

# The Impact of the 2021 Cyclone Shaheen on the Mental Health of Affected Omanis

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## ABSTRACT

**Objectives:** Nine strong cyclones have been recorded in Oman in the last 50 years, the last being tropical cyclone Shaheen in October 2021, in the northern Oman area. The aim of our study was to determine the relationship between property loss and the mental health of residents after cyclone Shaheen. **Methods:** We conducted a cross-sectional study among Omani citizens living in areas affected by cyclone Shaheen three to six months post-cyclone. In an online, self-reported questionnaire, we assessed the loss of participants' properties due to the cyclone and the impact on their perceived mental health. Descriptive statistics, chi-square tests, and associations between demographics, loss of properties, and mental health were performed. **Results:** Of 440 participants, 79.3% had their houses directly damaged by the cyclone and 90.7% had their outside properties damaged. Most of the respondents reported that they suffered from mental health symptoms in the months following the cyclone. Women, people with a lower socioeconomic status, the unemployed, and those without a university degree were associated with poorer mental health outcomes. Mental health was significantly lower for respondents whose properties were mostly affected by the cyclone. **Conclusions:** With scant knowledge about how cyclones directly affect Omanis' mental health, the results of this study are paramount for the planning of psychological care services to improve the country's response to extreme weather events.

Tropical cyclones have devastating impacts on human society as they cause loss of human lives and properties and threaten the physical and mental health of people.<sup>1,2</sup> Studies have shown that people affected by cyclones are deeply impacted at the health level as they suffer from physical injuries, not being able to access healthcare and medications, and mental health problems.<sup>3,4</sup>

Most studies carried out on the impact of cyclones focused on economic losses and physical health issues. For instance, after cyclones, people suffer economic stressors such as loss of income, property damage, insurance problems, and rebuilding problems.<sup>5</sup> However, recently, a growing number of studies are investigating the impact of cyclones on affected people's mental health.<sup>3,6</sup> In Australia, Matthews et al,<sup>7</sup> found that people whose houses were flooded and those who were displaced by the flood had a higher mental health risk. In England, a study has shown that people affected by a flood have higher rates of depression, anxiety, and post-traumatic

disorder.<sup>8</sup> Moreover, following the 2004 tsunami in the Indian Ocean, a Sri Lankan study found a strong association between mental health problems and the extent of economic loss from damages to households and businesses.<sup>9</sup>

Oman is particularly vulnerable to cyclones with over nine strong cyclones documented during the past 50 years.<sup>10</sup> In June 2007, tropical cyclone Gonu hit the coasts of Oman damaging infrastructures including bridges, roads, and electricity lines and killing 49 people, and creating over US \$4 billion in damage.<sup>11</sup> Cyclone Gonu was reported to have caused a rise in trauma-related visits to the hospital; however, it did not result in an increase in mental health disorders.<sup>12</sup> However, this study collected information from health centers and analyzed the patients admitted, but it did not assess the physical injuries, property losses, and mental health of affected Omanis who did not visit primary healthcare centers.

The most recent flood took place in October 2021 when cyclone Shaheen hit the north of Oman claiming the lives of at least 14 people.<sup>13</sup>

The floods caused by Shaheen damaged highways and roads, cars, and buildings causing around US \$100 million of damage.<sup>10,13</sup> The damage generated was mostly observed in Al Musannah, As Suwaiq,<sup>10</sup> Al Khabourah, and Saham.<sup>14</sup> We postulate that residents of these states living this traumatic event could be the most affected physically and mentally and this warrants further research.

Studies investigating the extent of property losses and mental health problems following the Shaheen cyclone are scarce in Oman. Moreover, no studies have investigated the association between direct losses of properties and mental health. Therefore, studying the impact of cyclones on Omani's loss of properties and its relation to mental health is essential to provide solutions to treat the implications.

The objectives of this study were to assess the impact of the 2021 Shaheen cyclone on property disruptions and the mental health of affected Omanis and to examine the associations between mental health outcomes and the demographics of the respondents. Moreover, we examined the association between the losses of properties and mental health effects in the Omani context.

## METHODS

A cross-sectional questionnaire was conducted online from January 2022 to April 2022 in four major cities affected by the Shaheen cyclone (Al Khabourah, As Suwaiq, Al Musannah, and Saham) according to the official warning published by the Omani civil aviation authority in October 2021. The questionnaire was delivered three months after the Shaheen cyclone and targeted Omani citizens aged  $\geq 13$  years in the four cities affected by the cyclone.

According to the National Centre for Statistics and Information, a census of population, housing, and establishments in 2020 in the four regions of Al Khabourah, As Suwaiq, Al Musannah, and Saham reported the population at 512 401 persons.<sup>15</sup> We used Slovin's formula to calculate the sample size based on a 95% CI and 10% attrition rate; we needed to recruit 440 participants.

