

Women's Vulnerabilities in Natural Disasters: A Study in Coastal Bangladesh

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ABSTRACT

Purpose: Bangladesh is widely acknowledged as one of the most disaster-prone countries in the world. In the coastal zone, women are more vulnerable to natural disasters. The study aims to explore the multifaceted vulnerabilities faced by women during and after natural disasters in the coastal area of Bangladesh.

Design/methodology/approach: A mixed approach was employed in this study, where primary data were collected for the survey from a total of 150 respondents via face-to-face interviews based on purposive sampling. Moreover, 10 in-depth interviews were conducted using semi-structured interview schedules to gain a deeper understanding of the phenomena under study.

Findings: The study found that women face numerous challenges during and after disasters, including inadequate shelter facilities, insufficient sanitation, lack of privacy, sexual harassment, health risks, and barriers to menstrual hygiene management. The study also found that pregnant women faced severe hardships in accessing healthcare. Additionally, disasters contribute to increased school dropouts, early marriages, domestic violence, psychological distress, and economic insecurity.

Conclusion: The study suggests that gender-sensitive disaster management policies are urgently required to address these vulnerabilities and enhance women's resilience in disaster-prone coastal areas.

Keywords: Coastal Bangladesh, Hatiya Upazila, Natural disasters, Women's vulnerability, Healthcare, Sanitation, Psychological distress, Economic insecurity.

1. INTRODUCTION

Bangladesh is widely recognized as one of the most climate-vulnerable and disaster-affected countries. On average, the country is affected by a natural disaster every year (Kabir, Hossain, & Haque, 2022). Over the past three decades, Bangladesh has experienced approximately 219 major natural disasters, resulting in an estimated economic loss of \$16 billion and causing hundreds of fatalities (Malaker, Islam, & Das, 2022). The coastal zone of Bangladesh has been ranked as one of the fifteen most at-risk zones around the world for environmental and disaster-related threats (Murshed, Griffin, Islam, Wang, & Paull, 2022). Due to its geographical settings, the coastal districts of Bangladesh are facing an increasing frequency and intensity of climate-induced hazards such as cyclones, tidal surges, floods, river erosion, and saltwater intrusion (Haque, Mimi, Mazumder, & Salman, 2020). These natural disasters affect millions of people every year, resulting in widespread damage to property, significant loss of life, and severe disruptions to livelihoods, particularly affecting the coastal people (Faisal, Saha, & Biswas, 2024). According to United Nations Development Programme (2022) women are more vulnerable to natural disaster than men. In Bangladesh, women are more vulnerable to any kind of natural climate-induced disasters as they play various roles in the family such as providing food, collecting water, fuel, and care for their loved ones (Md, Gomes, Dias, & Cerdà, 2022). Due to a range of socio-cultural and structural factors, women in coastal Bangladesh experience limited mobility, which makes them more vulnerable to disasters (Alam & Khalil, 2022).

In recent years, scholars have increasingly emphasized the importance of understanding how natural disasters affect women, particularly in the coastal zone. Rahman (2013) claimed that due to limited access to health care facilities, women become vulnerable to reproductive health problems as well as a higher incidence of sexual and

domestic violence. [Alam and Rahman \(2014\)](#) claimed that during disasters, a form of functional disruption emerges, where women have to experience different challenges compared to men. Women often face unique challenges, including the loss of livelihood opportunities, limited access to relief materials, exposure to sexual harassment, and minimal involvement in disaster response and management activities. [Garai \(2016\)](#) stated that the impacts of natural disasters differ between men and women due to their distinct societal roles and responsibilities. Women are often confined to domestic duties, including caring for children, along with disaster-specific tasks such as protecting household assets. These roles significantly increase women's vulnerability during natural hazards. [Asadullah, Islam, and Wahhaj \(2021\)](#) found that there is a positive association between natural disasters and child marriage. Women faced at least one event of disaster before getting married at an early age. This is because of financial vulnerability, coping with risk, and patriarchal norms in society. [Sultana \(2022\)](#) identified that women experienced various forms of vulnerabilities, such as loss of property, reduced livelihood opportunities, increased poverty, rising food insecurity, school dropouts among girls, and early marriage. [Nasrin \(2022\)](#) claimed that women face several challenges during and after disasters, such as inadequate sanitation, lack of pure drinking water, and inadequate latrine facilities, which cause health-related problems. [Fatema, East, Islam, and Usher \(2023\)](#) stated that during disasters, women experienced the risk of being abused and significant health risks due to inadequate hygiene and poor living conditions, including insufficient shelter, a lack of proper toilet facilities, and the absence of safe, gender-segregated accommodations. [Shamsuddoha et al. \(2024\)](#) found that women faced a lot of gender related issues, such as sexual harassment in the shelter centre, inadequate menstrual hygiene management, and inadequate living arrangements. Women also suffered from health issues, especially pregnant women, who suffered a lot during disasters.

