

Healthcare Capabilities in Disasters and Spatial-social Inequalities: A Case Study of Nijhum Dwip (Island) of Bangladesh

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ABSTRACT: This study examines the health and healthcare accessibility of locals on the remote island of Nijhum Dwip under Noakhali district of Bangladesh. The research employed a multi-strategy methodology, using diverse methods: a household survey (sample size of 118), three focus group discussions (FGDs), five key informant interviews (KIIs), and observational techniques to collect data from ten villages in Nijhum Dwip. Data analysis indicates that 70.4% of Nijhum Dwip people acquire medications from drugstores without consulting a physician and around one-fourth (25.5%) of the respondents have access to governmental or private healthcare services, and 4.1% of them consult *Kabiraj*. A significant proportion (84.7%) of childbirth takes place with the involvement of untrained midwives. In Nijhum Dwip, 79.4% of the population is living in poverty, deterring their ability to afford fundamental medical care (which exceeds USD 13 per treatment) and costly transportation (each journey about USD 26). Merely 66.3% of residents can get access to medical facilities during cyclones; of them, only 18.1% seek treatment at healthcare centres, while 81.9% procure drugs without contacting a physician. The research highlights two primary determinants of healthcare access in Nijhum Dwip: spatial disparities and disasters, both necessitating targeted intervention to enhance the health and wellbeing of local people. So, it is crucial to construct healthcare centers in Nijhum Dwip so that residents would not have to travel far to receive medical care. To lessen the effects of disasters and the island's spatial-social inequality, more roads, cyclone centers and educational facilities should be built.

Keywords: Spatial Inequality; Health; Healthcare; Poverty; Women

INTRODUCTION

The consequences of disasters on the healthcare system are severe. Understanding disaster effects on healthcare infrastructure is crucial for preparedness and response. Disasters may cause healthcare provider attrition in places which lead to significantly impaired healthcare services and leaving people exposed to medical emergencies with restricted access to medical care. Disasters increase medical needs due to physiological harm, acute diseases, and psychological distress (Shoaf and Rotiman, 2000; Leaning and Guha-Sapir, 2013). However, the presence of social inequalities has been found to be a contributing factor to heightened susceptibility to disasters (Donner and Rodríguez, 2008); disproportionately affecting economically disadvantaged and medically underserved persons, especially in rural areas (Davis et al., 2010). Rural

hospitals need enough capacity and community-wide response plan to natural and human-induced disasters (Manley et al., 2006). The scholarly work of Francescutti et al., (2017) brings to light the arduous obstacles that healthcare systems encounter when attempting to address the medical requirements of communities in the aftermath of calamitous events. This is especially true when healthcare facilities are compelled to shut down and evacuate due to the severity of the disaster. However, the health outcomes of the affected population are frequently negatively impacted when this emergency response is overlooked. This phenomenon has been extensively studied and documented by Francescutti et al. (2017). Powell et al. (2020) have highlighted the severe consequences of limited access to healthcare services during and after a disaster. It is essential to comprehend the effects of catastrophes on healthcare infrastructure to formulate effective plans for disaster planning and response. Francescutti et al. (2017) and Madanian and Parry (2021) underscores the critical importance of healthcare systems being equipped with the necessary resources and capabilities to effectively respond to catastrophic events, while also gleaning

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valuable insights from previous occurrences. There exist eleven distinct themes that exert a significant impact on the management of healthcare services during times of disaster (Pourhosseini et al., 2015). The issues encompass, but are not limited to, the administration of human resources, the distribution and utilization of resources, and the coordination of activities across various organisations engaged in disaster response. The health capacity of disaster-prone populations must be evaluated, and measures should be implemented to enhance conditions throughout both disaster and non-disaster periods (Sen 1999 in Wells, 2024).

Nevertheless, disasters have the potential to exacerbate pre-existing social inequalities within communities (Tierney, 2006; Benevolenza and DeRigne, 2019; Paul and Rahman, 2006). Individuals from low-income groups, marginalised populations, and minority communities have a greater possibility of severe consequences due to their limited access to resources, infrastructure, and support systems. Previous research has indicated that in the aftermath of disasters, there is a tendency for relief and recovery resources to be distributed unequally, thereby exacerbating pre-existing social disparities (Aldrich, 2010; Amarasiri de Silva, 2009). The aftermath of Hurricane Katrina in the United States revealed that the recovery process was more arduous for disadvantaged communities as compared to affluent neighborhoods. This observation underscores the correlation between disasters and social inequalities (Kroll-Smith, 2018).

The favelas, or informal settlements, located in Rio de Janeiro and São Paulo, Brazil, are frequently situated in high-risk areas and experience disproportionate impacts during floods and landslides (Listo & Vieira, 2012; Ardaya et al., 2017). In India, marginalized communities, namely Dalits and Adivasis, face an increased risk of disaster impacts due to their disadvantaged social position and limited access to resources (Mendes, 2017). Furthermore, gender disparities can heighten women's vulnerability to the adverse effects of calamities, as they often encounter unique challenges related to mobility, access to essential provisions, and decision-making authority (Cannon, 2002; Vickery, 2018).

