

Rural Resilience: A Comprehensive Study on Water Supply, Sanitation, Disease Patterns, and Hygiene Practices in Munshiganj, Bangladesh

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Abstract

This research project investigates the current status of water supply, sanitation, and hygiene practices in Munshiganj District, Bangladesh. Data collection involved a structured questionnaire and a reconnaissance survey. Findings reveal that 30% of individuals rely on surface water (hand-tube wells, rivers, and ponds), prioritized as canal > river > pond, while 70% depend on groundwater (subterranean electric motor, deep tube-well). Drinking water is generally sufficient, with 95% reporting adequacy throughout the year. About 45% use hand tube-well water, 28% use deep tube-well water, and 11% use supply tap water for various purposes. Bathing trends include underground water through electric motor > pond > hand tube-well water > river, while for cooking, the order is underground water through electric motor > pond > hand tube-well water > river. Toilet water supply ranks as supply tap water > hand tube-well water > deep tube-well water. Although sanitation awareness is high, some lack knowledge of good hygiene practices. After defecating, handwashing methods include soap, ash, soil, or water. Children's waste disposal varies, with some discarding it in open areas. Approximately 40% suffer from diseases like Diarrhoea due to unsafe water, primarily affecting children and elders. Training exists, but a significant portion lacks sanitation education. Dry skin or exposure to cold water may cause temporary irritation. Local government involvement in sanitation efforts is less active compared to non-governmental organizations. Results emphasize the need to enhance community awareness of safe water supplies and sanitation practices.

Keywords

Water Supply, Sanitation Practices, Hygiene Awareness, Groundwater Dependency, Community Health Intervention

1. Introduction

Due to the combined effects of rising living standards, economic development, and population growth, there is a rapid increase in the need for sanitary services and water supplies. There is continual budgetary pressure for more resource allocation to fulfill the growing demand for these services in both rural and urban areas because of their contributions to the economy and welfare as well as their political consequences. In Bangladesh, the previous few decades have seen remarkable progress in the fields of sanitation and water provision. Approximately 98% of rural pollinators and nearly all urban residents currently have access to water from taps, ring wells, or tubewells [1]. However, there are notable regional differences (such as lesser coverage in hilly and coastal areas) as well as differences in socioeconomic status. The widespread discovery of arsenic in tube well water from shallow aquifers is currently endangering the entire rural water supply program. A recent figure states that groundwater poisoning with arsenic affects 61 out of 64 districts, or 211 out of 460 Thanas. There is currently a 36-million-person projection that could be contaminated with arsenic. As a result, only roughly 80% of the population now has access to commercial water. The situation is anticipated to be significantly worse in the southern and northeastern districts due to the concentration of arsenic contamination in these areas. In the areas afflicted by arsenic, both the government and non-governmental organizations are pushing for alternate sources of water supply. As a result, a new trend in the water supply industry is emerging. It is necessary to assess how these modifications to the water supply industry will affect rural living [2]. The same physical problems also result from the additional effects of noise pollution, as we observed in a study on noise pollution in Gopalganj, Bangladesh [3].

Apart from arsenic, another issue impeding the advancement of safe water access is the infiltration of saline water into coastal areas elevated iron concentration issues in rocky and steep locations and a decline in the groundwater level during the dry season. The majority of these issues are local in origin and restrict access to clean water sources. For instance, if the present downward trend in the groundwater table persists [4].

Compared to the water supply sector, the sanitation industry is progressing far more slowly. The percentage of people who used sanitary latrines rose from 1% in 1971 to 16% in 1990 and almost 40% in 1997. Since 1993, the trend appears to have leveled off, with between 30 and 40 percent of people using sanitary latrines [5]. Based on the findings of a recent survey, 37 percent of households in rural areas and 71 percent of households in urban areas utilize sanitary la-

trines. According to the NGO Forum, only 9% of children under the age of five use hygienic latrines. It is necessary to assess the causes of the sanitation sector's stagnation [6]. As if people are affected due to sanitation, environment and damage are also affected. At the same time, another issue is that tobacco products cause environmental pollution, deforestation, Causes of climate change, and global warming. Growing and healing tobacco leaves deforest, while smoke, or environmental tobacco smoke, pollutes the indoor and outdoor environment [7].

