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Prevalence of depression among Bangladeshi village women subsequent to a natural disaster: A pilot study

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ABSTRACT

Women living in disaster-prone areas are at risk of developing and suffering from mental health problems, such as depression. However, this issue has not been studied previously among village dwelling women in Bangladesh. Improved knowledge of post-disaster depression rates and its risk factors could facilitate design and implementation of targeted disaster management protocols. Therefore, face-to-face surveys were conducted from September to October 2017 among 111 women in Dalbangha village, Bangladesh who survived cyclone Mora. Depression was assessed using the Bangla Patient Health Questionnaire – 9 (PHQ-9) along with relevant socio-demographics and disaster-related variables. The prevalence of depression was 64.9% and 36.9% of the women failed to receive any alert prior to the disaster. Along with a wide range of post-disaster consequences, 36.0% were physically injured, 27.9% had to be absent from work with consequent income loss, and 17.1% experienced death of a family member. Lower age group (18–30 years), being an income earner, disaster-related physical injury, and post-disaster work absenteeism emerged as the risk factors associated with depressive symptoms. In light of current findings, disaster preparedness programs and management protocols should incorporate measures aimed at palliating the risk factor elements that promote depression among vulnerable women following a disaster.

1. Introduction

The geographical location of Bangladesh makes it susceptible to frequent and recurring catastrophic natural disasters, more specifically tropical cyclones, storm surges, floods, and river bank erosion (Karim and Mimura, 2008; Khan, 2008). Annual floods inundate on average 20.5% of the country surface, but during an extreme flood event, up to 70% of the country may be affected (Mirza, 2002). These catastrophic natural disasters are fraught with enormous economical and health-related consequences, some of which are easily identifiable and quantifiable. However, almost every natural disaster affects not only physical health but is also associated with marked increased in mental impairments (Brackbill et al., 2006; Roorda et al., 2004). Indeed, although survivors can overcome and potentially recover from physical injuries within a short period of time, they often face mental health problems, such as post-traumatic stress disorder, depression, psychological distress, insomnia, anxiety, stress-related and adjustment disorders, and problems such as substance abuse and domestic violence, all of which can emerge well after the specific catastrophic event has occurred (Beaglehole et al., 2018; Krug et al., 1998; North and Pfefferbaum, 2013; Tang et al., 2014). These lingering mental health problems disrupt the quality of life and markedly impact on living standards in affected regions. Depression, followed by post-traumatic stress disorder, is by far one of the most common mental health problems being detected in the context of natural disasters (Beaudoin, 2007; North and Pfefferbaum, 2013), with a recent meta-analysis showing a wide range in the prevalence of post-disaster depression ranging from 5.8% to 54.0% (Tang et al., 2014).

Depression is the second leading cause of the global disease burden, and afflicts twice as many women as men across most countries (Abate, 2013; Lopez et al., 2006; Üstün et al., 2004). Among all age groups, depression will manifest as mood alterations, feelings of guilt, sleep problems, reduced appetite, decreased energy, increased fatigability, loss of interest in daily activities, and poor ability to concentrate on task

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(Arafat et al., 2019; Arafat et al., 2017; Kessler and Bromet, 2013). Among women, underlying socioeconomic factors that can facilitate the emergence of depressive symptoms include age, lower educational attainment, economic inactivity or poor economic status, being divorced or widowed, previous abuse either verbal or physical (Ali et al., 2002; Hosain et al., 2007; Rai et al., 2013). Potential consequences of depression among women surviving a natural disaster are far reaching ranging from low birth-weight births, poor health, reduced productivity, emergence of chronic diseases (Katon, 2011; Patel et al., 2004) and even may mediate suicidal behaviors (Arafat and Mamun, 2019; Mamun et al., 2019; Krug et al., 1998).

