Disaster Risk Communication: Challenges, Barriers, and Communication Strategies

ABSTRACT

This study explores the communication challenges faced by flood-affected communities in Pakistan during and after the 2022 flood events in Sindh and Balochistan. The research uses a qualitative approach, which includes 24 semi-structured interviews with relevant stakeholders, and 04 FGDs conducted with the affected communities. The study provides insights into improving disaster communication strategies and developing inclusive, community centred policies for future flood responses. It examines barriers to accessing timely and credible information, including language differences, low literacy level, and ineffective communication channels. The research also analysed the indigenous knowledge through oral narratives and participatory storytelling exercises. Findings highlights widespread dissatisfaction with available communication and support mechanisms, as well as the need for multilingual and culturally relevant disaster communication strategies. In order to bridge the gap between scientific and indigenous knowledge, the study put emphasises to strengthen local communication channels, integration of indigenous knowledge into disaster preparedness framework and its implementation on ground to provide information that is easy to grasp and widely accessible to the communities.

Keywords: Flood, climate change, disaster communication, disaster preparedness, communication barriers, vulnerable communities, Indigenous Knowledge.

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1. INTRODUCTION

Climate change caused unusual flooding in Pakistan, affecting millions of people by destroying their homes, livestock, and livelihoods. Women, children, and marginalised groups were impacted, highlighting the urgent need for improved, equitable disaster preparedness, response, and recovery strategies. While humanitarian relief efforts addressed immediate needs, however, significant gaps in effective disaster risk communication limited the ability of vulnerable communities to prepare for, respond to, and recover from the disaster.

This research examine the critical problem of inaccessible and insufficient communication during the 2022 floods, which left many communities uninformed, misinformed, or excluded from preparedness and response information. The study particularly explores how communication gaps, arising from communication barriers, weak infrastructure, exclusion of indigenous knowledge and socio-cultural inequalities aggravated vulnerabilities during crisis. Empirical evidence highlights the role of modern communication technologies, and social media in disaster management, but it often ignores how these channels fail when infrastructure breaks down and how the communities living in hard to reach areas get access to information. This study aims to fill this gap by examining the communication challenges faced in the 2022 floods, the role of indigenous knowledge and community support in overcoming these barriers, and the potential for more inclusive, resilient communication strategies. The objectives are to (1) analyse the effectiveness and limitations of disaster risk communication during the 2022 floods, (2) identify barriers to equitable information dissemination, and (3) recommend strategies that integrate local knowledge and community participation to improve preparedness and response.

1. Research Gap

The existing literature on flood risk management in Pakistan primarily focuses on early warning systems, and capacity of government response to the disaster. However, far less attention has been given to the communication, cultural, linguistic and infrastructural barriers faced by the most vulnerable groups including women, populations with low literacy or illiterate group, person with disabilities and those lacking access to technology. This approach creates a significant gap that how communities at risk actually receive, understand and act on risk information. In addition to that, few studies have documented the importance of indigenous and traditional knowledge such as local terminologies, storytelling, and informal networks, which are often considered the foremost trusted channels of risk communication, therefore, this rich reservoir of indigenous knowledge remain undocumented and absent from formal communication framework.
As a result, practitioners and policy makers do not have clear, and relevant evidence based guidance on how to integrate scientific knowledge with the culturally appropriate and indigenous knowledge that the communities trust the most.

This gap has two parts: a conceptual gap; not enough frameworks to bridge indigenous and scientific communication knowledge; and a practical gap; little evidence on what really works to deliver timely, trusted, and useful messages to people in hard-to-reach areas. Filling this gap is key to creating inclusive and effective disaster risk communication strategies for Pakistan's flood-affected areas. This highlights the need to explore tailored communication strategies that meet the specific needs of these communities. Such approaches are crucial for improving the effectiveness of disaster preparedness, response, and recovery efforts in Pakistan's flood-prone areas.

2. Problem Statement

The floods of 2022 in Pakistan had devastating consequences, destroying villages, towns, and small cities, and displacing large populations who were left without shelter, food, livelihood and healthcare. In the midst of such a dire humanitarian crisis, this research study investigates communication barriers and the lack of timely, credible information faced by the flood-affected communities before, during and after the disaster. It also explores the role of indigenous knowledge in enhancing disaster preparedness, mitigation, response and recovery efforts.

3. Research Objective

The study aims to analyse communication challenges faced by flood-affected communities before, during, and after natural disasters. The study will analyse limitations in infrastructure, technology, and information dissemination. The study also evaluates the availability and accessibility of timely and credible information, considering factors like language barriers, literacy levels, and effectiveness of communication channels. Additionally, it explores the role of indigenous knowledge and informal community practices in disaster preparedness, early warnings and recovery. Finally, the study seeks to propose practical solutions to reduce communication barriers and enhance access to critical information for disaster-affected populations.