Although a number of studies have addressed the impacts of natural disasters in Bangladesh, most have concentrated on the broader economic, infrastructural, or environmental consequences, with limited attention to the gendered dimensions of disaster vulnerability. Moreover, existing literature has predominantly relied on either quantitative surveys or qualitative narratives, without adequately integrating the two to offer a holistic view. Furthermore, despite being one of the most disaster-prone coastal areas in Bangladesh, Hatiya Upazila has received limited research attention. The suffering of the women in this area remains underrepresented in disaster studies, policy frameworks, and academic discourse. To address these gaps, the present study adopts a mixed-method approach to investigate women's vulnerabilities in natural disasters, with a specific focus on Hatiya Upazila. However, the specific objectives of the study are given below.

1. To investigate the specific challenges faced by women in the cyclone shelter.
2. To examine the health and sanitation-related consequences of disasters on women.
3. To investigate the suffering of pregnant women during disasters.
4. To assess the psychological effects of disasters on women.
5. To investigate the social impacts of natural disasters on women.
6. To examine the economic challenges faced by women.

2. METHODOLOGY

The study was conducted in Hatiya Upazila, a coastal zone of Bangladesh located at the confluence of the Meghna River and the Bay of Bengal. It is a subdistrict of Noakhali District in the Chittagong Division of Bangladesh, and is geographically located at approximately 22.3667°N latitude and 91.1250°E longitude. As a part of the low-lying delta region, the local population is at an increased vulnerability due to sea level rise and other adverse impacts driven by climate change ([Chowdhury, Ali, Chowdhury, & Islam, 2025](#)).

The study employed both quantitative and qualitative methods for a better understanding. For a quantitative study, primary data were collected through a field survey using a structured questionnaire. As we didn't know the exact number of vulnerable women in that area, we used a formula followed by [Shamsuddoha et al. \(2024\)](#) to determine the sample size.

$$\text{Sample size} = \frac{z^2 \times p \times (1-p)}{\text{Moe}^2}$$

Where

$z = 1.96$ (For 95% confidence level).

$p = 0.5$ (Standard deviation).

$\text{Moe} = 0.10$ (10% margin of error).

$$\text{Sample size} = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.10^2}$$

$$= 96$$

However, a total of 150 respondents were selected through purposive sampling due to the convenience of the researchers. Primary data of the study were collected from May to June 2025. The primary data were analyzed through descriptive statistics, including frequency distributions and percentages. All kinds of statistical calculations were conducted using SPSS software.

For the qualitative part of the study, ten in-depth interviews were conducted using semi-structured interview schedules to gain a deeper understanding of the phenomena under study, and among them, nine case studies were documented to cross-check the quantitative data and make the study well-representative. The qualitative data were analyzed thematically. The researchers collected secondary data from various sources such as journal articles, books, newspapers, and so on. The researchers properly addressed ethical issues in the course of the study.

Table 1. Demographic characteristics of respondents.

