

Water, Sanitation and Hygiene Conditions, and Health Outcomes: A Comparative Study Between Rohingya Refugees and Local People in Southeastern Bangladesh

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ABSTRACT: Bangladesh is now the home to 1.3 million Rohingya refugees living in the southeastern part of the country, specially following the massive violence in Rakhine state, Myanmar since August 2017. Water, sanitation, and an unhygienic situation have left the entire region the worst affected and most vulnerable, ultimately placing pressure on the health sector. This study assessed water, sanitation, and hygiene (WASH) conditions; and explored associated health outcomes, drawing empirical data from Kutupalong-Balukhali Rohingya refugee camp and its surrounding areas in south-eastern Bangladesh. To determine the WASH condition and associated health outcomes, we conducted 200 structured interviews (with both refugees and local residents), three focus group discussions, and two informal interviews with local physicians. The values of drinking water, sanitation, and hand washing ladders indicate that WASH conditions in both refugee camps and surrounding localities were basic to limited. Respondents believed that due to increasing heat and basic to limited WASH conditions, people suffer from many diseases such as diarrhea, heat rash, dehydration, dysentery, and pneumonia. As reported diseases are related to WASH, it is important to increase awareness among people about the significance of WASH.

Keywords: Rohingya Refugee; Local People; Public Health; WASH; Diseases

INTRODUCTION

The *Rohingya*, an ethnic minority in the Arakan province of Myanmar, is one of the most forgotten and the world's largest stateless communities (Mahmood et al., 2017; UNHCR, 2018). They carry an extensive and untold history of ethnic cleansing with exposure to human rights violations and systematic discrimination (Milton et al., 2017; Connolly et al., 2004). This has led to recurrent cycles of forced mass displacement between Myanmar, Bangladesh, and other neighboring

Southeast Asian countries since the early 1980s (Beyrer and Kamarulzaman, 2017; Tay et al., 2019). Among them, the most notable and history's largest refugee influx took place in August 2017, when around 750,000 Rohingya refugees crossed the *Naf River* (a bordering river between Myanmar and Bangladesh) and entered Cox's Bazar district in Bangladesh (BBC News, 2018). The clearance of a vast number of refugee populations, forest covers, and vegetated lands has threatened wildlife habitat and the natural settings of hilly lands in Kutupalong and Nayapara regions of the Ukhiya sub-district (Mukul et al., 2019; Rahman, 2019; Hassan et al., 2018; Imtiaz, 2018; UNDP Bangladesh and UN Women Bangladesh, 2018). The Forest Department of Cox's Bazar reported that the Rohingyas have encroached on an estimated 5013 acres of forestland,

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with this number increasing daily (Hussain, 2018). Furthermore, the unfavorable living conditions in the hastily constructed camps have serious implications for the refugees' health. Limited water, sanitation, and hygiene (WASH) access to refugees creates rapid transmission of infectious diseases such as diarrhea (Phillips et al., 2015). Refugees live in a congested manner with little access to pure drinking water, and sanitation may play a crucial role in spreading various communicable diseases such as cholera, dysentery, and respiratory infection (Connolly et al., 2004; Poumadere et al., 2005; Hajat et al., 2010).

According to Pocock et al. (2017), Rohingya refugees in Bangladesh face serious health risks from various sources that require proper attention. The congested nature of the camps, lack of access to pure drinking water, poor sanitation, hygiene maintenance, malnutrition, low vaccination coverage, and lack of awareness play a vital role in their health problems (Islam and Nuzhath, 2018; Inter-Sector Coordination Group, 2018; White, 2017; Tay et al., 2019). These vulnerable refugees are increasingly experiencing public health disasters due to various infectious diseases (Ahmed et al., 2018). Acute respiratory infections, watery diarrhea, measles, tuberculosis, malaria, diphtheria, and dengue eczema are widely reported diseases in the refugees' camps (Arie, 2019; Summers et al., 2018). Moreover, the situation in camps becomes more challenging in monsoon season (May–September) as seasonal floods submerge toilets and tube wells, which increases the chances of spreading water-borne diseases (Ahmed et al., 2018; Bangladesh Water Development Board, 2014; Chan et al., 2018; UNHCR, 2018).