4. Research Questions

- How can effective, authentic and timely information reach the flood affected communities and what are the means or channels of communication to reach the targeted population.
- What are the communication challenges faced by flood affected communities and how to address these communication barriers?
- How can indigenous knowledge help communities understand climatic changes and enhance community resilience and response to disaster
- How can indigenous knowledge inform the development of culturally appropriate communication materials on disaster risk reduction (DRR) and climate change adaptation (CCA) in local languages?

2. OVERVIEW OF THE 2022 FLOOD IN PAKISTAN AND ITS IMPACT

Climate change, driven by global warming, is increasingly evident and is expected to have severe consequences in the future (Shahvari et al., 2019). Developing countries like Pakistan are particularly vulnerable to its impacts due to lack of awareness about effective measures, institutional weaknesses, and limited resources (Rahman, Lateh and Ullah et al., 2019). Over the past two decades, South Asia has faced numerous climate related disasters, with Pakistan experiencing some of the most severe impacts. The country's warming rate is higher than the global average, with projections indicating a rise of 1.3-4.9 degrees Celsius by the 2090s. In 2022, Sindh and Balochistan, home to a combined population of 60 million, bore the brunt of this extreme weather event, experiencing rainfall levels of 625% and 501% above average, respectively. This disaster serves as a stark reminder of the urgent need for improved climate crisis preparedness, mitigation, and adaptation efforts not only in Pakistan but also in the entire South Asia region, which remains highly vulnerable to extreme weather events.

Malteser International, a humanitarian organisation has highlighted Pakistan's vulnerability to climate change and natural disasters. The country has faced frequent and severe natural disasters, including earthquakes, floods, extreme weather and droughts. The 2022 flood caused huge damage, particularly in the southern province of Sindh, due to its low-lying topography (DAWN). As the most densely populated province, Sindh experienced widespread destruction, as flood waters, channelled through the active Indus River and its tributaries, devastated infrastructure, livelihood and agriculture. According to the National Disaster Management Authority (NDMA) and UNOCHA, 84 districts were declared calamity-hit, with Sindh accounting for 70% of total losses. Other provinces including Punjab, Balochistan, and Khyber Pakhtunkhwa, were also affected, albeit to a lesser extent. The floods devastated millions of homes, crops, and livestock, pushing millions of people into poverty. UNICEF (2022) estimates that 33 million people are affected, half of whom are children.

Pakistan Floods 2022 Post Disaster Need Assessment indicates that the floods affected one third of the population, displacing estimated 8 million people. In addition, the economic losses were roughly calculated at US$15.2 billion, with a total restoration cost of around US$16.3 billion. The assessment also highlights the most affected sectors which include housing, agriculture, food, livestock, fisheries, transportation and communications. Sindh and Balochistan provinces are disproportionately affected due to their geographic and socio-economic vulnerabilities. Flood causes considerable losses particularly in livelihoods, agriculture and livestock sectors, further hindering economic development and community empowerment Therefore,

women emerged as the most vulnerable segment, bearing the brunt of these challenges. (Pakistan Floods 2022 Post Disaster Need Assessment). Addressing the needs of affected communities requires timely, coordinated relief efforts involving local, national and international stakeholders. These efforts must include humanitarian aid, rehabilitation, healthcare services, and sustainable livelihood support tailored to the needs of the most at-risk population.

2.1. Significance of Communication; and Disaster Risk Communication

During the 2022 floods, literature identified several critical gaps in disaster related information dissemination (Smith, J., & Johnson, A. 2022). The study suggested that timely and consistent communication before, during and after the disaster is a primary need of affected communities. Therefore, unequal access to information significantly increased community vulnerabilities, such as leaving some communities ill-equipped to respond effectively. The study indicated the significance of establishing women-led committees, mitigating risks, and developing accessible reporting mechanisms to bridge these communication gaps and empower local communities. Policymakers and local authorities must prioritise equitable information dissemination to address the frustration and confusion caused by inadequate communication (Smith, J., & Johnson, A. 2020).

Effective communication is essential to disaster risk management, enabling timely information dissemination, informed decision-making, and coordinated relief efforts (Ericsson, 2020). In developing countries like Pakistan, however, communication infrastructure is often inadequate, particularly in rural and marginalised areas (Smith & Johnson, 2022). Indigenous knowledge provides valuable insights for disaster preparedness and response. Local communities often possess traditional methods for predicting and responding to natural disasters, which can complement formal early warning systems (UNHCR, 2023). Despite its potential, indigenous knowledge is frequently excluded from formal disaster management strategies, creating a gap between scientific approaches and local practices.

