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Vulnerability, Preparedness, and Previous Experience of Disasters Among the Population of a High Hazard Region—Rural Southern Sindh, Pakistan

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Abstract

A cross-sectional, mixed-method study was conducted in Badin, a rural area in southern Sindh, which is considered a high-risk disaster zone, to assess the vulnerability, preparedness, and disaster experiences of the coastal population. A multistage sampling technique was employed to select the villages, study area, and 3 distinct populations (I, II, and III). Family heads of households were recruited for population I, village heads for population II, and community support group leaders from selected clusters for population III. The survey was conducted through face-to-face interviews. The results revealed that the population of rural southern Sindh, Pakistan, is highly vulnerable to disasters and exhibits lower levels of preparedness. The statistics about the vulnerable population may prove helpful in designing policies targeting specific groups to mitigate hazards in the future.

Pakistan has a tumultuous history marked by recurring devastating disasters, including deadly earthquakes and catastrophic floods. The vulnerable coastal belt in Sindh, particularly along the Indus River, has been repeatedly affected. The unprecedented 2010 floods submerged a vast land area, making it the worst disaster in the country's history. Cyclones and hurricanes have also inflicted immense suffering, with thousands of lives lost and basic infrastructure decimated.[1,2] Given the ongoing vulnerability, a study was conducted in Badin, rural southern Sindh, a high-risk disaster zone, to assess the vulnerability, preparedness, and disaster experiences of the coastal population.

Methods

It was a descriptive cross-sectional, mixed-method study conducted from May to December 2019. Participants provided informed consent and voluntarily took part in the survey anonymously. A multistage sampling technique was used. Sindh Province was purposively selected due to its frequent disasters. The coastal district Badin was chosen, consisting of 5 talukas and 46 union councils. The study area comprised 8 union councils located within 50 km along the coastal belt of Badin (Figure 1). Random sampling was used to select 25 settlement clusters or villages as "Primary Sample Units." For population I, 20 households were randomly recruited from each primary sample unit, resulting in a total of 500 households known as "Secondary Sample Units." Village heads from all 25 clusters were included for population II, and community support group leaders from the selected clusters for population III.

Questionnaires with closed-ended and open-ended questions were designed to assess vulnerability, preparedness, experience of previous disasters, and coping capacity. A checklist evaluated the availability of stocks and facilities. Disaster preparedness was evaluated using a 4-point Likert scale ranging from "unprepared" to "highly prepared" based on 8 items with scores ranging from 0 to 8. A pilot study assessed the precision and face validity of the questionnaires, and test-retest reliability exceeded 0.75 for all questions, determined using the Spearman rank correlation coefficient. Face-to-face interviews were conducted separately with each participant to minimize bias.

The study received approval from the Ethical Review Committee of Liaquat University of Medical and Health Sciences, Pakistan (Reference No. LUMHS/REC/-598).