The present research aims to address several specific objectives related to water supply, sanitation, health, and hygiene in a selected area. Firstly, the study seeks to evaluate the existing water supply problems and assess the extent of water supply coverage in the region. Additionally, it aims to examine the sanitation coverage to understand the prevailing sanitary conditions. The research also endeavors to identify the types of diseases affecting the rural population in the selected area, shedding light on health challenges faced by the community. Furthermore, an investigation into the current hygiene practices is undertaken to gain insights into the habits and behaviors that contribute to overall well-being. By focusing on these objectives, the research aims to provide a comprehensive understanding of the water, sanitation, health, and hygiene dynamics in the specified locality, contributing valuable insights for potential improvements and interventions.

2. Methodology

2.1. Study Area

Munshiganj, located in the Meghna River delta, was chosen for this study due to its size, location, and habitation type. Covering 1004 km² and divided into 67 union parishads, the region faces socio-economic challenges, with a predominantly subsistence-level population experiencing poverty, unemployment, and low literacy. Inadequate latrine conditions, marked by the deterioration of components like rings, slabs, and water seals due to subpar materials, contribute to unsanitary conditions, particularly impacting children's health. The selection of Munshiganj aims to shed light on these issues and guide potential interventions (see **Figure 1**).

2.2. Sampling and Methods

The research focused on Munshiganj district, selecting rural unions and employing simple random sampling to choose 20 villages for investigation. A total of 400 (Samples) homes were surveyed through household interviews, employing a questionnaire designed to align with the research objectives. The questionnaire covered various aspects, including water supply, cleanliness standards, and related topics, with an emphasis on clarity and understanding. Field surveys complemented the household interviews, providing insights into the actual situation, though acknowledging the potential for respondents to exhibit best practices.