According to Ericsson (2020), effective communication is vital in disaster response, as evidenced by Ericsson Response programme, which provides connectivity to humanitarian workers during natural disasters and medical emergencies. Ericsson (2020) explains communication across three phases: preparedness, response and recovery. In the preparedness *phase*, communication facilitates the dissemination of risk information and preparedness measures to the public and stakeholders. During the response phase, it enables timely access to critical information and supports informed decision making. *recovery phase*, communication supports in coordinating relief efforts and disseminating information about available aid and resources. In this relation, UNISDR. (2017) emphasises the significance of communication technologies in disaster prevention, mitigation and management. These tools are vital for hazard tracking, issuing alerts, warning populations and coordinating emergency responses. Post disaster, a community's resilience and recovery capacity largely depend on the availability of the communication systems.

The role of social media during natural disasters has been widely discussed in scholarly literature. Ishtiaq, N. (2022) analysed the National Disaster Management Authority crisis communication, use of social media during 2022 floods in Pakistan, highlighting its effective use of platforms like Facebook and Twitter to disseminate information. NDMA used various communication strategies, including visual content and targeted messaging to district and local administrative units, enhancing public understanding of supply needs and issuing monsoon and weather updates. Despite the potential usefulness of social media as a communication tool before disasters, the study does not address the limitations of social media during

disasters, particularly when internet and cellular networks are disrupted. This gap indicates the need for further research on how affected populations access critical information during crises, especially when traditional and digital communication channels are compromised.

In the context of disaster risk reduction, UNISDR (2017) highlights the significance of effective public communication, as outlined in the "*Words into Action Guidelines: National Disaster Risk Assessment."* The guidelines advocate fostering dialogue, delivering clear and practical messaging, and maintaining resilient communication infrastructure to engage stakeholders and reduce disaster risks. Guidelines also emphasise the vital role of media in disseminating information, engaging the public, and facilitating discourse on disaster risk reduction. The guidelines stress the need for targeted and context specific communication strategies to enhance community resilience (UNISDR, 2017).

2.2. Communication Challenges

The 2022 floods exposed several critical vulnerabilities in the communication infrastructure of Sindh and South Punjab (A Dangerous Information Gap, March 2023). One leading challenge was language: information was predominately disseminated in Urdu, causing confusion among non-Urdu and marginalised language speakers. Another setback was the lack of written or visual materials, as most information was shared orally, making it difficult for communities to verify or keep essential details.

Information was often shared with the general public such as landowners, rather than the most at risk groups. Thi**s** led to the spread of incomplete or misleading messages among affected people. Women were specifically disadvantaged due to limited phone ownership and reliance on male family members for updates. Hotline usage was also impractical given educational and awareness barriers. The report further observed that misinformation and manipulation were widespread, fueled by limited access to reliable official sources, leaving communities vulnerable to fraud, threat and exploitation.

Modern communication infrastructures like the internet, cellular networks, and satellite systems are vital for disaster response, yet remain vulnerable, particularly in underdeveloped regions like Sindh and Balochistan (DAWN). During the 2022 floods, Balochistan lost road access and connectivity which ultimately disconnected the province from the whole country. These include, educational disparities that limit understanding and preparedness (Häfliger, C., Diviani, N. & Rubinelli, S. (2023); cultural and language differences that hinder mutual understanding due to prejudices (Kim, H., Penry Williams, C. (2021); limited technological access, which restricts timely information dissemination; emotional barriers that prevent discussions on sensitive issues; and obstacles to public distrust in authorities (Charlotte Cooper, 2023). Tailored communication strategies by using multiple languages, simplifying complex information, and engaging trusted community networks to ensure messages reach all segments of the population effectively.

2.3. The Role of Indigenous Knowledge and Community Support in Overcoming Communication Barriers

Communication tools are often unavailable during natural disasters due to damaged infrastructure and limited connectivity. In such a context, traditional means, beyond radio and television, play an essential role in disseminating information about the situation, preparedness, and relief efforts. According to the UNHCR Fact Sheet report on “indigenous People’s Knowledge and Climate Adaptation, indigenous knowledge and community support are vital in overcoming communication barriers in flood-affected areas. The local communities possess deep environmental understanding and traditional methods for predicting and responding to floods, which can complement formal early warning systems and enhance information

dissemination. (UNHCR, 2023). Authorities can utilise community support, including trusted local influencers, leaders and local organisation working at grassroots level, to effectively deliver information. These actors/stakeholders are often already engaged in relief support and can ensure that information reaches a wider audience (Fluck et al., 2022).

Furthermore, community members can facilitate translating critical information into local language and context, improving accessibility. Similarly, women facilitate other women within the community if included in the formal information channels particularly in community-based initiatives. As we all equip them with necessary training they can play their role significantly.

During the 2022 floods in Pakistan, communication played an essential role in disaster response and management. Village Disaster Management Committees carried established communication channels with Provincial Disaster Management Authorities (PDMAs), district governments, humanitarian actors, and communities (Fluck, V., Thurston, A., Arbab, P., Atif, A., & Castillejo, A. 2022). Comparatively, in international contexts, crisis communication has been pivotal in managing natural disasters, terror attacks, and transportation incidents (Kjell Brataas, 2019).