Variable		Frequency	Percent (%)
Age group	15-24	34	22.7
	25-34	47	31.3
	35-44	28	18.7
	45-54	24	16.0
	Above 55	17	11.3
	Total	150	100.0
Level of education	No formal education	52	34.7
	Primary	56	37.3
	Secondary	24	16.0
	Higher secondary	14	9.3
	Graduate and above	4	2.7
	Total	150	100.0
Occupation	Housewife	86	57.3
	Work in fish firms	22	14.7
	Agricultural labourer	12	8.0
	Work in another house	14	9.3
	Service holders	16	10.7
	Total	150	100.0
Monthly household income (BDT)	Below 5000	50	33.3
	5000-10000	60	40.0
	10000-15000	20	13.3
	15000-20000	14	9.3
	Above 20000	6	4.0
	Total	150	100.0

Source: Field study, May-June, 2025.

3. FINDINGS OF THE STUDY

All the respondents who took part in this study were female. As demonstrated in Table 1, with regard to age, the largest proportion of respondents (31.3%) were in the 25-34 age group. The second largest respondents (22.7%) were in the 15-24 age group. Respondents aged 35–44 and 45–54 accounted for 18.7% and 16.0%, respectively. The lowest number of respondents (11.3%) was aged above 55 years.

In terms of level of education, the majority (37.3%) of the respondents had completed their primary education, while 34.7% of the respondents had not received formal education. A small number of respondents (16.0%) attained the Secondary level of education, followed by Higher secondary (9.3%), Graduate and above (2.7%).

Regarding occupational status, more than half of the respondents (57.3%) were housewives. About 14.7% of the respondents worked in fish firms, followed by working in another house (9.3%), and as Agricultural labourers (8.0%). Only 10.7% of the respondents were engaged in the service sectors.

The data on monthly household income revealed that the monthly income of the majority (40%) of the respondents was between 5000BDT to 10000, while 33.3% had below 5000BDT. Only 4.0% of the respondents had an income above 20000BDT.

Table 2. Types of disasters faced by respondents.

Types of disaster	Frequency (N=150)	Percent (%)
Cyclone	128	85.3
Flood	94	62.7
Tidal surge	105	70.0
Water logging	17	11.3
Salinity intrusion	85	56.7
River erosion	98	65.3
Heat weave	18	12.0
Drought	7	4.7

Source: Field work, May-June, 2025 (Multiple response questions).

Table 2 highlights several types of natural disasters faced by respondents. The majority (85.3%) of the respondents faced Cyclone, and others reported disasters were Tidal surge (70%), River erosion (65.3%), Flood (62.7%), and Salinity intrusion (56.7%). On the other hand, a small number of respondents experienced Heat weave (12%), waterlogging (11.3%), and Drought (4.7%).

