



## **Women's Vulnerabilities to Climate Induced Hazards and Their Coping Strategies in Chandradip Union of Southern Bangladesh**

**A. K. M. Abdul Ahad Biswas<sup>1\*</sup>, Nusrat Jahan Sonia<sup>2</sup>, Lutfun Nahar<sup>3</sup>,  
Md. Afjal Hossain<sup>1</sup> and Md. Faisal<sup>4</sup>**

<sup>1</sup>*Department of Disaster Risk Management, Patuakhali Science and Technology University, Bangladesh.*

<sup>2</sup>*Faculty of Disaster Management, Patuakhali Science and Technology University, Bangladesh.*

<sup>3</sup>*Food and Agriculture Organization of the United Nations, Bangladesh, House-30, R-4, Nirala, Khulna-9100, Bangladesh.*

<sup>4</sup>*Department of Resource Management, Patuakhali Science and Technology University, Bangladesh.*

### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author AKMAAB designed the study, wrote the methodology and supervised the work. Authors NJS, LN, MAH and MF collected all field and secondary data, performed all qualitative and quantitative analysis. Author AKMAAB managed the analyses of the study. Authors NJS, MAH and MF wrote the first draft of the manuscript. Authors LN, MAH and MF managed the literature searches. Author AKMAAB edited the manuscript. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/BJESBS/2016/22763

#### Editor(s):

(1) Chih-Wei Pai, Taipei Medical University, Taiwan, ROC.

#### Reviewers:

(1) Neha Bansal, Indian Institute of Technology, Roorkee, India.

(2) Bevaola Kusumasari, Gadjah Mada University, Indonesia.

(3) Gabriel Badescu, Technical University of Cluj-Napoca, Romania.

Complete Peer review History: <http://sciencedomain.org/review-history/12841>

**Original Research Article**

**Received 24<sup>th</sup> October 2015**  
**Accepted 24<sup>th</sup> December 2015**  
**Published 30<sup>th</sup> December 2015**

### **ABSTRACT**

**Aims:** To explore the women's vulnerabilities to climate induced hazards and coping strategies related to their life, livelihood, health, sanitation and water supply in disaster.

**Study Design:** The semi-structured questionnaire survey for primary and secondary data

\*Corresponding author: E-mail: [aahadpstu@yahoo.com](mailto:aahadpstu@yahoo.com);

collection; physical observation and key informant interview (KII) methods were followed.

**Place and Duration of Study:** This research has been conducted in Chandradip union under Bauphal Upazila in Patuakhali district of Bangladesh between 1<sup>st</sup> January 2015 and 30<sup>th</sup> June 2015.

**Methodology:** A total of 100 adult female respondents were selected through stratified random sampling method and 05 KII was conducted in 11 villages of the study area for primary data collection. The secondary data was collected from secondary sources.

**Results:** Study revealed that women's vulnerability to disaster is a combination effect of both climate change and social factors. The first factor includes exposure to climate induced disasters such as -cyclone, storm surge, tidal flood, bank erosion, nor'easter etc. The second factor involves social arrangements and expectations related to status of gender, age, livelihood, availability of basic needs, social safety and existing social barriers to the full participation of women in all phases of disaster management activities. Although women in the study area are worse victim but do carry out major vital role in coping with and prepared for prevention, response, recovery and adaptation activities that often counted their activities as housewife or caregiver. Present study discovered that they have the remarkable potentiality to make greater contributions to their own safety as well as that of others including family members.

**Conclusion:** More attention needs to be given to developing gender specific action plan in which women can participate in all phases of disaster. Community based research should be conducted to identify and characterize the women and child sensitive vulnerabilities; and gender-sensitive approach to reduce risk.

*Keywords: Coping strategies; shelter; vulnerability and women.*

## 1. INTRODUCTION

Hazard is a potentially damaging physical event, a phenomenon that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. It may include latent conditions that represent future threats and can have different origins such as natural (geological, hydro-meteorological and biological) and/or induced by human processes/man-made hazards (environmental degradation and technological hazards) [1]. Disaster is a serious disruption of the functioning of a community or a society that involves widespread human, material, economic or environmental impacts, which may exceed the ability/capacity of the affected community or society to cope using its own resources [1]. Capacity is the combination of all strengths, attributes and resources available within a community, society or organization to manage and reduce the risks and strengthen resilience [1]. Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management. Coping capacity is the ability of people, organizations and systems to use available skills and resources, to face and manage adverse conditions, emergencies or disasters. Coping capacities contribute to the reduction of disaster risks [1]. Vulnerability is the degree to which a population, individual or

organization is unable to anticipate, cope with, resist and recover from the impacts of disasters. Children, pregnant women, elderly people, malnourished people, and people who are ill or immune compromised, are particularly vulnerable when a disaster strikes, and take a relatively high share of the disease burden associated with emergencies. Major contributor to vulnerability is poverty – and its common consequences such as malnutrition, homelessness, poor housing and destitution [2].

Three categories of vulnerabilities are [3]: *Physical/Material Vulnerability:* For example, poor people often live on marginal lands; they don't have any savings or insurance; they are in poor health –have few physical and material resources, usually suffer harder time surviving and recovering from a calamity than people who are better off economically. *Social/organizational Vulnerability:* People who have been marginalized in social, economic or political terms are vulnerable to suffering from disasters more than well organized and have high commitment groups. *Attitudinal/Motivational Vulnerability:* People who have low confidence in their ability to change effects and feel defeated by events they cannot control, are harder hit by disasters than those who have a sense of their ability to bring the changes they desire.

Bangladesh leads the top 10 countries in the Asia-Pacific region based on absolute physical

exposure to floods; is 5th for storms; and 8th for earthquakes [4]. According to the World Bank [5], the geographical location of Bangladesh makes it one of the most vulnerable countries to climate change and natural calamities. Sixty percent of the worldwide deaths caused by cyclones in the last 20 years occurred in Bangladesh. The climate is becoming more variable and creating additional risks. Women are becoming more vulnerable in this changing situation [6]. These changing situations affected the livelihood of coastal people in many folds including scarcity of pure drinking water, malnutrition, extreme poverty, health problems, losses and damage in crop cultivation etc [6].