The coastal areas of Bangladesh are highly vulnerable to natural hazards (Brammer, 2014; Shameem et al., 2014; Hossain et al., 2012). Various disasters are responsible for increasing social inequalities among the disaster-hit

society and affecting their health care access (Rezwana, 2018). For example, marginalized communities residing on Hatiya Island of coastal Bangladesh encounter inequitable disaster vulnerabilities during cyclones. This is attributed to their restricted resources, substandard living conditions, limited transportation and insufficient healthcare accessibility (Mallick et al., 2011; Khan, 2008). The observed disparities serve to reinforce existing social inequalities. Moreover, the impact of disasters is most severe on vulnerable communities, as it affects their livelihoods and income (Alamgir et al., 2021). The post-disaster recovery phase has been observed to result in uneven distribution of resources and aid, which can contribute to the widening of economic inequalities. Again, the absence of access to these fundamental resources is a contributing factor to economic disparities and exacerbates social inequalities. Disasters significantly affect the educational system on Hatiya Island (Parvin et al., 2008).

Juran and Trivedi (2015) reveal that gender inequalities are still prevalent on Hatiya Island, specifically in relation to access to education and employment opportunities. During times of disaster, it has been observed that women and girls are subjected to unique challenges that are not experienced by their male counterparts. These challenges include heightened vulnerability to gender-based violence, restricted mobility, and limited access to healthcare services (Paul and Rahman, 2006). There is a tendency to neglect women's health requirements, and the availability of reproductive healthcare facilities may be restricted in the aftermath of calamities (Juran and Trivedi, 2015). The unequal treatments facilities are observed in this context have the potential to worsen pre-existing health disparities.

The number of existing research on islands in Bangladesh is scarce. Especially, inter-relation of disasters, health and social inequalities has not received proper attention yet. However, it is absolutely essential to address the underlying spatial and social inequalities to improve crisis management and increase healthcare access in islands. This study attempts to examine the effects of disasters, such as cyclones, on the healthcare conditions of the island, while enduring prevailing spatial and social inequalities. To achieve these aims, this research establishes the following objectives: 1. to analyze the impacts of disasters on pre-existing spatial and social inequalities (locational inequality, poverty and gender disparity) in the study area. 2. to assess factors affecting

healthcare accessibility in disasters, and 3. to analyze the relationship among disasters, spatial and social inequalities, and healthcare access.

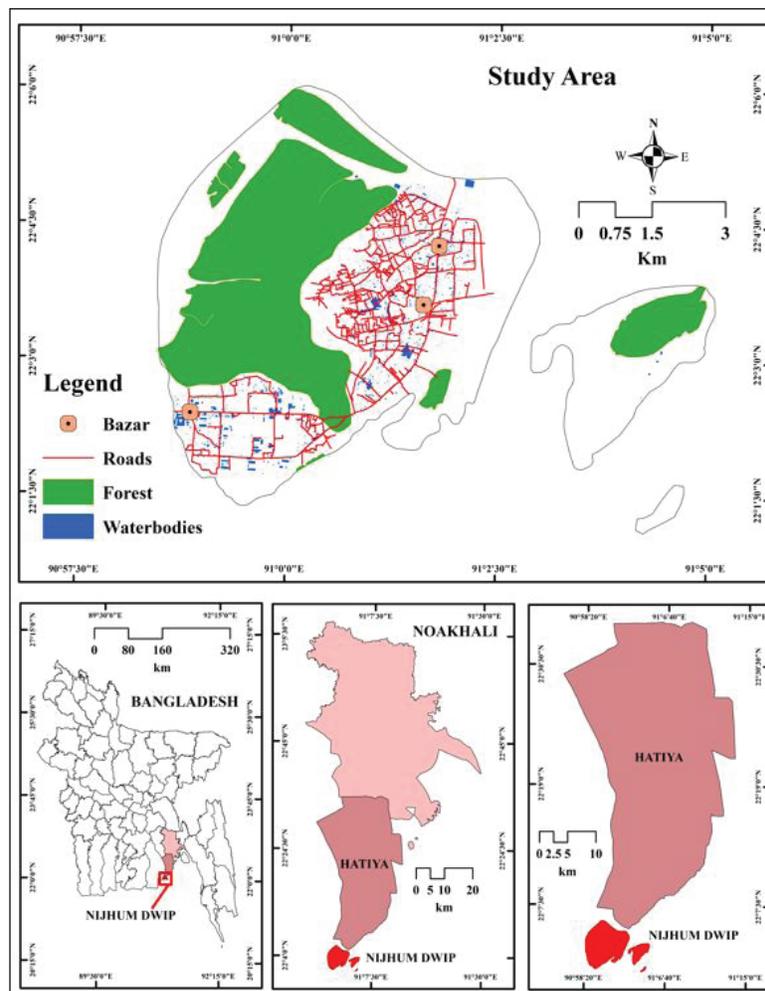
MATERIAL AND METHODS

Study Area

The present study was Nijhum Dwip, a remote island, of Hatiya Upazila under the Noakhali district of Bangladesh (Fig. 1). Hatiya Upazila has been identified as one of Bangladesh’s most disaster-prone upazilas due to its geographical location and poor socioeconomic condition (GoB, 2017). This upazila covers an area of 1507.35 square kilometers (BBS, 2011).