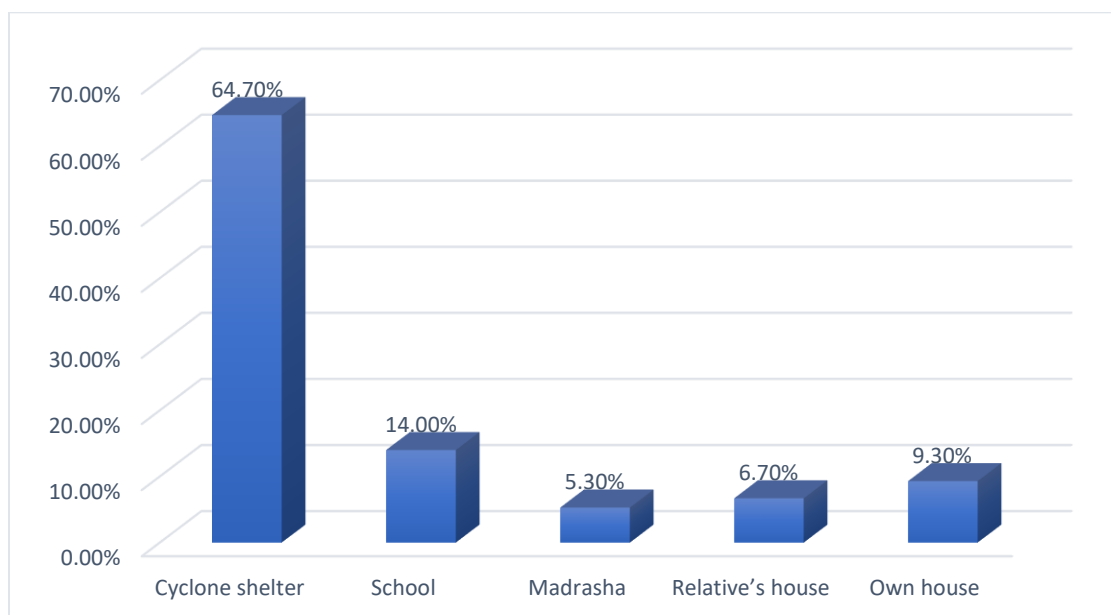


Figure 1. Shelter place of respondents during disasters.

Source: Field work, May-June, 2025.

Figure 1 illustrates the shelter preferences of respondents during disasters. The majority (64.70%) of the respondents took shelter in their closest Cyclone shelter at the time of disasters. Other shelter options included School (14.0%), Madrasha (5.30%). Some respondents (6.70%) reported that they took shelter in their relative's house during disasters. Only 9.30% of the respondents reported that they stayed in their own house.

Table 3. Challenges faced by women in the Shelter Centre.

Challenges	Frequency (N=150)	Percent (%)
Sexual harassment	26	17.3
Insufficient sanitation	110	73.3
Lack of drinking water	95	63.3
Lack of food and clothing	81	54.0
No separate toilet and washroom facility	71	47.3
Theft	29	19.3

Source: Field work, May-June, 2025 (Multiple response questions).

As demonstrated in Table 3, a significant number of respondents (73.3%) said that they faced insufficient sanitation in the Shelter Centre during disasters. Additionally, 63.3% of the respondents reported that they experienced a Lack of drinking water, followed by a Lack of food and clothing (54.0%). No separate toilet and washroom facility was another concerning issue for 47.3% of the respondents. Furthermore, 19.3% of the respondents experienced theft, while 17.3% reported an incident of sexual harassment in the Shelter Centre.

One of the respondents (aged 27) reported that:

*"In Shelter Centre, I didn't have access to sanitation facilities like at home because there were so many people there. Often, both men and women had to use the same toilet, so I would avoid going even when I needed to. I used to feel a bit embarrassed."*¹

Another respondent (Aged 19) shared her experience:

*"There were many unknown men around, and the shelter was overcrowded. At night, I couldn't sleep properly because I was scared someone might try to touch me or come near. I had to stay alert all the time and always sit close to other women."*²

So, the above explanations indicate that women face several challenges in the Shelter Centre during and after the disaster.

Table 4. Types of diseases suffered by women during and after the disaster.

Types of diseases	Frequency (N=150)	Percent (%)
Diarrhea	104	69.3
Skin diseases	92	61.3
Typhoid	26	17.3
Cholera	13	8.7
Hypertension	33	22.0
Snake bite	2	1.3
Physical injury	26	17.3
Fever	69	46.0
No event	15	10.0

Source: Field work, May-June, 2025 (Multiple response questions).

Table 4 represents several types of diseases suffered by respondents during and after the disaster. A significant number of respondents (69.3%) reported that they had suffered from Diarrhea, followed by Skin diseases (61.3%), Fever (46.0%), Hypertension (22.0%), Typhoid (17.3%), Physical injury (17.3%), and Cholera (8.7%). A very small number (1.3%) of the respondents experienced Snake bite during and after disaster. Only 10.0% of the respondents reported that they didn't face any health problems.

*"My one-year-old daughter and I suffered from severe Diarrhea. The environment was unhygienic, with no access to clean drinking water or proper sanitation. Although I somehow survived, I couldn't save my breastfeeding baby. There was no medical support, no oral saline, not even a clean cloth to wipe her,"*³ shared an interviewee of her painful experience.