For instance, Zimbabwe's integration of Indigenous Knowledge Systems (IKS) into its climate policy highlights the value of traditional knowledge in enhancing adaptation and resilience. By incorporating IKS, policymakers gain local insights into mitigation strategies and strengthen community-level responses to climate change (Kamuti, 2022). This approach underscores the importance of including diverse knowledge systems in climate action. The effectiveness of disaster communication strategies depends on technological infrastructure, community preparedness, and the ability of authorities to disseminate timely and accurate information. In both the Pakistani and global instances, rapid information exchange and the involvement of local communities have been key in reducing disaster impacts.

3. RESEARCH METHODOLOGY

This study employed a qualitative research approach, including semi-structured interviews, focus group discussions, and a systematic literature review. A total of 24 participants, including community members, subject matter experts, and social workers, were interviewed. Four focus group (6-8 participants each) discussions were conducted with flood-affected communities in Sindh and Balochistan, with particular attention to Gwadar due to its high vulnerability to natural disasters.

Participants were selected using a stratified purposive sampling technique, ensuring diverse representation of the population based on age, gender, profession, ethnicity, socio-economic background, knowledge on natural disaster, and experience with climate change. All participants were local residents of the selected areas. Interviews were conducted in Urdu and local languages (Sindhi and Balochi), with translations provided for analysis. The research tool consisted of open-ended, semi-structured questions aimed at exploring communication challenges, indigenous knowledge, and disaster preparedness. Respondents shared their experiences regarding the impact of natural disasters, access to preparedness messaging, and whether safety information was provided on time by the authorities.

Cultural, socio-economic, and linguistic factors influencing disaster communication were analysed, along with any innovative strategies identified at the community level. In areas where Urdu was not widely spoken, local collaborators assisted in translating the tool and conducting interviews in regional languages. Discussions were recorded with participant consent, then transcribed and translated into English. Thematic

analysis was applied to identify key themes across the data, using a manual coding approach. Ethical principles were upheld throughout, including participant confidentiality and voluntary participation.

4. RESULTS

Participants represented varying levels of disaster preparedness based on the area they were residing in, the location of the housing, economic condition, and the support system they already had in place. The salient themes that emerged during the discussions include early communication, the mode of communication during such crises, the difficulties in accessing relief services, the prevailing health issues with limited medical facilities, and the food insecurity resulting from disrupted supply chains. By analysing these themes, this research aims to deepen our understanding of the specific communication-related issues faced by flood victims and contribute to the development of more effective disaster response communication strategies for the local communities. Some of the major results are

- All the respondents showed disappointment with the government response in communicating and facilitating the affected communities during and after the flood.
- Lack of communication is considered one of the predominant factors exacerbated by the loss of human lives, livestock and shelter.
- Due to no availability of network and internet connectivity, the information must circulate through non-traditional means of communication.
- Social media (Facebook) is not considered as a credible source of information in the time of disaster as this may spread confusion among people.
- Communities have indigenous knowledge about climatic changes while they lack to integrate international terms and jargon with their local knowledge and information.
- Communication gap was highlighted by the respondents due to language barrier and international scientific terms.

5. KEY FINDINGS

5.1. Indigenous Knowledge and Practices of the People

The study found that communities in flood-prone areas possess indigenous knowledge and a strong local understanding of climatic changes, though they are unfamiliar with scientific terminology. They rely on traditional beliefs and contextual observations to prepare for and respond to disasters. The study examine that effective, authentic, and timely information can reach flood-affected communities by integrating local, culturally relevant communication methods with improved institutional coordination. Communities emphasised the importance of clear, practical messages delivered in local languages and through trusted, accessible channels.

For example, a respondent from Sindh noted the traditional expectation of weather changes after the Holi festival, a pattern now seen as unreliable. Others identified, there seems to be a recurring pattern every decade, marked by heavy rainfall which results in severe floods. Some community members interpret

climate change through a religious lens, viewing natural disasters as divine punishment for collective wrongdoings. Others associate myths and superstitions with the Sindu Darya (Indus River), believing that human colonisation and dam construction have disrupted its natural flow, contributing to rising water levels.

These findings highlight the importance of integrating indigenous knowledge into formal climate communication strategies to improve preparedness and build community resilience.

5.2. Communication Gaps between NDMA and Local Communities

Respondents from Balochistan and Sindh reported limited or no guidance from authorities before the floods. While some received information from the NDMA, it was often ineffective—either not reaching the right people or lacking practical advice. Others received no early warnings, evacuation instructions, or protective measures for livelihoods and livestock.