Nijhum Dwip is host to an important selection of wildlife and biodiversity that falls under the authority

of Hatiya Upazila (BirdLife International, 2021). The Island is bordered by the Bay of Bengal in the south and west, with the Damar Char and the Meghna River to the east and Hatiya Island to the north. The Island is approximately two meters above sea level (Saha et al., 2014). Physiographically, the present area is located in the active delta (Rashid 2019). Along with neighboring landmasses, this island was formed by sedimentation carried by the Ganges, Brahmaputra, and Meghna rivers of Bangladesh (Goodbred and Kuehl, 2000). The Nijhum Dwip Union has a total area of 40,141 square kilometers and a total of 2,464 households. The population of the Nijhum Dwip union is 12,796 with a density of 79 individuals per square kilometer (Kumar and Luna, 2018).



Source: Developed by the authors

Figure 1: Location of Nijhum Dwip in Bangladesh

Disasters in the Study Area

Hatiya has suffered severe cyclones and storm surges throughout several years, including 1960, 1961, 1970, 1985, 1991, 1994, 1997, 1998, and 2007 (Parvin et al., 2008). A substantial flood and storm surge occurred on the island during the 1960s (Das, 2017). This event persisted for duration of 22 days and resulted in extensive devastation to both the local economy and the physical infrastructure. The Upazila Administration report (2005) estimated that since its independence in 1971, Bangladesh has seen over 130,000 fatalities due to cyclones and storm surges. In 1970, a cyclone event resulted in the tragic deaths of around 10,000 individuals within a span of one night. Notably, it was observed that 80 % of the fatalities were comprised of women and children, aged 43 and below. In 1991, there was another significant cyclone that led to the loss of around 6,000 lives, with more than half of the fatalities being women (DUS, 2016). According to Islam (2015), disasters resulted in significant harm to human settlements, as well as the loss of livestock and damage to crops. There are five flood shelters and 117 cyclone shelters in Hatiya Upazila (BBS, 2022). The number of healthcare centers is very low in this Upazila while the inhabitants of Nijhum Dwip face various challenges in accessing essential healthcare services as a result of the island's geographical location. They need to cross river to visit healthcare centers as there is only one women and children private clinic located in this island which does not treat any emergency case of treatment. The socioeconomic status of the majority of individuals is expected to fall short in meeting their healthcare requirements which may increase social disparity.

Research Methods

The study followed a multi-strategy research methodology to fulfill the aim and objectives. Both

qualitative and quantitative techniques were applied to collect data from the field in 2022, which encompasses methods like household surveys, Focus Group Discussions (FGDs), in-depth interviews and field observations. In addition to primary data, secondary data was collected from many sources, including local and national government offices, published publications, journal articles, and official reports.

Sampling and Respondents

A simple random sampling method was undertaken for conducting the present survey. A total of 118 households of different villages (Namar Bazar, Batayon, Bashundhora, Chayabithi, Anondo, Agomoni, Jugantor, Dhanshiri, Shurjodoy and Purbachol) of Nijhum Dwip were surveyed for the purpose of the present study. The sample size of 118 households for this study was determined using Statistical formula (Raosoft.com, 2023): Margin of error 7%, Confidence level 95%, and Response rate 80%, while the total household number of this island is 1913 (BBS 2011).

To get in-depth information on the concerned issues, five key informants (KIIs) were interviewed. These include the union council chairman, a local political leader, a school teacher, a community leader and a local knowledgeable person. KIIs were beneficial when understanding the inter-relationship among disasters, social inequalities and healthcare access. Additionally, three FGDs were undertaken to ascertain the overall situation of the population in the research area (Table 1).

Here, it should be noted that each participant gave their verbal consent and was free to withdraw from the survey at any time. This paper does not reveal any names or identities, and the data was stored securely.

Table 1: FGD Details

FGD No. and Place	No. of Participants	Participants
1.Namar Bazar	8	Union Council Chairman, businessmen, local knowledgeable person, community leader (local <i>matabbor</i>), <i>Imam</i> (who leads Muslim worshiper in prayers)
2. Maa-Moni Clinic	8	Women Union Council member, housewife, businessman
3.Namar Bazar	12	Fishermen

Data Analysis

Collected household survey data was analyzed with Statistical Packages for Social Sciences (SPSS). This software helped to apply the chosen statistical method: Chi square test, to identify the relationship among different variables. Qualitative analysis method: thematic analysis was performed to derive results from KIIs and FGDs. Observation was also a very important method which helped to discern the issues from the field. All these methods assisted to complete triangulation to address the research questions.

RESULTS

Spatial and Social Inequalities in Nijhum Dwip

According to Morrill (2001) spatial inequality refers to the uneven distribution of residents' (individual to societal) well-being across space. It includes not only uneven physical environment utility, but also significant disparities in access to resources, rights and rewards. Following Morrill's concept on spatial inequality, Nijhum Dwip's spatial inequalities are explained in the following paragraphs.

Nijhum Dwip is located in the Bay of Bengal with no direct road connection to the mainland. There is only one road, which is in poor state that runs from North to South of this island. People have to cross rivers by local boats to reach the neighboring land. There is no general healthcare center (except a Women and Child private clinic) for 1913 households on this island which shows a sharp disparity with the rest of the nation's doctor patient ratio; 8.3 doctors per 10,000 people in 2023 (DGHS, 2024). During emergencies, the patients have to leave the island in auto rickshaw, auto van and local boats to receive proper treatment outside the island which brings great sufferings to the patients. However, even this form of access halts during cyclones. The patient suffers with health problems and injuries for days. This island has only one school for the local children while there is no higher education institution here. Lack of educational institutions, poverty, gender disparity and tradition put the locals in a challenging situation to get higher education facilities. There is no employment opportunity on this island except fishing and farming. However, these sectors are infected with corruption and power politics which creates a strong interpersonal economic disparity among residents followed by spatial

inequality (Lessmann 2011). For being located at the south-end of Bangladesh, this island experiences spatial and social inequalities almost in all aspects.

