessary or time-consuming. Regional studies support these findings: Mebrahtu and Zerabruk [8] observed that untreated water use was linked to diarrheal outbreaks, while Okpara et al. [9] found that untreated water users face higher microbial contamination risks.

### *3.3. Types of the Toilet*

**Table 3.**
The Frequency and Percentage Distribution of Households' Types of Toilets.

| Item | Frequency | Percentage |
|---|---|---|
| 1. To the septic tank | 45 | 75 |
| 2. No facility, brush, or river | 15 | 10 |
| **Total** | **60** | **100** |

The findings reveal that 45 households (75%) used septic tanks, while some practiced open defecation in common or shared toilets without separation for men and women. WHO & UNICEF [5] affirm that septic tanks play a key role in reducing exposure to fecal pathogens and improving sanitation coverage. However, some households still use common or shared toilets without gender separation,

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reflecting gaps in safe and inclusive sanitation practices. Shared sanitation poses health and social risks, as these facilities are often overcrowded, poorly maintained, and linked to diarrheal and parasitic infections [23]. The lack of gender-segregated toilets further undermines privacy, dignity, and safety, especially for women [24]. Recent studies confirm that shared toilets carry higher contamination levels [25] and increase fecal–oral risks due to weak management systems [26]. Thus, while septic tank usage shows progress, equitable, safe, and gender-sensitive sanitation remains a pressing need.

A total of 15 households (10%) reported having no prescribed toilet facility, practicing open defecation in bushes, fields, or rivers. This condition reflects a critical sanitation gap that continues to threaten public health and environmental safety. According to Sclar et al. [27], open defecation is strongly linked to higher risks of diarrheal diseases, parasitic infections, and stunted child growth due to fecal contamination of water and soil. Similarly, Garn et al. [24] emphasized that communities practicing open defecation experience increased exposure to fecal–oral pathogens, undermining progress toward universal sanitation goals. WHO & UNICEF [5] further noted that the persistence of open defecation is often associated with poverty, lack of infrastructure, and cultural practices. These findings highlight the urgent need for inclusive sanitation programs that provide affordable, accessible, and context-sensitive toilet facilities to eliminate open defecation practices.

### *3.4. Level of Awareness on the Effect of Open Defecation*

**Table 4.**
Mean Distribution of the Level of Awareness on the Effect of the Open Defection.

| Statement | Mean | Description |
|---|---|---|
| 1. Practice whereby people go out into fields, bushes, forests, or open spaces rather than using a toilet to defecate. | 2.58 | Moderately Aware |
| 2. In urban areas, it is driven by a number of reasons, including a lack of space to build toilets in high-density settlements and tenants' unwillingness to invest in toilets where landlords do not provide them. | 2.42 | Moderately Aware |
| 3. Cause of acute bloody diarrhea cases and death. | 1.95 | Aware |
| 4. Cause of water-borne disease. | 1.56 | Aware |
| 5. Cause of public health problems | 1.50 | Aware |
| 6. Cause of high child mortality, as well as high levels of undernutrition. | 1.65 | Aware |
| 7. Cause of viral disease such as dengue. | | |
| Overall means | 1.93 | Aware |

The persistence of open defecation, particularly in rural and urban poor settings, continues to undermine global sanitation progress. Open defecation is commonly practiced in fields, bushes, or bodies of water due to a lack of household toilet facilities, aligning with the finding that awareness of this practice remains only moderate (mean = 2.58). In urban areas, awareness is also moderate (mean = 2.42), reflecting recognition of barriers such as lack of space in dense settlements and tenants' reluctance to invest in sanitation infrastructure when landlords do not provide toilets. According to Garn et al. [24], open defecation is strongly associated with poverty, insecure housing, and inadequate land tenure in both rural and peri-urban areas. Similarly, Tidwell et al. [23] noted that even when awareness is high, structural challenges such as tenancy arrangements and limited urban planning constrain sanitation adoption. WHO & UNICEF [5] further emphasize that sustained elimination of open defecation requires not only infrastructure provision but also policy reforms that address land tenure and rental housing inequities. These findings highlight that awareness alone is insufficient; enabling environments and inclusive urban sanitation strategies are crucial to eliminating open defecation.