'No safety measures or safety protocols were communicated to the communities living in the flood affected areas, people were aware or informed about rain prediction made by the government when the rain had already begun, the water was already entering into homes and, at 7 PM in the night, authorities informed that the resident had to empty the village, do you think there was any safety measure, no people just ran to save their lives.' **(Sindh, KII)**

'Due to government negligence and lack of information such incidents create hostility between two communities living in different villages, for instance, during the recent floods, one village's water management measures led to flooding in another village, creating animosity between the two communities.' **(Sindh, KII)**

'Awareness of the flood-prone location where I built my home could have prevented significant damage. The lack of information led to the loss of my home wall. Access to accurate information is crucial for making informed decisions and avoiding construction in high-risk areas prone to floods.' **(Balochistan, KII)**

Respondents noted varying levels of vulnerability within communities, with those lacking resources and support systems being most affected. Many were left stranded in unsafe areas due to limited access to safer locations. Some respondents reported that preparedness messages were shared via social media and television. However, in Sindh, damaged electricity infrastructure prevented access to these messages. In Gwadar, persistent network issues made it impractical to rely on mobile phones or television for communication, even before the floods began.

'When people receive information about the rain forecast through social media, they often lack clarity on how to respond effectively. They may be uncertain about where to seek shelter or what actions to take in preparation for the rain.' **(Sindh, KII)**

'Yes, lack of information definitely affected us a lot. In cities like Gwadar people usually rely on social media and television early alert warnings in case of emergency and also for other information. However, most of the time we do not have connectivity and a network as a result people cannot benefit from the early warnings and other information related to preparedness. Early evacuations were delayed due to unawareness.' **(Balochistan, KII)**

5.3. Preferred Mode of Communication During Floods

Community cooperation played a crucial role in relaying information during the floods. All respondents mentioned that connectivity was a major challenge, and in the absence of support from local authorities,

community members relied on one another for communication. A participant from Sindh described how residents used whistles to alert others when floodwater began entering residential areas.

'*We were disconnected during the flood, mobile networks and internet connectivity don't work in such conditions in our area. We couldn't communicate with others during such times.'***(Balochistan, KII)**

Similarly, a participant from another village in Sindh recalled a frightening experience when a dam burst due to heavy rainfall, creating a catastrophic situation. With no formal communication channels available, villagers resorted to firing gunshots as a warning signal to alert others of the urgent need to evacuate. Although initially alarmed, the community quickly understood the signal and evacuated in time, ultimately saving lives.

'People in our area use their traditional prediction methods to guess the chances of rain and other weather-related catastrophes.' **(Balochistan, KII)**

One stakeholder recommended using non-traditional communication methods during natural disasters to reach vulnerable populations, particularly those without access to traditional media. In many of the worst-affected areas, internet and cellular connectivity are unreliable or entirely absent. Alternative methods, such as word of mouth, firing gunshots as warning signals, and community-led river monitoring, become essential. Participants noted that monitoring river levels is often entrusted to senior community members, who assess risks and relay timely information to others.

*'When the flow of the river increased. People communicated locally in such a way that people from one village told the people from another village that the river flow has increased.'***(Sindh, KII)**

During discussions on credible information sources, participants expressed varying views. Broadcast media (TV) was widely regarded as efficient and reliable. Many women in focus group discussions (FGDs) from Sindh reported relying on WhatsApp for flood-related updates. However, other social media platforms were viewed as less dependable during crises, as they often spread misinformation, leading to confusion and panic within communities.

'Due to programs like The Benazir Income Support Programme (BISP) (A poverty reduction program in Pakistan), people, even the illiterate, are aware and are capable of understanding these messages, particularly in the Urdu language, or they identify the numbers from which message came, and due to social media people are much aware of their situation and in this regard, people are capable of easily communicate.' **(Sindh, KII)**

5.4. Difficulties in access to Relief Services

Access to relief services was a major challenge, particularly for respondents from Balochistan. Language barriers and the unfamiliarity of relief workers with the local culture and context further hindered effective communication. As a result, aid distribution was often perceived as ineffective and inequitable, leading to resource mismanagement and a mismatch between provided aid and the actual community needs. Flood damaged roads also delayed relief efforts, aggravating the already critical situation.

'Due to the destruction of the roads, relief services could not reach us on time. In the time of need, we were without any relief and were on our own. Relief services were delayed by several days and still, we don't have proper facilities. The most important facility is the road, and we still don't have roads.' **(Balochistan, KII)**

The language barrier was more prominently outlined by respondents from Balochistan than those from Sindh, indicating a region-specific challenge. It not only hindered effective communication but also created a sense of alienation for those seeking assistance. These findings highlighted the importance of deploying relief workers who are familiar with the local languages and customs to ensure more efficient and equitable aid distribution. Addressing these issues is essential to improving the effectiveness and responsiveness of relief efforts in flood-affected regions.

