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GEOPHYSICS AND MENTAL HEALTH: PREPARING FOR EFFECTIVE PUBLIC COMMUNICATION

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Abstract. *Natural disasters, particularly earthquakes, are not merely geological phenomena but complex psychological events with lasting impacts. This paper examines the 2002 Tbilisi earthquake case of a 26-year-old mother, highlighting early trauma, cultural narratives, and stress responses. The discussion emphasizes cumulative trauma, intergenerational effects, and survival behavior. Recommendations include integrating trauma-informed care, psychological first aid, and long-term monitoring.*

Key words*: Earthquakes, Trauma, Mental Health, Disaster Preparedness*

Introduction

Earthquakes are typically understood through seismic parameters such as magnitude, depth, and structural damage. However, they represent one of the most complex and psychologically traumatic events, combining elements of immediate threat, unpredictability, loss of control, and long-term consequences [3]. As a form of collective trauma, earthquakes share similarities with war, yet unlike war, they have no identifiable "enemy." This often complicates survivors' ability to direct anger, intensifying feelings of guilt or helplessness (Goenjian et al., 2000). Earthquakes and other natural disasters leave enduring impacts on individuals, influencing behavior, emotional regulation, and decision-making under stress.

Study Area, Material and Methods: The study area is Tbilisi, Georgia, which experienced an earthquake on April 25, 2002 (magnitude 4.5–5.0 Mw). The material for this report is based on the psychiatric evaluation of a 26-year-old woman in August 2002, whose depressive symptoms were temporally associated with the earthquake. Diagnostic assessment was carried out using standard psychiatric evaluation and clinical interview, with reference to ICD-10 criteria. Literature sources on disaster-related trauma and depression were used to contextualize the case.

Historical Context – Accounts of the patient's earlier exposure to the 1988 Spitak and 1991 Racha earthquakes, which provide insight into cumulative trauma.

Secondary Sources – Peer-reviewed literature on disaster psychiatry, post-traumatic stress disorder (PTSD), and cultural narratives surrounding survival behaviors. [4, 5, 6]

Qualitative Content Analysis. Narratives related to family influence (e.g., emphasis on salvaging valuables), symbolic behaviors (e.g., rescuing jewelry), and emotional responses were coded thematically. This allowed for identification of cultural scripts and intergenerational messages that guided behavior under stress.

Comparative Historical Analysis. The patient's reactions were compared across three seismic events (Spitak 1988, Racha 1991, Tbilisi 2002) to demonstrate the concept of cumulative trauma.

Interdisciplinary Integration. Clinical insights were combined with geophysical context, emphasizing the importance of cross-disciplinary frameworks that consider both physical hazards and psychological vulnerability.

The methodological design highlights the limitations of relying solely on structural or epidemiological data in disaster studies. Instead, it underscores the necessity of incorporating psychosocial and cultural dimensions when assessing the full impact of earthquakes in seismically active regions.

Case Description

In August 2002, a 26-year-old woman – a mother of two young children – was assessed by a psychiatrist. She presented severe depressive symptoms, including suicidal ideation, anhedonia, significant weight loss, insomnia, and emotional numbing [1]. Although her clinical presentation met criteria for postpartum depression, the onset of symptoms coincided with the Tbilisi earthquake. During the event, she rapidly evacuated her home carrying a box of jewelry, only realizing 30 minutes later that her children had been left inside. This incident triggered profound maternal guilt and persistent depressive symptoms.

Historical Context of Trauma: Her response was shaped by early-life exposure to seismic events. At age 10, she experienced the 1988 Spitak earthquake (Mw 6.8–6.9), recalling her mother's panic and cultural messages emphasizing salvaging valuables. At age 13, she was at the epicenter of the 1991 Racha earthquake (Mw 7.0), where her family's house was damaged and two neighbors perished. Her parents' absence reinforced helplessness and abandonment. These experiences highlight how prior trauma shapes responses to future crises, illustrating the principle of cumulative trauma.