In Bangladesh, several studies have been conducted on the public health of Rohingya refugees. Islam and Nuzhath (2018) studied refugees' health risks and reported that the massive size and unplanned nature of camps put refugees under serious health stress. Other studies (e.g., Summers et al., 2018; Ahmed et al., 2018; Chan et al., 2018; Pocock et al., 2017; Milton et al., 2017) reported nutritional status, natural hazards, availability of drinking water, sanitation, hygiene, and associated health problems. These studies focused only on refugees and did not look at the problems of local

people. Various problems, including diseases, may also affect the host communities adjacent to refugee camps (Connolly et al., 2004). There have been no previous studies that compare the health issues of refugees and local people. This study has the potential to bridge these gaps by investigating the WASH-induced health problems faced by both refugees and local residents. This study aimed to clarify the state of WASH in Kutupalong-Balukhali refugee camp and its surrounding area, and to explore the occurrence of WASH-related diseases among Rohingya refugees and the local population.

MATERIALS AND METHODS

Study Area

Southeast Bangladesh is home to the Kutupalong-Balukhali Rohingya refugee camp and its surrounding areas. Apart from these areas, Hakimpura, Jamtoli, Bagghona, and Chakmarkul have been considered study areas. Though Rohingyas live in refugee camps, local residents live outside of them. The researchers selected these areas based on their accessibility and convenience. The area of this study lies between 21°07'30"N to 21°14'00"N latitude and 92°03'00"E to 92°10'30"E longitude. Figure 1 shows the map of the study area.

This is a hilly area covered with sub-tropical forests. The mean temperature ranges from 14.9°C to 27°C, with an average annual rainfall of 4411mm (BBS, 2011). Kutupalong Refugee Camp is one of the world's largest refugee camps. It existed in this region since 1991 and became hugely populated after the 2017 influx. The population of the study area is around 800,000 individuals, concluding both hosts (BBS, 2011) and refugees (Inter Sector Coordination Group, 2018). Kutupalong-Balukhali accommodates the majority of refugees across all refugee camps in the Ukhia and Teknaf regions. The construction of makeshift camps and other infrastructure, along with the habitation of these large populations, has resulted in environmental degradation. This degraded environment is, in turn, adversely affecting the health of communities living in the area (Rahman and Paul, 2022).