Economic Conditions and Social Disparities and Inequality

Economic Conditions

Fishing is the most common occupation of the Nijhum Dwip residents (71.5 %). Only 16 % of them are involved in farming and 12.5 % are businessmen. Most of the residents of Nijhum Dwip, 64.5 % earn less than 250 USD monthly, 31.8 percent earn within 250 USD to 430 USD, and only 3.7 % earn more than 430 USD. About 79.4 % of the total respondents are living below USD 2.15 per person per day. Again, 35.5 % of the total residents of this island have taken loans. Unemployment is considerable with 19 % of the respondents having no occupation or being temporarily unemployed due to disaster impacts such as losing fishing nets and boats during cyclones or fishing tools are getting ceased, as they were not able to pay up installments of loans from the *Dadons* (businessmen). They mostly take loans from *Dadons* or relatives. *Dadon* is the money lending process at the individual level in the communities. Every loan comes with a high interest rate. For example, an amount of BDT 100,000 is required to be paid within a one-year timeframe, resulting in a total sum of BDT 130,000.

The majority of the fishermen are very poor because they work as labourers under the fishing businessmen (*Mahajan*) who own big fishing boats. This island is ruled by some powerful individuals: wealthy *Mahajan*, *Dadons* and local political leaders. The impoverished are exploited in a variety of ways. Fishermen at the individual level cannot export their fish outside the island as the state of the road system is very poor. The individuals engage in regular transactions wherein they offer the fish they caught to members of a syndicate at a discounted rate. Fishermen who take loans for the *Dadon* (money lenders) are obligated to sell the fish to them at a low price. They do not receive the expected rates of the fish. According to the residents, *Dadons* connive together to keep the road in a poor condition so that they can exploit the poor fishermen who do not have boats and fishing nets. If these roads improve, they may be able to sell them to markets at a good profit. In the farming sector, the sharecroppers who do

not have land of their own also face discriminations. The landowner receives 50% of the money from selling the crops while the farmer receives 50%, and have to bear all the related expenses. These situations enhanced frustration and fear among the farmers and fishermen. Similar social inequalities were elaborately discussed in Suza and team's research on Hatiya Island in 2024. Exploitive power dynamics among small-scale farmers and moneylenders, artisanal fishers and *Mahajan*, as well as fishers and coastguards, have led to increasing discontent, social conflicts, and grievances. Understanding the relationship between climate change and conflict requires putting social and political factors first, as well as structural limitations like healthcare and education (Suza et al. 2024).

House Types and Ownerships

In Nijhum Dwip, 78 percent of the inhabitants live in *kutch*a houses, showing the precarious situation in which they exist. The *kutch*a houses are made of tin, wood and straw. *Pucca* structures (made of cement and bricks) are almost negligible in frequency, with only 6 percent of the houses being *pucca*. Nearly three-fourths of the respondents own their housing. However, given the fact that the vast majority of the respondents live in *Kutch*a houses (78 percent), ownership of their housing is not as much of an asset as it may seem (Hossain et.al., 2008). Nearly 85 percent of the households have access to sanitary toilets and all households use tube wells for drinking water purposes.

A total of 84.5 percent of respondents have access to electricity since 67.3 percent of all respondents use solar power and 17.3 percent rely on alternative sources (using chargeable devices and charging it in the marketplace or neighboring households that have a solar connection or share a line to light up one bulb in their house). The scenario indicates a vulnerable condition for the people in terms of getting power facilities while 15.5 percent of the respondents do not have access to electricity.

Education Level

Nearly half of islanders are illiterate (45.9 percent). Among those that attained formal education, 24.5 percent studied up to Class 5 and 25.5 percent studied up to Secondary School Certificate (SSC) Examination. These two categories are the most representative of

the resident profile. The majority of the locals attend *madr*asas and *moktob* (local educational institutions) for education, and there was just one junior secondary school with four teachers which is also used as cyclone shelters during disasters. Higher education qualifications among the surveyed residents are almost non-existent, with only one percent and 3.1 percent of respondents holding Higher Secondary Certificate (HSC) and above HSC degrees, respectively. This island only has the resources to provide a class-eight level education. If someone wishes to pursue further education after completing class eight, they must move to Hatiya or somewhere else such as Upazila headquarter, Noakhali Sadar or other places.

Health Problems and Healthcare Access Under Spatial and Social Inequalities and Disasters

Nijhum Dwip is a good example of a disaster-vulnerable area, affected by various disasters: cyclones, riverbank erosion, coastal flooding (Alam, 2012; Suza et al., 2024). This island is under constant coastline changes due to erosion and accretion processes (Ghosh et al., 2015) and climate change impacts (Alam, 2012). Nijhum Dwip regularly experiences cyclones and storm surge during the disaster periods, however, this island has a long history of facing mighty cyclones. Nijhum Dwip residents have mentioned multiple problems on which disasters have substantial impacts such as economic problems (according to 26 percent of the respondents), health related problems (25.5 percent) and water access problems (23.5 percent). About 4.1 percent of the respondents indicated that violence increases after disasters in the study area due to a scarcity of funds among the people. The present research has revealed that 58.1 percent of the respondents mentioned their own health issue, while 51.1 percent of the respondents reported their family members were facing some health problems. Different types of diseases such as allergy, ulcer, fever, typhoid, cough etc. are very common among the surveyed residents. However, the number of diseases and affected population (62.4 percent) increase after every cyclone.