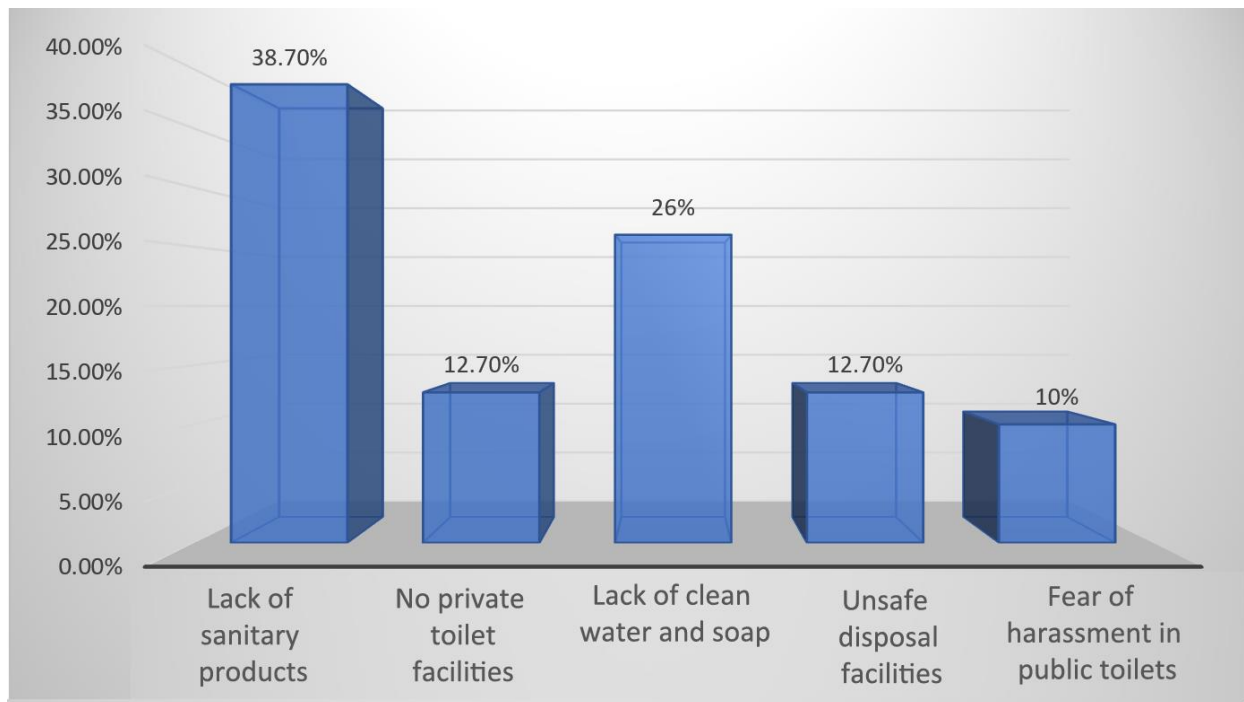


Figure 2. Challenges of menstrual hygiene management.

Source: Field work, May-June, 2025.

Figure 2 highlights the challenges faced by women in maintaining menstrual hygiene during and after a disaster. A significant number of respondents (38.70%) reported that they faced a lack of sanitary products during and after a disaster, followed by a lack of clean water and soap (26%), which hampered their menstrual hygiene management. Moreover, both no private toilet facilities and unsafe disposal facilities were reported by 12.70% of respondents. Additionally, 10% of the respondents expressed fear of harassment in public toilets, which was also considered a barrier to menstrual hygiene management.

"I was on my period during the flood. I didn't have pads for days, and the shops were closed due to the flood. I had to use old pieces of cloth. The worst part was not having clean water or soap to wash myself properly,"⁴ expressed by a teenage girl about her experience in maintaining menstrual hygiene.

