

Effects of Climate Change and Maternal Morality: Perspective from Case STUDIES in rural Bangladesh

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Abstract: The study explored the community perception of maternal deaths influenced by natural disaster, practice of maternal complications during natural disaster among the rural population in Bangladesh. It also explored the challenges faced by the community for providing health care and referring the complicated pregnant mothers during disaster. Three focus group discussions (FGDs) and eight in-depth interviews (IDIs) were conducted in the marginalized rural communities in the flood-prone Khaliajhuri sub-district, Netrakona district, Bangladesh. Flood is one of the major risk factors for influencing maternal death. Pregnant mothers seriously suffer from maternal complication, lack of antenatal checkup and even any doctor during flood. During the time of delivery, it is difficult to find even a skilled attendant and referring the patient with delivery complications to the healthcare facility. Boat is the only mode of transport. Majority maternal deaths occur on the boats during transfer from the community to the hospital. The rural people feel that the maternal deaths influenced by natural disaster are the natural phenomena. It needs some pre-preparation to support pregnant women during the disaster. There is unawareness of maternal health, related care and complications during disaster among the local health service providers and volunteers.

Keywords: Maternal death, Marginalized community, Flood, Natural disaster, Bangladesh

1. Introduction

Natural disaster is identified as one of the most important factors for deaths of women, especially during pregnancy. Female to male death ratio is 3:1 during natural disaster [1]. During the disaster, women are the most vulnerable for pregnancy complications including retained placenta, obstructed labour and fetal distress. It is difficult to manage maternal health problems during disasters as health care facilities and providers are not available. Delivery in unsafe condition increases maternal deaths [2]. Disaster also impacts on the reproductive health through spontaneous abortion, birth defects and low birth weight of the baby [2,3]. In Pakistan, about 500 000 expecting mothers were affected by the 2010 flood while 1.5 million women needed emergency obstetric care [4]. Among the pregnant mothers during disaster 1700 women delivered with hundreds of them suffered from delivery complications in Pakistan. Maternal deaths are also high in Pakistan due to a lack of medicine and the absence of female health care provider during disaster [5]. Bangladesh is considered to be one of the world's most natural hazard-prone countries, and flood is one of the most common disasters experienced regularly by the people of Bangladesh where on average, 18% of the country affected by floods every year [6]. In a study by UNFPA of nine districts in Bangladesh, it was found that 1,876,636 people are affected by flood disaster where 32,000 – 33,000 pregnant mothers [7]. Pregnant women, lactating mothers and differently disabled women suffered the most, as they found it difficult for moving during and after a disaster. Sometimes women cannot express their problems [8]. In Bangladesh, it is found that non-availability of transport in and around all flood-affected areas and disruption of communications seriously hindered women's ability to access health facilities for deliveries [9]. Moreover, the delay in decision making and delays in transportation influence the maternal deaths in rural communities [10]. It is also found that some of the healthcare centers are inundated with flood water. So, access to health services becomes limited as a result of routine immunization and outpatient consultation, antenatal care become disrupted in the affected villages in Bangladesh [11]. Due to climate change, Bangladesh is overexposed for natural disasters such as floods. This study explored the perception of maternal death during the flood. This study also explored the practices and challenges of the community people for emergency maternal care with complications during the flood period. The study tried to investigate the community recommendation for preventing maternal death during a natural disaster.

2. Materials and Methods

2.1. Study Methods

A qualitative study was conducted at Khaliaghuri Upazila (sub-district) in Netrakona district of Bangladesh during July to September 2015. Three Focus group discussions (FGD) and eight in-depth interviews (IDI) were conducted in two unions of the sub-district. For FGDs, we chose three groups. Each group was selected from the union where the maternal deaths were reported during the previous six months. FGD members consisted of the neighbors of the deceased mother's family, male and female guardians of pregnant and recently delivered mothers, pregnant mothers, community group members, school teachers, religious leader, Union Parisad members and elite person of the society who have idea on the incidence of the maternal death. From 9 to 11 participants were included in each of the FGD.