After a major disaster, a significant portion of the population experienced a multitude of health conditions. Of all the diseases reported, fever ranks the most frequent (34 percent) by the surveyed respondents (Table 2). Diarrhoea (18 percent) and running nose and

cough (12 percent) were also reported commonly by the respondents. The individuals were unable to bring water to its boiling point, hence failing to purify it, and the water sources were damaged which led to the increase in dirty water use. Moreover, 11 percent of respondents reported different types of pains.

According to Alam (2012) and Cash et al. (2013) study

on Hatiya Upazila, the residents of this island are experiencing increased health problems due to adverse climate change impacts whereas children and women become the prime victim of these problems. The present study reveals that 62.4 percent of the residents are affected by natural disasters (cyclones) which influence their health conditions also.

Table 2: Diseases During Disasters

Diseases	Frequency	Percentage
Fever	63	34
Diarrhoea	33	18
Running nose and cough	22	12
Pains	20	11
Allergy	18	10
Skin disease	15	8
Others	12	7
Total	183	100

Source: Field Survey, 2023

Drugstores are the most popular option (70.4 percent) by a large margin, with more than half the residents indicating it as their first choice for taking treatment, as at least one drug store is available in every local market. They often buy medicines without any prescription from authorized doctors. Within the respondents, 11.2 percent visit Maa-Moni Clinic and 8.2 percent visit Upazila health complex for their health problems. A few residents (4.1 percent) mentioned that they take treatment from local Kobiraj.

This trend of healthcare changes during disasters. Of the respondents, 33.7 percent reported not obtain treatment for their health issues during catastrophes, whereas 66.3 percent confirmed receiving healthcare services during disasters. Dependency on drug stores increases during and after disasters (Table 3). According to the survey, people cannot afford to go that far by crossing a river during the emergency times, so they depend on drugstores; however, drugstores are widely used even during the non-disaster periods. Again, availability of

transports and related cost for accessing healthcare also has a strong impact on the place of treatments chosen by the residents of Nijhum Dwip. Among the respondents, 40.6% use CNGs and 22.8 percent use auto vans, 19.8 percent use motorbikes, 14.9 percent use bicycles, and only two percent use cars. The lightweight vehicles run and are used more due to the poor condition of the roads and due to the low travel cost, and quick availability, and can be reserved at their convenience. However, transporting patients on these vehicles is very difficult and risky for patient's health. It is a matter of concern that these facilities even get scarcer after a cyclone occurs (Fig. 2). The challenges of accessibility to the mainland posing as the daily struggles for Hatiya residents were studied by Aziz and Jabeen in 2021. They have identified the high cost and risk which islanders take for accessing health care, increasing their vulnerability to disasters. They mentioned in their paper: 'disaster risks remain higher in transportation with the potential for losing life and injury' (Aziz and Jabeen, 2021).

Table 3: Treatment Places of the Respondents

Treatment place	Non-disaster periods Percentage	During disaster periods Percentage	After disasters (recovery phase) Percentage
Drug store/pharmacies	70.4	81.9	78.3
Maa-Moni clinic	11.2	6.9	4.3
Upazila health complex	8.2	4.2	17.4
Kobiraj	4.1	-	-
Government hospital	4.1	1.4	-
Union health complex	2	5.6	-
Total	100.0	100	100



Source: Field Survey, 2023

Figure 2: Damaged Road in the Study Area after the Cyclone Sitrang in 2022

Women in the Vicious Cycle of Disasters and Spatial–Social Inequalities

Gender disparity is a significant issue in Nijhum Dwip. The respondents who were interviewed for this study mostly were men, as female members had to maintain and follow social restrictions, and that did not allow them to talk with outsider men. Gender disparity is

also very clear in terms of education. Due to a lack of awareness and schools, a high proportion of people were either illiterate or went to schools up to class five for both men and women. Disaster has a strong effect on the girl's education; according to 75% residents. The impacts are multi-faceted; according to 30.4% respondents- girls maybe are taken out of from schools and married off at an early age after disasters (according

to 23% respondents) and the teaching program may remain paused (according to 21% respondents) and there are some economic reasons which have impacts on girl's education: job loss of parents (according to 9% respondents) and increase in the amount of dowry money if the bride gets older (according to 17% respondents). More than 90% of the girls are married off before the age 16 years and they do not continue their education. The present study could not meet any female resident who has studied more than higher school education level.

Dowry and Social Crimes

The Dowry system is highly practiced in this area. The bride's father has to pay the dowry: money and gold. In many cases, lands have to be written down, and cows and goats have to be offered. One of the respondents, who is a CNG driven auto driver, had to pay BDT 350,000 (USD 2900) and 17.5 gm of gold to marry off his daughter. On the other hand, a grandmother is now running a shop with dowry money which she managed to collect after marrying her grandson. However, the dowry system has detrimental impacts on girls. A very young girl (aged 11 years) was married off with a condition of dowry money but she was then sent to her parents' house by the in-laws as her parents could not pay a sum of BDT 80,000. Additionally, they issued a demand of BDT 200,000, otherwise they threatened that she would not be allowed to return to her husband unless this condition was fulfilled. However, there was a complaint that her in-laws neglected or failed to attend to her basic needs.