The statements "Cause of acute bloody diarrhea cases and death," "Cause of waterborne diseases," "Cause of public health problems," "Cause of high child mortality," and "Cause of viral diseases such as dengue" obtained means of 1.95, 1.56, 1.50, 1.86, and 1.65, respectively, described as aware. In a cross-sectional survey in Tanzania, Mweya [28] found that while a majority had heard of dengue, fewer could

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associate specific waterborne or viral disease risks with unsafe water or poor sanitation. Similarly, Hamed [29] in Saudi Arabia, there is reports good general knowledge of dengue symptoms and risk factors, but a more limited understanding of its broader public health implications, such as mortality or links with other waterborne illnesses. The literature underscores that awareness alone does not reliably translate into action unless coupled with health education, infrastructure improvements, and risk communication strategies. For example, Ali et al. [30] studied dengue knowledge in urban Bangladesh and highlighted gaps in recognizing severe outcomes, despite frequent messaging.

### *3.5. Households Type of Bin*

**Table 5.**
The Frequency Distributions of the Households' Types of Bin.

| Item | Frequency | Percentage |
|---|---|---|
| 1. No storage-direct disposal to dump | 22 | 36.66 |
| 2. Rubbish bin/ drum | 16 | 26.66 |
| 3. Garbage bag/cellophane | 16 | 26.66 |
| 4. Cardboards | 6 | 10 |
| **Total** | **60** | **100** |

The table shows that the majority, or 36.66 percent, of households have no storage and dispose of their garbage directly at the dumping field. Improper waste disposal, such as dumping garbage directly at dumping fields or in open areas, is a pervasive problem in many low- and middle-income settings. A study in Bule Hora Town, Ethiopia, found that almost all households disposed of solid waste in open surfaces, along roadsides, or in streams, largely due to lack of formal disposal infrastructure and irregular collection services [31]. Similarly, research in Uganda (Lira City) identified that households without access to reliable waste collection often resort to disposing of waste in backyard pits, communal dumping sites, or open fields [32]. These practices are driven by several factors: lack of sufficient municipal services; cost and accessibility of private collectors; and low awareness or enforcement of proper disposal regulations.

A total of 16 households (26.66%) reported using rubbish bins, drums, and 16 households (26.66%) using garbage bags for waste storage, while 6 households (10%) relied on cardboard boxes. Research highlights that household waste storage practices are shaped by socio-economic conditions, urban infrastructure, and the availability of municipal services. In low- and middle-income settings, families commonly use accessible containers such as plastic bags, bins, or drums. Studies, such as one in urban Ghana, show that covered bins and drums contribute to better waste management outcomes by reducing litter, pests, and exposure to environmental hazards. Conversely, cardboard boxes, though used by some households, are less effective and pose risks of spillage, contamination, and pest infestation. Singh et al. [33] found this practice prevalent in lower-income households with limited-service access. To address these gaps, effective waste management strategies emphasize access to durable containers, subsidies for standardized bins, and education on proper storage and hygiene practices.

### *3.6. Dispose of Generated Waste*

**Table 6.**
The Frequency Distribution of Households' Disposal.

| Item | Frequency | Percentage |
|---|---|---|
| 1. Nearby home | 37 | 61.66 |
| 2. Open spaces | 15 | 25 |
| 3. River | 8 | 13.33 |
| **Total** | 60 | **100** |

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The table reveals that 61.66% of households disposed of waste near their homes, reflecting the absence of proper compost pits or dumping sites. Studies in low- and middle-income countries confirm that inadequate infrastructure often forces households to manage waste within or close to their residences. In Bule Hora Town, Ethiopia, 66.7% of households practiced poor waste disposal due to a lack of designated sites or communal containers, often storing or dumping waste at home [31]. Similarly, research in South Africa found that over half of households used non-designated spaces or burned waste because of limited municipal collection, high costs, and poor access to bins [34]. Accessibility, affordability, and awareness significantly influence waste disposal practices.

The findings show that 25% of households disposed of waste in open spaces, while 13.33% discarded it in rivers, reflecting a lack of proper waste disposal facilities. Studies across developing countries confirm that in the absence of formal collection systems, households often resort to dumping in open areas or water bodies. In Vhembe District, South Africa, many households disposed of refuse along roadsides, drains, and rivers due to limited municipal services and weak infrastructure [35]. Similarly, in Lira City, Uganda, households without access to collection sites dumped waste in drainage channels and waterways, especially during rainy seasons [32]. Such practices create environmental and health risks, underscoring the need for stronger infrastructure, accessible disposal sites, and community-based interventions.