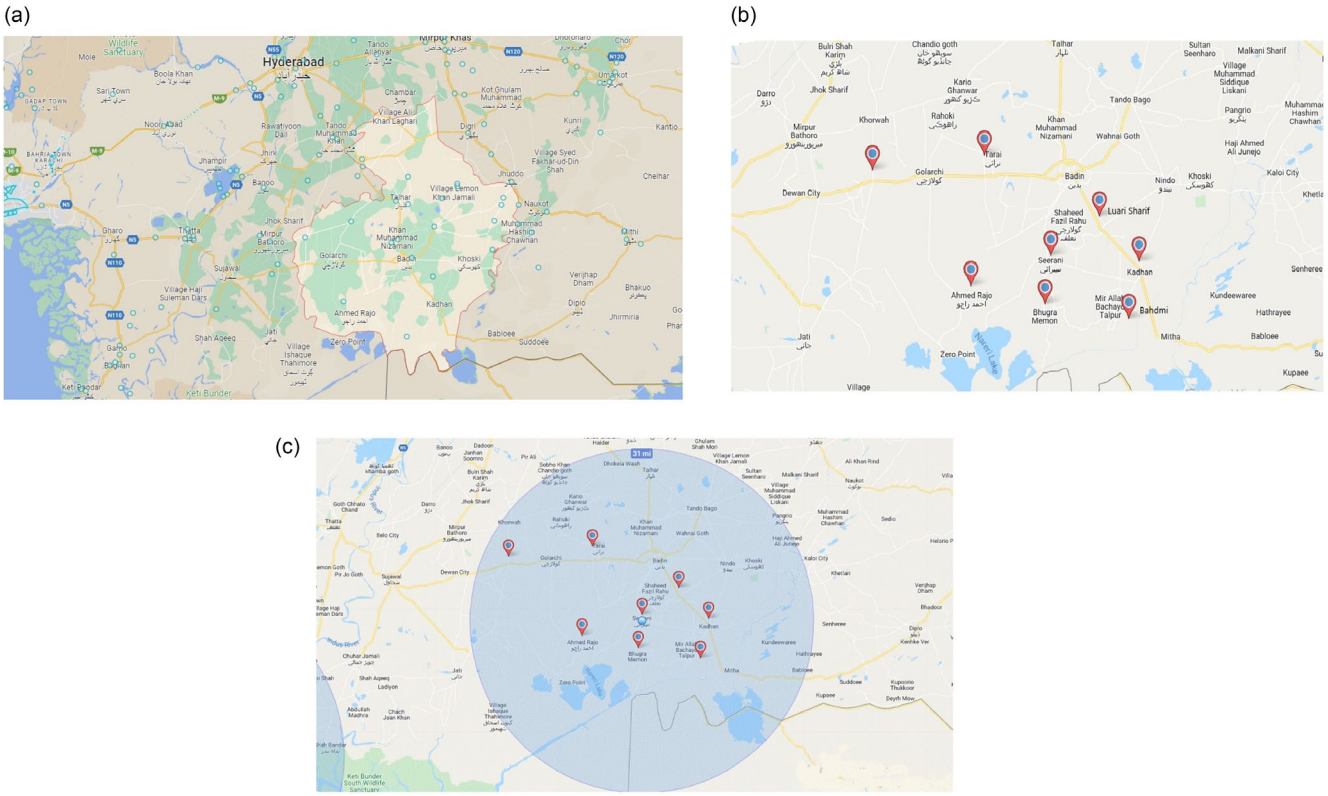

Figure 1. (a) Boundaries of coastal district Badin (Source: Google Maps; red line demarcates the boundaries of district Badin). (b) Study area map showing selected union councils/villages. (c) Study area map of the study showing selected union councils/villages within 50 km (30 miles [mi]) of the coastline of district Badin. (Map constructed by using Maptive software; available online: https://www.maptive.com/.)

Results

The survey had a 100% response rate. Table 1 presents sociodemographic characteristics, vulnerability, and disaster preparedness levels. The score indicated that population I was relatively unprepared for disasters, whereas population II showed higher preparedness. Population I had experienced various disasters every 2 to 4 years, causing significant damage to their homes. Additionally, they have been enduring a persistent drought in their area for the past year.

In our study, out of 500 households, 96.8% had no impact on work capacity before and after disasters. Strong social bonding was observed, with all households expressing connections with family and friends, restoring activities, and discussing disaster issues. The majority (98.2%) took care of friends and family. However, only 39% searched for people in unfavorable situations, and 6.4% helped the community in various ways. After 6 months, the majority of households spent time with family and friends (97.4%) and resumed daily routines (52.6%). Nearly half (49.4%) engaged in enjoyable activities as a coping strategy. The majority expressed shared feelings (61.8%) and accepted help from others (73.4%). Population involvement with the community increased from 6.4% to 79.6% after 6 months, but the majority (96.2%) desired relocation to a safer place.

Twenty villages had < 1000 population, and 5 had 1000–3000 people. All households and village heads lacked stored resources, health care access, and disaster forecasting ability. However, they had access to safe places and community support groups. These groups targeted rural populations, alerted villages, addressed health concerns, and participated in relief efforts. All community support group structures were secure and easily accessible, with road access and vehicles. Although most were in kaccha-houses (96%), they had nearby pakka-houses. None had a doctor, but 11 had health care staff, and 16 had additional volunteers. All group heads were trained in disaster management. A shortage of medications and vaccines was observed. Drinking water and food quantities were insufficient. All community support groups experienced calamities and participated in relief efforts.

Discussion

A comprehensive vulnerability analysis is crucial for disaster-prone areas to facilitate the implementation of emergency plans and enhance risk management. Gender, age, education, employment, disability, type of housing, and proximity to coastal areas are linked to vulnerability and disaster preparedness.[3–5] In the present study, population I exhibited high vulnerability due to illiteracy, larger family sizes, and poverty. Conversely, population II, consisting mostly of illiterate individuals over age 60, exhibited extreme vulnerability to disasters. Previously, it was evident in the aftermath of Hurricane Katrina, where around 70% of fatalities occurred among those ages 65 and above, particularly the older adults and disabled individuals.[6]

Previous disaster experiences, early warnings, and evacuations contribute to improved preparedness and awareness. However, our study, consistent with previous research in Pakistan,[7] revealed a lack of awareness among respondents regarding climate change and impending disasters, resulting in inadequate preparedness. Alarmingly, most households were unprepared for emergencies.