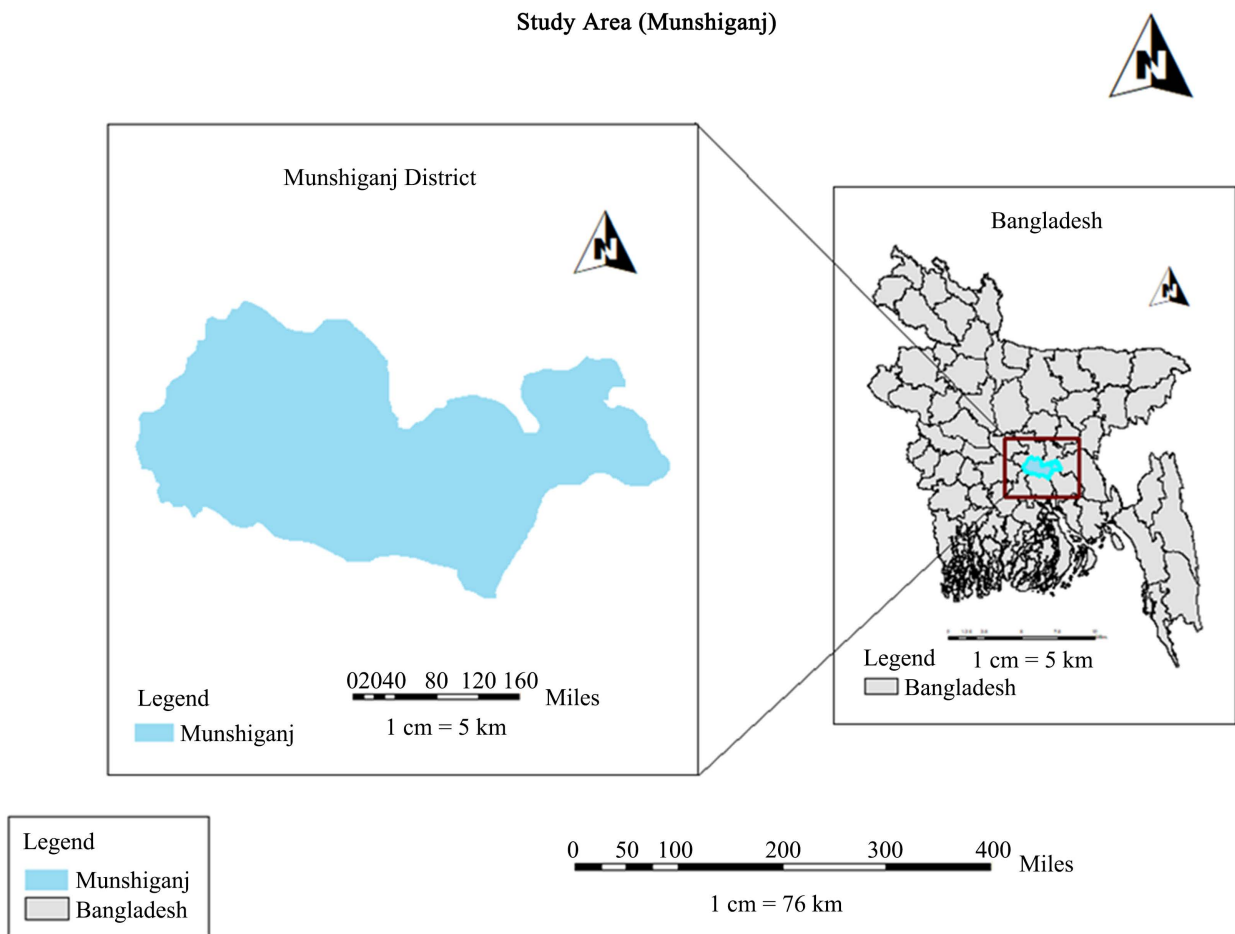


Figure 1. Study area Munshiganj district.

Additionally, a Focus Group Discussion was conducted to explore specific research questions, with participants selected based on relevant knowledge and experience. Observations during the survey period, recorded through non-participatory observation, offered additional insights. Secondary data collection involved utilizing official and non-official documents, including publications, research papers, and reports. Data processing and analysis utilized statistical software such as Microsoft Excel and IBM SPSS-26 ensuring the relevance, reliability, and validity of the results. The field survey design aimed to assess the environmental conditions, water supply, sanitary facilities, and health status in the coastal region, employing a questionnaire survey and non-participatory observation to gather data.

3. Results

3.1. Demographic Information

3.1.1. Age of the Respondents

Surveyed household respondents were categorized into three age groups: 22% aged 17 - 22, 61% aged 23 - 45, and 17% aged 45 and above; a majority displayed limited awareness of sanitation and hygiene practices (see **Table 1**).

Table 1. Age group of the respondent.

Age	Number of the Respondents	Percentage
17 Year - 22 Year	88	22%
23 Year - 45 Year	244	61%
Above 45 Year	68	17%

3.1.2. Educational Status of the Respondents

Table 2 indicates varied education levels among respondents (illiterate 34%, primary 22%, secondary 37%, higher secondary 7%), suggesting diverse knowledge backgrounds on water supply and sanitation in the study area.

3.1.3. Occupation of Respondents

The **Table 3** highlights household occupations: students (57%), housewives (26%), farmers (11%), and business (6%). The survey reveals high interest and cooperation from students, while housewives show less motivation to share detailed information on sanitation and hygiene practices.

3.2. Sanitation Facilities

3.2.1. Toilet Facilities of Households

Surveyed families predominantly use modern upgraded latrines 60%, followed by pit latrines 35%, and a minority resorting to open or hanging latrines 3% or water bodies 2%. Modern latrines reflect improved hygiene, while pit latrines are semi-improved. Awareness has reduced the use of low-improved latrines, and 82% of households have access to latrines, with 47% practicing clean usage (see **Figure 2**).

3.2.2. Sharing Toilet Facilities with Other Households

The **Figure 3** reveals that 40% of households share restrooms, while 60% do not.

3.2.3. Disposal of Children Feces

Figure 4 depicts children's feces disposal: 10% open defecation, 90% in public areas.

3.2.4. Frequency of Toilet Cleaning

Above **Figure 5** illustrates latrine cleaning habits: 60% weekly, 30% every 1.5 weeks, and 10% monthly.

3.3. Water Supply

3.3.1. Main Sources of Drinking Water

Figure 6 reveals primary drinking water sources: 80% underground water with electric motors, 20% hand-tube well water.

3.3.2. Main Sources of Household Water

Figure 7 above shows cooking water sources for studied homes: hand-tube wells (10%), electric motor wells (70%), rivers (5%), and ponds (15%).