### *3.7. Households Types of Waste*

**Table 7.**
Frequency Distribution of Household Types of Waste.

| Item | Frequency | Percentage |
|---|---|---|
| 1. Kitchen wastes | 30 | 50 |
| 2. Plastics | 24 | 30 |
| 3. Papers | 50 | 83.33 |

The data reveal that the majority, 83.33 percent, of household waste consists of paper. Meanwhile, thirty (30) or 50 percent of the waste comprises kitchen waste, and twenty-four (24) or 30 percent consists of plastics. Studies in developing and middle-income countries show that household waste is largely composed of organic materials, paper, and plastics. For instance, Win et al. [36] found that in Mandalay, kitchen waste made up over 80% of household refuse, followed by plastics (10.7%) and paper/cardboard (3.2%). Similarly, in Hanoi, Vietnam, food and garden waste accounted for about 78.9%, with paper and plastic comprising smaller yet notable shares [37]. These findings align with the present data, where paper products dominate household waste streams, with kitchen waste and plastics also forming substantial portions.

### *3.8. Households With or Without a Bin*

**Table 8.**
Frequency distribution of households with and without bins.

| Item | Frequency | Percentage |
|---|---|---|
| 1. With bin | 13 | 21.66 |
| 2. Without bin | 47 | 78.33 |
| **Total** | **60** | **100** |

The majority, or 78.33 percent, of the households had no trash bin or were without a bin. The data imply that the majority of the respondents had no trash bin in their house. This further indicates that the majority of the households lack knowledge of waste segregation and proper sanitation. Recent research highlights that the absence of household trash bins reflects limited knowledge of waste segregation and poor sanitation practices. In Addis Ababa, Ethiopia, Alemu et al. [38] found that over

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70% of households lacked designated bins, leading to indiscriminate disposal and weak segregation practices. Similarly, Ngalo and Thondhlana [34] reported that families in South African informal settlements often used open containers or discarded waste nearby, increasing environmental and health risks. These behaviors are linked to poverty, lack of awareness, and inadequate municipal services. Osei and Boateng [39] emphasized that affordable bins combined with education on segregation improve sanitation outcomes. Overall, the absence of bins underscores the need for integrated strategies involving infrastructure, community education, and stronger waste management systems.

### *3.9. Hand Washing and Tooth Brushing*

**Table 9.**
Mean Distribution of the Time Period of Respondents on Hand Washing.

| Statement | Mean | Description |
|---|---|---|
| 1. After using the toilet | 1.36 | Never |
| 2. After cleaning the baby's bottom after they have defecated | 1.53 | Rarely |
| 3. Before eating | 1.06 | Never |
| 4. Before feeding a child | 1.58 | Rarely |
| 5. Before cooking, cutting, or preparing food | 1.40 | Never |
| Overall Mean | 1.11 | Never |

Table 9 reveals critical gaps in personal hygiene among respondents. Findings show that they rarely wash their hands before feeding a child (mean = 1.58) and after cleaning a baby's bottom following defecation (mean = 1.53). Even more concerning, respondents reported never washing their hands after using the toilet (mean = 1.36) and before cooking, cutting, or preparing food (mean = 1.40). Additionally, data indicate limited knowledge and practice of personal hygiene.

Similar patterns are reflected in global research. Poor handwashing at critical moments, particularly before feeding a child or after cleaning a baby, remains widespread in low- and middle-income countries. Mekonen [40] found that only 28.5% of mothers in South Ethiopia washed their hands with soap after cleaning a child's bottom, with even fewer doing so before feeding. A 2024 meta-analysis by Sisay et al. [41] reported that only 43.18% of mothers practiced handwashing at critical times. Likewise, Shrestha et al. [42] in Nepal, inadequate handwashing after cleaning a baby's bottom is linked to higher risks of child undernutrition. These studies underscore the health consequences of poor hygiene practices.