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Table 1. Demographic characteristics, vulnerability, and disaster preparation of populations I and II

Demographic variables		Population I n (%) n = 500	Population II n (%) n = 25
Gender	Male	496 (99.2)	25 (100)
	Female	04 (0.80)	0
Taluka	Badin	440 (88)	22 (88)
	Golarchi	60 (12)	03 (12)
Age (years)	21-30	88 (17.6)	0
	31-40	190 (38)	0
	41-50	135 (27)	02 (8)
	51-60	52 (10.4)	10 (40)
	Above 60	35 (7)	13 (52)
Educational status	Illiterate	331 (66.2)	15 (60)
	Primary	97 (19.4)	06 (24)
	Middle	42 (8.4)	0
	Matric/ intermediate	30 (6)	04 (16)
Disaster vulnerability			
House type of households	Kaccha	500 (100)	15 (60)
	Pakka	00 (0)	10 (40)
Residence distance from coastal belt	Below 10 km	300 (60)	14 (56)
	11 to 20 km	100 (20)	04 (16)
	21 to 30 km	100 (20)	07 (28)
Below 18 years of age in family	1 to 2	177 (35.4)	08 (32)
	3 to 4	272 (54.4)	05 (20)
	Above 4	51 (10.2)	12 (48)
Above 60 years of age in family	1 to 2	498 (99.6)	17 (68)
	3 to 4	02 (0.4)	08 (32)
Number of women in family	1 to 2	134 (26.8)	05 (20)
	3 to 4	247 (49.4)	07 (28)
	Above 4	119 (23.8)	13 (52)
Anyone with a disability in the family	Yes	08 (1.6)	02 (8)
	No	492 (98.4)	23 (92)
Disaster preparedness scale			
1. Do you prepare prior to disasters?	Yes	316 (63.2)	25 (100)
	No	184 (36.8)	00 (0)
2. Do you take measures to clean gutters and trim vegetation to save homes?	Yes	304 (60.8)	25 (100)
	No	196 (39.2)	00 (0)
3. Do you have an evacuation or emergency plan?	Yes	310 (62)	20 (100)
	No	190 (38)	05 (0)
4. Do you access hazard mapping?	Yes	00 (0)	20 (100)
	No	500 (100)	05 (0)
5. Do you access warnings by government agencies?	Yes	304 (60.8)	25 (100)
	No	196 (39.2)	00 (0)
6. Have you participated in any disaster education program or training running in this village?	Yes	62 (12.4)	25 (100)
	No	438 (87.6)	00 (0)
7. Do you participate with community in coping with disaster?	Yes	250 (50)	25 (100)
	No	250 (50)	00 (0)
8. Have you spoken to any responsible person for improvements?	Yes	45 (9)	25 (100)
	No	455 (91)	00 (0)
Level of preparedness for disasters (scoring)			
Unprepared	0-2	175 (35)	00 (0)
Not very prepared	3-4	138 (27.6)	00 (0)
Somewhat prepared	5-6	187 (37.4)	05 (20)
Highly prepared	7-8	00 (0)	20 (80)

Population I, family heads of the selected households; population II, the village heads of all the 25 clusters.

Social networks play a crucial role in enhancing coping capacity during disasters by providing emotional and social support. These networks offer resources and aid to affected individuals.[8] For instance, Kirsch et al.[9] reported the severe impact of the 2010 Pakistan floods on both rural and urban populations, leading to challenges in income, sanitation, electricity, and the overall economy. Rural populations experienced a slower recovery and were more likely to relocate rather than return home after 6 months.

Conclusion

Community support groups are vital for effective disaster management, mobilizing resources, improving communication, and enhancing access to health facilities and first aid.[10] However, rural areas lack sufficient facilities, requiring increased attention and relief efforts. Our study reveals the high vulnerability and low preparedness levels among Sindh's rural population, underscoring the need for targeted policies and relief efforts. Adequate tools and resources are crucial for community support groups to fulfill their roles effectively. Limitations include the study's focus on rural areas, limiting generalizability to urban settings, and potential recall bias. Nevertheless, the study provides valuable statistics and insights to inform policy design for future hazards in rural areas of Sindh.

Author contributions. AHK: Conceived idea, designed study and survey, conducted data analysis.

KNM: Supervised and designed study, formulation of questionnaires, critical review.

FFK: Study design, literature review, manuscript writing and editing.

HR: Literature review and participated in study design analysis.

IHK: Critical review and drafting.

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