Enarson [7] articulates areas where women suffer social, gender and economic vulnerabilities from inequality, making them more at risk in disasters. These characteristics indicate women are more likely to- live below the poverty line; rely upon state supported social services; lack savings, credit and insurance; lack inheritance rights, land rights and control; be unemployed or work in the informal economy; be self-employed, home based, contingent workers; reside alone, be rearing children alone; depend on functioning care giving systems; depend on public transportation, travel with dependents; reside in public housing, mobile homes, rental housing, informal settlements; live at risk of assault and abuse; be displaced into domestic violence shelters; be responsible for others (family, kin, neighbors) as paid and unpaid caregivers; physically depend on others due to late pregnancy, recent childbirth, age, chronic illness; be living with disabilities, chronic illness; be subject to gender norms controlling mobility and use of public space; be subject to male authority in the household regarding use of emergency assistance assets and key decisions about evacuation and relocation. To look into this multilevel vulnerability, it is important to note that specific vulnerabilities are exactly specific for a given place and time and change in different seasons, across climate conditions and their stage of health, pregnancy, and age [8].

Evidently women are more severely affected by climate change and natural disasters because of their social roles, discrimination and poverty. In rural Bangladesh they are especially vulnerable since they are highly dependent on local natural resources for their livelihood [8].

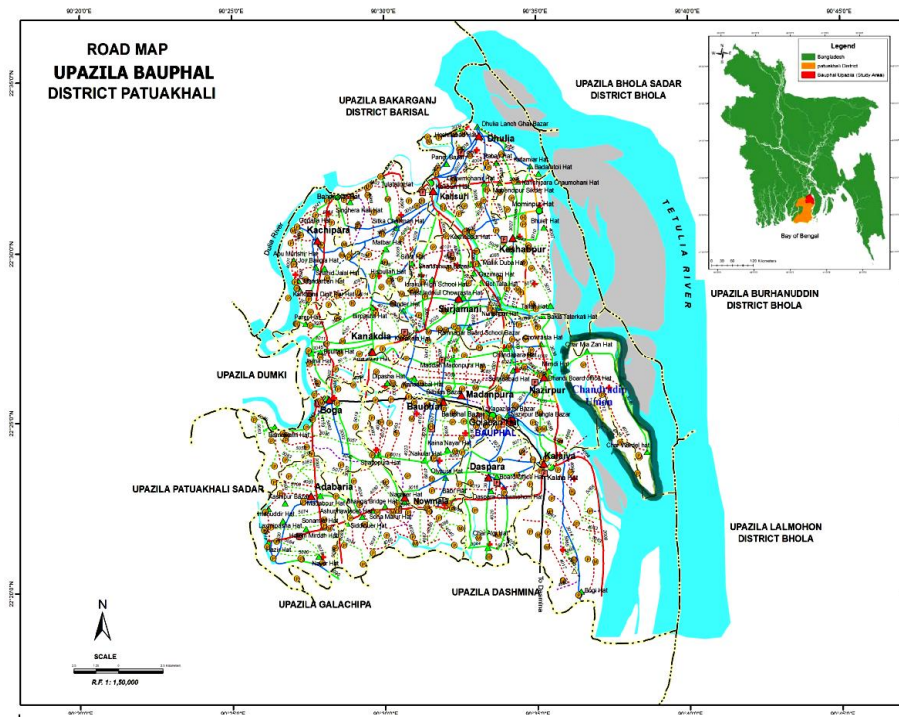
Risk in Bauphal Upazila is considered to be a great constraint for sustainable development [9]. Women and children are affected more due to climate induced hazards [9] in Chandradip Union than their male counterparts. Moreover, the effects of climate change-related events on women are quite noticeable compared with their male counterpart [10]. The vulnerable women of the coastal areas in Bangladesh are not getting proper support from the government and non-government organization(s), but their indigenous coping capacities are encouraging [11]. Due to the poverty and gendered individuality in comparison with men, women make up an unequal share of self-protection, social protection and livelihood resilience [12]. Recently, the information of women's vulnerability and their role in sustainable disaster management attracted great attention of relevant scientists to detail study of vulnerability faced by women's and their activities throughout the disaster management cycles. This has been caused by the intensive search for gender specific vulnerability and adopted strategies connected to DRR and CCA. At the same time extensive literature review indicates that no study was undertaken to analyze the risks faced and its reduction strategies adopted by the women of Chandradip Union in the Bauphal Upazila in Bangladesh. For this reason, this research has been conducted having the following objectives:

- To identify the harmful impacts of hazards on women
- To explore their own preparedness techniques and coping strategies
- To make some suggestions to reduce the vulnerability and to improve their capacity

## 2. METHODOLOGY

### 2.1 Selection and Location of Study Area

Cyclone surges in the Patuakhali districts are very high (above 1 meter high) and this district is the most vulnerable to cyclonic hazards. In this context, the coastal belt, especially the exposed areas and islands are the most hazard-prone hard-to-reach areas in Bangladesh [8]. This study was conducted at Chandradip Union of Bauphal Upazila in Patuakhali district of Bangladesh (Fig. 1). According to the Bauphal Upazila office the Chandradip Union is newly formed in 2014. This union consists of 11 villages. Area is 55 sq km, total population is 11,915 -male 5804 and female 6111. Household



**Fig. 1. Location of Chandradip union of Bauphal Upazila in Patuakhali district (marked by green color)**

number is 2647. Annual average temperature is 22.3°C and rainfall is 2830 mm. It is bounded on the north by Tentulia river; on the east by Tentulia river and Borhanuddin Upazila of Bhola district; on the south by the Tentulia river and Lalmohon Upazila of Bhola district; and on the west by Tentulia river and Nazirpur and Kalia unions of Bauphal Upazila. Main River is Tentulia. Main sources of income are agriculture, livestock and fisheries. Baseline study revealed that the Chandradip Union is situated outside the embankment surrounded the Bauphal Upazila. This area is just like an island and surrounded by Tentulia river, therefore too much vulnerable to flood, storm surge, river bank erosion, water logging and inundation (Bauphal Upazila Statistics Office, 2015). Hence, people living in the disaster affected areas, especially women and children suffer from deprivation of the basic needs and facilities. They become vulnerable to several risks. Therefore this study area was selected to fulfill the objectives of the present study.

## 2.2 Data Collection and Analysis

Both primary and secondary data have been collected from various sources and forms.