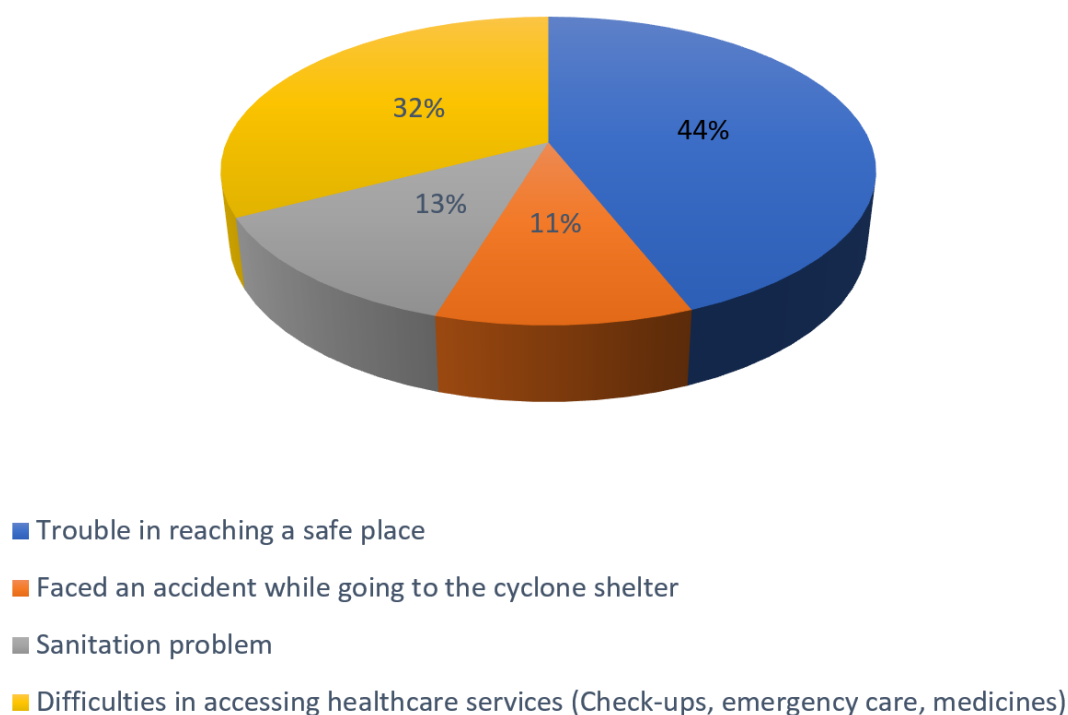


Figure 3. Problems faced by pregnant women.

Source: Field work, May-June, 2025.

Figure 3 indicates the problems faced by pregnant women during and after a disaster. The major problem was trouble in reaching a safe place, reported by 44% of the respondents. Difficulties in accessing healthcare services, such as check-ups, emergency care, and medicines, were considered the second major problem reported by 32% of the respondents. Additionally, 13% of the respondents expressed sanitation problems, and faced an accident while going to cyclone shelter was reported by 11% of the respondents.

“There was no emergency vehicle available when I suffered from labour pain. So, in severe pain, I had to be carried by my mother-in-law and husband on their shoulders. When I finally reached the hospital, the doctors said I needed an emergency cesarean section. I couldn’t forget that day,”⁶ shared a pregnant woman about her critical experience.

Table 5. Impacts on education, child marriage, and domestic violence.

Variable		Frequency	Percent (%)
Increase in school dropout among girls in the respondent’s family	Yes	92	61.3
	No	58	38.7
	Total	150	100.0
Increase in incidents of child marriage in the respondent’s family	Yes	46	30.7
	No	104	69.3
	Total	150	100.0
Increase in incidents of domestic violence in the respondent’s family	Yes	56	37.3
	No	94	62.7
	Total	150	100.0

Source: Field work, May-June, 2025.

Table 5 presents the effects of disasters on girls’ education, child marriage, and domestic violence. A majority (61.3%) of the respondents reported an increase in school dropout among girls in their family due to disasters. In terms of child marriage, 30.7% of the respondents reported that girls below 18 years in their family got married,

while 69.3% did not report such an increase. Regarding domestic violence, 37.3% of the respondents faced such incidents during and after the disaster, while 62.7% did not face such incidents.

