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Shifting grounds: Exploring the physical and psychosocial impact of landslides

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Abstract

Landslides, as recurring natural disasters, pose significant threats to societies, economies, and public health, often triggering a chain of secondary impacts. While the physical damage and loss of life caused by landslides are well-documented, the mental health consequences for survivors remain inadequately studied. This manuscript seeks to address this gap by exploring the psychological and emotional well-being of individuals affected by landslides. Through an in-depth examination of landslide events and their aftermath, the paper provides a comprehensive overview of major historical landslides, followed by case studies that illustrate the psychosocial effects experienced by survivors, including the trauma of displacement and evacuation. The analysis underscores the importance of recognizing mental health challenges in the wake of such disasters and highlights the need for tailored psychosocial interventions to aid in recovery. By emphasizing the long-term psychological impacts of landslides, this work advocates for the integration of mental health support systems into disaster response strategies, offering key insights for improving survivor care and resilience.

Keywords: Landslides, mental health, psychosocial effects

Introduction

The term "landslide" refers to the movement of slope materials such as rock, soil, or artificial fill, which can occur through various processes like falling, sliding, spreading, or flowing. It is a natural event that involves the sudden displacement of rock or soil, often caused by both natural conditions and human activities. In India, landslides occur frequently, especially in hilly regions, and present ongoing challenges for scientists, engineers, and planners (Wieczorek *et al.*, 1996) [6].

According to oxford dictionary "Landslide is mass of earth, rock, etc. that falls down the slope of a mountain or a cliff"

Landslide in India

India features a diverse range of topographies, climates, and ecosystems, from the snow-capped peaks of the Himalayas to the wetlands and lush forests of the northeast and south, as well as the arid deserts of Rajasthan. Landslides are a common natural hazard in the country's hilly areas, with around 15% of India's land area vulnerable to landslides. In fact, India records the highest number of landslide fatalities annually worldwide. The southern part of the Himalayan region and the southwest coast are recognized as the two major landslide-prone areas globally. The economic impact of landslides in India amounts to an estimated annual loss of \$400 million (Hemalatha *et al.*, 2015) [2].

Psychosocial impact of evacuation during landslide

In the aftermath of a recent landslide in Indonesia, individuals displaced by the disaster were relocated to refugee camps where essential supplies like food, water, and shelter were provided. While these basic needs were addressed, many of the displaced people struggled to adjust to their new environment. They expressed a deep sense of loss for their homes and experienced significant emotional distress, which often manifested physically, such as through persistent headaches and dizziness.

Previous Major landslide in India

Nilgiris, Tamilnadu landslide October 1990	Heavy Northeast monsoon hit Niligiris and cloud burst occurred which buried 35 families alive in a place called Geddai.
Assam landslide July 1991	About 300 people were reported to be dead causing heavy damage to roads and buildings.
Pithoragarh mudslide in Uttar Pradesh August 1998	Heavy incessant rains triggered massive landslides in Pithoragarh district of Uttar Pradesh. About 300 people died including 180 Kailash Mana-sarover pilgrims. More than 10,000 villages were affected
landslides Ghatkopar Suburbs, Mumbai July 2000	Heavy rains caused mudslides in Ghatkopar suburbs of Mumbai. About 67 people were reported to be dead in this incident
Joshimath Landslide July 2004	Heavy landslides hit Lambagarh area and washed away nearly 300-meter-long road between Joshimath and Badrinath. 17 people were reported to be dead in this event
Kedarnath landslide, Uttarakhand June 2013	The landslide took place on June 16, 2013 and was the result of Uttarakhand floods. Over 5700 were reported dead and over 4,200 villages had been affected by the floods and post-floods landslide
Malin landslide, Maharashtra	The landslide occurred on July 30, 2014, in a village in Malin. The landslide occurred due to heavy rainfall and around 151 people died and 100 people went missing after the disaster.