'We faced many challenges because most of the relief workers of PDMA or NDMA belonged to other cities and were not local. They spoke other languages which most of the locals could not understand so they couldn't facilitate the locals properly.' **(Balochistan, KII)**

5.5. Lack of Access to Health Services

Waterborne and insect-borne diseases such as malaria, diarrhea, typhoid, dengue, fever, and respiratory infections were widespread following the floods. Respondents from Balochistan and Sindh attributed these illnesses to the consumption of contaminated water. Malaria and diarrhoea were reported as the most common, with limited access to healthcare further exacerbating the situation, especially for vulnerable individuals.

This highlights the urgent need for improved access to clean drinking water and better hygiene and sanitation education. Such measures are essential to prevent the spread of disease, particularly among children. The research also indicated that low healthcare spending and limited public awareness about disease prevention have worsened the crisis. Strengthening disaster preparedness within the health system and promoting health education are critical to protecting vulnerable populations during future disasters.

'Yes, everyone in my family including myself was diagnosed with waterborne diseases such as dengue, malaria, and typhoid. These diseases are very common in our areas during the flood' **(Balochistan, KII)**

5.6. Food Insecurity Amid Floods

During the discussion, access to food emerged as a critical challenge highlighted by the respondents particularly from Balochistan. The primary cause of this issue was the disruption of the food supply chain due to damaged roads resulting from the flood. Additionally, the unavailability of food items from other areas further intensified the problem, leading to high levels of food insecurity among the affected communities.

'Yes, food insufficiency was a big issue for us. Although we had rice, flour and other food essentials, we couldn't move them timely so they were destroyed by the rain. The food which was distributed by the relief was also not enough. For 2 days we could only eat a meal two times a day.' **(Balochistan, KII)**

The lack of facilities and inadequate support from authorities worsened the challenges faced by flood-affected communities. Delays and shortfalls in relief assistance left many individuals and families vulnerable, relying on limited food supplies and informal support from local communities—resources that were often insufficient to meet growing needs.

The combined effects of damaged infrastructure, food scarcity, and ineffective relief efforts had a severe impact on community well-being. This highlights the urgent need for timely and comprehensive interventions to address food insecurity during crises. Strengthening response mechanisms and ensuring the availability of essential food items are critical to enhancing the resilience of affected populations.

5.7. Local Communication Tools and Strategies Already in Place

Mosques play a vital role during floods by leveraging the influence of religious leaders within their communities. These leaders help address the needs of affected populations, mobilise support, encourage volunteerism, and coordinate relief efforts. By using loudspeakers and local languages, mosques help overcome communication barriers and reach wider audiences.

Participants noted challenges with traditional evacuation signals such as bullet fires, whistles, or shouting. Bullet fires often caused panic, with some mistaking them for criminal activity, while whistles and shouting had limited reach, leaving many uninformed. These limitations highlight the need for clearer and more effective communication methods during evacuations. One respondent suggested providing rechargeable loudspeakers to each village. Designated individuals could use these to deliver timely announcements, including updates on safe shelters and precautionary measures, enhancing disaster preparedness and response.

Land-marking systems were also identified as crucial for disaster risk reduction, especially in flood-prone areas near dams. Clear directions can guide communities toward safe areas and away from danger zones, reducing risk and assisting emergency responders in locating high-need areas more efficiently.

During the FGD, participants were introduced to the concept of elevated livestock sheds, as practice common in other countries. These sheds can protect animals from flood waters by enabling farmers to relocate livestock to higher ground. While respondents expressed concerns about land allocation, construction, maintenance, and the lack of community ownership. Participants recommended that the government pilot such initiatives, as Pakistan has lost an estimated 70% of its livestock in recent floods. Community sheds could prove valuable for farmers in vulnerable areas.

During the KIIs, one participant emphasised forming volunteer guide groups to protect livestock and support communities during floods. These volunteers could educate residents on safeguarding animals, identify safe grazing zones, and collaborate with local authorities and veterinary services to coordinate rescue and relief operations for stranded or injured livestock.

6. DISCUSSION

The research highlights significant gaps in current disaster management communications during the 2022 floods in Interior Sindh and Balochistan. Addressing these issues is essential to improving community preparedness, potentially saving lives and reducing vulnerabilities. The study explored 04 key questions through this research with regards to disaster risk communication in Pakistan during 2022 flood crisis.

RQ1: How does timely, authentic, and effective information reach flood-affected communities?

The study findings reveal that during any natural disaster, provincial and national level bodies such as NDMA and PDMA are responsible for informing the communities by issuing early warning messages, however, they often fails to reach communities at risk in a timely and comprehensible way. Respondents from Sindh and Balochistan repeatedly mentioned that they often rely on the locally trusted channels such as volunteer networks, mosques announcement, observing environmental cues like changes in river flow, word of mouth, and traditional land marking methods, because during crisis, the communities remain disconnected due to damaged infrastructure and weak local coordination. This study emphasis the importance of informal communication channels and stress the need to integrate indigenous, cultural and

local knowledge with scientific understanding to develop effective, context specific communication strategies.