Primary data has been collected through questionnaire survey by face to face interview from the 100 selected women. For this purpose, a semi-structured interview schedule (close and open ended) was prepared for data collections, which had been pre-tested prior to the field work in order to improve its reliability and validity. As this is an academic and time bounded research, stratified random sampling (only 2% of the adult women population) method was followed to fulfill research objectives in due time. 100 adult female respondents were selected randomly for primary data collection. Samples were collected from the 11 villages as follows -Char Ray Saheb-10, Chor Miajan-10, Chor Kochua-9, Chor Nimdi-8, Chor Dhandi-9, Chor Algi-8, Chor Pach Khajuria-9, Chor Kichmot Pach Khajuria-8, Chor Baret-9, Chor Diara Kochua-10 and Chor Odel-10. The data has been collected from 1<sup>st</sup> January, 2015 to 30<sup>th</sup> June, 2015. The secondary data such as year round phenomenon of different hazards and vulnerability information according to their intensity and frequency; previous 10 years history of natural disasters, damages, losses; demographic features of study areas: women's role in disaster management; socioeconomic conditions of the study area; previous status of livelihood diversifications and women's role in

livelihood activities: displaced peoples; adaptation and coping strategies adopted by women; GOs and NGOs development activities related to gender specific disaster management etc. have been collected through various institutes and key personals working with the issue and from different report, research articles, newspaper articles, public documents and websites related to the study area. Different secondary data were analyzed and integrated with primary data. Data computation and analysis was done using Microsoft Office Excel 2007 to get the Correlation (CORREL) between different dependent and independent variables. ANOVA was performed to determine the significance at 10% level of probability (P=.10).

### 3. RESULTS AND DISCUSSION

#### 3.1 Demographic Characteristics

All the respondents were female and 20 to 65 years old; married (77%), unmarried 4%; 3% divorced and 16% were widowed. In a society like Bangladesh, where women in general are constrained, it is obvious that the widowed, divorced, and abandoned ones are in worse condition [13], vulnerable to natural and anthropogenic disaster. Hence the vulnerability is 16% in terms of widowed women. With less access to education and skills and also for social restrictions, in Bangladesh, women have fewer economic opportunities and hence virtually have no alternatives but to be in marriage and reproduce husband's family line [13]. In the study

area maximum respondents are housewife (79%); beggar 10%, day labor 1%, handicraft 1%, lower job 1%, maid servant 4%, agriculture related business 2%, student 1% and tailor 1%. Level of education was- illiteracy is high (41%), 21% respondents have non-formal literacy, 23% up to class five, 14% class six to eight and 1% SSC or equivalent. The number of family members are 1 to 4 (58%); 5 to 7 was 38% and 4% have eight or above family members. On an average, there are 4 members in every family. Researchers reported that the ability of households to cope with disasters is also significantly impacted by family members' experiences and their economic context at the village level [14].

From Fig. 2 it was found that 86% families earning income person is one, 12% have 2 and 2% have 3 income persons. According to World Bank calculation Gross National Per Capita Income of Bangladesh in 2014 was 1080 US dollar [15].

In Chandradip union per capita annual income (Fig. 3) was maximum 2,159.00 US dollar, more than two times of the country average per capita income (covered only 5% respondent); minimum 154 US dollar i.e. seven times lower than the country's average per capita income (covered 95% respondent) and average income was 797 US dollar; indicates 95% people are highly vulnerable to earning income. Above discussion revealed that the poverty rate was high in the study area.

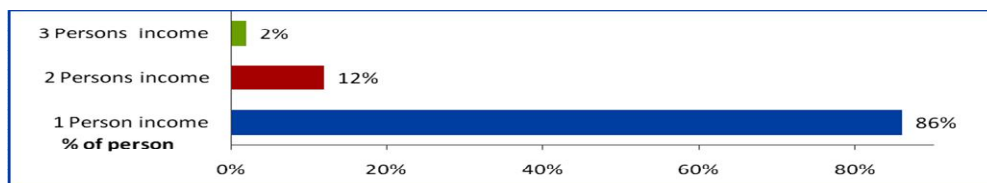


Fig. 2. Income persons of the respondent's family

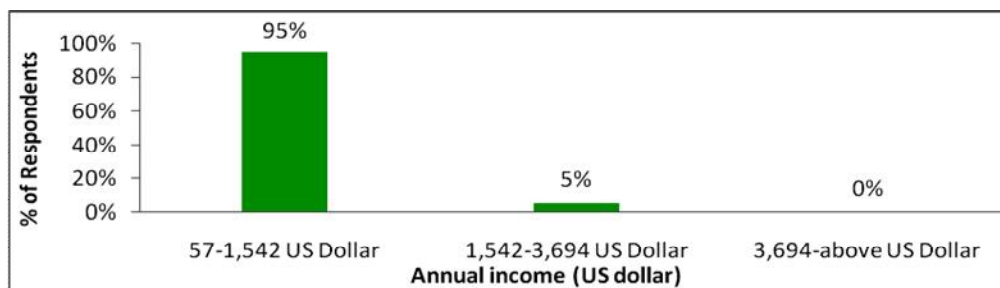


Fig. 3. Annual income and household condition of the respondents

The household's condition in the study area was - 26% respondents are always faced lack in income, 29% are occasionally faced lack of earning and 45% are break even and well off as shown in the analyzed data in Fig. 4. This result shows that approximately 55% respondent are deficit in household condition. Due to lower living standard led by the community, lower household demand and lifelong perceived vulnerability, the acceptable risk is higher in the study area than the place where vulnerability is lower. Researchers have analyzed [16] how poor households are able to cope with and mitigate the impacts of shocks and an ongoing stress also depends on a number of factors at the micro or intra-household level. They concluded that household members' vulnerability is shaped by household composition (e.g. dependency ratios, sex of the household head, number of boys and girls in the household), individual and household ownership and control of assets (land, labor, financial capital, livestock, time and so on), access to labor markets, social networks and social capital and levels of education. One research [17] of 'Challenging the Frontiers of Poverty Reduction (CFPR)', found out that where women were supporting their household needs in managing the household and increased income has resulted in increased household expenditure on food, education and health.

### 3.2 Information about Vulnerability, Hazards, Disasters and Their Devastating Effect

#### 3.2.1 Vulnerability, hazards, disasters and their devastation

The major threats faced by people living in the coastal zone are cyclones and storm surges, floods, drainage congestion and water logging, droughts and salinity intrusions, erosion and

deteriorating ecosystems. This is aggravated by a greater probability of increased rainfall during the monsoon season, less precipitation in winter, higher temperatures and sea level rise leading to adverse impacts on the livelihoods of people in the coastal zones [18]. From the current study, it was found that during 1990 to 2013 Patuakhali district faced at least 10 devastating cyclones (storm cyclone in 29–30 April 1991, 31 May-2 June 1991, 29 April-3 May 1994, 21–25 November 1995, 16–19 May 1997, 25–27 September 1997, 16–20 May 1998, 19–22 November 1998, Sidr in November 2007, Aila in 2009 and Mohasen in 2013) of which two-SIDR and AILA hit Chandradip union of Bauphal Upazila. Analysis of a report [19] indicated that Tentulia and Lohalia river erosion demolished 15 villages of Bauphal Upazila during last 36 years including 03 villages of the Chandradip union. Information from Union Parishad office discovered that this river erosion rendered more than 1300 people homeless from Chandradip union.