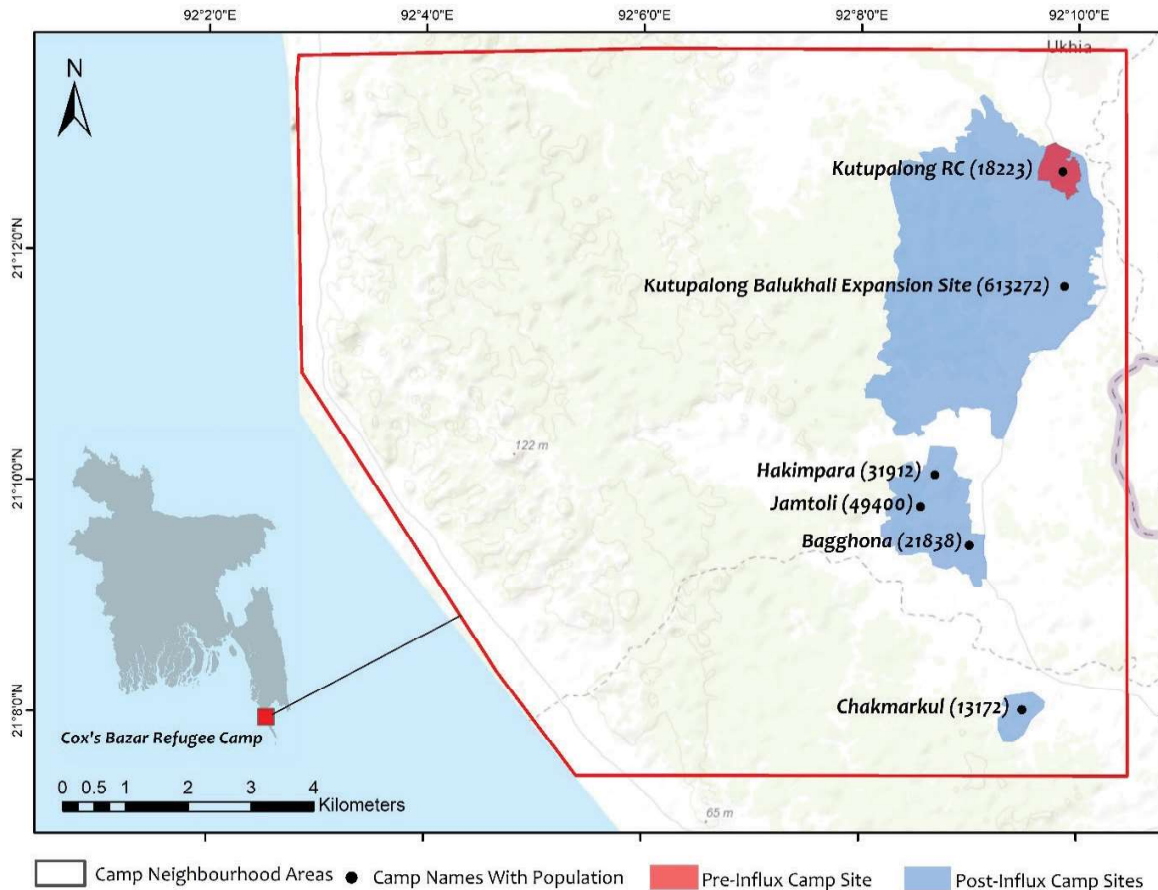


Figure 1: Map of the Study Area

Data Collection and Analysis

This study used both primary and secondary data. We collected primary data through questionnaires and focus group discussions (FGD). We collected secondary data for this study from various sources. We conducted the fieldwork for the social survey in the winter, specifically between October 6 and 14, 2022, and February 9 and 13, 2023. Fieldwork consisted of household interviews using a pre-tested, semi-structured questionnaire, personal observation, group discussion, and key informant interviews with health workers. The questionnaire contained respondents' socio-economic information, their perceptions of temperature change, induced health problems, and WASH status. Despite the conservative attitude of the respondents, we completed a total of 200 interviews, involving 124 refugees and 76 local people, with a confidence level of 95% and a confidence interval of $\pm 7\%$ (Phillips et al., 2015). Most respondents, including both refugees and local residents,

expressed reluctance to participate in interviews about their health issues. We prepared the questionnaires in English but conducted the interviews in the *Chittagonian* language. Both refugees and local people are familiar with the *Chittagonian* language (a local dialect). We selected respondents from Kutupalong and Balukhali refugee camps using convenient random sampling. We have widely used this sampling method for a large population where respondents are easily accessible (Etikan, 2016). We developed WASH-related questions based on the work of Nahimana et al. (2017), Phillips et al. (2015), and Mahamud et al. (2012). WASH practice-related questions included water source, storing and transportation method, handwashing behavior after toilet and before eating food, soap availability, sanitation type, and practice. For the respondents, we observed the types and distances of water sources, sanitation types and conditions, and the availability of hygiene facilities. We recorded the self-reported health issues, symptoms, and seasonal variations of all respondents'