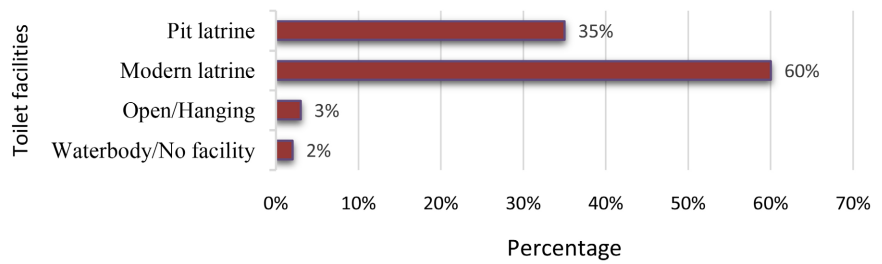


Figure 2. Toilet facility among surveyed households.

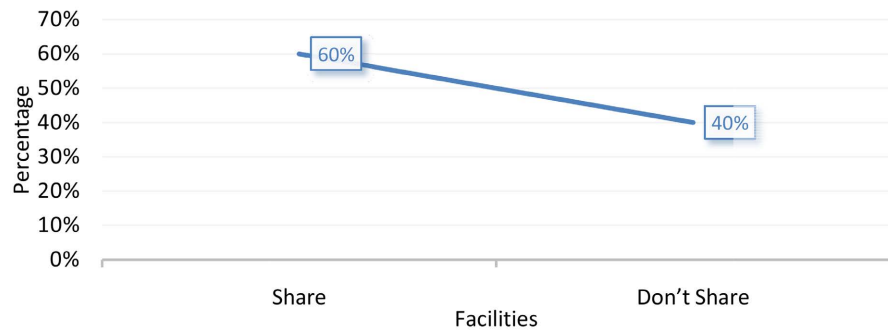


Figure 3. Sharing toilet facilities among surveyed households.

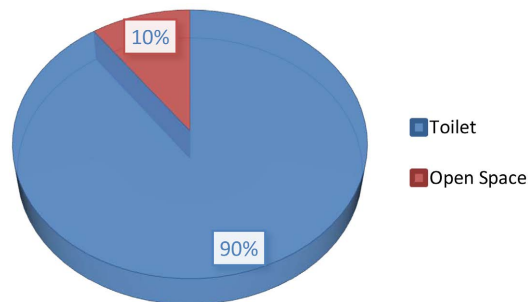


Figure 4. Disposal of children feces among surveyed households.

Table 2. Educational qualification of the respondents among surveyed households.

Educational Qualification	Number of Respondent	Percentage
Primary	88	22%
Secondary	148	37%
Higher Secondary	28	7%
Illiterate	136	34%

Table 3. Occupation of the respondents among surveyed households.

Occupations of Respondent	Number of Respondent	Percentage
Student	228	57%
Farmer	44	11%
Housewife	104	26%
Business	24	6%

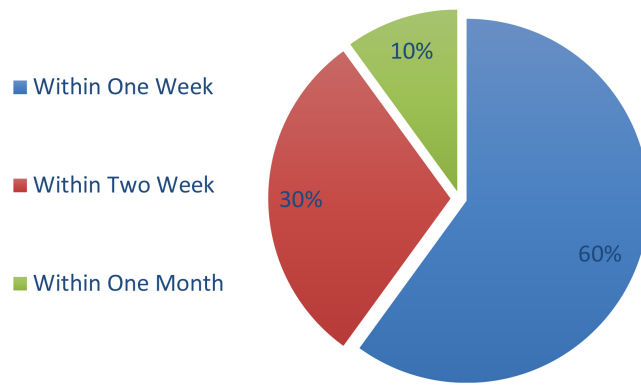


Figure 5. Frequency of toilet cleaning among surveyed households.

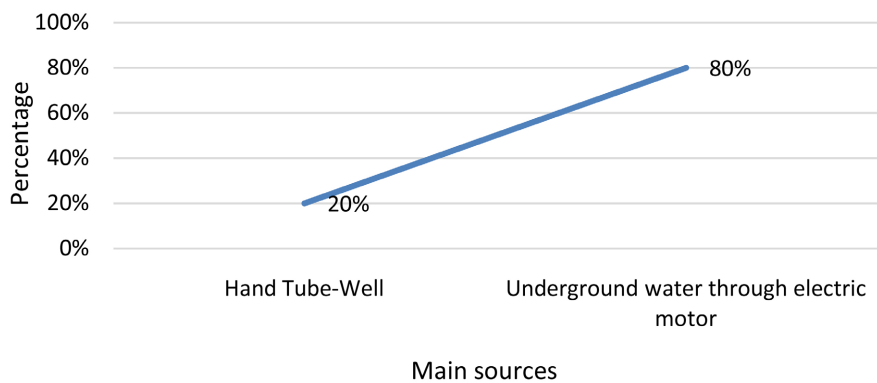


Figure 6. Main source of drinking water among surveyed households.