Information provided by Chandradip Upazila administrative office revealed that in Chandradip union 5,220 people are vulnerable to cyclone; 3,500 are to storm surge; 900 are to flood; 5,200 are to Nor'easter and 4,000 are vulnerable to river bank erosion compared to Bauphal Upazila (Fig. 5).

The most devastating hazards faced by the respondents in the past 10 years were (Fig. 6) cyclone/storm surge, tidal flood, river bank erosion and nor'wester. According to the respondent's perceptions, 83% faced highest damages and losses due to cyclone/storm surge disaster; 46% faced medium damages and losses due to tidal flood; 21% faced moderate damages and losses due to river bank erosion and 15% asked they have faced lower damages and losses due to nor'wester respectively.

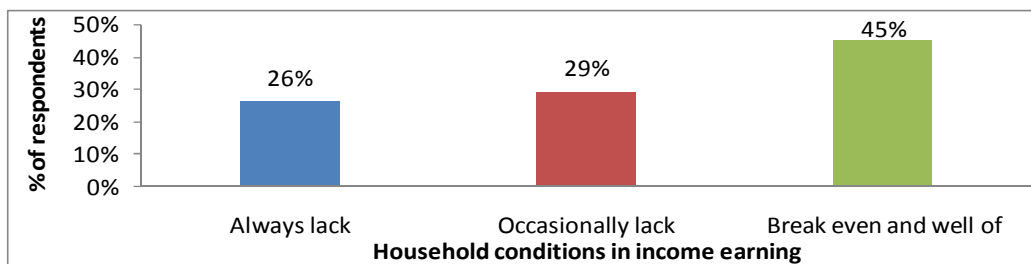


Fig. 4. Household condition of the respondents

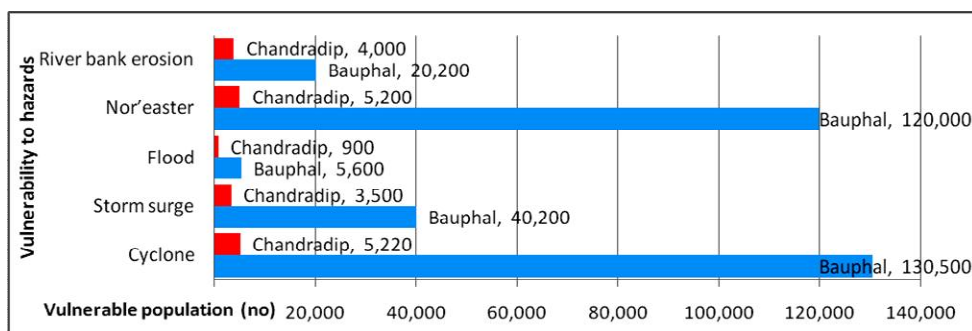


Fig. 5. Overall vulnerable conditions of Chandradip Union due to different hazards

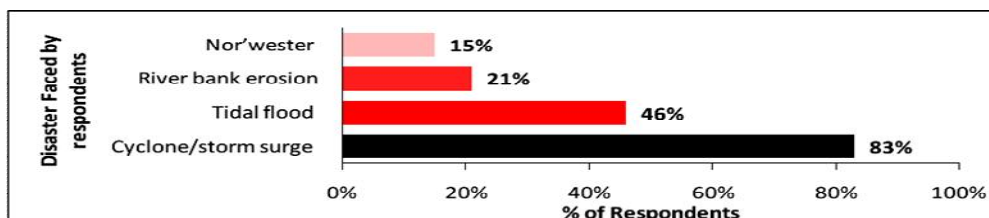


Fig. 6. Most devastating hazard faced by the respondents in the past 10 years in Chandradip Union

Table 1 shows the disaster rank, damage, intensity of losses and affected area of the Chandradip union and revealed that because of these hazards crop-livestock-fisheries production, human health sectors, local level critical facilities, education, infrastructure development and biodiversity is seriously damaged. These disasters caused widespread damage and increasing vulnerability to hazards.

### 3.2.2 Month wise hazards calendar

According to the respondent's experience of occurring adverse impact of hazards at different time extent a seasonal hazard calendar was prepared for Chandradip union is shown in the Table 2. The color codes of each calendar are used to understand the risk or probability of occurrence of particular hazards at different time of the year. The year round frequency of different hazards made the study area vulnerable showed in the Table 2.

The synchronization of hazards (nor'wester, storm wind, surge, tidal bore, bank erosion and tidal flood) has the peak during the summer and rainy seasons and it takes place approximately within a three months' time period. This is from June, July and August causing a sudden increase in high tidal bore, inundation, submergence and water logging with storm wind in practically all areas of the Chandradip union.

This caused damage to the standing crops and vegetables; lock all types of livelihood activities; destroy houses and other structural measures; losses of livestock, poultry and increase diseases prevalence. Table 2 shows that the high frequency and vulnerability due to storm surge, cyclone, bank erosion and nor'wester occurred consequently in the wet season; summer and spring seasons; wet and autumn seasons; wet and autumn seasons; and summer and spring seasons of the year. These events result in too much vulnerability during almost all the year round. Storm surge remain low in autumn to spring seasons; reaches medium in summer and autumn seasons; and high in wet season causing high damage of rice cultivation. Cyclone storm reaches high in spring and summer seasons causing high structural damages and losses of human. Tidal flood reaches high in wet and autumn seasons and causes high damage of agriculture production, outbreaks of water borne diseases; loss of livestock production etc. Bank erosion reaches high in wet season and starting part of the autumn and causes damage of embankments, roads etc. These caused inundation and water logging that made Aman paddy cultivation uncertain. Thus, the farming families of the villages are badly affected and cannot prepare their seed bed in time. Nor'wester remains high in summer and spring and causes frequent damages of human, wealth, plant, houses and crops.