For in-depth interviews, participants were chosen from that specific communities (where FGDs were conducted). Eight IDIs were performed where two were conducted with the male guardian and two were conducted with the female guardians of the pregnant or recently delivered mother, two were conducted with the village doctors and the remaining two were conducted with the traditional birth attendant of that specific community where maternal death was reported. All IDIs were conducted following guidelines by face-to-face interview at the household level. This qualitative research technique has vast advantages to explore the interviewee's perspective on a particular situation [12,13] (Table 1).

Table 1: List of Participants in the qualitative study

Qualitative instruments	Age range	Participants
FGD (n=03)	18 - 50 years	Neighbor of the deceased mother's home includes Pregnant mothers, recently delivered mothers with their guardians, community group members, Elite person of the society Religious leader
IDI (n=08)	25 - 60 years	Female guardians (02) Male guardians (02) Traditional Birth Attendants (02) Village doctors (02)

2.2 Data Collection

Field training was conducted among two research officers and guidelines were pre-tested. During FGDs, one research officer facilitating the discussion whereas, other research officer took important notes. The objectives of the research were demonstrated to the respondents before the interviews. A written consent was taken from each of the respondents before the interviews or FGDs. A number of prompts were used to obtain the information. Audio voice recording was done with prior permission from the respondents. From the audio-recordings and

hand notes of the interviewer's, the research officers prepared verbatim transcripts of the IDIs and FGDs in native Bengali language. Later, English translations of the transcripts were performed by two expert bi-lingual researchers. The principal researcher controlled the transcript quality by randomly selected transcripts reviews and translation.

These transcriptions were also checked by public health specialists. Peer debriefing also performed to maintain its reliability of the data. Initial open coded was done, then from those open code, selective coding was done. Themes were identified after read and re-read of the data [14,15] and finally, thematic analysis was performed (Table 2).

Table 2: Content of the focus- group discussion and In-depth interview

Area of discussion	Types of Prompts used
Perception on the occurrence of maternal death and natural disaster	Either any maternal death occurs here? Why and when maternal deaths occur in this area? Either any natural disaster observed? When disasters occur here? What types of disaster occur here? Either disaster occur regularly and duration of the disaster?
Practices of maternal health care during natural disaster	How maternal health care during a disaster? What preparation during pregnancy and delivery complications at the time of disaster? What are the community people do during complication at disaster? Where and how they go during maternal complication?
Barrier of the marginalized community to practices on maternal care during disaster	What are the challenges for maternal care during a disaster? Types of obstacles faced during the referral of risky mother? Either referral of mother is delay and why?
Relation of maternal death with natural disaster	Whether maternal death influenced by natural disaster? How natural disaster causes maternal death with example?
Recommendation and initiatives to prevent maternal death during disaster	How to prevent maternal death for natural disaster? What initiatives taken by the community people to overcome such situation? What are the recommendations to increase maternal health care during a disaster?

2.3 Data Analysis

Qualitative content analysis was conducted following the guidelines by Graneheim and Lundman [16]. The participant's actual words were analyzed as actual content and interpretation and judgment of participants' response was analyzed as latent content [17]. We analyzed the data with a repeated look over the written transcription by identifying each of the meaning units and listening to the audio recorder [16].

3. Results

Flood is the common and annual natural disaster in the study area, especially during monsoon in the Khaliaghuri sub-district of the Netrakona district, Bangladesh. Maternal health care is seriously disrupted during such a disaster period. There is community ignorance on special maternal care as a whole including disaster period. The health care providers are not available during maternal complications of the mother during and after the disaster. It is difficult to organize the delivery of the mother during and after the disaster period. It is a very complex task to organize place and person for delivery. Skilled birth attendant for delivery is unavailable at the disaster area. Even it is very difficult to organize the traditional birth attendant for assisting the delivery. If delivery complication arises then referral of mother from community to facility is very difficult and cumbersome process. The boat is the most common mode of transportation. Transporting the risky mother with delivery complications takes a lot of time to reach the health care facility. As a result, sometimes mothers died on the boat due to delay in transferring her to the hospital.

3.1 Perception on occurrence of maternal death during flood

Most of the community people who participated in FGD and IDI has perception of natural disaster and maternal death in their area. However, they perceive that both of the things occur due to the destiny/ ill-fate. Though floods occur in one season (monsoon) but its effect persists throughout the year in that area. Floods make their life more complicated as there are problems of housing, communication, food and medical treatment. Their life becomes under threat during flood. Pregnant mothers and their children are more vulnerable during the flood. Maximum maternal death occurs during the disaster period due to difficulty in treatment and communication. Maternal deaths occur due to complications after delivery and delay to reach the hospital due to communication and transportation problems.