Again, there is a lack of awareness on the issues of domestic violence against women, discrimination, and eve teasing in this study area. Females usually refrain from engaging in social activities outside of their residences. Majority of the females do not participate in any economic activity or earn. However, surprisingly the majority of the residents (mostly male) who participated in the survey reported that they do not experience any sort of harassment inside their family and there are no societal inequities between men and women, however, the reality is quite different. Moreover, Bangladeshi coastal women frequently experience gendered effects as a result of climate change (Ahmed and Eklund, 2021).

DISCUSSION

Nijhum Dwip is located in the Bay of Bengal, surrounded by water with no road connection to the mainland. The island is about two km southwest of Hatiya Island and it takes two hours to reach by engine boat. During cyclones, this communication becomes totally inaccessible, leaving the island and medical patients isolated for days. Along with this geographical location, this island experiences a lack of healthcare centres, required educational institutions and a proper road system within the island (Alam, 2012). During the field work, residents mentioned several problems of living on this island, whereas spatial inequalities were mentioned by 76.8 percent. According to 26.8 percent of the residents, lack of medical facilities is the major problem of this island whereas 20.8 per cent mentioned the poor transport system, 15.5 percent mentioned insufficient number of educational institutions, 13.7 per cent mentioned about water scarcity, 10.7 percent mentioned economical problems and 12.5 percent mentioned other problems. Residing on a small island presents significant challenges for the inhabitants, since disasters, spatial disparities, and socioeconomic inequities profoundly affect the local economy, social conditions, and the health and well-being of the population (Zaman, 2019). Researchers all over the world have worked on island and spatio-social inequalities and have advised to emphasize in taking contextual analysis to reduce disaster risk in these small islands (Mercer et al., 2007; Kuruppu & Willie, 2015; Sujarwoto & Tampubolon, 2016; Panagiotopoulos & Kaliampakos, 2019).

Comparison Between Income and Healthcare Access

By applying cross-sectional analysis, it became apparent that healthcare access has a significant relation with income of the residents (proved by Chi Square test, Fig. 3). It shows that most people from higher income ranges have accessibility to healthcare in the study area, similar research result on cyclone victims in Bangladesh are observed also (Uddin and Mazur, 2015). People encounter difficulties accessing healthcare facilities owing to a lack of transportation options, high medical expenses, and costly travel; each journey incurs an approximate cost of 26 USD, while hospital fees frequently exceed 13 USD. So, poor people often avoid visiting doctors.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.899 ^a	15	.039
Likelihood Ratio	22.791	15	.089
Linear-by-Linear Association	5.249	1	.022
N of Valid Cases	106		

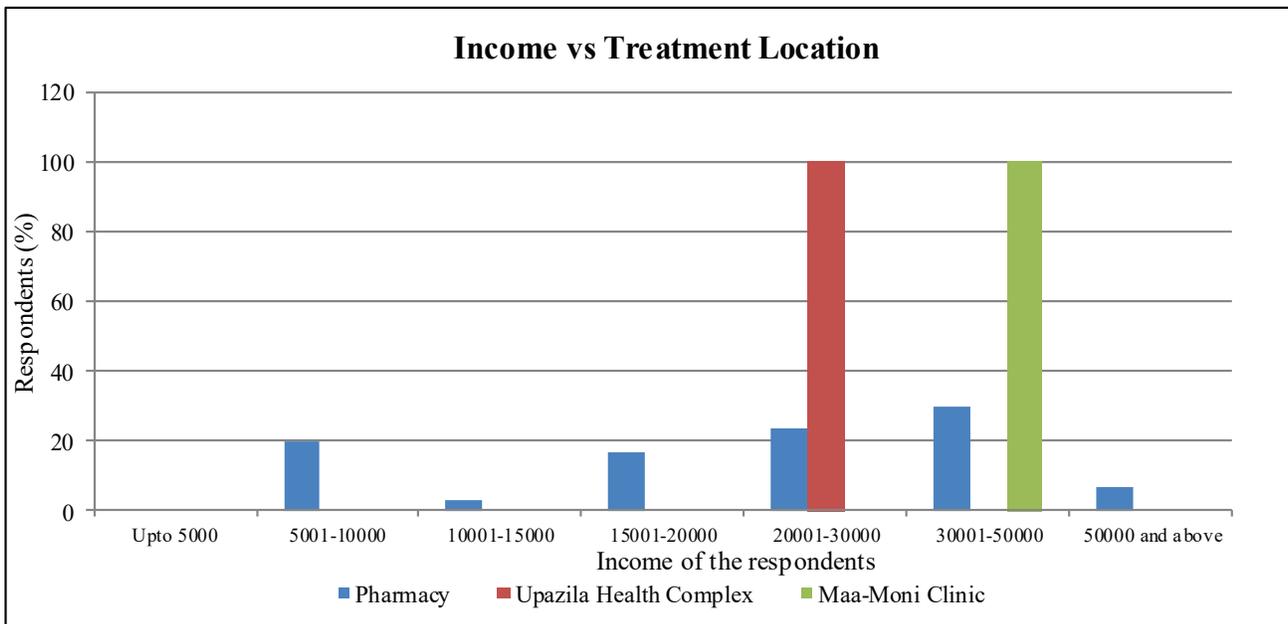
a. 15 cells (62.5%) have expected count less than 5. The minimum expected count is .06.
 Chi square test between Income and Healthcare Access shows a P value of 0.039 which is less than 0.05. Hence there is a significant relation between income and healthcare access.

