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Impacts of Earthquake on Child Health in Jajarkot District

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Abstract

This study examines the physical and psychological impacts of the 2023 earthquake in Jajarkot district on children. Using a mixed research design, 110 households with at least one child affected by the disaster were selected through purposive sampling. Primary data were gathered through structured and unstructured interviews with household heads. The study reveals that physical outcomes were notably severe, with 30 cases of death, 19 amputations, 16 disabilities, and 10 injuries reported. Psychologically, anxiety was the most prevalent condition (30 cases), followed by depression and fear (20 each), isolation and insomnia (12 each), aggressiveness (10), and concentration difficulties (6). These findings underscore the vulnerability of children during natural disasters. The study further highlights the urgent need for child-specific emergency medical care and psychosomatic support within disaster management systems. By investigating the direct and long-term effects of the earthquake on children's health, the study provides essential insights for policymakers, healthcare providers, and educational institutions to develop child-centered strategies for disaster recovery. The research also emphasizes the importance of addressing both physical injuries and mental health challenges, which are often overlooked in disaster response, thereby ensuring a holistic approach to child welfare in disaster-prone regions. This study contributes to the creation of targeted programs to safeguard children's health and development during and after natural disasters, ensuring a comprehensive recovery process.

***Keywords**:* Children, disaster management, Jajarkot earthquake, physical impact, psychological impact, psychosocial support

Introduction

The term "earthquake" encompasses seismic activities of varying intensities, ranging from minor tremors to catastrophic events. An earthquake is the sudden shaking or trembling of the Earth's surface caused by the rapid release of energy from the Earth's crust. This energy release usually occurs along faults or fractures in the crust due to tectonic plate movements, volcanic activity, or human-induced factors such as mining or explosions. Earthquakes vary in intensity and duration, and they can result in ground rupture, structural damage, loss of life, and disruption of environmental and social systems. Earthquakes are considered one of the most devastating natural disasters because they not only cause immediate physical destruction but also trigger secondary hazards such as landslides, tsunamis, fires, and long-term socioeconomic challenges. Vulnerable populations, especially children, are at higher risk due to disruption of health, education, and social systems, making earthquake preparedness and mitigation critical (Bronfenbrenner, 1979; UNDRR, 2023). Children, due to their physical and emotional vulnerability, are particularly at risk in the aftermath of such disasters, experiencing both immediate injuries and long-term developmental consequences. Furthermore, Moreover, Earthquakes are one of the most catastrophic natural disasters that significantly affect children across the world. The health impacts on children extend beyond the immediate physical injuries to long-term psychological, emotional, and developmental consequences. These effects vary across regions, but the vulnerability of children makes them particularly at risk, both physically and mentally. This passage explores the global status of earthquake impacts on child health, focusing on physical, psychological, and developmental issues, along with efforts by international organizations to address these challenges.

Studies from past earthquakes have highlighted the disproportionate impact on children. For example, in the 2015 Nepal earthquake, children suffered significantly due to their smaller body size, limited mobility, and the vulnerability of school and residential buildings, which often collapsed during the tremors (Mohammad et al., 2016). Similarly, during the 2010 Haiti earthquake, over 1.5 million people were displaced, and thousands of children faced severe malnutrition, diarrheal diseases, and exposure to unsanitary conditions due to the breakdown of basic services and infrastructure (UNICEF, 2010). These physical health impacts include fractures,

head injuries, burns, and an increased susceptibility to diseases such as respiratory infections, skin conditions, and diarrhea, particularly among children under five years of age (WHO, 2016).

Beyond physical harm, the psychological toll of earthquakes on children is often profound and enduring. Research following the 1999 Turkey earthquake found that 61% of children aged 9 to 15 displayed symptoms of Post-Traumatic Stress Disorder (PTSD), including nightmares, flashbacks, anxiety, and depression (Goenjian et al., 2001). In the case of the 2015 Nepal earthquake, around 24% of children exhibited depressive symptoms, while 32% showed signs of anxiety and psychological distress (Hawke et al., 2017). These mental health issues are further exacerbated by the disruption of routines, loss of caregivers, and forced relocation into temporary shelters. Behavioral problems such as aggression, social withdrawal, and difficulty concentrating have also been observed, as seen in Chile after the 2010 earthquake, where children exhibited reduced academic performance and increased emotional instability (Haro et al., 2011).