**Table 1. Disasters, years, losses and affected sectors**

Disaster and rank	Years	Losses (medium*/high**) and affected sectors
Storm surge-1	2006, 2007, 2008, 2009, 2011, 2013	High: Fisheries, health, infrastructure and Medium: Agriculture, livestock, communication.
Cyclone-1	2004,2005,2006,2008,2009,2010,2011,2013	High: Agriculture, medical care and Medium: Fisheries, cattle.
Nor'wester -4	1988,1991,1992,1995,1997,2005,2002	High: Agriculture, human resources, infrastructure and Medium: Fisheries, Livestock, communication.
River bank erosion - 3	1986,1987,1988,1995,1998,2004,2008,2009, 2013	High: Agriculture, infrastructure, roadways and Medium: Fisheries, cattle, human resources.
Tidal Flood -2	1986,1987,1988,1995,1998,2004,2009	High: Agriculture, human, infrastructure and Medium: Fisheries, Livestock, communication.

(\*\*High means above 50% damages and losses, \*medium means below 50% damages and losses) Source: Field Survey

**Table 2. Month wise hazards calendar**

Hazards	Season					
	Summer	Wet / Rainy	Autumn	Dewy	Winter	Spring
	15 April -15 June	15 June-15 August	15 August-15 October	15 October-15 December	15 December-15 February	15 February -15 April
Storm surge	Medium	High	Medium	Low		
Cyclone	High	Medium				High
Tidal flood		High		Medium	Low	
Bank erosion	Medium		High	Low		
Nor'wester	High	Low				High Low

(Source: Field survey and Bauphal Upazila Office)

**3.3 Vulnerable Condition of Women during and after Disaster**

**3.3.1 Getting early warning signal**

Study revealed that only 38% respondents get early warning signal of hazard. They lack the information and modern weather forecasting technologies because they don't have radio, T.V, internet or mobile phone etc. to get the real time warning signal. Moreover, in most cases women are neglected to provide warning information via men and are not inspired to evacuate. In some cases, due to the gendered nature (about 5%) and unsafe condition (36%) in the shelter, they are self-enthused to stay at home. Respondents also commented that due to the transportation crisis women, girls and disables are left behind (17%) to leave houses during emergency evacuation. Researcher [20] commented that women have limited access to information such as early warning systems. The majority of women are left aside from most information lines. Women are less able to minimize risks because they did not get enough time to get prepared for their own and families to cope with vulnerabilities. On the other hand, women virtually shoulder the whole responsibility of looking after the children and protecting their families [8].

**3.3.2 Getting relief**

Women cannot move to get relief more often due to the lack of transport facilities, gendered sensitive harassment by the men in the relief line, discouraged by their household male; also aged women and disable people are not able to become enlisted to receive relief. Walking long distance and standing in the queues with male people is a common matter in all types of disaster in the study area. Study shows that only 63% respondents get relief after hazard, 37% get nothing and they repeatedly suffer insecurity and loss of dignity while they wait in the queue to collect relief. Previous researchers also supported the above constraints faced by women and disable persons during relief collection and commented that lack of transport facilities, walking long distance to the relief distribution place, loss of dignity and harassments by men while waiting in the relief line and standing in queues with male people is a common in all types of disaster [21-24].

**3.3.3 Taking shelter and shelter environment**

After survey studies it was unveiled that only 20% respondents take shelter in the cyclone center, 2% on road and 7% at relative's residences and 13% at neighbor's house as



shown in Fig. 7. The real situation of shelter place was discovered in this study that most of the respondents faced lack of appropriate safety, security, privacy, gender-friendly environment. Also lack in sanitation and hygienic facilities discourage them to evacuate their own residences that worsen the situation by making women, adolescent girls, disables and elderly peoples vulnerable.

Study found that majority of the respondents (58%) stay in their own residences during the disaster. They think if they leave their houses, those will be damaged more and they will lose their assets. Analysis unveil that (Fig. 8) most of the female respondents faced physical and mental torture (41%) due to lack of security. About 28% respondents experienced theft; 6% faced sexual harassment in the shelter. Near about 6% faced lack of social network, communication problems and lack of transportation facilities in the shelter.

Researchers concluded that sexual violence against women became extensive at the shelter centers during floods. All these factors create psycho-social impact on women's life [21].

**3.3.4 Selling of livelihood related assets**

Local women commented that disaster damages their source of cash income and livelihood-livestock, poultry, fisheries, trees, crops, seedlings and animal fodder etc.; reduced production of milk and meat; selling of their assets like jewelry and other source of livelihood

are more (72%) than men's assets during crisis and they become economically insecure, though women's responsibility and workload increased after disaster. Researchers also supported these findings and also commented that as women sell their own cash income resources like livestock, poultry and also borrow money from relatives in case of emergencies such as diseases of children and fall into financial crisis [25] during the coping mechanism in disaster, women became economically insecure and face the most vulnerable condition [26].

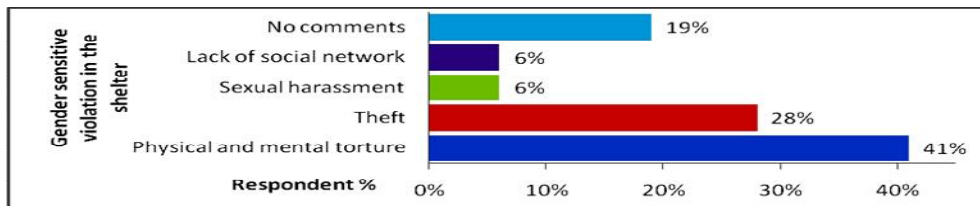
**3.4 Harmful Impacts on Women's Health and Sanitation**

**3.4.1 Availability of gender sensitive materials**

Social tradition and customs have contributed to health problems for young and pregnant women in disaster situations. Analyses of the result showed that inside the shelter 95% women and adolescent girls severely faced lack in gender sensitive washing, sanitation, and hygienic facilities and they don't have their own arrangements. This finding was reinforced by other researchers who commented that the lack of privacy at latrines, unavailability of separate toilets and showers for women and adolescent girls are some unresolved issues that culture has always failed to address [22,23]. Findings from the research [27] proved that women are likely to suffer increased mental strain, and bear the burden of certain social constraints; for instance, they are shamed by using public toilets or being seen by men when in wet clothing.