family members. The interviewer briefly described the study's objectives before each interview began and ensured the respondents' verbal consent. Each interview took approximately 30–35 minutes to complete. We recorded both male and female members' health issues and symptoms in detail during the interviews. Although it was difficult to manage female respondents from both groups for this survey, researchers tried to hear both male and female voices equally. However, we conducted three group discussions with 6–8 local people and NGO workers to identify correlations between various factors and diseases before and after the recent refugee influx. We also conducted two key informant interviews with physicians from Gonoshasthaya Kendra (GK) and Kutupalong Refugee Health Unit (KRHU) within the camp to cross-check self-reported health issues and their relations with increased temperature, water, sanitation, and hygiene. We sequentially processed and analyzed the questionnaires after collecting the data. We estimated the percentages of responses and conducted Chi square tests using R studio to establish a correlation between socio-demography, WASH-related attributes, and respondents' responses. We analyzed qualitative data using the Grounded Theory (GT) method, emphasizing various coding and analysis strategies such as description, classification, and establishing connections between data. Finally, we prepared individual service ladders for water, sanitation, and hygiene using indicators from WHO/UNICEF (2016). The ethical review committee of Cox's Bazar Medical College, Bangladesh, reviewed and approved this research (Memo No. CMC/ECC/2021/437).

RESULTS

The refugees live in an emergency-like situation that is low quality and unhealthy. They are living in makeshift tents in hugely overcrowded settlements with overflowing latrines and contaminated water. The living conditions in the Rohingya refugee camps are very congested and poor in terms of access to water, sanitation, and hygiene (WASH). However, other environmental threats in and around the Rohingya refugee camps, such as falling groundwater levels, an increase in land surface temperature, and massive vegetation loss due to camp expansion, pose health risks. People believe that the increasing land surface temperature and WASH situation in the camps and their surrounding areas have caused many communicable and non-communicable diseases.

Socio-Economic Profile of the Respondents

Both female and male respondents who were available took part in the interviews. All respondents were over 18 years old, so they had sufficient understanding about water, sanitation, hygiene, and WASH-induced health risks. For both locals and refugees, almost half of the respondents were male, but most of them were 18–50 years old. More than 85% of the respondents were married, and for the majority of them, household size varied from 4 to 6. About half of the total respondents did not receive any education, and most of them were refugees (62.5%). Most of the refugees were unemployed (49.19%), while the local residents were mostly businessmen (47.37%).

Water: Sources and Quality

Numerous water-related challenges are prevalent in the Rohingya refugee neighborhoods, particularly related to water source locations, water quality, and storage techniques. Regarding water source, most of the local people's (88% respondents) main source of water was a water pump, while refugees could collect water from deep tube-wells (48%), supplied water (32%), and shallow tube-wells (19%) (Table 1). Respondents commented that water flow from shallow tube wells during dry months was very low, so they suffered from water scarcity. One of the female respondents stated,

'Our daily lives are getting harder. My family owns a tube well, but it remains dry during the entire winter. We can't take a bath regularly. We struggle to use enough water while defecating. We have to collect water from our neighbors to drink and cook'.

Respondents who were using water pumps also claimed that sometimes they get reddish water, probably due to iron, which is not suitable for drinking. On the other hand, the refugees draw water from deep tubewells and supply it for drinking purposes. Generally, the camp installs one shallow tubewell for 15 to 20 households. However, the water from those tubewells is not suitable for consumption. One of the refugee respondents said,

'The depth of these tube-wells is only 50 ft. These sources produce water that is neither clean nor suitable for drinking. We have to fetch drinking water from a distance.'

They mentioned that only water from deep tube wells

is safe for drinking. Moreover, they primarily use the water from shallow tube wells for household, cleaning, and bathing purposes. But there were only a few deep tube wells installed in the refugee camps. Table 1 describes the water situation.