A snowballing distribution method was used to deliver the questionnaire using mainly WhatsApp community groups (e.g., Al Khabourah news, As Suwaiq news, etc.), local government, and local businesses. Moreover, social media platforms were used to enhance awareness about the questionnaire.

Two of the authors in this article come from the affected region and had access to the WhatsApp groups and social media platforms related to the four cities. A consent form created using Google Forms was provided at the beginning of the questionnaire.

The questionnaire was divided into three sections. The first section collected demographic data, which included age, gender, city of residence, educational level, marital status, monthly income, number of children, occupation, and whether the participant lost someone during the cyclone. The second section collected information about the losses of properties of Omani people due to the Shaheen cyclone. This comprised four questions assessing whether the household, outside properties, vehicles, and other properties had been lost during the cyclone. The last section assessed mental health in people affected by the cyclone using a validated and reliable instrument (the Kessler 6 questionnaire). Kessler Psychological Distress Scale is a six-item self-report measure of psychological distress intended to be used as a quick tool to assess the risk for serious mental illness in the general population. Six questions on a five-point Likert scale asked the participants how often during the six months after the cyclone they had felt (1) nervous, (2) hopeless, (3) restless or fidgety, (4) so depressed that nothing could cheer them up, (5) that everything was an effort, (6) and worthless.<sup>16</sup> This questionnaire was found to be valid and reliable.<sup>2,16</sup> Cronbach's alpha, a measure of internal consistency, was calculated for this scale and found to be 0.89, which indicates high reliability. The tool was translated by an expert translator from English to Arabic and checked by five Arabic speakers' specialists, which found it to be accurate. In our study, Cronbach's alpha of the scale was 0.878 showing high reliability. Permission to use the scale was obtained from the author.

Sociodemographic characteristics were analyzed using descriptive statistics. Loss of participants' property and mental health perception during the Shaheen cyclone were analyzed using a chi-square test. The association between mental health perceptions and demographic characteristics and between mental health perceptions and loss of properties were evaluated using Pearson's chi-square tests. All analyses were performed using SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.).

**Table 1:** Sociodemographic characteristics of the study participants (N = 440).

Sociodemographic factors	n (%)
<b>Gender</b>	
Male	225 (51.1)
Female	215 (48.9)
<b>City of residence</b>	
Al Khabourah	228 (51.8)
As Suwaiq	126 (28.6)
Al Musannah	60 (13.6)
Saham	26 (5.9)
<b>Age, years*</b>	
13–29	197 (45.6)
≥ 30	235 (54.4)
<b>Educational level</b>	
Secondary education	267 (60.7)
University degree	173 (39.3)
<b>Marital status</b>	
Unmarried	159 (36.1)
Married	269 (61.1)
Separated, divorced, widowed	12 (2.7)
<b>Monthly income, OMR</b>	
< 500	309 (70.2)
≥ 500	131 (29.8)
<b>Number of children</b>	
0	174 (39.5)
1–3	122 (27.7)
> 3	144 (32.7)
<b>Occupation</b>	
Student	82 (18.6)
Employed	206 (46.8)
Unemployed	152 (34.5)
<b>Loss of loved ones</b>	
Yes	36 (8.2)
No	404 (91.8)

\*Eight participants did not mention their age (missing data)..

Ethical approval for this study was obtained from the College of Nursing Ethics Committee at Sultan Qaboos University.

## RESULTS

A total of 440 participants completed the questionnaire and gave their informed consent. Out of the 440 participants, 51.1% were males, 51.8% were living in Al Khabourah, 28.6% in As Suwaiq, 13.6% in Al Musannah, and 5.9% in Saham. Overall, 53.4% were > 30 years of age. The majority (60.7%) had completed their secondary school education, and 61.1% were married. Most (70.2%) earned < 500 OMR as their monthly income, and 46.8% were

**Table 2:** Loss of participants' property during cyclone Shaheen.

Properties	n (%)	Chi-square value	p-value
<b>Household damage</b>			
Yes	349 (79.3)	151.282 <sup>a</sup>	< 0.001
No	91 (20.7)		
<b>Outside properties damage</b>			
Yes	399 (90.7)	291.282 <sup>a</sup>	< 0.001
No	41 (9.3)		
<b>Vehicle damage</b>			
Yes	280 (63.6)	32.727 <sup>a</sup>	< 0.001
No	160 (36.4)		
<b>Had to move out of the house</b>			
Yes	276 (62.7)	28.509 <sup>a</sup>	< 0.001
No	164 (37.3)		

<sup>a</sup>indicates significant chi-square results at  $p < 0.050$ .

employed while 34.6% were unemployed. A total of 36 participants (8.2%) lost loved ones during the cyclone [Table 1].

