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## In the Aftermath of Disasters: The Impact on Women's Health

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### Abstract

Women are disproportionately injured and killed during natural disasters. The reasons are complex and related to their responsibilities in families and their vulnerable status in their societies. Pregnancy outcomes are adversely affected both the disaster and the care given following the event. This commentary reviews current literature pertaining to the dangers women face in various disasters. Disaster responders and healthcare providers who treat women must be trained to manage these challenges.

**Keywords:** Disasters; Obstetrics in disasters; Gender based violence; Women and children in disasters

### Introduction

The American College of Obstetricians and Gynecologists (ACOG) noted that the lack of resources including food, water, and shelter in the aftermath of a disaster adversely impact pregnancy and pregnancy outcome [1]. Women and children are the most vulnerable members of societies. The social, political, and cultural norms of societies very commonly set women and children up to be disproportionately harmed in a catastrophe [2].

The disaster environment increases pregnancy-related morbidities. ACOG called for emergency preparedness that should include maintaining prenatal care, preparing emergency delivery kits for patients, developing evacuation plans, providing shelters that are safe, and contraception.

There are many challenges to women's health in a disaster. All aspects of the care for pregnant women-prenatal, intrapartum, and postpartum care can be compromised. Contraception options may be reduced. Sexual violence can lead to a rise of sexually transmitted diseases and injuries. Mental health issues, both acutely and chronic posttraumatic stress disorders, impacts the health and welfare of women and their families [3].

Risk for violence against women increases for many reasons. Male perpetrators have dominance over female victims and single females can be separated from male family members.

There are psychological strains in refugee camps. Absence of support systems for protection, general lawlessness, alcohol and drug abuse, and politically motivated violence against refugees increases dangers for women [4,5].

The first responders of disaster teams will confront these complex, humanitarian issues that disproportionately harm women. Current training and selection of disaster response teams has not uniformly addressed this crucial need. The needs during a disaster can be divided into three phases. In the first phase I, which lasts five to seven days, acute injuries are predominant, especially orthopedic catastrophes. In phase 2, which occurs one to three weeks after the event, injuries treated by responders include those from mob violence and motor vehicle accidents. The third phase, three weeks and longer after the disaster, includes management of general surgical care, wounds ready to be grafted, and definitive care [6]. In addition, ongoing care must be provided for chronic medical conditions such as diabetes, heart disease, hypertension given the disruption of available services and medications. Throughout all these phases, the specific healthcare concerns of women and the management of pregnant women make up at least 10 percent of the care delivered by rescue workers [7].

There are immediate and long-term consequences to natural disasters. Reproductive health concerns are important during the different phases of a disaster and can compound risks of morbidity and mortality of women [8]. While women face the same constellation of injuries from orthopedic injuries, infections, and food insecurity as men, they also have inherently unique risks by virtue of their social roles and vulnerability to sexual predators. These unique risks during disasters include pregnancy loss, long-term consequences on pregnancy outcome and future fertility, sexual violence, and sexually transmitted diseases [9].

The World Health Organization (WHO) definition of a disaster is any occurrence that causes damage, ecological disruption, loss of human life or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community [10].

From 1990-1999 approximately one billion people were affected by natural disasters [11]. During that decade, there were 600,000 fatalities. Eighty-six percent of people killed worldwide succumbed to natural events, which included 35%

fatalities from wind storms. Floods make up three fourths of all disasters and affect largest proportion of people [12].

People in low income countries are four times more likely to die [5]. Two thirds of deaths from disasters occur in Asia [13]. Commonly, earthquakes and natural disasters significantly weaken the pre-existing medical and legal infrastructure of a region. The lack of pre-existing safety features of buildings and overcrowded conditions and immense poverty in some low income countries lead to a higher proportion of injured and dead in these countries [14].

The impact of a disaster is both due to the natural environment and socioeconomic issues such as crowded cities, limited natural resources, industrialization, inequality, severe poverty, and unstable political regimens. Electricity, running water and communications systems are commonly severely damaged in high population density regions that are struck by these disasters [15].

The barriers to health care change during the aftermath and during the acute and chronic phases of a natural disaster as pre-existing systems become overwhelmed. Scarce resources are diverted to acute trauma and away from maintenance of health. There are also physical barriers such as impassable roads and dangerous physical structures. Treatment services are commonly all provided out-of-doors. Lack of communication prevents good collaboration among different rescue organizations. The lack of appropriate sanitation increases the risk of epidemic outbreaks [14].

Data on the increased injuries to women has been derived from several natural disaster sites. Women are uniquely vulnerable. Seventy percent of world's poor are women. Their vulnerability is accentuated by race, ethnicity, and age [16]. Women have less financial means and less decision-making power. They bear the burden of meeting needs of family and their health and safety directly impacts the outcome of their children. Food security is commonly a significant concern [17]. Women stop breast-feeding in the setting of stress, displacement, and poor nutrition [18].

There may not be access to clean water. In the 1998 floods in Bangladesh, adolescent girls reported perineal rashes and urinary tract infections. They were not able to wash out menstrual rags properly in private, and often had no place to hang the rags to dry. They reported wearing the still damp menstrual cloths [19].