In the aftermath of cyclone Mora, approximately 52,000 houses were damaged or destroyed in Bangladesh (reliefweb, 2017), and around 335 shelters were reported as destroyed in the Barguna district, where our study site "Dalbangha" village is located (Nirapod, 2017). However, there are no official statistics or documentation regarding preceding disasters and their frequency, the impact of cyclone Mora on the village being assessed. It can be anticipated that in light of the fact that Dalbangha is a disaster-prone village with verbal recollection of annual disaster of lesser or greater magnitude, cyclone Mora would be expected to impose tremendous effects on this vulnerable population. Furthermore, it is well-known that compared to men, women residing in disaster-affected areas are more vulnerable to sustaining injuries during a disaster, and being less likely to reach safety along with increased insecurity, all of which could play a role in fostering lingering mental health problems, such as depression (Arora-Jonsson, 2011; Cannon, 2002). Moreover, considering the global indicators of economic and other welfare metrics, Bangladeshi women exhibit increased vulnerability towards depression (Hosain et al., 2007). We are unaware of any study in Bangladesh examining the prevalence of depression and its associated risk factors among village-dwelling women living in disaster-prone areas. Such information however, could be used to improve disaster preparedness models, and to facilitate and optimize post-disaster recovery and support. Thus, this study was conducted specifically to assess the prevalence of depression following cyclone Mora among the women residing in the disaster-prone village of Dalbangha located in the Barguna District of Bangladesh.

2. Methods

2.1. Study site and population

Dalbangha village is located within the Barguna District in Bangladesh (22.1508°N 90.1264°E). The village is situated between two rivers, namely the Biskkhali and Paira. During the monsoon season, the village is routinely hit by tropical cyclones. Mora, is the most recent cyclone and its destructive path overwhelmingly affected Dalbangha village on May 30th, 2017. A primary school in the village was used as the cyclone shelter for the inhabitants. Eligible participants in the study were women aged ≥18 years (one per household or family) who were permanent residents of the village. The village population consists of a total 200 families. Using a convenient sampling method- data were collected from a total 111 families, therefore the representative poll was 55.5%.

2.2. Ethical approval

A formal permission for conducting the study was obtained from the Ethical Review Committee of Independent University, Bangladesh. Informed consent was obtained from all participants. Anonymity and confidentiality of the data were ensured.

2.3. Study procedure

This cross-sectional pilot study was conducted between September and October 2017. A total of 111 women (mean age = 40.1 [± 13.6] years) above the age of 18 years completed the survey. Face-to-face interviews were conducted in all households in which an eligible woman was available for interview. A structured questionnaire was administered by a trained interviewer. The structured questionnaire consisted of questions on socio-demographic characteristics, disaster-related events and outcomes, and the Bangla PHQ-9 survey. The questionnaire took around 30 min to complete.

2.4. Measures

2.4.1. Bangla patient health questionnaire

The Patient Health Questionnaire (PHQ-9) was developed for the screening of depression in community settings (Kroenke et al., 2001). In this study, the Bangla PHQ-9, a Bangladesh validated version of the PHQ-9) was used (Chowdhury et al., 2004). Respondent answers were recorded on a 4-point Likert scale (0 = not at all, 1 = several days, 2 = more than half of the days, and 3 = nearly every day) whereby a score range of 0–27 is therefore possible, with a score of 0 indicating absence of depression symptoms, and a total score of 27 indicating daily depressive symptoms. A score of ≥10 was retained as indicating the presence of depression (Mamun and Griffiths, 2019). This cut-off has previously shown a 88% sensitivity and 88% specificity for depression (Kroenke et al., 2001). In the present study the Cronbach's alpha was high (0.85).

2.4.2. Socio-demographics

Socio-demographic variables included name, age, education, marital status, number of children, and whether the respondent was an earning member in the family. For educational attainment, the questionnaire included the following options: no education, grades 1 to 8 was considered as primary level, and > grade 8 as secondary level education.

2.4.3. Disaster related questions

Disaster-related information was obtained based on the cyclone Mora data and its consequences. Several questions consisting of a binary answer ('Yes/No') were asked i.e., any types of injury, loss of work, death of the family member(s), receiving any relief, and cyclone warning prior to cyclone landing. Regarding death of a family member - the questionnaire included questions on the occurrence of death in the family due to the cyclone Mora by means of drowning, electrocution, snake bite, or other. Post-work absenteeism was assessed by asking if subjects were not capable to gain meaningful work following the infrastructural and agronomic loss associated with the cyclone. Moreover, financial losses (including home, land and personal goods) was categorized on the basis of Bangladeshi currency (BDT) by measuring the damage to the house structure, loss of crops, damage to furniture and loss of cattle or other belongings.

2.5. Data analysis

SPSS version 22.0 (Chicago, IL) was used to perform data analysis. Descriptive statistics as well as bivariate and logistic regression analyses were used to explore potential associations of depressive symptoms with socio-demographic and disaster-related variables. All variables were entered into a binary logistic regression model with 'depression' as the dependent variable. The results of logistic regression are reported with 95% confidence intervals, with two-tailed p values <0.05 being considered as fulfilling statistical significance.