(Sharma *et al.*, 2020) ^[4]

Physical and Psychosocial Impacts of Landslides: Lived Experiences and Interpretations

Theme	Lived Experience	Psychosocial impact
I scampered to save my life	<p>The disaster occurred on a Thursday, which was a market day. It was raining. I had so many customers in my bar and restaurant enjoying themselves. They were eating, drinking, and dancing. At around 1 p.m., I heard a funny sound and people raising the alarm. The customers didn't hear. Some of them were already drunk. The music was loud. I got out. I saw people running. I realised there was something happening. I scampered to save my life. I couldn't go back inside the bar to alert the customers that a disaster was coming. I felt several times. The stones hit and hurt me, but I couldn't stop. Although I managed to save my life, I failed those who were inside my bar and restaurant. I have the pain and trauma. I lost my sister, who had come to visit, and 32 customers who were drinking and partying. They were washed away by the flash floods and boulders. I am stranded here. Where do I start a new life? All the plans and investments I had were in this place. I lost everything. I haven't received anything since the devastating disaster occurred. I am struggling with five children. My name is not on the list of affected persons. I fear remaining in this place anymore. It's dangerous. I might be the next person to perish like my sisters and customers. I am willing to be relocated anywhere.</p>	<p>This vignette paints a picture of a person dealing with deep emotional turmoil and survivor's guilt. In a traumatic event, the individual managed to escape and save their life, but the burden of having left others behind, especially their sister, weighs heavily on their mind.</p> <p>The survivor's internal struggle is rooted in guilt and helplessness, common reactions in trauma survivors who experience survivor's guilt—the overwhelming feeling that they should have done more to save others. The inability to rescue those trapped in the restaurant intensifies this guilt, creating a deep emotional scar. The pain is twofold: not only is there grief over the loss of lives but also the internal conflict of "why did I survive when they did not?"</p> <p>In addition to survivor's guilt, the loss of a sister heightens the trauma. This personal connection makes the tragedy even more unbearable. The individual likely replayed the events in their mind, wondering what they could have done differently, fueling the fear that death could come for them next. The survivor's trauma becomes a persistent, looming fear—paranoia that they might share their sister's fate.</p> <p>This fear pushes the individual to seek evacuation—a desire to escape from their current environment in an attempt to feel safe. Being in the same place, near the site of trauma, likely triggers constant reminders of the event, which is overwhelming for them to cope with. This wish to relocate stems from their belief that a new, distant location might shield them from the emotional distress or impending doom they fear.</p> <p>Such reactions are often seen in cases of post-traumatic stress disorder (PTSD), where the survivor relives the traumatic event, experiences intense fear or anxiety, and actively seeks avoidance from any reminders of the trauma.</p>
Lost everything	<p>I was in the shop. I heard a loud explosion around 1pm. I got out immediately. I climbed the mountain. I saw water and stones coming down with speed. I took off and ran to cross the bridge. Whoever heard the sound and came out of their houses was able to run and survive. Those who stayed in the houses all went with the waters, mud, and stones. There was no chance for them to survive the water and boulders. Two of the people with whom I was seated inside the shop died in the disaster. They failed to get out and run because they doubted the sound and people's alarm. They were kind of confused about what was happening. They were washed away. We managed to</p>	<p>The individual feels lost due to a combination of practical and emotional losses, and their sense of helplessness is compounded by the heavy responsibility they feel toward their family. However, with structured support and a focus on gradual progress, they can begin to rebuild both their life and their sense of self.</p>