Respondents classified water quality into three categories: poor, moderate, and good. For 63.16% of local respondents, water quality was fairly good, and for refugees (45.16%), it was moderately good. Nearly one-fifth of local residents and one-third of refugees reported that water quality was poor because of the presence of iron, dust, or other contaminants in the water. How we store water also affects its quality. Open storage exposes the water to various contaminants and bacteria, potentially leading to various human diseases

(Roberts et al., 2001). The majority of respondents use water pitchers for storage, but about 75% of them, both refugees and local residents, do not clean their water storage pots every day. About 28% of respondents commented that it took more than 30 minutes to fetch water from the nearest water source. This increases the risk of water contamination during transportation and storage. The JMP (Joint Monitoring Program for Water Supply and Sanitation) initiated the ‘drinking and sanitation service ladder’ to monitor equitable and adequate sanitation access for all (WHO and UNICEF, 2016). Based on this ladder, we can categorize more than 50% of the water sources in the study areas as limited and basic in terms of accessibility and purity.

Table 1: Water Use Status in the Study Area

Variables		Local	Refugee
Water Source ($X^2 = 167.1$, Df = 3, $P < 0.001$)	Deep tube well	0.00	48.39
	Water pump motor	88.16	0.00
	Shallow tube well	11.84	19.35
	Supplied water	0.00	32.26
Water Quality ($X^2 = 40.341$, Df = 2, $P < 0.001$)	Poor	21.05	35.48
	Moderate	15.79	45.16
	Fairly good	63.16	19.35
Storing Method ($X^2 = 57.96$, Df = 3, $P < 0.001$)	Bucket	1.32	24.19
	Jug	5.26	36.29
	Pitcher	92.11	39.52
	Tank	1.32	0.00
Associated Problems ($X^2 = 9.2548$, Df = 3, $P < 0.01$)	Faulty machine	0.00	5.65
	Less availability	53.95	19.35
	None	28.95	65.32
	Presence of iron	17.11	9.68
Collection Time	<30min	71.05	71.77
	>30min	28.95	28.23
Weekly Clean Storage	Once/week	22.37	25.81
	2-3times/week	28.95	34.68
	4-6times/week	23.68	14.52
	Everyday	25.00	25.00
Drinking Water Ladder	Limited	28.95	28.23
	Basic	28.95	26.61
	Safely managed	42.11	45.16

(Source: Field work, 2023)

Sanitation: Types and Facilities

The Sustainable Development Goal (SDG) 6 aims to achieve safe sanitation and hygiene for all and put an end to open defecation. Besides, adequate sanitation for excreta disposal can reduce diarrheal disease, typhoid fever, vector-borne disease, and scabies (Connolly *et al.*, 2004). Table 2 shows the sanitation status of the refugees and local people in Kutupalong and Balukhali refugee camps, as well as their surrounding areas. We found that all latrines in the refugee camps are semi-pacca (100%), while the majority of local people use pacca (82.89%). According to the respondents' opinions and the researchers' observations, the sanitation quality in the refugee camps ranged from very poor to moderate, while 75% of the sanitation in the surrounding local areas was considered good. We carefully observed the latrines' excreta disposal facilities to determine whether they were hygienically separated from human

contact or not. We observed an improvement in the excreta disposal facilities in most latrines, with rates of 94.74% and 79.84% among local residents and refugee camps, respectively. However, most of the respondents said that they do not clean their latrines every week. Respondents also reported that refugee camps and local residents shared all latrines with more than five households. Brooks *et al.* (2003) found that sharing a latrine with more than three households increases the risk of infectious diseases like diarrhea and cholera. We estimated a sanitation ladder based on the excreta disposal facility, whether shared or not, and found that all refugees (100%) have limited sanitation access, while 56.58% of local residents safely manage sanitation facilities. This demonstrates that refugees are highly vulnerable to health risks due to a lack of proper sanitation facilities.