I had many dreams. I wanted to grow up, continue my studies, and stand beside the people of vulnerable women of Hatiya. But after the cyclone, my father lost everything and struggled just to keep our family going. So, he married me off and sent my younger brother to work in fishing. This cyclone shattered my dream of education in an instant!”⁷ exclaimed a victim of dropout and child marriage. She could not continue her studies because her father became unable to bear her educational costs due to the disaster, and she was forced to be married off at her early age.

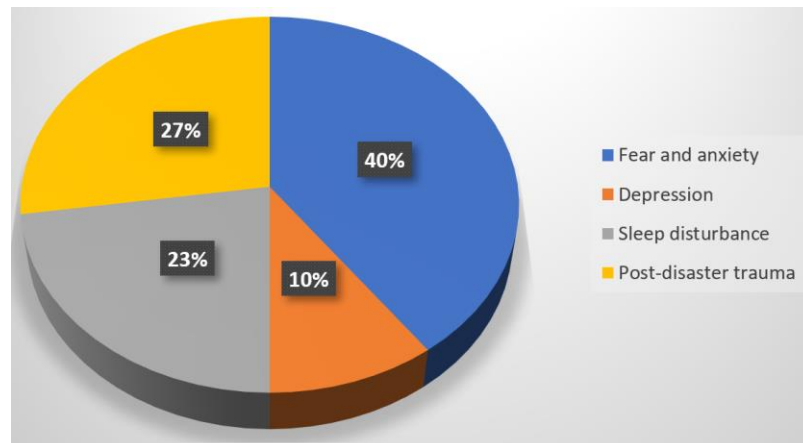


Figure 4. Mental distress of respondents during and after disasters.

Source: Field work, May-June, 2025.

Figure 4 illustrates various types of mental distress of respondents during and after the disaster. A majority of the respondents (40%) stated that they experienced fear and anxiety during and after the disaster, followed by Post-disaster trauma (27%), Sleep disturbance (23%), and Depression (10%).

“I’m already old, I was extremely terrified during the cyclone. I was thinking that I might die at any moment. I was completely traumatized. I still can’t forget that night,”⁸ shared an elderly woman.

Table 6. Economic challenges.

Variable		Frequency	Percent (%)
Loss of livestock, crops, or income-generating tools due to disaster	Yes	105	70
	No	45	30
	Total	150	100.0
Borrowed money or took loans after the disaster	Yes	97	64.7
	No	53	35.3
	Total	150	100.0
Ability to buy necessities during and after the disaster	Having ability	17	11.3
	Little ability	49	32.7
	Don’t have ability	84	56
	Total	150	100.0

Source: Field work, May-June, 2025.

Table 6 presents the economic challenges experienced by the respondents during and after the disaster. A majority (70%) of the respondents reported the loss of livestock, crops, or income-generating tools due to disaster, while 30% did not experience such losses. Additionally, 64.7% of the respondents stated that they need to borrow money and take loans to maintain their family, while 35.3% of the respondents did not take loans or borrow money. Regarding the ability to buy necessities, more than half of the respondents (56%) reported that they did

not have the ability to buy necessities during and after the disaster, followed by little ability (32.7%) and having ability (11.3%).

One of the participants (Aged 45) said that:

*"The fish farm was the only source of income for our family, but the sudden flood washed everything away right before our eyes, and we were helpless to do anything. Now, we have nothing left except our homestead. We survive by working on other people's land and taking a loan to rebuild our farm."*⁹

4. DISCUSSION

The study examines the multifaceted impacts of natural disasters on women in the coastal area of Bangladesh. Most of the respondents come from low-income families, many of whom lack formal education and rely heavily on fragile livelihoods such as fishing, farming, or domestic labour. This economic instability and domestic responsibilities limited their ability to prepare for, respond to, or recover from disasters. The participants of this study experience a range of natural disasters, including cyclones, tidal surges, floods, and river erosion are common. Most of the respondents take shelter in the cyclone shelter during disasters.