	<p>recover their bodies and bury them. It's a tragedy to lose a cousin and friend with whom you were seated. I feel a lot of pain in my body. I sustained injuries to my hands, knees, and back in the process of running to save my life. I don't have any money to get proper medication. Life is hard and difficult. I lost everything. All items and money in the shop were destroyed and washed away. I am sharing a small tent with my wife and seven children. We have to depend on the church, humanitarian agencies, and government relief assistance.</p>	
<p>It was a miracle that I survived</p>	<p>Everybody ran away and left me. I was abandoned. My daughter, who was feeding, fled and left me alone. She didn't bother about paralysed and elderly mother. I couldn't get out and run. I remained seated in bed. I prayed to God to save me. The water entered the house and covered it. I knew I was dead. It was a miracle that I survived.</p>	<p>When someone loses their primary support system, such as a close family member, friend, or partner, it can dramatically worsen their emotional and psychological state, especially during a crisis. For the lady in question, this likely meant losing the person she depended on for emotional, financial, or practical assistance. In times of distress, having a support system is essential for coping and decision-making, as well as for maintaining mental well-being.</p> <p>Without this support, the individual might experience heightened feelings of isolation, helplessness, or anxiety. Navigating daily responsibilities becomes more difficult, and accessing essential resources or care may be challenging without someone to help guide or accompany them. Additionally, the grieving process, combined with the stress of the crisis, could lead to overwhelming mental health struggles such as depression or severe anxiety.</p> <p>This type of situation often requires outside intervention, either from social services, mental health professionals, or community networks, to provide necessary support and help the individual regain stability.</p>
<p>All those in the houses were washed away</p>	<p>I had a permanent house and shop. But all destroyed and washed away within minutes. I was selling in the shop. I heard people raising the alarm and running in different directions. They were screaming 'soil and water [landslides] are coming to finish us'. I ran and crossed the bridge. My nephew who was following me from behind couldn't make it. He was caught by the speeding water while trying to cross the bridge and washed away. I watched in disbelief as he was swept off. I couldn't help. Most of the people who died were caught while running to cross the bridge. Some were got while resting, eating, and drinking in the local bars. All those in the houses were washed away. I am still struggling to come to terms with what happened. I mourn my relatives, friends, and customers I lost in this landslide. We lost everything. We appeal to government to compensate us for the losses and property destroyed by the landslides to start new life. It's so dangerous. We can't continue to stay here.</p>	<p>The narrative reveals the profound psychosocial impact of experiencing a landslide disaster, encompassing trauma, grief, loss, and displacement. The user, having lost their home, shop, and a loved one (nephew), is in shock and emotional distress, struggling with disbelief and numbness. The suddenness of the disaster and the helplessness in saving the nephew have exacerbated the trauma. Grief over the loss of family, friends, and community members, coupled with the destruction of their livelihood, intensifies the pain. Survivor's guilt adds to the emotional burden, as the user feels guilty for surviving while others, like their nephew, did not. The displacement and uncertainty from losing their home and source of income have left them in a precarious situation, further heightening their fear and anxiety about safety. The appeal for government compensation reflects a desire for external support to rebuild both materially and emotionally, underlining the need for assistance to recover from the trauma and regain stability.</p>
<p>I couldn't see my house, neighbors' and friends</p>	<p>This disaster occurred when I was returning from Bududa Hospital. My wife had accompanied me for treatment since I was weak. As we returned home from the hospital, it began to rain, so we diverted to a safe location to wait for the rain to stop. A few minutes later, we saw running water and boulders along the river. It was carrying iron sheets and trees. We knew a landslide had occurred up the mountain. When it stopped raining we tried to cross Nakwasi Bridge, but the water levels were high and we waited for it to subside. We saw two bodies and managed to retrieve them. One, the head was smashed, and the other's leg was cut off. When I got to our village centre I found it completely destroyed. It was all covered with huge boulders. I couldn't see my house, neighbours, and friends. They were all carried away. If I hadn't gone to the hospital, I would be in the house resting or sleeping. The floods would have carried me away. The trauma is much. I lost an eight-year-old girl, two brothers, a neighbour, and three friends in this devastating disaster.</p>	<p>Death profoundly impacts individuals and families, leading to significant shifts in family dynamics and social structures. The grieving process brings a range of emotions, such as sadness, anger, and guilt, which can disrupt daily routines and social interactions as individuals navigate their feelings. The immediate death of a family member often necessitates role changes, with surviving relatives assuming new responsibilities, such as managing finances or caregiving. Over time, these roles may shift further, leading to long-term adjustments. Social status can also change, with survivors facing shifts in their social interactions and economic stability, particularly if the deceased was a primary breadwinner. The burden on remaining family members can increase, requiring them to take on additional responsibilities and seek external support to manage both emotional and practical challenges. Death can disrupt established family dynamics, leading to strained relationships and affecting community cohesion, especially if the deceased was a prominent figure. Long-term effects of grief can include</p>