Table 2: Respondents' Perceptions of Sanitation Status in the Study Areas. We Measured the Quality of Sanitation Based on Personal Observation

Variables		Local	Refugee
Sanitation Type ($X^2 = 187.57$, Df = 3, $P < .001$)	No Toilet	3.95	0.00
	Kaccha	9.21	0.00
	Semi-Pacca	3.95	100.00
	Pacca	82.89	0.00
Sanitation Quality ($X^2 = 130.71$, Df = 3, $P < .001$)	Very Poor	7.89	20.16
	Poor	7.89	39.52
	Moderate	9.21	40.32
	Good	75.00	0.00
Disposal Facility ($X^2 = 7.28$, Df = 1, $P < .01$)	Improved	94.74	79.84
	Unimproved	5.26	20.16
Frequency of cleaning latrine	Not in a week	48.68	54.03
	Once a week	1.32	39.52
	2-3 times/week	5.26	6.45
	Everyday	44.74	0.00
Sanitation Ladder ($X^2 = 120.69$, Df = 4, $P < 0.001$)	Open Defecation	3.95	0.00
	Unimproved	9.21	0.00
	Limited	28.95	100.00
	Basic	1.32	0.00
	Safely Managed	56.58	0.00

*Kacha = made of low-quality materials, Pacca = concrete floor, wall and roof, Semi-pacca = only the floor is concrete.

(Source: Field work, 2023)

Hygiene Practice

Poor hygiene facilities and practices lead to the spread of many communicable diseases, such as diarrhea (Ersel, 2015; Phillips *et al.*, 2015). Table 3 presents the results of hygiene practices in the studied areas. Though most refugees and locals bathe daily, some do not. Hand washing with soap and water is one of the core indicators of all hygiene practices to achieve SDG 6.2 targets (WHO and UNICEF, 2016). Most of the respondents (refugee 82%, local 93%) reported that they wash hands with soap after toilets, and they commented that NGOs and outreach workers continuously inspire them for proper hygiene maintenance. About fifty percent of respondents used toilets barefoot because they could not afford to buy footwear. More than 67% respondents

in both study groups reported that they do not put soap near the latrine. On the other hand, we found that 35% refugee and 26% local people do not keep water pot near the latrine. We prepared a hand washing ladder, modeled after the ‘JMP service ladder’, to illustrate the hand washing facilities available for each household. We classified households with a soap and water hand wash facility as “basic hygiene facilities,” and those without a soap or water facility as “limited facilities” (WHO and UNICEF, 2016). The estimated hand washing ladder indicates that 55.26% of local residents and 61.29% of refugees had limited hygienic facilities. Respondents who did not practice proper hygiene were susceptible to a wide range of diseases.

Table 3: Hygiene Status of the Respondents

Variables		Local	Refugee
Daily Bath ($X^2 = 9.4055$, Df = 1, $P < .01$)	No	14.47	35.48
	Yes	85.53	64.52
Hand Washing After Toilet ($X^2 = 4.1177$, Df = 1, $P > .05$)	No	6.58	17.74
	Yes	93.42	82.26
Foot ware For Latrine ($X^2 = 7.0699$, Df = 1, $P < .05$)	No	43.42	63.71
	Yes	56.58	36.29
Soap Presence Near Latrine	No	67.11	70.97
	Yes	32.89	29.03
Water Pot Presence Near Latrine	No	35.53	26.61
	Yes	64.47	73.39
Hand washing Ladder	Basic	21.05	19.35
	Limited	55.26	61.29
	No facility	23.68	19.35

(Source: Field work, 2023)

Self-Reported Disease Prevalence

Following WHO (2018), respondents’ self-reported diseases were categorized into four classes (Table 4): skin disease, waterborne disease, Respiratory Tract Infection (RTI), and miscellaneous diseases. The notable diseases reported by refugees are diarrhea (43%), heat rash (37.1%), dysentery (29.77%), dehydration (27.27%), pneumonia (27.58%), asthma (24.63%), and itching (22.55%). On the other hand, local people

reported that diarrhea (26%), dehydration (18.79%), and dysentery (17.13%) are common diseases. During the survey, a middle-aged Rohingya woman stated,

‘I’ve been suffering from skin disease for the last two years. I think I got this disease from my next-door neighbor. When the temperature rises, it causes terrible itching. At first, it started in between my fingers, then slowly spread to my whole body.’