**Fig. 7. Place of taking shelter (%) during and after disaster**



**Fig. 8. Gender sensitive violation faced by respondent in shelter (%) in disaster**

### **3.4.2 Pregnant women and maternal care**

A total of 99% pregnant and neonatal mother commented that during and after emergency, trained and well equipped volunteers with resources to support the delivery of services were not found during emergency. In the study area 89% breastfeeding women were under the scarcity of suitable places for babies' breastfeeding and proper sanitary materials. Therefore, they were affected by different physiological problems due to unhygienic conditions, faced vulnerability to reproductive and sexual health problems. After disaster the health condition of women deteriorates distressingly. Because, shelter management community neglected the importance of women's privacy; basic needs for good health and hygienic measures; and continuously avoids addressing the gender sensitive and health related issues of providing institutional health care [10]. Also socialization factors such as the negligence of these basic needs along with women, play an important role in determining their health condition. Researchers commented that it is a matter of great sorrow that majority respondents of the study area had lack of sufficient food and drinking water, privacy, separate place for pregnant women, sufficient air and light, separate washrooms and such other facilities in shelters [24].

### **3.4.3 Food and nutrition**

Women require special nourishment when they are pregnant or breastfeeding. Study showed that 92% respondents get no sufficient food supply in the shelter and women are more likely to suffer from malnutrition or they share food with their children or they take food less due to food shortages. In case of solvent family, the respondents get normal food supply (5%) before and after disaster. A significant ( $P = .10$ ) moderate positive relationship (30%) between respondents' economic solvency and food supply was found. This result is reinforced by previous research [24] which reported that women in matters of their taking food are always neglected – particularly, mothers eat less during shortages of food and it is frequently occurred during and after disaster – as such they are always deficient in nutrition and calorie intake.

### **3.4.4 Safe water availability**

Field study revealed that generally 95% respondent used tube-well water before disaster as the major source. Pure drinking water was not

available during and after the disaster period noticed by 66.67% respondents. During and after hazards functioning deep tube wells were not available in the study area. Drinking water becomes an acute crisis for household use. Women get responsibility to provide drinking water for their families. Researchers [24] found that drinking water was available for only 15% respondents in the disaster affected area.

### **3.4.5 Getting in contact with polluted water**

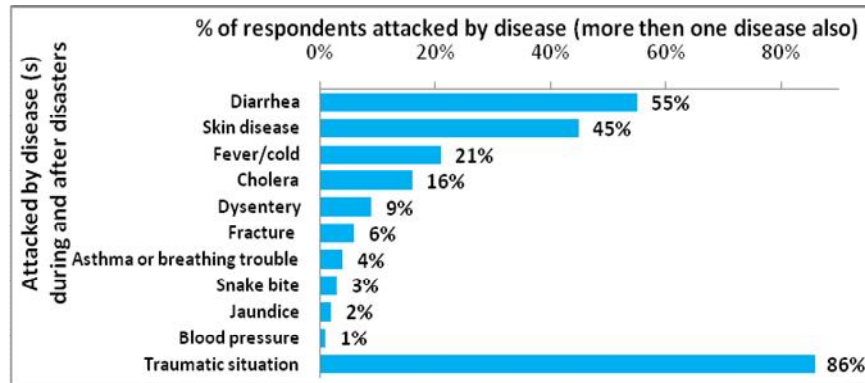
Analysis found that 78% women hold the utmost risk of getting in contact with unclean and polluted water and attacked by diseases after emergency and suffered by water-borne diseases. This result was reinforced by previous research [22,23] which reported that women and girls face maximum risk of getting in contact with polluted water and falling sick during and after disasters.

### **3.4.6 Use of hand wash and sanitary practices**

Study shows that most of the respondents (79%) don't clean their hand with hand wash after evacuation. Only 21% respondent use soap or hand washes. Most of the time, they just clean their hands with water, soil or ash. After hazard some tube-wells become out of order because of the polluted and saline water intrusion. Also due to lack of money, respondents could not buy their minimum food and meet the minimum requirements of basic needs. In this situation use of soap is nothing but a luxury to them. In the previous research [28] and also in the current research, results are approximately similar and we can comment that after disaster, the rates of washing hands with water and soap before taking food and after defecation were 29.4% in both Kalapara and Galachipa respectively. From the above discussion, we can conclude that there was a deterioration of hygiene practices after disaster, as reflected by their sanitation practices after disasters.

### **3.4.7 Diseases sufferings**

Study also showed that during and after disaster, 86% of the respondents attacked by various diseases -55% diarrheas, 45% skin diseases, 21% fever/cold, 16% cholera, 9% dysentery, 6% fracture, 4% from asthma or breathing trouble, 3% snake bite, 2% jaundice, 1% blood pressure and 86 % of the respondents suffer from traumatic situation during and after disaster (Fig. 9).



**Fig. 9. Respondents attacked by various diseases (%) during and after disaster**

Investigation discovered that due to disaster when the respondent forced in using polluted flood water, simultaneously increased diseases prevalence in the study area. A significant ( $P=.10$ ) moderate positive relationship (60%) between respondent's source of drinking water and the water borne diseased condition during and after disaster was found. Study [21] revealed that due to lack of clean drinking water, almost all the respondents were attacked by various water borne diseases during and after disaster.

### **3.4.8 Financial capacity to buy food and medicine**

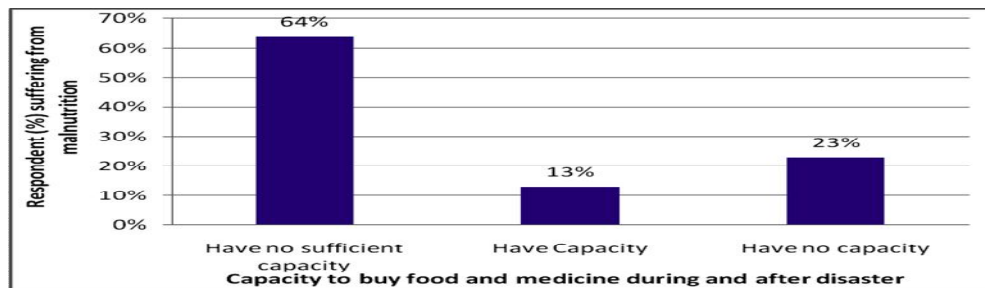
Analysis revealed that women chronically suffer from attacked diseases because of not being able to buy medicine. Study showed that women staying in shelter during and after disasters suffering from malnutrition -64% have no sufficient capacity to buy food and medicine; only 13% percent had; and 23% had no capacity to buy food and medicine during and after disasters (Fig. 10). Study [21] reported that nearly 89% of women suffered from food insecurity due to lack of access to and control over resources.

A significant ( $P = .10$ ) moderate positive relationship (60%) between respondents' household conditions with respect to economic solvency and their capacity to buy food and medicine was found.