However, the shelter conditions are not adequate and safe for women. The study reveals that women face a range of challenges in the shelter centre, such as insufficient sanitation, lack of privacy, and even sexual harassment. This finding is equivalent to the findings of several studies (Fatema et al., 2023; Nasrin, 2022; Shamsuddoha et al., 2024). The study indicates that most of the respondents suffer from several diseases, with a high incidence of diarrhea, skin diseases, fever, and other health problems due to contaminated water and, lack of medical support. The study also reveals that pregnant women are more vulnerable to disasters because they face trouble in reaching a safe place during disasters. They also face difficulties in accessing healthcare services, such as check-ups, emergency care, and medicine. These findings are supported by several studies (Abdullah, Dalal, Halim, Rahman, & Biswas, 2019; Alam & Rahman, 2014; Fatema et al., 2023; Nasrin, 2022; Rahman, 2013; Shamsuddoha et al., 2024). The study reveals that women face difficulties in menstrual hygiene management. They don't have adequate sanitary products, clean water, or a proper disposal system. Sometimes they face harassment in public toilets as there is a lack of private toilet facilities, which affects their mental and physical health. This finding is in line with some other studies (Alam & Rahman, 2014; Fatema et al., 2023; Nasrin, 2022; Shamsuddoha et al., 2024). The study reveals that a large number of respondents report an increase in school dropout among girls in their families. Some girls are forced to marry at an early age to reduce financial burdens. Some of the respondents face domestic violence due to a financial crisis in their families. These findings are similar to some other findings (Asadullah et al., 2021; Carrico, Donato, Best, & Gilligan, 2020; Rahman, 2013; Rezwana & Pain, 2021; Sultana, 2022).

The psychological impacts of disasters are also alarming for women. Many women experience fear and anxiety, post-disaster trauma, and sleep disturbance during and after disasters. This finding is in line with some other findings (Bell & Folkerth, 2016; Heanoy & Brown, 2024; Karim et al., 2024; Kim, Kim, & Lim, 2021).

The study reveals that women experience severe economic challenges during and after disasters. Most of the families lose their livestock, crops, or income-generating tools due to disaster and are forced to take loans or borrow money just to survive. Besides, most of the respondents cannot afford basic necessities during and after the disaster. These findings are supported by the findings of several studies (Alam & Rahman, 2014; Kreutzer, Millerd, & Timbs, 2023; Sultana, 2022).

5. CONCLUSION

The study has explored multifaceted vulnerabilities experienced by women during and after natural disasters in the coastal region of Hatiya Upazila, Bangladesh. The study shows that women face severe challenges in disaster situations, including inadequate shelter facilities, poor sanitation, lack of privacy, and risks of sexual harassment. The study highlights that health-related problems such as diarrhea, skin diseases, and menstrual hygiene issues are common among women in disasters. The study also indicates the challenges faced by pregnant women, including difficulties in reaching a safe place, the risk of accidents while going to a cyclone shelter, and a lack of access to healthcare services during disasters. The study reveals that disasters lead to an increase in school dropouts, early marriages, and domestic violence within respondents' families. The study finds that women experience mental

distress during and after disasters, such as fear, anxiety, post-disaster trauma, and sleeping disturbance. Additionally, the study highlights the financial hardships of women in disasters.

As such, the study suggests that gender-sensitive disaster management policies should be undertaken to ensure safe shelters, healthcare, and sanitation for women during disasters. The study also suggests that policymakers, NGOs, and government agencies should emphasize women's needs and implement awareness programs to minimize the suffering of women. By highlighting the unique vulnerabilities of women, this study can help policymakers and practitioners working in disaster risk reduction and management to develop more inclusive and effective strategies.

Although the study holds substantial significance in the field of academic and policymaking, its focus on a single upazila may limit the generalizability of the findings to other coastal regions. However, acknowledging its shortcomings, the study proposes conducting further studies that cover multiple coastal districts and explore the long-term impacts of disasters on women's livelihoods.

FUNDING

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INSTITUTIONAL REVIEW BOARD STATEMENT

The Ethical Committee of the Noakhali Science and Technology University, Bangladesh, has granted approval for this study on 4 May 2025 (Ref No. NSTU/SCI/EC/2025/373).

TRANSPARENCY

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

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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