Figure 3: Comparison Between Income and Healthcare Access

Comparison between Income and Treatment Location

Figure 3 depicts the relationship between income and treatment location. People of every economic class prefer visit to pharmacies. However, it is evident that people with higher incomes prefer to visit to clinics or

hospitals rather than depending on medication obtained without a prescription from pharmacies. Poverty is a major problem for the low-income people who do not often go to clinics and private hospitals as these institutions are costlier compared to the available nearest pharmacies.



Source: Field Survey, 2023

Figure 4: Comparison between Income and Types of Treatment Location Respondents Choose

Comparison between Education and Treatment Location

The residents of the Nijhum Dwip with no schooling (illiterate) are the majority of those that visit pharmacies in higher number (75 per cent) compared to the residents that possess primary level education (55.6 per cent) and higher secondary level (63.6 per cent), since they lack awareness and sufficient understanding about the dangers of taking medicine without professional assistance. This study reveals that education level of the patients and treatment locations are inter-related (Liu et al., 2017).

Gender and Healthcare Access

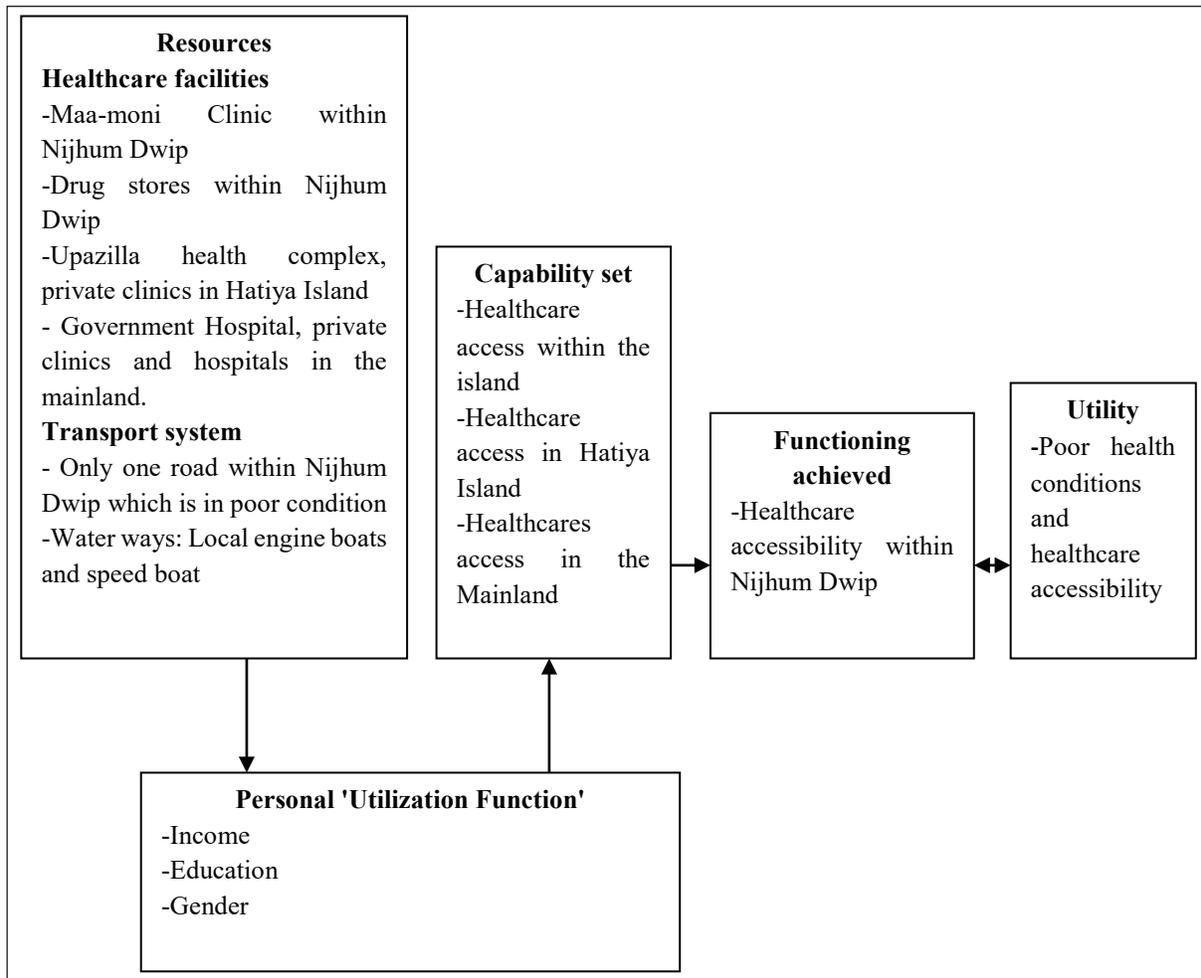
The study reveals that drugstores (81.9 %) are the most preferred location among residents to seek treatment during disasters. By far the most prevalent site for women to seek medical assistance (62.2 %) was also drugstores (Alam, 2012; Rezwana, 2018). However, during the non-disaster periods, the situations are also not well enough. Only 40% of pregnant women reported having three prenatal appointments throughout their pregnancy. However, one and two appointments remain equally common at 10 % and 30 % respectively. There is one Expanded Programme on Immunization (EPI) centre as a part of an immunization program provided by the government of Bangladesh to meet the World Health Organization's objective of eradicating hepatitis B virus (HBV) infection. When it comes to medical check-ups, the majority preferred private hospitals (Maa-Moni Clinic) (70.2 %) followed by the Upazila Health Complex (14.9 %). Only 15.3 percent of respondents went to a doctor for pregnancy delivery, with the majority of them (84.7 %) relying on untrained midwives (Yaha et al. 2016). As other data provides, proper medical treatment is less frequent in the population, with 62.7 % of respondents having delivered their children at home. Caesarean service for a child delivery is not offered in in this island. If individuals are in need of Ceasar, they are referred to Hatiya, an option that comes with significant costs. In order to get this particular service, it is necessary for them to secure transportation by making a reservation and paying in advance. Moreover, the presence of a deficient road network or destroyed roads due to disasters significantly hampers effective communication. An interview was conducted with a 60-year-old midwife residing in Nijhum Dwip, who also happens to be the sole