3. Results

One hundred and eleven women completed the survey. All were

Table 1
Distribution of socio-demographic and disaster-related variables with Depression.

Variables	Total (111); *n* (%)	Depression; *n* (%)	X^2 test value	df	*p*-value
Socio-demographics					
Age					
18–30	37 (33.3)	28 (75.7)	6.764	2	0.034
31–40	32 (28.8)	15 (46.9)			
41 +	42 (37.8)	29 (69.0)			
Education					
No Education	19 (17.1)	14 (73.7)	0.819	2	0.664
Primary (1–8)	74 (66.7)	47 (63.5)			
Secondary (>9)	18 (16.2)	11 (61.1)			
Children (s)					
No children	10 (9.0)	8 (80.0)	4.872	2	0.088
1–4	51 (45.9)	36 (70.6)			
5–10	25 (22.5)	12 (48.0)			
Earning member (s)					
No	46 (41.4)	25 (54.3)	3.812	1	0.050
Yes	65 (58.6)	47 (72.3)			
Disaster-related variables					
Physical injury					
No	71 (64.0)	41 (57.7)	4.381	1	0.036
Yes	40 (36.0)	31 (77.5)			
Absence from work					
No	80 (72.1)	46 (57.5)	6.818	1	0.009
Yes	31 (27.9)	26 (83.9)			
Death of family member (s)					
No	91 (82.0)	62 (68.1)	1.670	1	0.196
Yes	19 (17.1)	10 (52.6)			
Relief received					
No	33 (29.7)	19 (57.6)	1.095	1	0.295
Yes	78 (70.3)	53 (67.9)			
Total monetary loss (BDT)					
30,000 or less	68 (61.3)	41 (60.3)	1.911	2	0.385
30,001–60,000	22 (19.8)	15 (68.2)			
>60,000	21 (18.9)	16 (76.2)			
Cyclone warning					
No	41 (36.9)	26 (63.4)	0.060	1	0.807
Yes	70 (63.1)	46 (65.7)			
Depression status					
No	39 (35.1)	–	–	–	–
Yes	72 (64.9)	–	–		

married, 33% were aged 18–30 years, 28% were 31–40 years and 37.8% were 41 years and older. Approximately 65% of the participants ($n = 72$) experienced depressive symptoms (Table 1).

The percentage of women fulfilling the criteria for depression was higher in the younger age group (75.7%, 46.9%, and 69.0% in the age groups 18–30, 31–40, and 41 and above respectively; $X^2 = 6.764$, df = 2, $p = 0.034$). Approximately 80% of the women with no children had positive scores for depression when compared with 70.6% and 48% among women with 1–4 and 5 or more children ($X^2 = 4.872$, df = 2, $p = 0.088$). Regarding family earning member, 72.3% of the women in a family having at least an earning member had depression compared to 54.3% who did not have any earning member ($X^2 = 3.812$, df = 1, $p = 0.050$). (Table 1)

About 36% of the women were physically injured during the cyclone. Among these, 77.5% had depression ($X^2 = 4.381$, df = 1, $p = 0.036$). The majority of women (72%) had to miss work, and among them, 83.9% were depressed compared to those who were able to continue working ($X^2 = 6.818$, df = 1, $p = 0.009$). Moreover, 70% of the participants received relief and welfare assistance (i.e., food, medicine, drinking water) after the cyclone. However, 36.9% did not receive any alert of the pending cyclone. (Table 1)

Logistic regression analysis further revealed that younger women were more likely than those >41 years to manifest depression (OR = 1.39, 95% CI = 0.51–3.776; $p = 0.039$). Similarly, being physically injured (OR = 2.52, 95% CI = 1.05–6.07; $p = 0.039$) and having to miss from work (OR = 3.84, 95% CI = 1.34–11.04; $p = 0.012$) were identified as the risk factors of depression. (Table 2)

4. Discussion

The vulnerability of women in the context of risk of depression in Bangladesh has been steadily increasing (Hosain et al., 2007). However, how exposure of women to natural disasters and the risk factors potentially contributing to the emergence of depressive symptoms has not been previously studied. In the present study, we provide initial observations in women residing in rural areas sustaining frequent exposures to natural disasters, and identify a set of risk factors associated with the development of the post-disaster depression in Bangladesh.