"Flood occurs every year in rainy season but it was most dangerous in 2014. People couldn't go out from home. Tube wells and toilets were sub-merged. We stayed on the roof of our houses. We could not cook due to wind and heavy rain. Many children died with diarrhea. Some people died by thunderstorms."- (P20, FGD 1) one of the male guardians mentioned

"Maternal deaths occur due to excessive bleeding after delivery and difficult to reach at hospital as boat is the only mode of transportation. Sometimes the mother died within the boat. This is most common during the flood period." – (P13) village doctor said

3.2 Practices of maternal health care during natural disaster

According to the community people, pregnant mothers suffer a lot during flood. They had no prior planning for the management of maternal complications during the flood. Pregnant mother didn't receive special attention of care or treatment. Local public healthcare facilities and health care providers were not available for maternal care. Husband of the mother with severe labor pain commonly accompanied during boat transportation. But if any complication arises, they communicate with the village doctors (quack), local kabiraj (a type of quack practicing traditional Ayurveda) and traditional birth attendant for help. If any serious maternal complication arose,

they arranged an emergency boat, trawler or any available mode of transport to transfer the mother to the nearby hospital as per suggestion by the village doctor and traditional birth attendant.

"We call kabiraj and village doctor if there is any complication of the pregnant mother during flood. They provide treatment after checkup. We can't go to the public hospital due to difficulties in transportation. But if the kabiraj and village doctor fail to provide treatment and suggest us to go to the hospital then we try to arrange for transferring the mother which is very difficult. At first, we have to go to Krishnopur bazaar (nearby market place) to arrange a boat for reaching to Samachor (nearest available land with motorable road), then we book the auto-rickshaw or laguna (indigenously makeshift tri-cycle with installed water-pump motor) to reach hospital. The process is very time-consuming and expensive." – (P2, FGD 2)

"Koki's wife died with delivery complication because she was not sending to the hospital timely due to flood at that time in our village. When she reached the hospital she died. The road and transport system are not fine here and it's difficult to reach hospital timely during emergency case which is a reason for the maternal death." – (P12, FGD 3)

"I try to make delivery of the mother at home but during flood, it is difficult for me to reach the pregnant mother's home. But if I realize that the mother is at risk then I immediately refer her to Upazila hospital though it is very difficult and time-consuming to reach the hospital by boat." – (ID15) traditional birth attendant said

3.3 Obstacle to practices on maternal care during disaster

Communication and transportation are the major obstacles of maternal care in the flood-affected areas. Public healthcare facilities or hospitals in rural areas are close and health care providers do not regularly checkup the pregnant mothers during the flood. The satellite clinic does not organize during the flood period. Though there are some volunteer activities for supporting flood-affected people but there is no special support for maternal health care. Even it is difficult to find a village doctor and traditional birth attendant. The only vehicle is the boat for transportation. When any difficulties arise among pregnant mothers then it is difficult to organize the boat. It is also very time consuming to reach to the hospitals. Sometimes they depend on the destiny for any maternal complication during the flood, if they can not organize any boat. Boatmen are not easily available or even they do not agree to carry the risk to transport the complicated pregnant mother. They demand a high amount of money for the emergency boat transportation.

"Boat is the only vehicle for transportation during flood. Sometimes a boat can't easily manage during an emergency. Boatmen demand a lot of money during transportation of mother with maternal complication as it is time-consuming." – (P8, FGD 1)

"We can't easily find any village doctor or traditional birth attendant during maternal complication at the period of flood as there is huge pressure of patient at that time. Sometimes we have nothing to do but just to depend only on the fate" – (ID18) One of the female guardians said

3.4 Barrier to referral of complicated mothers

Community people are mostly depending on the kabiraj, village doctors (quack) and traditional birth attendant during maternal complication. They normally do not refer the mother until serious condition occurs as they know the barriers of communication and transportation during flood. Moreover, doctors are not available at healthcare facilities. The traditional practitioners refer the complicated mothers when they failed to provide necessary support. Sometimes they have to move from village doctor to Union sub-center, then from there to Upazila health complex by boat and then district hospital by any mode of transportation which is very time consuming and painful for the mother.