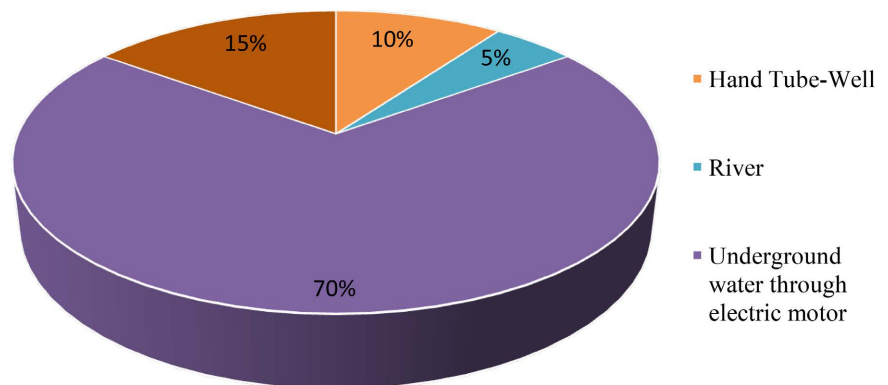


Figure 7. Main sources of household's water among surveyed.

3.3.3. Water Purification Materials

Residents primarily use hand-tube wells and rivers for drinking and cooking, necessitating water purification. Water filtration is the most common method (85%), followed by boiling (10%), and bleaching (5%) (see **Figure 8**).

3.3.4. Bathing Purpose

For bathing purpose, most used water is underground water through electric motor which is around 70%. Following that, only 20% water is being used from pond. Only 5% deep tube-well water is being used (see **Figure 9**).

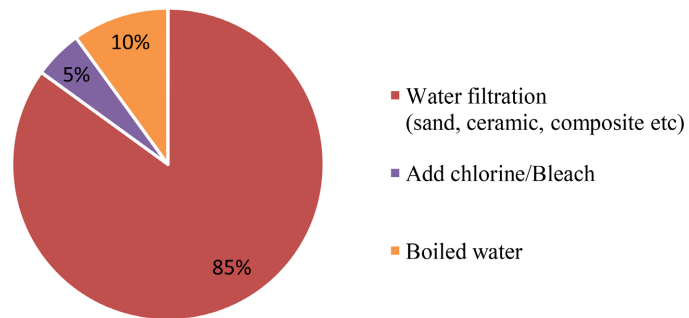


Figure 8. Purification materials are used for water among surveyed households.

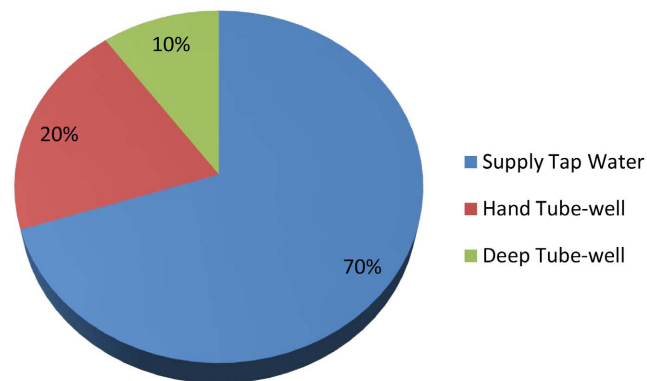


Figure 9. Bathing purpose.

3.4. Information about Hygiene

3.4.1. Washing Hands after Defecation

Above **Figure 10** indicates challenges in handwashing practices among respondents, with only 10% of members (children) consistently washing hands after defecation, highlighting a 90% non-compliance rate.

3.4.2. Materials for Hand Washing after Defecation

Figure 11 details post-defecation hand-cleansing items: 90% use soap, 5% ash, and 5% soil. Lower-class families predominantly use ash or soil, indicating low-quality hygiene, but increased awareness is contributing to gradual improvement.