Respondents reported that during seasonal changes, they (mostly children and old people) suffer from RTI. A doctor in the Refugee Health Unit, Kutupalong, stated,

‘We receive more RTI cases when the season changes, especially at the beginning of summer or winter. Because of an unhealthy

lifestyle, diarrheal diseases persist throughout the year among children.’

On the other hand, local respondents commented in a FGD that after the influx of refugees, the number of RTI patients has increased due to environmental pollution.

Table 4: Diseases Grouped into Four Categories (Skin, Waterborne, Respiratory and Others) among the Refugees and Local Residents. The Correlation of the Diseases with Their Corresponding Factors are Included in the “Remarks” Section

Type	Disease	Local	Refugee	Remarks
Skin	Ring worm	5.35	8.79	In the group discussions, the participants made it clear that these diseases are caused by the excess heat that they are facing. Refugees and local residents who have been living prior to the recent influx commented that heat increased substantially after the influx period, and these reported diseases have increased as well. The interviewed physicians said that unhygienic conditions and increasing heat are major contributors to these skin diseases.
	Psoriasis	5.53	12.71	
	Abscess	5.84	9.39	
	Eczema	11.70	15.40	
	Itching	8.71	22.55	
	Scabies	10.21	25.4	
	Infection	2.37	13.39	
	Heat rash	15.0	37.12	
	Pox	4.71	0.77	
	Exfoliative Dermatitis	3.66	13.85	
Waterborne	Diarrhea	26.0	43.0	Participants in group discussions agreed that poor water quality is the prime cause of waterborne diseases. They mentioned that in the summer months, due to increased heat, the number of waterborne diseases increases. The doctors who were interviewed suggested that these diseases worsen during the monsoonal months.
	Typhoid	9.13	18.39	
	Dysentery	17.13	29.77	
	Cholera	1.58	6.50	
Respiratory	Cough	12.05	17.77	In group discussions, the participants implied that dust pollution was responsible for their respiratory problems. The interviewed doctors proposed a potential link between seasonal variations and this type of disease.
	Pneumonia	8.53	27.58	
	Asthma	7.29	24.63	
	Bronchitis	3.13	9.00	
Others	Abdominal pain	2.37	4.63	
	Fever	15.68	18.50	
	Headache	12.79	21.55	
	Dehydration	18.79	27.77	
	Body pain	0.00	3.47	
	Dizziness	3.79	7.77	
	Pressure	1.32	0.39	
	Weakness	0.00	1.94	
	Jaundice	4.00	12.77	
Tonsil	1.58	4.00		

DISCUSSION

The health of refugees and their adjacent people is at high risk due to unsafe water, poor sanitation, and poor hygiene both in the refugee camps and their neighborhoods. The living conditions in the Rohingya refugee camps and their neighborhood are very congested and poor in terms of access to water, sanitation, and hygiene (WASH). Some studies (Chan et al., 2018; Hossain et al., 2019; Summers et al., 2018; Islam and Nuzhath, 2018; Paul et al., 2022) found that poor hygiene and nutritional status, lack of access to safe water, food, and sanitation, overcrowding, inadequate access to vaccination, and health needs are fueling various diseases among Rohingya refugees. However, other environmental threats linked to health risks in the Rohingya refugee camps include falling ground water level, an increase in land surface temperature, and massive vegetation loss due to camp expansion (Rashid et al., 2020; Rahman and Paul, 2022). The present research shows that many respondents cannot afford safe drinking water from deep tubewells. Reports indicate that the water quality was poor due to the presence of iron, dust, or other contaminants. According to the respondents' opinions and the research team's observations, the sanitation quality was extremely poor, particularly in refugee camps, where the majority of respondents reported not cleaning their latrines on a weekly basis. Most of the respondents believe that water source scarcity, poor drainage, and a lack of effective sanitation facilities, particularly insufficient latrines, are the primary causes of waterborne and infectious diseases.