### **3.4.9 Use of sanitary latrine**

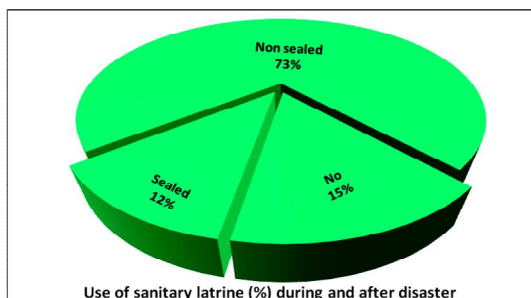
In the study area 12% women use sealed sanitary latrine; 74% non-sealed sanitary latrine and rest 15% have no sanitary latrine (Fig. 11). Only 57% latrines are fenced with banana or coconut leaf or rope tied with bamboo pillar.

As the Chandradip union surrounded by Tentulia river, 65% sanitation facilities were affected by the flood, inundation and submergence of water and become unfit for use after disasters. Overall it creates an unhealthy damp environment and increases the chances of disease and respondents leave their closet in open space which is very unhealthy. A significant ( $P = .10$ ) positive relationship (40%) between respondent's economic solvency, availability of sanitary facilities and use of soap was found. A significant negative relationship (10% level of provability) has been observed also in the case of diseases'



**Fig. 10. Respondent's capacity to buy food and medicine and suffering from malnutrition during and after disaster (%)**

prevalence, non-availability of sanitary facilities (86%) and use of soap (5% only) in the study area. In case of respondent where diseases' prevalence was higher, availability of sanitation facilities and tradition of use of hand wash was lower. As a newly established small administrative unit, in the study area, the primary health care for the families is still inadequate and they mostly depend on the traditional knowledge and local quack doctors.



**Fig. 11. Respondent's use of sanitary latrine during and after disaster (%)**

### 3.5 Preparedness Techniques and Coping Strategies

#### 3.5.1 Reconstruction and repairing of houses

Women have the ability to be innovators and change makers [8]. About 69% of the women in the study area try to cope with disasters with their traditional knowledge and arts which becomes a little help due to change of the nature of hazards. Study found that women and girls, who help their household males to refurbish their houses before disasters, are more resilient to disasters. They usually elevate the height of the bed for family members using locally available resources like bamboo pole, straw, jute rope, mud and elevate the house height more than previous as experienced in the last flood water level. Women in Chandradip union also participate in making house platforms, increase plinth height, making bamboo bridges, protecting crops and livestock and engaging in income generating activities at before, during and after a disaster. Poor women find it extremely difficult to ensure food and drinking water security when they struggle to live in flooded condition [25]. Women's participation in reconstruction and repairing of houses to increase the strength of their old houses and related activities were found in the studies of other researcher [23] and commented that these types of activities are essential in disaster management.

#### 3.5.2 Homestead gardening as an adaptive mechanism and household related activities

Among the respondent women, 96% were stored fodder for domestic animals. As the Char island, in the study area, we observed that 78% homestead gardening was managed by women and this help them increase their economic contribution to their households and help women make a role in household decision-making. Researcher [29] commented that results of activities like homestead gardening highlight the multiple benefits. These programs can ensure the poor family level food and nutritional security and development.

#### 3.5.3 Rearing livestock and household related activities

In the study areas, women generally take care of livestock and poultry and other small assets. When a disaster occurs, to avoid the loss of these assets they sell these sources of cash income in order to meet household financial needs during disaster and when her husband's or male has no income. Selling animals, mortgaging, or borrowing against assets, or borrowing from neighbors are common indigenous and traditional strategies for survival and adaptation in the study area. Women are the first to provide nursing care for the injured animals whether it is a flood or any calamities before any official relief work or activities of veterinary services begins. Women also store straw, roughages, household and kitchen agricultural product residue for their domestic animals. Rearing and sale of livestock and poultry are vital profitable activities wholly carried out by women [11]. Their knowledge, advancement and adjustment in caring and rearing of livestock are imitable. Before flood season women help her household male to increase level of cow sheds, thus make it resilient to flooding or inundations. This own technique is often used to protect goats and poultry from flood water.

#### 3.5.4 Ensuring food security, serving household and own family members

Women store handful of rice putting aside each time a boiled rice is cooked, store fried and puffed rice, flattened rice; round year save money that her male family member earns which she hides in a bamboo-hole or in the roof or keeps in a trunk or in a mud made bank;

maintain storing dry fuels; collect firewood; by arranging for the temporary migration of the children, the elderly, teenage girl and the sick; taking shelter to relative's house in the Bauphal city; and by procurement of commonly needed medicines before striking of disaster and prepare portable mud stoves for crises period. Study [25] also cited these activities in their report during disaster by women. The social scientist [30] commented from his research study that women save like mice, patiently and diligently and saving is a virtue of womanhood... a beggar woman also saves for her emergency.

Physical visit and key informant interviews discovered that identification of the hazard risks and taking effective mitigation measures is considered with neglected eyes at Chandradip. Some NGOs have started to work on the disaster in Bauphal Upazila, which is very inadequate compared to the needs. But all respondents said that there are no organizations or authorities that separately work for women's vulnerability due to natural hazards.

#### **4. CONCLUSION AND RECOMMENDATION**

This research was conducted to explore the condition of women, their special vulnerabilities to climate induced hazards and coping strategies related to daily life, livelihood, health, sanitation and water during hazardous situation. Studies revealed that agriculture, livestock, fisheries, human health sectors and local level critical facilities are the most at-risk elements of the study area due to five major active hazards - cyclone, storm surge, tidal flood, river bank erosion and nor'wester in the study area. Poverty rate was high in the study area. 95% respondents were below the national average per capita income. In the study area only 20% respondents take shelter in the cyclone center; 95% women and adolescent girls were severely lack in gender sensitive basic facilities, 99% pregnant women and neonatal mother was severely lack in health services, 41% faced physical and mental torture by men; 28% face theft; 6% sexual harassment, 6% face lack of social network, 78% women hold the utmost risk of getting in contact with unclean and polluted water, 67% women noticed no sources of pure drinking water were available, 86% attacked by various diseases, 92% suffered by malnutrition and 87% women had no/insufficient capacity to buy food and medicine in the study area. All these factors create psycho-social impact on

women's lives. In this situation, identifying the hazard specific risks and vulnerability and taking effective mitigation measures to reduce the vulnerability for women and children are much needed. Before the disaster, women and girls help their household male to prepare for and coping with disasters e.g. old house reconstruction and repairing; plinth elevation; store puffed and flattened rice; save round year small savings of money. During post disaster women sell their source of cash income in order to meet household financial needs; mortgage assets or borrow money from neighbors. During disaster women arrange temporary migration for the safety and security of their family members to relative's house etc. Therefore to reduce the damages and loss due to climate induced disaster, we simply need to put the policies that ensure that women as well as men are fully involved in planning DRR strategies and are full participants in recovery efforts and thus these policies will be more likely to succeed. To reduce the women vulnerabilities to climate induced disasters, field based location specific risk analysis researches in a gender-responsive manner and adoptions of gender-sensitive approaches are needed.