**Table 10**.
Mean Distribution of Time Period of Respondents in Brushing their Teeth.

| Item | Frequency | Percentage |
|---|---|---|
| 1. Every morning | 1.95 | Rarely |
| 2. After eating breakfast | 1.48 | Never |
| 3. After eating lunch | 1.58 | Rarely |
| 4. After eating dinner | 1.45 | Never |
| Overall Mean | 1.61 | Rarely |

The table shows that respondents rarely brushed their teeth every morning (mean = 1.95) and after lunch (mean = 1.58), and never brushed after breakfast (mean = 1.48) or dinner (mean = 1.45). This indicates limited knowledge and weak adherence to proper oral hygiene, particularly brushing after the three major meals. Such practices highlight the need for interventions that strengthen awareness and promote habit formation in tooth brushing. Recent studies reflect similar patterns. In Fujian Province, China, Zheng et al. [43] reported that while 68.1% of respondents brushed twice daily, very few brushed after all meals. Deficiencies in brushing duration, floss use, and dental visits were also observed, influenced by age, gender, and education. Likewise, a 2025 survey in Saudi Arabia by Abogazalah et al. [44] found that only 15.8% brushed twice or more daily, with many brushing less than once per day. These findings confirm that brushing frequency is strongly linked to sociodemographic factors.

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**Table 11.**
Frequency Distribution of Areas Where Households Wash Their Hands.

| Item | Frequency | Percentage |
|---|---|---|
| 1. Kitchen | 38 | 3.33 |
| 2. Toilet | 37 | 61.66 |
| 3. Outside of the house | 28 | 46.66 |

The table shows that 38 households (63.33%) washed their hands in the kitchen, while 37 households (61.66%) did so inside the toilet where lavatories were built. A few households washed their hands outside the home. This indicates that most households lacked proper or designated areas for handwashing. Research highlights the importance of having accessible, fixed handwashing facilities, particularly near kitchens and toilets, as these locations strongly influence whether people wash hands at critical times O'Brien et al. [45]. Sharma et al. [46] found in Nepal that wealthier households are more likely to have permanent handwashing stations compared to poorer ones, who often lack such infrastructure. Similarly, Kamm et al. [47] reported that in western Kenya, although most households had soap, few had designated handwashing stations, limiting consistent hygiene practices. These findings suggest that the absence of proper facilities reduces effective hand hygiene and contributes to higher risks of preventable diseases.

## 4. Conclusions

This study revealed critical gaps in WASH practices among households in selected barangays of Maguindanao del Sur and Maguindanao del Norte. While most residents demonstrated awareness of the health risks associated with poor sanitation, this awareness did not consistently translate into safe practices. The reliance on piped water sources and improvised filtration methods highlights both progress and limitations in water safety. The high prevalence of households without toilet facilities underscores the persistence of open defecation and its associated risks. Similarly, inadequate waste management, absence of trash bins, and poor hygiene habits, such as infrequent tooth brushing, indicate systemic shortcomings. Overall, the findings emphasize the urgent need for comprehensive WASH interventions that integrate infrastructure provision, community education, and sustainable behavior change strategies to safeguard public health and promote environmental sanitation.

## 5. Recommendations

Based on the findings and conclusions of the study, the following are recommended:

1. Strengthen community education and behavior change campaigns.
- Launch intensive WASH education programs in barangays focusing on proper handwashing, regular tooth brushing, safe water handling, and the dangers of open defecation.
- Use culturally appropriate IEC (Information, Education, and Communication) materials, school-based programs, and peer facilitators to ensure messages are well understood and practiced.

2. Improve Sanitation Infrastructure
- Collaborate with local government units (LGUs) and NGOs to provide affordable and accessible toilet facilities to reduce open defecation.
- Encourage the construction of communal or household latrines with sustainable and low-cost technologies.

3. Enhance Water Safety Measures
- Strengthen monitoring of piped water systems and provide affordable household water treatment options such as chlorination, ceramic filters, or safe storage containers.
- Train households on simple and effective water filtration and boiling methods.

4. Promote Proper Waste Management
- Establish community-based waste collection and segregation systems, and distribute household trash bins to encourage proper disposal.

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- Organize barangay clean-up drives and incentivize recycling practices.

5. Institutionalize WASH Programs

- Integrate WASH interventions into local development plans, with regular monitoring by health workers and barangay officials.
- Partner with schools, health centers, and faith-based groups to sustain long-term hygiene practices and environmental sanitation.

## Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

## Copyright:



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