Among the salient findings in the present study, we should emphasize the fact that the prevalence of post-disaster depression among women was 65%, a markedly higher prevalence than the depression rates reported around the world after sustaining a natural disaster, Indeed, prevalence rates ranging from 5.9% to 53% have been reported, clearly a lower figure than in Bangladeshi women (Tang et al., 2014). We should also point out, that we are unaware of any previous studies in Bangladesh evaluating depression after a natural disaster, such that we are unable to compare or estimate whether the location and populations studied is representative of the rest of Bangladeshi women or represents a uniquely vulnerable and susceptible cohort. However, a similar prevalence of depressive symptoms in women has been reported (61.6%), albeit in female patients after sustaining a cerebrovascular stroke while they were inpatients at two hospitals in Dhaka, Bangladesh (Islam et al., 2016). Conversely, another study among outpatient suffering from diabetes in Bangladesh reported that only 23% of the women were depressive (Roy et al., 2012). Moreover, using the same instruments, Mamun and Griffiths (2019) suggested a high prevalence of depression among university students (46.3%). A unrelated study reporting on 187,496 subjects from 53 countries showed that the prevalence of depression varied substantially, ranging from 0.4 to 15.7% (Rai et al., 2013). Therefore, the post-disaster depression rate found herein is alarmingly elevated, and certainly well above any other regional estimates or reports from post-disaster areas in other countries.

As indicated above, depression seemed to particularly affect women in the younger age group. It is possible that younger women may have lower resilience to cope with the disaster and its consequences, and therefore suffered from more depressive symptoms (Shehzad et al., 2015). Among the three age groups, the second highest prevalence of depression was noted among the older age group, a finding that could be attributable to the development of chronic diseases (Katon, 2011). We should also remark that women in age group with the lowest rates of depressive symptoms are more likely to have access to financial and other support from their spouses and the rest of their families. Moreover, they may also be more physically and mentally capable of coping with unexpected situations, making them more resilient to the aftermath of disasters (Shehzad et al., 2015).

In previous studies, it was reported that women with lower educational attainment appeared to have a lower capacity for managing and coping with both pre- and post-disaster situations, and that a higher risk for increased prevalence of depressive symptoms would be anticipated compared to women with higher educational attainment levels (Bjelland et al., 2008; Tang et al., 2014). Such differences in depressive symptomatology were not apparent in our cohort, whereby women with no education appeared to be at similar risk of being depressive when compared to those with better education. However, having more earning members in a family means that the family is in a more favorable and sustainable economic position. Therefore, one would have anticipated that earning women may be protected from depression after a natural disaster. This was not the case in our cohort, and participants from families having an earning member were at increased risk of depression, which was opposite to previous studies showing that economic inactivity or poor economic status were associated with increased depression rates (Ali et al., 2002; Hosain et al., 2007; Rai et al.,

Table 2
Logistic regression analysis of the variables with the presence of depression.

Variables	Unadjusted model Odds ratio (OR)	95% Confidence Interval (CI)	*p*-value	Adjusted model Adjusted odds ratio (AOR)	95% Confidence Interval (CI)	*p*-value
Age						
18–30	1.395	(0.515–3.776)	0.039	1.994	(0.387–10.265)	0.006
31–40	0.396	(0.152–1.027)		0.128	(0.024–0.689)	
41 +	Reference			Reference		
Education						
No Education	1.782	(0.442–7.176)	0.668	2.702	(0.217–33.708)	0.165
Primary (1–8)	1.108	(0.384–3.195)		0.510	(0.066–3.949)	
Secondary (>9)	Reference			Reference		
Children						
No children	4.333	(0.763–24.610)	0.096	3.496	(0.391–31.240)	0.350
1–4	2.6000	().967–6.991)		3.112	(0.549–17.658)	
5–10	Reference			Reference		
Earning member (s)						
No	0.456	(0.206–1.009)	0.053	0.547	(0.142–2.108)	0.381
Yes	Reference			Reference		
Physical injury						
No	Reference			Reference		
Yes	2.520	(1.047–6.070)	0.039	2.920	(0.646–13.188)	0.164
Absence from work						
No	Reference			Reference		
Yes	3.843	(1.339–11.036)	0.012	1.897	(0.437–8.233)	0.393
Death of family member (s)						
No	Reference			Reference		
Yes	0.520	(0.191–1.417)	0.201	0.395	(0.099–1.575)	0.188
Relief received						
No	0.640	(0.277–1.480)	0.297	2.527	(0.615–10.379)	0.198
Yes	Reference			Reference		
Total monetary loss (BDT)						
30,000 or less	Reference			Reference		
30,001–60,000	1.411	(0.509–3.914)	0.392	1.415	(0.312–6.415)	0.487
>60,000	2.107	(0.691–6.430)		2.990	(0.500–17.880)	
Cyclone warning						
No	Reference			Reference		
Yes	1.106	(0.495–2.472)	0.807	0.628	(0.180–2.193)	0.466