3.4.3. Footwear Use in the Latrine

Above **Figure 12** illustrates Sandel usage in bathrooms, with 90% of members utilizing it, while 10% (children) do not, potentially contributing to childhood illnesses.

3.5. Information about Diseases

3.5.1. Water, Sanitation, and Hygiene Related Diseases

The **Figure 13** illustrates the impact of hygiene, sanitation, and drinking water-related illnesses on family members in the past year. Diarrheal disease accounts for 40% of illnesses, followed by skin diseases (25%), water-borne illnesses (30%), and miscellaneous illnesses (5%).

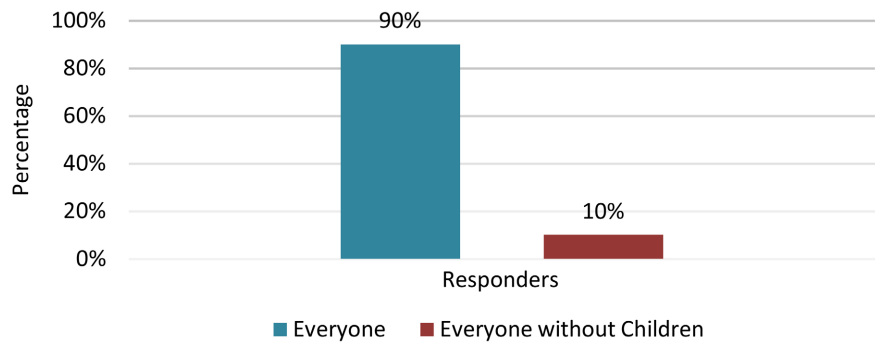


Figure 10. Washing hands after defecation among studied area.

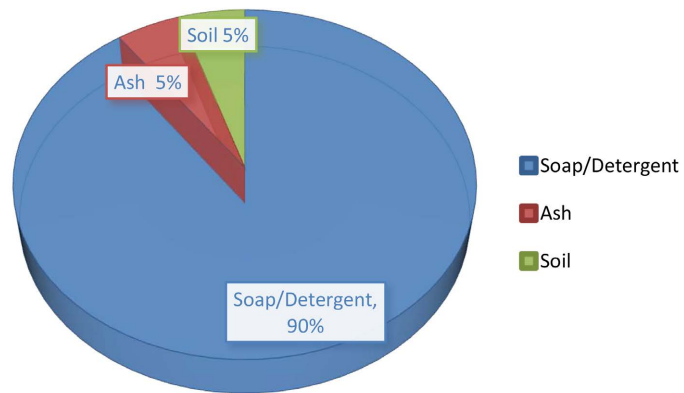


Figure 11. Hand washing materials are used after defecation among surveyed household.

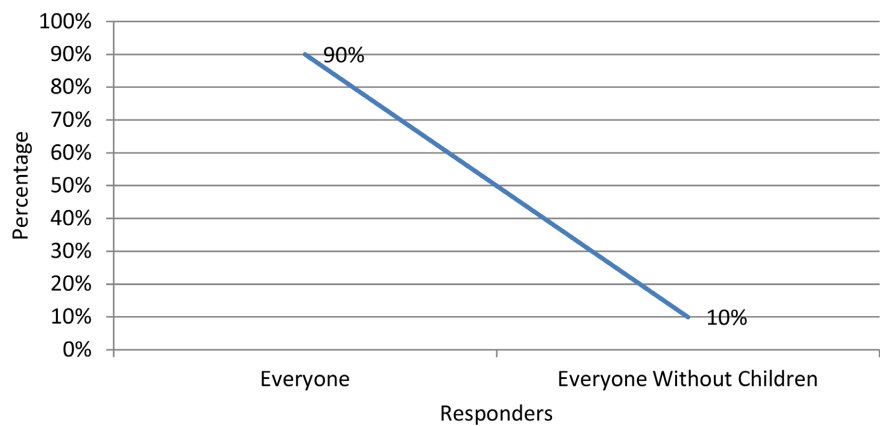


Figure 12. Footwear used in the latrine among surveyed household members.

3.5.2. Most Affected Person

Children, lacking hygiene awareness, are mainly impacted by water, sanitation, and hygiene-related illnesses due to inconsistent handwashing and hygiene habits (see **Figure 14**).

3.5.3. Main Causes of Diarrhoea

The primary cause of sickness, according to respondents, is poor hygiene habits, identified by 80%, followed by food poisoning at 15%, and other causes at 5% (see **Figure 15**).