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

#### **REFERENCES**

1. UNISDR. UNISDR terminology for disaster risk reduction. UNISDR Geneva, Switzerland; 2015. Available:[www.unisdr.org](http://www.unisdr.org)
2. Gender and Health in Disasters. Department of Gender and Women's Health. World Health Organization, 20, Avenue Appia, Geneva, Switzerland; 2002.
3. Anderson M, Woodrow P. Rising from the Ashes: Development strategies in times of disaster, UNESCO and West view Press, Inc. Colorado; 1990.
4. UNDP. Bureau for Crisis Prevention and Recovery (BCPR). Climate risk management for agriculture sector in Bangladesh. New York, NY: UNDP BCPR; 2013.
5. World Bank. Bangladesh: Bolstering Economic Growth to Reduce Poverty; 2013.

6. Nasreen M. Climate change and livelihood in Bangladesh: Experiences of people living in coastal regions. 2013;1-25. Available:<http://www.buildresilience.org> (Accessed 04 October 2015)
7. Enarson E. SWS fact sheet: Women and Disaster; 2006.
8. UN Women. Assessment of women's livelihood needs in three eco-zones of Bangladesh. Norwegian Embassy, BCAS and UN Women of Bangladesh; 2014.
9. Rahman MM. Bauphal Upazila disaster management plan. Formulated by Upazila Disaster Management Committee and CDMP, Phase-II. MoDMR. Dhaka; 2014.
10. Rahman S. Climate change, disaster and gender vulnerability: A study on two divisions of Bangladesh. *American Journal of Human Ecology*. 2013;2(2):72-82.
11. Islam MR. Vulnerability and coping strategies of women in disaster: A study on coastal areas of Bangladesh. *Arts Faculty Journal*. 2012;4:147-169.
12. Blaikie P, Cannon T, Davis I, Wisner B. *At risk: Natural hazards, people's vulnerability and disasters*. London: Routledge; 2003.
13. Momen M, Bhuiya A, Chowdhury M. Vulnerable of the vulnerable: The situation of divorced, abandoned and widowed women in a Rural Area of Bangladesh. Working Paper Number 11. The BRAC-ICDDR, B Joint Research Project Dhaka, Bangladesh. 1995;1-28.
14. Zhang H, Zhuang T, Zeng W. Impact of household endowments on response capacity of farming households to natural disasters. *Int. J. Disaster Risk Sci*. 2012; 3(4):218-226.  
DOI: 10.1007/s13753-012-0022-2
15. World Bank, GNI per capita, Atlas method (current US\$); 2015.  
Available:<http://data.worldbank.org/indicator/NY.GNP.PCAP.CD> (Accessed 29 October 2015)
16. Byrne B, Baden S. Gender emergencies and humanitarian assistance. BRIDGE Report 35. Brighton: IDS; 1995.
17. Holmes R, Mannan F, Dhali HH, Parveen MS. Gendered risks, poverty and vulnerability in Bangladesh. Case study of the Challenging the Frontiers of Poverty Reduction programme (CFPR), Specially Targeted Ultra Poor II (STUP II), Overseas Development Institute, 111 Westminster Bridge Road, London SE1 7JD, UK; 2010.
18. Ahmed S, Wilde K. Moving coastlines: emergence and use of land in the Ganges-Brahmaputra-Meghna Estuary.
19. Situation Report. River erosion: Jamalpur and Patuakhali District of Bangladesh. Network for information, response and preparedness activities on disaster. Reporting by-NIRAPAD Secretariat, 19/13 (Ground Floor), Babar Road, Block-B, Mohammadpur, Dhaka; 2010.
20. Hamid S. Female-headed Households, In rethinking rural poverty: The case of Bangladesh Rahman HZ, Hussain M. (Eds). Dhaka. Bangladesh Institute of Development Studies. 1992;77-190.
21. Azad AK, Hossain KM, Nasreen M. Flood-induced vulnerabilities and problems encountered by women in Northern Bangladesh. *Int. J. Disaster Risk Sci*. 2013;4(4):190-199.
22. Mehta M. Gender matters: Lessons for disaster risk reduction in South Asia, ICIMOD, Kathmandu, Nepal; 2007.  
Available:[www.gdnonline.org/resource/Gender&disaster-preparedness-ICIMOD.pdf](http://www.gdnonline.org/resource/Gender&disaster-preparedness-ICIMOD.pdf) (Accessed 1 January 2008)
23. Dasgupta S, Siriner I, Sarathi De P. (editors). 'Women's encounter with disaster' Front page Publications Ltd, India; 2010.
24. Biswas AKMAA, Sattar MA, Zaman AKMM, Osman MS, Jahan R. Flood risk and its reduction strategies practiced by women. *J. Patuakhali Sci. and Tech. Univ*. 2014;5(2):147-164.
25. CCC. Climate change cell. Gender and vulnerable groups in Bangladesh. Climate Change Cell, DoE, MoEF; Component 4b, CDMP, MoFDM. Dhaka. 2009;104.
26. Enarson E. Gender and natural disasters, In focus program on crisis response and reconstruction, Working Paper 1; 2000.
27. Rashid SF, Michaud S. Female adolescents and their sexuality: Notions of honor, shame, purity and pollution during the floods. *Disasters*. 2000;24(1):54-70.
28. Concern Universal. Community Perspectives on Water and Sanitation towards 'Disaster Risk Reduction' (DRR). 2008. Study Conducted by Eminence. 7/3, Block -A Lalmatia, Dhaka 1207, Bangladesh.
29. Bushamuka VN, de Pee S, Talukder A, Kiess L, Panagides D, Taher A,

- Bloem M. Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh. *Food Nutr Bull.* 2005;26(1):17-25.
30. Blanchet T. Rural women, savings and credit: An anthropological view. An Occasional Paper, PRIP/PACT, Women for Women Research and Study Group Library, Dhaka, Bangladesh; 1986.

---

© 2016 Biswas et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<http://sciencedomain.org/review-history/12841>