RQ2: What communication challenges are faced by communities, and how can these challenges be overcome?

Upon asking about the communication barriers faced by the communities during flood crisis, respondents mentioned that the warning messages are often delivered in Urdu language instead of local language, ignore local context of the the affected area, and the messages not considering the specific needs of the person with disabilities. In addition to that, women participants mentioned they particularly feel excluded from formal channels, so they have to dependent on their male family members for warning related messages and information. Respondents suggested in order to overcome aforementioned challenges, there is need to translate the alerts and other communication material into local languages, keeping in mind the local context, using oral and visual media, engaging local influentials such as local leaders, social workers and local organisations, in developing educational materials by adopting inclusive and participatory approaches that enhance programme effectiveness.

RQ3: How does indigenous knowledge contribute to improving community resilience and response?

While indigenous knowledge helps communities to foresee and cope with floods, because communities are aware that climatic changes are affecting their lives, although, they lack an understanding of its causes and international climate protocols. Communities recognises that environmental changes are impacting their daily lives, however, they explain these changes through cultural, religious and experiential lenses. In this regard, they often rely on traditional knowledge and observations, such as expected weather changes after local festivals such as Holi in Sindh, which historically indicated seasonal transitions and influenced preparedness activities, traditional flood markers, and storytelling about past disasters to anticipate and respond to floods.

Moreover, during natural disaster, when formal infrastructure becomes inaccessible, as well as the absence of support from local authorities, communities rely on each other for communication. They use informal and nontraditional ways of communications, such as blowing whistle to alert others when floodwater began to enter residential areas, firing gunshots as warning signals, and community-led river monitoring to inform about the rising water level. This approach of combining nontraditional information and indigenous knowledge with the scientific data with culturally grounded language is required to address the needs of the communities at risk due to natural disaster such as flood.

RQ4: How can indigenous knowledge inform the development of communication materials on disaster risk reduction (DRR) and climate change adaptation (CCA)?

The study findings indicate that indigenous knowledge provides a deep rooted foundation for developing effective communication strategies. Tools that reflect cultural context, include indigenous knowledge are more likely to be understood and trusted by vulnerable communities. Respondents emphasised that warning messages in local languages, metaphors, and traditional narratives are considered to be more comprehensible and trusted. Using indigenous knowledge helps to bridge the gap between scientific information and how community perceive it. Subject matter experts also suggested that the communication material must include stories linking ancestral practices with current climate challenges, visuals showing traditional flood markers alongside modern forecasts, local elders delivering messages in local languages.

This approach not only improves comprehension but also fosters trust and ownership of DRR and CCA measures, enhancing their effectiveness and sustainability.

7. POLICY RECOMMENDATIONS

This study offers several policy recommendations. These include enhancing collaboration between government bodies and local humanitarian organisations, strengthening community engagement, and supporting indigenous knowledge systems. Local leaders and influencers can play a key role in integrating traditional communication practices into official disaster strategies. Challenges such as language barriers, limited access to technology, and misinformation must be specifically addressed. Additionally, communication strategies must be culturally sensitive and tailored to the needs of diverse communities. Improved coordination between disaster management authorities and meteorological services is essential. As Pakistan transitions from relief to recovery and reconstruction, there is an urgent need to apply lessons from both the 2010 and 2022 floods. Bridging institutional disconnects is critical for enhancing national resilience to climate-related risks.

The research identifies key themes to consider when developing disaster communication materials: which include i) Indigenous Knowledge and Practices, ii) Enhancing Livelihood Resilience iii) Food Security and Health Crisis, iv) Guidelines for the Relief Workers v) and Preferred mode of Communication pre and post disaster. Each theme proposes specific recommendations for creating effective, context sensitive communication material. The study also proposes essential communication channels to ensure timely and widespread outreach to at-risk communities during natural disasters.

7.1. Indigenous Knowledge and Practices of the Local Communities

- Translate complex climate concepts into clear, accessible terms in local languages that resonate with indigenous perspectives and experiences.
- Incorporate traditional environmental indicators and forecast approaches into educational materials such as pamphlets and posters to make scientific information more relatable.
- Collaborate with local influencers and respected community members to develop short videos and audio messages that convey preparedness strategies, using familiar cultural narratives and local dialects.
- “Climate Education" delivers climate literacy initiatives specifically targeted at at-risk communities, ensuring the content reflects their lived realities and traditional knowledge systems. Actively involve communities in identifying local climate challenges and solutions. This participatory approach ensures communication materials are context-sensitive and culturally appropriate, enhancing their effectiveness and fostering long-term resilience.