During the Shaheen cyclone, 79.3% reported household damages, 90.7% had damage to their outside properties, 63.6% had their vehicles damaged, and 62.7% had to move out of their houses [Table 2].

Participants reported that they suffered from the following mental health symptoms all the time and most of the time; nervousness (35.2%), hopelessness (34.3%), restlessness or being fidgety (42.7%), so depressed that nothing could cheer them up (31.4%), that everything was an effort (41.8%), and worthlessness (26.1%) [Table 3]. However, most participants reported a perceived mental health problem some of the time and a little of the time.

A chi-square analysis of the participants' mental health and their demographic characteristics like gender, occupation, monthly income, educational level, and occupation, showed a significant association at  $p < 0.05$  [Table 4]. Female gender ( $\chi^2$  (degree of freedom (df) = 2) = 7.186;  $p = 0.028$ ), those who were unemployed ( $\chi^2$  (df = 4) = 11.000;  $p = 0.027$ ), those who had a monthly income of < 500 OMR ( $\chi^2$  (df = 2) = 9.181;  $p = 0.010$ ), and those who had secondary school education ( $\chi^2$  (df = 2) = 9.400;  $p = 0.009$ ) reported that their mental health was affected some of the time and a little of the time during the Shaheen cyclone.

The method of crosstab analysis and Pearson chi-square statistics were used to assess whether participants categorized by most affected and least affected by the Shaheen cyclone can present

**Table 3:** Participants' mental health perception during cyclone Shaheen.

Mental health	n (%)	Chi-square value	p-value
<b>Nervous</b>			
All the time and most of the time	155 (35.2)	125.077 <sup>a</sup>	< 0.001
Some of the time, a little of the time	238 (54.1)		
None of the time	47 (10.7)		
<b>Hopeless</b>			
All the time and most of the time	151 (34.3)	86.377 <sup>a</sup>	< 0.001
Some of the time, a little of the time	224 (50.9)		
None of the time	65 (14.8)		
<b>Restless or fidgety</b>			
All the time and most of the time	188 (42.7)	102.577 <sup>a</sup>	< 0.001
Some of the time, a little of the time	205 (46.6)		
None of the time	47 (10.7)		
<b>So depressed that nothing could cheer you up</b>			
All the time and most of the time	138 (31.4)	36.236 <sup>a</sup>	< 0.001
Some of the time, a little of the time	202 (45.9)		
None of the time	100 (22.7)		
<b>That everything was an effort</b>			
All the time and most of the time	184 (41.8)	46.995 <sup>a</sup>	< 0.001
Some of the time, a little of the time	177 (40.2)		
None of the time	79 (18.0)		
<b>Worthless</b>			
All the time and most of the time	115 (26.1)	12.059 <sup>a</sup>	0.002
Some of the time, a little of the time	174 (39.5)		
None of the time	151 (34.3)		

<sup>a</sup>indicates significant chi-square results at  $p < 0.05$ .

**Table 4:** Association between perceptions of mental health of the participants and their demographic characteristics.

Demographics	All the time and most of the time n (%)	Some of the time and a little of the time n (%)	None of the time n (%)	Pearson chi-square value	p-value
<b>Gender</b>					
Male	24 (10.7)	161 (71.6)	40 (17.8)	7.186 <sup>b</sup>	0.028
Female	10 (4.7)	174 (80.9)	31 (14.4)		
<b>Occupation</b>					
Student	6 (7.3)	58 (70.7)	18 (22.0)	11.000 <sup>b</sup>	0.027
Employed	21 (10.2)	148 (71.8)	37 (18.0)		
Unemployed	7 (4.6)	129 (84.9)	16 (10.5)		
<b>Monthly income, OMR</b>					
< 500	29 (9.4)	239 (77.3)	41 (13.3)	9.181 <sup>b</sup>	0.010
≥ 500	5 (3.8)	96 (73.3)	30 (22.9)		
<b>Education</b>					
Secondary education	24 (9.0)	211 (79.0)	32 (12.0)	9.400 <sup>b</sup>	0.009
University degree	10 (5.8)	124 (71.7)	39 (22.5)		

<sup>b</sup>indicates significant Pearson chi-square results at  $p < 0.050$ .

different mental health conditions. Participants were categorized as least affected (if they answered 'no' to all loss of properties questions in Table 2) and most affected (if they answered at least one question with

a 'yes' in Table 2). Chi-square tests indicated that people who were the most affected by the Shaheen cyclone were significantly impacted in their mental health ( $\chi^2$  (df = 2) = 16.653;  $p < 0.001$ ) [Table 5].

**Table 5:** Evaluation of perceived mental health assessed by participants affected and not affected by the Shaheen cyclone.