2013). It is possible that loss of earnings post-disaster may have translated to an substantial attrition in living standards in our cohort, whereas living in conditions that were already very strained and difficult among the women without any earning members may have led to relatively small differences in their living standards after the cyclone, thereby reducing the likelihood of depression among the poorest group. Of note, higher socio-economic status was associated with higher prevalence of depression in a study from Pakistan (Zainab et al., 2012).

As a corollary to the aforementioned findings, women who reported to be physically injured during cyclone Mora were also at higher risk of experiencing depressive symptoms compared to women without any physical injury. Moreover, absenteeism from work after the disaster revealed a four-fold increased risk of being depressive. Potential reasons accounting for this finding may reside in the fact that women not working may underlie lack of work opportunities after the cyclone, as well as physical injury caused by the preventing them from working. Substantial lines of evidence indicate that unemployment, joblessness and job insecurity create not only economic loss and financial hardship, but also promote feelings of failure, while increasing vulnerability toward depression (Meltzer et al., 2010; Tang et al., 2014). For example, a study in the United States reported that current unemployment status and out-of-the-labor-force status were both significantly associated with experiencing depressive symptoms (Mossakowski, 2009), and similar findings were described among black American women (Brown and Gary, 1988).

This study also found a large portion of the participants did not receive pre-disaster alerts (36.9%). This is a fundamentally critical infrastructure problem, since Bangladesh has already entered into the digital communications era, where the country has a disaster risk reducing vision by increasing access to early warning systems. It has been suggested that cost-effective early warning systems in disaster management protocols may not only save lives but also may reduce the post-disaster aftermath immediate consequences, and potentially even prevent longer-term issues such as depression (Collins and Kapucu, 2008).

5. Implications

This pilot study was conducted among women residing in a disaster-prone village in Bangladesh and represents an initial exploration of this issue following a devastating cyclone hitting this community. The higher risk of depression among younger women is particularly concerning, since it could undermine their capacity for growth and development along with curtailment of their personal and social skills development (Whiteford et al., 2013). Moreover, our study stresses the fact that victims of natural disasters are prone to develop mental health problems, including depression with its attendant consequences (Krug et al., 1998). Therefore, disaster preparedness programs in Bangladesh need to focus on early mental health interventions, and particularly address the needs of women of younger age to help them develop resilience tools to cope with natural disasters. In addition, pre-disaster alert systems as part of infrastructural improvements may be also beneficial.

6. Limitations

The present study is by its very nature fraught with substantial limitations. First of all, this study did not include a control group, and in the absence of longitudinal monitoring of disaster-prone areas to enable the acquisition of both pre- and post-disaster representative assessments, such desirable comparative data will be arduous to obtain. Moreover, the data originate from a single village and a convenience

sampling approach was undertaken. Expansion of the survey to other similar villages to ascertain the congruence and homogeneity of our findings would be desirable. Additionally, the study was cross-sectional in nature. In addition, depression rates were not repeatedly evaluated in the same cohort, and therefore the impact of previous repeated disasters and other traumatic events cannot be ignored and may have added to the high rates of depression found in the current study. Therefore, generalizability to other disaster-prone locations in this country may be limited. Furthermore, pairing of the village to a similar village in a region in which natural disasters are seldom seen would also be desirable. Moreover, gaining of increased insights into the response to intervention by a longitudinal study design may provide important and corroborating evidence as to the role of socio-economic and disaster-related factors associated with depression in the context of natural disasters.

7. Conclusions

Depression rates among women living in a disaster-prone village following the occurrence of cyclone Mora is extremely elevated compared to other vulnerable groups in Bangladesh and around the world. A few specific risk factors associated with increased risk for depression in women after a natural disaster emerged and may assist with improved targeted interventions in disaster preparedness and prevention of post-disaster depression in vulnerable at-risk women.

Conflict of interest

None.

Declarations of interest

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Supplementary materials

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