"My sister-in-law was admitted to Upazila hospital during the last flood with complication and she was referred to the Sylhet district hospital which took a minimum of five hours to reach by boat. Moreover, the wave of the river was too high to move and there was no other way to move and ultimately she delivered on the boat under high waves with high risk." – (P2, FGD 1)

"Actually, in case of advanced pregnancy, women are in more trouble during the flood. There is no proper treatment of the mother during that period. The financial problem is common at that time for proper checkup and treatment of the mothers. Moreover, moving from the Khaliaghuri to another destination by boat is the only vehicle that takes lots of time and any accidents can happen at that time." – (P3, FGD 2)

"if the traditional birth attendants cannot handle the complicated delivery then she refers the mother to the village doctor and if village the doctor failed then he refers to the hospital. But before that, both of them tried traditionally. It takes a long time to decide to refer the mother to a healthcare facility. And after that, the transportation by boat takes a long time. So, as a whole we lose long time, resulting in more life-threatening complications for the mother." – (ID17) one of the male guardians said

3.5 Influence of maternal death by natural disaster

Most of the community people perceived that maternal deaths are seriously influenced by natural disasters like floods in the affected areas. As the mother, who has been already suffering from malnutrition and anemia with other diseases, cannot receive proper maternal care during flood, if any delivery complication arises, she dies resulting the maternal death during the natural disaster. The tarred-decision and transportation delay are common during flood which influence maternal death. Ignorance of traditional practitioners to identify the risky mother and negligence of the community people causes delay in decision making. Moreover, arranging boat, managing money, selecting people to assist and delay in boat arrival make delay in transportation.

"Two years ago, during the flood, a daughter of my brother-in-law died with delivery complication in boat on the way from KhaliAjhuri. At first, she was carried to the village doctor's chamber which was too far away from her home but it was very difficult to find the said doctor at night. Then he suggested for going to Upazila hospital for severe complications. Eventually, she died on the way to hospital." - (P4, FGD1)

"Mother can survive luckily with maternal complication during flood. But it is a very risk of maternal death. A mother and her infant died during the last flood period inside the boat while going to hospital with adverse weather and could not reach to hospital on time." - (P3, FGD2)

"I madly swim for searching a vehicle to transfer my nice with maternal complications. But I could not manage the boat easily at night. At last, we started to move to Sylhet for receiving her treatment at night with stormy weather. However, later she died after delivering on the boat." – (P9, FGD 4)

"During flood, the wave of the river is large enough and it is a risk of drowning even for a large-sized boat. So, community people afraid to go out from home with such stormy weather. Risky referral mother can't transfer quickly to Mymensingh medical and Dhaka through water even in the emergency." – (IDI4), male guardian

"A maternal death occurred after four to five hours of delivery. The bleeding started immediately after delivery but it needs two hours to manage a boat. When the boat was arranged the mother died inside the boat with profuse bleeding." – (IDI9), One of the village doctors said

3.6 Community recommendation to prevent maternal death related to disaster

Maximum participants responded about the initiative of transferring complicate mother safely and quickly to the referral center. Many people said to improve the communication and transportation system in these areas where natural disaster like flood is very common. Some persons also said about the water ambulance for referring the risky mother during disaster. Some persons also said about the establishment of temporary health camp for proper care of the pregnant mother during the flood period.

"If complicated pregnant mother could be admitted to hospital before delivery, then many mothers' life can be saved. If there is availability of qualified doctors in the nearby facilities during flood then maternal death can be prevented." – (P9, FGD5) One of the participants

"if the government takes initiative for quick transfer of high-risk pregnant mother then there will be no maternal death would occur, as earlier it happened in this area." – (IDI18) One of the village doctors said

4. Discussion and Conclusions

Flood disaster occurs almost every year at the Khaliaghuri Upazila of the Netrakona district in Bangladesh. This disaster occurs immediately after the rainy season. The suffering lasts over the year. The flood intensity and severity are increasing over the years mainly due to climate change. During the flood period, there is difficulty in communication, transportation, housing, safe water and food. The maternal and child cares are most affected. Maternal deaths commonly occur during flood period in the absence of proper care and treatment. Boat is the only mode of transport for transferring referral mother to hospital which is risky, time and money consuming. Maximum maternal deaths occur on the boat. The decision delay and transport delay are common during the flood disaster period which influences and results in maternal deaths.