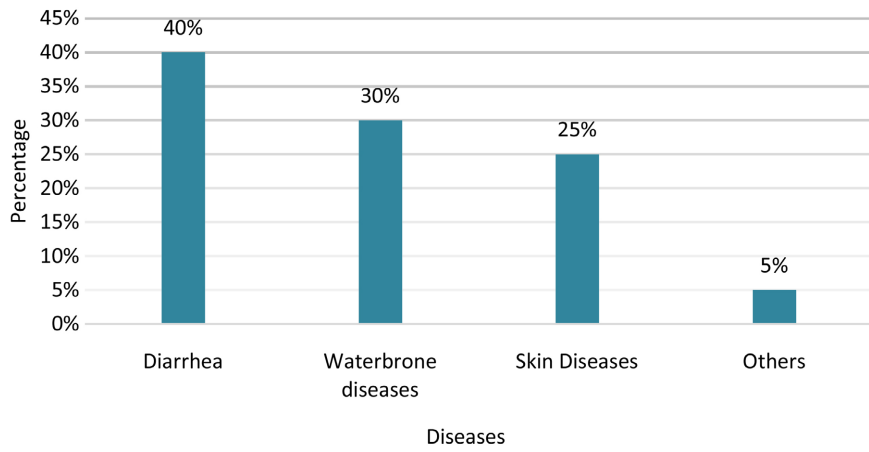


Figure 13. Water, sanitation and hygiene related diseases.

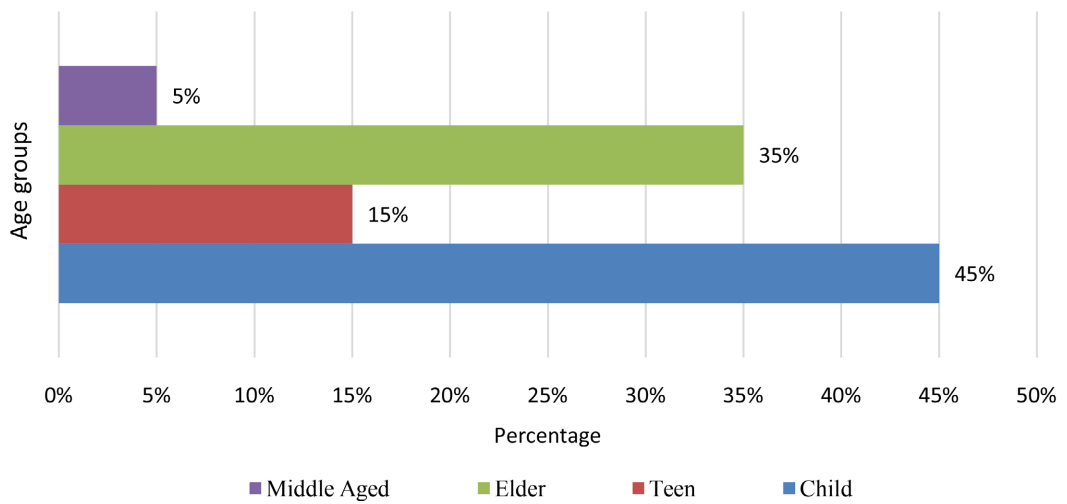


Figure 14. Percentage of affected members among surveyed household.

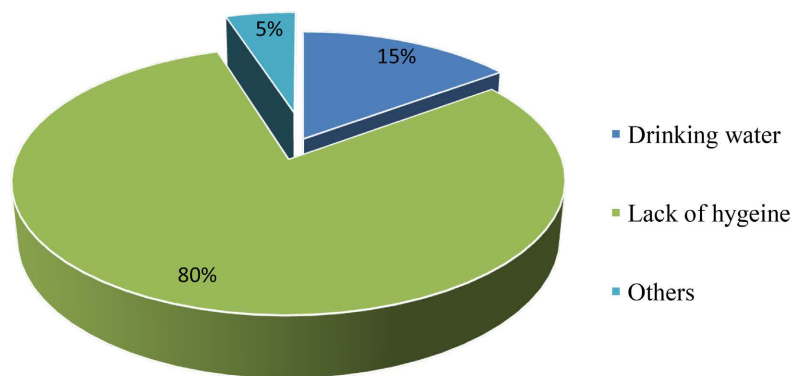


Figure 15. According to respondent’s main causes of Diarrhoea.