7.2. Enhancing Livelihood Resilience

- Develop targeted communication material that addresses the specific challenges faced by different livelihood sectors, for example, for drivers and transportation workers, share information on road conditions, alternative routes, and transportation services after a flood.
- Provide information on available financial support programs or loans specifically designed for individuals whose livelihoods are affected by natural disasters. Explain the application process, eligibility criteria, and any relevant documents required to access these resources.
- Communication material should include case studies and success stories from individuals who have successfully recovered or adapted to their livelihoods after floods. These narratives can inspire others and provide practical examples of resilience and resourcefulness.

7.3. Communication material related to Food Security

- Educate communities on storing nutritious, non-perishable food items, including guidelines on appropriate storage methods to preserve quality and meet dietary needs during emergencies.
- Encourage local administrations and organisations to establish communal kitchens and volunteer-led food-sharing networks. Communication tools should highlight the value of collective action in mitigating food shortages.
- Materials should motivate individuals to share resources, volunteer, and advocate for improved food relief efforts. Active community engagement strengthens social solidarity and improves local response capacity.
- Messaging must emphasise the importance of addressing the needs of at-risk populations, such as pregnant women, by ensuring equitable food distribution during crises to protect maternal and child health.

7.4. Communication Material related to Health Crises

- Doctors can be engaged through video messages to educate the public on urgent health risks and prevention during floods. For example, medical experts can explain how stagnant flood water promotes mosquito breeding, increasing the risk of malaria and dengue. These videos can also offer practical tips, such as installing insect screens, using mosquito repellents, and wearing loose-fitting, light-colored clothing to reduce insect bites in affected areas.
- Develop animated videos featuring healthcare professionals demonstrating proper hygiene practices and water purification methods. These should educate communities on simple, low-cost techniques to make contaminated water safe for drinking, as well as proper storage and preservation of clean water during and after floods.
- Additionally, communication materials should include guidance on staying safe from snakes and other dangerous animals that may enter residential areas with flood waters. Raising awareness of such hazards is essential to reducing health and safety risks in flood-affected regions.

7.5. Communication material for Relief Workers

- Communication material should also address relief workers and community leaders, where they should be asked to use language to establish clear communication on relief procedures and resources. They should be asked to engage with the local representatives who could convey the specific needs of the community.
- Relief workers should be encouraged to use multiple communication channels including both traditional medium like radio and non-traditional means to get in touch with a community like in-person meeting.
- Communication strategy should also include the Gender specific needs to ensure inclusion of all the segments of the society.
- Through animated videos, provide guidelines and build capacity of the relief workers with particular focus on effective communication techniques as well as use of whistles, loudspeakers and other local signalling techniques during natural disasters.

7.6. Communication Channels

- Although the government disseminates messages via radio and other channels, they often fail to reach the most marginalised communities. A video should be developed listing radio stations, SMS alert systems, and links to safety related videos, covering evacuation plans, safety measures, and flood updates, particularly targeting remote areas with limited media access. WhatsApp was widely mentioned by participants as the most accessible and reliable platform.
- Animated messaging for school children can raise awareness about post flood health risks. Clear public messaging on epidemic prevention will help protect vulnerable groups, including children, women and the elderly.
- Early warning alarms and visual billboards in local languages, with pictorial content for low-literacy populations, should be installed. Community-level awareness sessions can further circulate critical preparedness information through local networks.

7.7. Precautionary Measures

- Develop communication materials that raise awareness about the dangers of building homes in flood-prone areas. Educate communities on how to assess housing vulnerability, including signs like structural cracks or ongoing construction in high-risk zones. Encourage temporary relocation to safer shelters during heavy rainfall or flood warnings.
- Include step-by-step guidelines on protecting important documents—such as ID cards, property papers, and educational certificates—by storing them in sealed plastic bags. These simple precautions can help communities avoid significant losses and complications in the aftermath of a disaster.

Conclusion

The study highlights the importance of delivering disaster-related messages in ways that are understandable and contextually relevant to vulnerable communities. There is a clear need for improved messaging from

both governmental and non-governmental stakeholders through traditional and non-traditional channels, such as community gatherings, videos, infographics, and mobile messaging. These efforts should include clear safety guidelines, effective use of resources like mosques, strategies to overcome language barriers, and the integration of local knowledge into climate change education. Community-level awareness campaigns can strengthen social cohesion and long-term resilience. The study further emphasises the importance of climate change awareness tailored to local cultures and languages, making communication more relatable and actionable. By addressing these key areas, stakeholders can significantly improve community preparedness and resilience in the face of future natural disasters. With regards to the effective and authentic means of channels for the communication, study identified that blending indigenous practices, community networks, and multichannel communication strategies will help to reach to the targeted population. Moreover, in order to address the communication gap, the message should be delivered in local languages by engaging trusted community leaders, as well as, utilisation of mosques by making announcements, volunteer networks, and land marking systems are the major ways to make information accessible when modern infrastructure fails.

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