The report on the International Red Cross (IRC) hospital after the 2006 Kashmir earthquake showed that among the 316 patients treated at the hospital, 246 were women and children (77.9%). Two-thirds were hospitalized with over 90% because of the need for surgery or surgical consultation. Altogether 345 operations were performed on 157 patients. The majority of patients had infected wounds with or without fractures [7].

Three times as many women perished than men the 2005 Indonesian tsunami which may be due to the role women have as caretakers of children [20]. Women may be less able to run from the waves when carrying their children. Additionally, their clothes and long hair make them more vulnerable to being

trapped by the debris of the disaster. In the Pakistan earthquake, more women than men were killed [2]. The loss of adult women has terrible implications for girls. There is an increase in sexual assault and sex trafficking and a decrease in the education of women [21].

A review of the impact on women of flash floods in Bangladesh confirms their special suffering caused by these sudden floods. Women's job is to find drinking water. It is common to have epidemics and hunger. Food condition deteriorates with crop damage and the loss of livestock that are washed away. Water from floods can last 5 months and change seasonal length. Latrines are washed away and it is difficult for women to have private sanitary area [22].

Analyses of several natural floods and cyclones from Bangladesh again confirm the disproportionate number of women affected. Part of this is due to the location of women during disasters [23]. A 2005 post-tornado cohort study in rural Bangladesh identified elevated levels of death and injury to the elderly and to women. Females were 1.24 times (95 per cent CI: 1.15-1.33) more likely to be injured than males. The elevated risk of injury was significantly associated with structural damage to the house and tin construction materials. In the 1991 cyclone in Bangladesh, many women perished with their children at home as they had to wait for their husbands to return and to make evacuation decisions [23].

Other sociologic studies show how status in society plus female gender increases the risk of injury and death from disasters. One minority group in Bangladesh, the Jaladash, is the most oppressed and poorest minority in the nation. All men go to sea for 5 months leaving women vulnerable to attack. Their shanty dwellings were washed away by cyclones. Two other Bangladesh minorities are also deeply impacted by natural disasters due to their status in society. The Jakkhain women who are gifted crafts workers are reluctant to go to shelters because of prejudices from Bangla majority. It is part of their cultural mores that the men climb the hills but women stay with children and elderly. The Garo minority lives in hills in Bangladesh. While the Garo men share responsibilities, the women carry children on their backs during work and are vulnerable to being washed away [24].

Many other health consequences can be present during a pregnancy. It is important to look at the issues of obstetrical and reproductive health in both resource poor and rich regions in a non-disaster setting. These baseline challenges are compounded when a disaster hits. The disaster experience for pregnant women is intensified by the increase in overall casualties at the disaster site. In the United States, obstetrical trauma complicates 6-7% of pregnancies [25]. Trauma is the leading non-obstetric cause of maternal morbidity and mortality and makes up 46% maternal deaths. Because of the physiologic and anatomic changes of pregnancy, risk of trauma to mother and fetus increases with gestational age [26]. These anatomic changes of pregnancy alter the pattern of injury [27]. The increased engorgement of pelvic vessels leads to an increased risk of retroperitoneal hemorrhage and hematoma. Blunt abdominal trauma can cause injuries to the bladder, spleen, and pelvic fractures. Blunt trauma can also lead to uterine rupture by

rapid deceleration, especially where there has been a prior Cesarean section. Upper abdominal stab wounds can lead to more complex bowel injury due to upper displacement of abdominal contents [25].

The average maternal age of women who experience trauma in the United States is 24 years and the average gestational age when trauma occurs is 25.9 weeks. The majority of obstetrical trauma is due to motor vehicle accidents (MVA) (55%), falls (22%), and assaults (22%). Burns make up 1% of trauma in the United States [25].

The outcome is delivery in 5-24% for patients delivered during hospitalization for trauma and the majority of deliveries occur within 24 hours of injury. The majority (71-75%) are delivered by C-section. Eighty-two percent of fetal deaths occur from motor vehicle accidents (MVA). Other causes of fetal death from maternal trauma occur because of gunshot wounds (6%), falls (3%), and maternal death (11%) [28].

Abruption is most frequent cause of death from trauma. US statistical survey of 2008 identified ninety-five maternal deaths in 1,461,270 pregnancies (6.5 per 100000 pregnancies). The causes of death included preeclampsia, pulmonary thromboembolism, amniotic fluid embolism, obstetric hemorrhage, and cardiac disease. There was only 1 death from a placenta accreta. During this time, twenty-seven deaths (28%) were deemed preventable. There were 0.2 deaths per 100000 for vaginal birth and 2.2 per 100000 for cesarean delivery [29].

In contrast, the worldwide rates of maternal mortality per 100000 births vary by the socioeconomic resources of the region [30]. While Europe has an overall rate of 24 per 100,000, Sub-Saharan Africa has a rate of 830 per 100000, Southeast Asia is 210, and the South Central Asian rate is 520 per 100000 World Health Organization [31].