Flood is common during the rainy season in every year at the study area which started from early rainy season till next month of the season. Normally, 20-25% of Bangladesh is inundated during every monsoon from June to September. In the case of extreme flood events, 40-70% area can be inundated, which amply proved the extreme flood events [18].

Pregnant women are identified as the most vulnerable human beings during flood in Bangladesh. Maternal deaths are common in this period with several complications like bleeding after delivery obstructed and prolong labour. A high number of pregnant mothers are found affected by the flood which is similar to the UNFPA findings where approximately 1.75% of the flood-affected mothers are pregnant in the nine districts in Bangladesh [7]. It has been noticed that pregnant women, children, elderly, disabled people and women are more vulnerable than the other section of the population. During disaster, they are left behind to leave in cases of emergency because they lack knowledge, mobility and resources [8].

It is found that many mothers died due to natural disaster due to lack of health facility during flood and stormy period of time. Many mothers refrain from using the toilet during the day and consequently suffer from urinary tract infections. Pregnant women, lactating mothers and differently-abled women suffered the most. It is difficult to move before and after the cyclone [19]. The rate of inadequate antenatal care increased from 1.3% to 3.9% during any disaster [2].

Maternal deaths are influenced by flood due to decision delay and transport delay is common among the complicated pregnant mothers during this period. The factors included delays in recognizing the problem and decision making to seek care; long distances to health facility;

scarcity of money and/or unavailability of transportation and long-time necessary during transportation by boat. In Nepal, it was found that 14% of the pregnant mothers in transit to or from a facility during disaster died. Of those 46% were died in a public facility with maternal complication due to transport delay. This shows that more women are willing to avail healthcare facilities but transportation delays are causing death threats [20]. Another study shows that Pakistan has recently been gravely affected by the worst monsoon flooding in a century. The number of people directly affected by the floods stands at 20.2 million, with over 1.9 million houses reportedly damaged or destroyed and women and girls comprising 85% of the persons displaced by the floods [5]. Therefore, the natural disaster is increasing in the Indian sub-continent threatening more pregnant women due to climate change.

Pregnant women are seriously deprived of proper care and treatment during the disaster period. It is more difficult to refer complicated pregnant mother for getting proper treatment during this period. It is recommended from a study that flood shelters should have increased separate accommodations for pregnant mothers. At least one room should be earmarked for child delivery and infants [9]. A study found serious threat to pregnant women and children (0-6 months) in flood-affected sub-centers was reduced by providing delivery kits to the ANMs for as it lowered the individual risk of being exposed to waterborne and skin diseases [11].

Community people recommended for attention of the authority for special support of pregnant mothers during disaster and emergency management of transport of high-risk pregnant mothers. Some study also supports such suggestion for welfare of the mothers and infants for healthy pregnancy and safe delivery during disaster [21].

Conclusion

Maternal deaths mostly occur during the rainy season in flood-affected areas. Negligence of maternal health care, unavailability of facility and proper care services, dependency on unqualified doctors, communication and transportation problems, barriers to referral of the complicated mothers during flood cause maternal deaths. To prevent such unwanted maternal deaths during disaster, policy-makers need to take special initiative including community awareness about preparation of maternal care, provide support for proper care and treatment by qualified service provider and quick reference of the complicated mothers to the hospitals. Special attention of the authority is essential to decrease the decision delay and transport delay of the risky pregnant mothers to reach to the hospital from the home and the community.

Author Contributions

Conceptualization, A.B. & K.D.; Data curation and Formal analysis, A.S.M.A.; Methodology, A.B. & K.D.; Project administration & Supervision, A.S.M.A.; Visualization, F.R.; Writing—original draft, A.S.M.A.; Writing, review & editing- A.B.; K.D, F.R., and A.H. Critical review: K.D.

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Conflicts of Interest

The authors declare no conflict of interest.

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