midwife serving the local community. She delivered 500 newborns. The midwives either taught this task themselves or were taught by relatives. Individuals experiencing unfavorable economic circumstances are compelled to depend on this type of midwife. Typically, individuals offer clothing, oil, soap, and monetary contributions as customary gifts. The impact of the situation was explained by a participant '*We are helpless in an emergency, we do not have enough money to travel far, there isn't a nearby medical facility, by the time we can manage the money, it is always too late...*'. The present research team met a critically ill woman who had experienced a miscarriage.

Health Capability in Spatial and Social Inequalities

The above discussion illustrates the actual picture of healthcare accessibility of the Nijhum Dwip inhabitants which is influenced by several factors like available resources, socio-economic conditions and gender. Their healthcare accessibility can be explained with the help of Capability Approach by Sen in 1999. This approach 'focuses directly on the quality of life that individuals are actually able to achieve' (Wells, 2024). Considering the core concepts of this approach, the present study reveals that resources, personal utilization functions and capability set lead to locally available healthcare facilities in Nijhum Dwip: Drugstores and Maa-Moni clinic for women and children which do not offer emergency treatments, leads to underprivileged health conditions and poorer healthcare access (Fig. 5).

Now the question arises: why is this situation created in the health sector of Nijhum Dwip? Having analyzed the results, it is clearly seen that spatial inequality is one of the major reasons for this backwardness in healthcare. As an island, Nijhum Dwip is separated from the mainland having a poor road network; even the waterway is in poor condition with a temporary boat terminal. This singular communication system also remains closed for days during cyclones. Again, there is only one healthcare centre (for the women and children) in the island which cannot provide treatment to 12,796 people. Whereas, the nearest Hatiya Island (seven km away from Nijhum Dwip) has 35 community clinics along with a Upazila Health complex with 50 beds (MOHFW, 2016). The nearest mainland (13 km distance from Nijhum Dwip),



Source: Author's construct: modified from 'Sen's Capability Approach' in Wells (2024)

Figure 5: Health Capability

Noakhali district headquarter has several healthcare centres (more than 40 in number) along with the District Hospital (Healthcenterbd, 2024). However, due to poor economic conditions (79.4 % of the total respondents living in poverty), residents of Nijhum Dwip cannot afford costly transports to visit these healthcare facilities. Spatial inequalities along with socio-economic disparities and disasters have created difficult conditions for Nijhum Dwip residents to receive treatment during disaster and non-disaster periods. Hatiya Island needs special assistances from the relevant government departments or others to overcome the challenges which the islanders face in order to access basic health services and education facilities (Suza et al., 2024).

CONCLUSIONS

The island's geographical isolation and persistent economic disadvantages present significant barriers to accessing healthcare services, even during non-disaster periods. The remoteness of Hatiya Island limits connectivity with the mainland, thereby restricting the timely delivery of medical assistance and essential health resources. These challenges are further intensified during disaster events, such as cyclones or tidal surges, which disrupt transportation and communication networks and exacerbate the pre-existing disparities in healthcare access and service quality. Consequently, the islanders remain markedly deprived of basic healthcare facilities due to both geographical constraints and the prevailing socioeconomic vulnerabilities that characterize the entire study area. A comprehensive examination

of healthcare access and quality in Hatiya Island is therefore imperative to identify the underlying factors contributing to these inequalities and to propose viable strategies for improvement. The shortage of healthcare infrastructure, the insufficiency of trained medical personnel, and the inadequacy of medical equipment and supplies are major contributing factors to the disparities observed in healthcare delivery. Addressing these gaps through targeted interventions could significantly enhance the resilience and well-being of the local population. Furthermore, the integration of public health and primary healthcare principles is essential for establishing a sustainable healthcare framework suited to the unique conditions of remote islands in Bangladesh. Strengthening educational facilities could play a vital role in transforming traditional health-related practices and promoting awareness of hygiene and disease prevention. Coordinated actions between local authorities and the national government—through the implementation of context-specific health programs, improved logistical support, and capacity-building initiatives—can substantially improve the overall health conditions and quality of life for the island's inhabitants.

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