Unsafe water, poor housing conditions, and poor sanitation in the region cause many tropical diseases. Diarrhea and outbreaks of cholera, malaria, dengue fever, diphtheria, etc. are very common in the Rohingya camp area and its surroundings. Moreover, the incidence of water-borne diseases usually rises during the monsoon season (Hossain et al., 2019). Chan et al. (2018) found that due to poor nutritional status, water, food, and sanitation, the refugees are suffering from various diseases such as acute respiratory infections, measles, tuberculosis, hepatitis A, hepatitis E, cholera, bloody diarrhea, typhoid, and so on. White (2017) mentioned that cases of dehydration, diarrhea, and respiratory tract infection are the major causes of morbidities, which closely correlate with water, sanitation, and hygiene (WASH). According to Islam and Nuzhath (2018), the refugees are suffering from various diseases due to shortages of food, inadequate access to health needs,

an unhygienic situation, and proper accommodation facilities.

The data reveals that the majority of the camps and surrounding neighborhoods are located in an unhygienic environment. Many of them think that most residents have physical health problems and that diseases are mostly caused by an unhygienic environment. People are living in refugee camps and in heavily populated settlements nearby. Conditions in this area are woefully unhealthy, with overflowing latrines and contaminated water. These camps become the 'breeding ground' for many diseases, especially infectious ones. Skin diseases such as ringworm, abscess, eczema, itching, scabies, heat rash, pox, infection, etc. are the most common communicable diseases among refugees and local residents. A good number of respondents, including health workers, mentioned that seasonal flu and respiratory diseases like cough, pneumonia, asthma, and bronchitis are also common in the whole area. The hilly location of the refugee camps leads to an abundance of mosquitoes, which are the primary cause of parasitic diseases. Unhygienic environments primarily influence colds, coughs, and high fevers. Both refugees and local residents think that contaminated water and dirty latrines cause waterborne diseases like diarrhea, typhoid, dysentery, cholera, etc., which are very common in the refugee camps and their neighboring areas. In the rainy season, these types of diseases spread quickly. The doctors who were interviewed stated that these diseases intensify during the monsoonal months. The respondents also identified poor bathing conditions as a threat to their health. Some respondents indicated that they exhibit symptoms of jaundice, commonly referred to as a 'yellow disease'. Their skin, eyes, and urine become yellowish while they face this disease. Health care workers think that water and food contamination are responsible for jaundice. During the Focus Group Discussion (FGD), both refugees and local residents identified their tiny dwelling spaces as significant risk factors for disease occurrence. Moreover, the present research shows that refugees and local residents think that their health risk has increased more than before.

CONCLUSIONS

The objectives of this study were to examine the status of WASH and the occurrence of related diseases among the Rohingya and local respondents in the Kutupalong-Balukhali refugee camp. Findings show that refugees

have limited access to pure drinking water, proper hygiene maintenance, and sanitation, which ultimately exacerbates the health risk of people residing in the camps and surrounding areas. Unhygienic and overcrowded refugee camps are affecting not only the physical wellbeing of the refugees but also the residents. A lack of clean water, sanitary facilities, and unhygienic conditions have led to the spread of numerous infectious or contagious diseases in both the camps and their neighboring localities. In order to improve the WASH conditions and public health, we recommend ensuring easy access to pure drinking water, sanitation, and maintenance of hygienic practices. Increasing people's understanding of the importance of WASH is also crucial. Since this study was conducted in a specific camp with only 200 respondents, we suggest further studies across different refugee camps and surrounding localities to understand the comprehensive situation of WASH and its associated effects on public health.

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