In Haiti before the 2010 earthquake, there were significant pre-existing challenges in access and delivery of obstetrical care. In a total population of 9,203,083, the average age was 20 years. The infant mortality rate was 58.07 deaths per 1000 live births and the maternal mortality rate was 520 per 100000 births. The overall life expectancy was 61.38 years. Bleeding and infection were the major causes of maternal morbidity and mortality [32,33].

In another low income country, Gambia, the 2005 maternal mortality ratio was 690 per 100000 live births [34]. The most common life-threatening emergencies included pregnancy-related conditions: massive peri-partum hemorrhage, eclampsia and sepsis. The infant mortality rate in 2006 was 84 per 1000 live births and the under-5 year mortality was 113 per 1000 live births. The causes of death in newborn infants included failure to breathe at birth and sepsis and in children; malaria, pneumonia, malnutrition and diarrheal disease. At all ages, major trauma such as burns and road traffic accidents were significant. The indirect causes of morbidity and mortality that impact pregnant women are severe anemia and malaria [34].

Maternal death has a devastating impact on child survival and the family structure [33]. In one rural region of Bangladesh, from 1982 through 2005, there were 1,44,861 live births and 14,868

children died by 10 years of age. The probability of surviving to age 10 was 24% for children whose mother died compared to 89% for children whose mothers were alive but was not impacted by the father's presence. The greatest effect was seen at ages 2-5 months [35].

These pre-existing healthcare problems in low resource environments are compounded when a natural or man-made disaster strikes. During the earthquake disaster in Turkey the Israeli Defense Forces Field Hospital in Adapazari, reported that 10 % of the victims seen had obstetric or gynecologic issues.6 Other reports confirm that 10% of disaster victims have obstetrical problems or needs [36,37]. Female psychosocial needs are rarely met. In a survey of 50 female Hurricane Katrina evacuees, gender sensitive services were nonexistent [38].

Medical needs and outcomes after a disaster can be divided into immediate and long term.8 Increased delivery rates were reported during the first 48 hours after five quakes in Israel and increased premature delivery rates were noted compared to delivery rates 2 weeks before quakes [39].

Long-term birth outcomes after disasters include fetal loss, prematurity and fetal growth retardation. Other outcomes include psychological stress and fertility. The effects of earthquake timing on stress responsivity in pregnancy was studied in forty pregnant women who had experienced an earthquake during pregnancy or shortly afterward. The earthquake was rated as more stressful when it occurred early in pregnancy compared with late in pregnancy. Stress experienced early in pregnancy was associated with shorter gestational length (RR=.35; P<0.05) [40].

Rates of pelvic inflammatory disorders (PID), menstrual disorders, and reduced fertility were higher after the 2008 Wenchuan Earthquake [41]. In another report analyzing the obstetric outcome after the flood disaster in Kotlin Klodzki, Poland 1997, for 47 pregnant women who were injured in the flood pregnancy loss was 55.3% compared to no loss in a random control group of a 100 pregnant women in 1996. For the flood victims, loss occurred from increased premature delivery, premature rupture of membranes, increased missed abortion, birth asphyxia, and intrauterine growth retardation [42].

Obstetrical Outcomes after Hurricane Katrina has been intensively studied. Specific high exposure to Katrina and the intensity of the experience was associated with low birth weight babies [3,43].

Women who had a high exposure to Hurricane Katrina were more likely to have had a cesarean section compared to women who did not [44]. After Katrina, obstetric, prenatal, and neonatal care was compromised in the short term. Increases in adverse birth outcomes such as preterm birth, low birth weight, and maternal complications were limited to highly exposed women [45]. The stress of disasters affects birth rates. The impact of Katrina was noted with a 19 percent decrease in total number of births in the year following the hurricane in 14 counties and parishes affected by the storm [46].

Post-traumatic stress has been associated with premature deliveries, increased cesarean rates, and small for gestational

age babies in several studies that looked at the aftermath of the September 11 terror attacks [47-50].

In the 2010 Haitian earthquake, pregnant women in Port-Au-Prince faced significant health consequences [37]. There were no safe homes to deliver in. There were no intact hospitals to go to. Women were undernourished and dehydrated. Sanitary challenges, as in other resource-poor environments, increased the risk of infection and maternal mortality [51]. Cord cutting in a contaminated environment, led to a higher rate of neonatal tetanus. Labor patterns were abnormal due to dehydration and fear.

There are many challenges to practicing obstetrical care in a disaster setting. There are limited resources and lack of follow-up. The lack of trained obstetricians on many disaster teams places pregnant women at higher risk for complications. The work-intensive nature of labor management and the likelihood of abnormal labor patterns put additional pressures on the team to expedite deliveries by cesarean sections. Complications of surgery and poor obstetrical outcomes relate to the level of experience of the practitioners [52,53].

Disasters are complex intersections of geophysical, biological, social, political, economic, and cultural spheres. Women are disproportionately injured and killed due to these complexities. Disaster training must be interdisciplinary but must include experienced women's-healthcare providers.

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