3.5.4. Main Causes of Skin Diseases

Water-related issues are identified as the primary cause of skin illnesses by 65% of respondents, followed by poor hygiene habits at 25%, and other factors at 10%, according to the data in figure (see **Figure 16**).

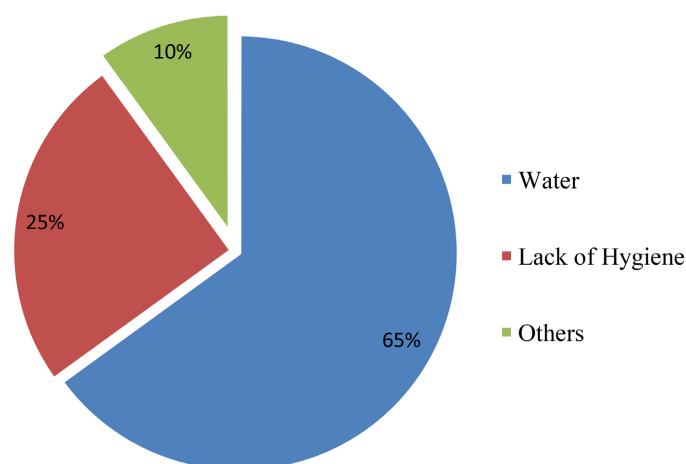


Figure 16. According to respondents' main causes of skin diseases.

4. Discussion

The findings of this research shed light on the current state of water supply, sanitation, and hygiene practices in Munshiganj District, Bangladesh. The predominance of reliance on groundwater sources, particularly subterranean electric motor and deep tube-wells, by 70% of the population indicates a significant dependence on these sources for daily water needs. This aligns with previous studies highlighting the widespread use of groundwater in Bangladesh due to its accessibility and presumed safety [8]. The preference for surface water among 30% of individuals, with canals being the most prioritized source, underscores the diversity in water sources within the region. The hierarchy of preferences, canal > river > pond, may be attributed to factors such as proximity, perceived water quality, or ease of access. This highlights the complex decision-making process individuals undertake when selecting their water sources [9].

The overall adequacy of drinking water reported by 95% of the respondents throughout the year is a positive indication of the region's water availability. However, the disparity in water sources for various purposes, such as hand tube-well water being predominantly used for bathing and cooking, raises questions about the allocation and distribution of water resources for different needs. Similar variations in water source preferences for different purposes have been noted in other studies [10]. The hygiene practices revealed in the study indicate a relatively high level of awareness regarding sanitation, as evidenced by the varied handwashing methods employed after defecation. However, the presence of individuals using ash, soil, or water instead of soap suggests gaps in knowledge or access to proper hygiene resources. This aligns with studies emphasizing the importance of hygiene education to bridge these gaps [11].

The prevalence of diseases like Diarrhoea affecting approximately 40% of the population, particularly children and elders, due to unsafe water underscores the urgent need for interventions to improve water quality. Similar health implications associated with unsafe water sources have been extensively documented, emphasizing the broader public health implications [12]. The limited involve-

ment of local government in sanitation efforts, as compared to non-governmental organizations, indicates a potential area for policy improvement and increased government initiatives. Collaborative efforts between governmental and non-governmental entities have shown promise in enhancing water and sanitation infrastructure in various contexts [13].

5. Conclusion

In summary, the field survey conducted in Munshiganj District, Bangladesh, uncovered significant challenges regarding access to safe water and sanitation for many households in the area. Although there has been progress in providing water sources like tube wells and piped water, a considerable number of households still lack access to safe drinking water. While most households have sanitary latrines, the proper disposal of fecal matter and the maintenance of hygienic practices are areas of concern. The survey also highlighted the need for increased awareness and education on the importance of safe water and sanitation practices, especially among children and in schools. Addressing these challenges will require a collaborative effort involving government agencies, NGOs, and local communities to enhance infrastructure, raise awareness, and promote healthy behaviors. Through coordinated action, it is feasible to ensure that all households in Munshiganj District enjoy access to safe water and sanitation, contributing to a healthier and more prosperous future.

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Author Contributions

All co-authors have been involved in all stages of this study while preparing the final version. They all agree with the results and conclusions.

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Conflicts of Interest

The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate

Not applicable.

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