		<p>chronic stress, depression, or anxiety, influencing family dynamics and individual well-being. Additionally, cultural rituals surrounding death can affect how families process their grief and maintain social balance.</p> <p>In this case study, the person lost his eight year old daughter. As per the study, death leads to the bottling of grief, the projection of anger, and the projection of grief, helplessness, and paranoia (Bowlby <i>et al.</i>,1983).</p>
<p>I had to run to save my life</p>	<p>This disaster happened when I had just returned back from the garden and opened the shop. I had four friends and customers who were drinking local brew. I heard people raising the alarm and I got out. The four stayed behind. They thought people were chasing a common thief. I stared up. I saw the terrible flash floods coming. I didn't waste any time. I took off without bothering to return to the shop to alert and warn those inside of the danger. I had to run to save my life. The four perished. When the water calmed down we started searching for the bodies. We managed to retrieve the body of an old woman who was selling local brew near my place and three of the four people who were drinking at the shop. We haven't yet recovered one. I have stopped taking alcohol. My friends died because they were drunk. They couldn't hear any sound.</p>	<p>This case described an individual faced an extreme situation of fear for his own life, which overshadowed his sense of moral responsibility towards others. While grappling with the immediate threat, he was unable to prioritize the safety of those around him. Consequently, individuals who were under the influence of intoxication, and thus less capable of making sound judgments or taking protective actions, ended up succumbing to their dire circumstances. The tragedy was compounded by the fact that these individuals lost their secondary support system, which could have offered assistance or intervention in their time of need. This support system, typically comprising friends, family, or community members, plays a crucial role in crisis situations by providing emotional, practical, or physical help. The absence of such support during this critical moment left the intoxicated individuals without the necessary aid, leading to their tragic demise. This case underscores the critical importance of maintaining a balance between personal survival instincts and moral obligations towards others, especially in life-threatening situations.</p>

One of the key factors contributing to this emotional and psychological strain was the disruption of personal privacy and sexual well-being—both crucial for maintaining a sense of normalcy and stability. Refugee camps, which are often overcrowded and built in temporary or makeshift conditions, severely limit personal space and privacy. This lack of privacy, combined with the disruption of normal routines and sexual health needs, can intensify stress and anxiety, making it even harder for individuals to cope with their displacement.

Furthermore, the inability to meet basic personal needs in such a confined and chaotic environment can have long-lasting effects on an individual's mental health, hindering their ability to adapt to their new circumstances. The psychological toll of these challenges can slow down the recovery process and exacerbate the trauma they have already experienced due to the disaster. It becomes clear that addressing the emotional and psychological needs of displaced individuals, including restoring a degree of privacy and ensuring sexual health needs are met, is vital for supporting their recovery and helping them rebuild their lives in the aftermath of such traumatic events (Sutini *et al.*, 2021) ^[5].

The physical symptoms like headaches and dizziness should not be seen in isolation, but as indicators of deeper psychological issues that need attention, making it imperative for relief efforts to take a more holistic approach in addressing both the immediate survival needs and the psychological well-being of displaced populations.

Conclusion

The psychological impact of natural disasters extends far beyond the immediate aftermath, with long-term consequences on individuals, families, and communities. The disruption of everyday life, the loss of loved ones, and

the destruction of homes and infrastructure can lead to severe emotional and psychological distress. This distress is not only felt in the short term but can affect people's mental health for years to come, disrupting their ability to function, adapt, and rebuild their lives. These events often bring about significant changes in family roles and societal functions, exacerbating feelings of anxiety, trauma, and loss. Consequently, the psychological toll can impede both personal recovery and broader community resilience, highlighting the importance of addressing mental health as an integral component of disaster response.

Limitations

While the importance of psychosocial interventions is clear, there are several limitations to consider. First, the availability and accessibility of mental health services may be limited, especially in remote or underserved areas. Additionally, cultural factors may influence how people process trauma and seek help, meaning interventions that are effective in one region may not work as well in another. Furthermore, immediate relief efforts often prioritize physical and material needs, leaving emotional support underfunded or overlooked. The stigma surrounding mental health can also deter individuals from seeking necessary psychological assistance, potentially delaying recovery or exacerbating long-term emotional issues. Lastly, the long-term psychological impact of disasters is not always fully understood, which can complicate the design and implementation of effective interventions.

Implications

Given the profound psychological effects of natural disasters, integrating psychosocial care into disaster management is crucial. This includes developing comprehensive strategies to provide emotional and mental

health support alongside physical aid during disaster response and recovery. Such interventions should focus not only on helping individuals process their trauma but also on strengthening community resilience by fostering coping mechanisms and social support networks. In addition, these strategies should be tailored to fit the unique cultural and social dynamics of affected communities. For long-term recovery, mental health services should be a continuous part of rebuilding efforts, ensuring that individuals have ongoing access to the support they need as they adjust to new realities. Investing in psychosocial care not only aids immediate recovery but also strengthens a community's ability to withstand future challenges, promoting a more resilient and mentally prepared society.

Ultimately, integrating mental health into disaster planning and response enhances overall community resilience, aiding both the short-term recovery and the long-term psychological well-being of those affected by disasters.

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