Relevance in the Era of Global Crises: This case highlights that disasters are not solely geological events; they are deeply personal, psychological, and intergenerational phenomena. Survivors often carry invisible burdens such as trauma, guilt, and silence. Mental health systems remain underprepared to address PTSD, survivor guilt, and other sequelae, particularly in hazard-prone regions. Viewing disasters through this broader lens is increasingly urgent in the context of climate change, armed conflicts, and recurrent seismic activity.

Discussion

Trauma Mechanisms. Natural disasters disrupt the basic sense of safety. The unpredictability and uncontrollability of earthquakes activate survival mechanisms such as "freeze," "fight," or "flight." Behaviors that appear irrational (e.g., carrying valuables instead of saving children) may represent dissociative responses or unconscious survival patterns rather than deliberate choices.

Accumulated Childhood Trauma. Previous exposure to disasters leaves lasting "emotional imprints." Early traumatic experiences (Spitak, Racha) sensitized the patient's nervous system, lowering her threshold for stress tolerance. Each new catastrophe reactivated earlier wounds, producing more intense reactions – a phenomenon known as cumulative trauma.

Cultural Narratives and Family Influence. Social and cultural messages significantly shape survival behavior. In this case, repeated family remarks that "those who saved gold could start anew" became an internalized script. Under stress, the patient acted according to this narrative, showing how collective beliefs can override individual instincts.

Guilt and Identity Breakdown. The survivor's guilt was amplified by maternal identity. Leaving her children behind, even briefly, created a rupture between the ideal of the "protective mother" and the reality of the traumatic moment. This dissonance often fuels depression, self-blame, and suicidal ideation after disasters.

Symbolic Meaning of Material Objects.Saving jewelry went beyond materialism, symbolizing an unconscious effort to maintain stability, control, and hope amid chaos. Material possessions can anchor identity and represent survival or the possibility of rebuilding.

Intergenerational Transmission. The patient's story illustrates how trauma is not confined to one generation. Unprocessed fear, cultural scripts, and silence can be passed down to children, shaping their psychological resilience or vulnerability in future disasters.

Limitations and Future Directions

While this case provides valuable insights into the interplay of cultural narratives, cumulative trauma, and seismic hazards, it remains a single-case study and therefore cannot be generalized to the wider population. Further research should incorporate longitudinal studies and larger samples to assess how psychological vulnerability and resilience evolve in communities repeatedly exposed to earthquakes. Moreover, future investigations should examine gender differences, children's adaptation, and the role of social support systems in mitigating post-disaster psychological impacts. Integrating mental health considerations into geophysical risk communication strategies remains an essential goal for sustainable disaster preparedness.

Implications for Contemporary Practice

Modern disaster response necessitates a broader and more integrative perspective. Trauma-informed care should be embedded within disaster preparedness plans, not only in hazard-prone areas but also across clinics, schools, and community centers where vulnerable groups are likely to seek support. In addition, geophysicists and emergency response personnel would benefit from basic training in psychological first aid, enabling them to recognize acute distress and provide immediate, supportive interventions. Equally important is the implementation of long-term mental health monitoring systems, with particular attention to children and mothers living in disaster-prone regions, as these groups are especially susceptible to enduring psychological consequences.

Bridging Psychiatry and Geophysics: The University's Third Mission

The intersection of psychiatry and geophysics illustrates how science transforms when it crosses disciplinary boundaries to engage society directly. While geophysics offers vital knowledge on earthquake prediction, risk assessment, and infrastructure safety, psychiatry addresses the human dimension – trauma, PTSD, social support, and long-term psychological effects that may persist across generations. In this context, the university's third mission of public engagement becomes essential, shifting scientific communication from "What was the earthquake's magnitude?" to "How did people endure psychologically?" [2] Such integration not only advances scholarship but also embodies civic responsibility, positioning universities as centers for understanding and managing collective trauma.

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