Loss of properties	All the time and most of the time n (%)	Some of the time and a little of the time n (%)	None of the time n (%)	Pearson chi-square value	p-value
Most affected (n = 193)	21 (10.9)	155 (80.3)	17 (8.8)	16.653 <sup>b</sup>	< 0.001
Least affected (n = 247)	13 (5.3)	180 (72.9)	54 (21.9)		

<sup>b</sup>indicates significant Pearson chi-square results at  $p < 0.050$ .

## DISCUSSION

To the best of our knowledge, this is the first study to evaluate the health impacts of the 2021 Shaheen cyclone in Oman. Our results showed that the majority of respondents living in Al Khabourah, As Suwaiq, Al Musannah, and Saham were affected by the cyclone in both their properties and some psychological problems, dominantly anxious-depressive symptoms. Females, unemployed people, and those without a university degree and earning < 500 OMR per month had a greater prevalence of psychological problems. Affected Omanis whose properties were damaged by the cyclone were more likely to report psychological problems.

Our results agree with previous studies that reported high mental health issues in people who experienced direct losses from cyclones. Two studies in the UK found that people whose houses were directly affected by the flooding had two to five times higher prevalence of psychological symptoms than a control group.<sup>17,18</sup> People directly affected by cyclones had an increased risk of psychological problems such as sleep problems, psychological distress, and post-traumatic disorders.<sup>2</sup>

Our results also showed that psychological problems might be worse in different subgroups of the Omani population. Females, the unemployed, those who earn < 500 OMR, and those with only up to secondary school education reported worse levels of psychological problems. These findings are consistent with other research showing that females and people of low socioeconomic status are most vulnerable to mental health problems. Following the 2004 Asian tsunami, it was found that females were most at risk of developing mental health issues.<sup>19</sup> Similar results were found in a population affected by a cyclone in coastal Bangladesh where women showed more stress disorders and sleep disturbances.<sup>20</sup> On the other hand, after Hurricane Katrina, people from

low socioeconomic backgrounds had higher mental health problems.<sup>21</sup> Similarly, a study from Bangladesh has shown that people with low income affected by the 2021 Amphan cyclone were found to have a high prevalence of mental health symptoms.<sup>22</sup> These authors suggested immediate and long-term mental health support for this vulnerable population. Our results also showed that respondents who have an education only up to secondary level and without a university degree are more prone to develop psychological problems. This could be possibly explained by the fact that people with a university degree might have a better coping mechanism, which could be associated with better mental health outcomes. This has been previously shown in patients suffering from chronic diseases where those with a university degree showed better emotional well-being and social function than patients with no university degree.<sup>23</sup> Another possible explanation could be that people with a university degree have better jobs and are better paid, which could enable them to cope better with the losses from the cyclone.

Our results also showed a strong association between loss of properties and development of anxious-depressive symptoms. A study from Indonesia showed that people who were displaced from their houses after the 2004 tsunami had mental health problems.<sup>24</sup> Moreover, in a study from Bangladesh, the authors found that people who lost their houses after cyclone Amphan had higher mental health problems.<sup>22</sup>

This study had some limitations. Our data were collected three to six months after cyclone Shaheen, which does not reflect the immediate impact of the cyclone nor a long-term assessment of some psychological problems, dominantly anxious-depressive symptoms. Moreover, the questionnaire was sent only to people from affected areas in Oman, and therefore, only affected people might have been

motivated to fill in the questionnaire, which could constitute a selection bias. Indeed, around 79.3–90.7% of respondents had their households and outside properties damaged by the cyclone. People from the affected areas whose properties were not impacted by the cyclone or people from outside these areas who witnessed the cyclone affecting their neighbors or loved ones were under-represented.

Our results are important for public health policymakers who should target vulnerable subgroups of the population to mitigate the negative mental health impacts of cyclones. Oman is likely to see more cyclones in the future and therefore more people will be affected by property loss and mental health issues. Understanding which subgroups of the Omani population are at higher risk of mental health problems is paramount in order to develop strategies to improve resilience and coping mechanisms. Public health authorities and disaster management units should provide mental health support to the affected community. Psychiatrists, psychologists, and social workers should be available to provide psychological care in affected areas.

## CONCLUSION

An important proportion of Omanis living in the affected areas reported psychological problems following cyclone Shaheen. Many factors seemed to affect mental health following the cyclone. Women, individuals with lower socioeconomic status, lower education levels, and unemployment were found to be more vulnerable to psychological problems. It is paramount to target the most vulnerable with interventions to support mental health. The results of this study may help to enhance the resilience of Omanis to cope with the consequences of future cyclones, especially in terms of mental health via developing proper strategies within disaster management programs.

### Disclosure

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