In disaster settings, children's access to healthcare, education, and nutrition is often severely compromised. The collapse of health centers, loss of medical personnel, and destruction of roads hinder the timely delivery of care. In Haiti, many health facilities were destroyed, leading to treatment delays for children suffering from injuries and infectious diseases (WHO, 2011). In the Jajarkot earthquake, children experienced a similar fate, with severe injuries from collapsing structures, food insecurity due to damaged farmland, and limited medical assistance, all of which contributed to a rise in malnutrition and disease (UNICEF, 2015; Government of Nepal, 2015). The psychological effects were equally severe, with many children reporting acute stress, persistent fear of aftershocks, and emotional trauma (Save the Children, 2015). Additionally, the destruction of schools resulted in prolonged educational disruption, impeding their cognitive and social development (Bhatta, 2015). Children are particularly vulnerable to the physical effects of earthquakes, with injuries and **f**atalities being the most immediate consequences. In addition to direct injuries, children also face severe nutritional deprivation as food distribution and access to clean water are often severely disrupted after major earthquakes. Psychologically, earthquakes can trigger acute stress, anxiety, and post-traumatic stress disorder (PTSD) in children. They may exhibit symptoms such as nightmares, withdrawal, and difficulty concentrating, which can affect their education and social relationships. Additionally, disruptions to education, nutrition, and healthcare

services can impair a child's cognitive and physical development. For instance, after the 2015 Nepal earthquake, many children faced malnutrition due to food shortages and will be unable to attend school for extended periods, hampering their overall growth (World Vision, 2015). Moreover, Earthquakes often cause significant physical injuries to children, including fractures, lacerations, and burns. The collapse of poorly constructed buildings and the lack of child-specific safety measures heighten their vulnerability. Injuries are often compounded by delays in medical care due to overwhelmed healthcare systems. Additionally, the spread of diseases such as diarrhea, respiratory infections, and skin conditions in unsanitary post-disaster environments disproportionately affects children. Children less than five years old are particularly susceptible to waterborne diseases in the aftermath of earthquakes, as access to clean water is often disrupted (WHO, 2016). According to this concept the impact of earthquakes on children's health is profound, affecting them both physically and psychologically. Children face an increased risk of injury, malnutrition, and mental health issues. The psychological toll, which includes PTS, anxiety and behavioral issues, often lasts far longer than the physical recovery from the disaster. Vulnerable groups, such as young children, those with disabilities, and adolescents, are at a heightened risk and require targeted intervention. Global efforts to provide psychological effort, healthcare and educational recovery are crucial in helping children rebuild their lives after such traumatic events. Additionally, earthquake can pose unique risks of physical injuries, psychological disorder and behavioral disruptions to the children life and they may not exhibit their good behavior in social relationship due to their physical and mental problems. Most of the children under five years' age group are particularly susceptible due to airborne and waterborne diseases created by unsanitary environments after the earthquake.

Beyond injuries and diseases, children also suffer from the disruption of healthcare services in the aftermath of earthquakes. In Haiti, many health facilities were destroyed, leading to delayed treatment for children who needed immediate medical attention, particularly for infectious diseases and vaccine-preventable illnesses (WHO, 2011). Furthermore, the physical displacement of children into overcrowded shelters exacerbates their vulnerability, increasing the likelihood of respiratory infections and poor sanitation-related diseases. Children from socioeconomically disadvantaged backgrounds are particularly vulnerable to the long-term impacts of earthquakes. Limited resources, poor housing conditions, and reduced access to healthcare exacerbate the effects of such disasters (UNICEF,

2016). As noted by Save the Children (2016), earthquakes contribute to a cycle of poverty and ill-health, where children not only suffer injuries and malnutrition but also face lasting emotional and behavioral problems. In unsanitary post-earthquake environments, diseases such as diarrhea, fever, and respiratory infections are common (Khanal, 2022). Children under five are particularly susceptible due to their developmental needs and reliance on consistent, nutritious food for growth and immune defense.

The Jajarkot earthquake, while tragic in its destruction, also serves as a warning for future, potentially larger disasters. According to Bhandari et al. (2020), the event highlighted the urgent need for retrofitting infrastructure, improving early warning systems, and enhancing post-disaster reconstruction strategies. Effective post-disaster response must include not only the rebuilding of physical infrastructure but also the provision of child-specific healthcare services and psychosocial support systems. Failure to address these needs can result in long-term developmental setbacks, chronic health conditions, and generational trauma among affected children.

Ultimately, the impact of earthquakes on children is complex and multifaceted, spanning physical injuries, psychological disorders, behavioral disruptions, and developmental delays. These outcomes are intensified by socioeconomic inequalities and the failure of emergency systems to cater to children's specific needs. In light of these challenges, global and national responses must prioritize children's health and well-being in disaster-prone regions. The provision of emergency medical services, mental health support, nutritional aid, and education continuity are essential to mitigating the long-term impacts of earthquakes on children (World Vision, 2015; WHO, 2016).

The earthquake in Jajarkot District profoundly affected the health and well-being of children, leaving long-lasting physical, psychological, and social impacts. In the immediate aftermath, many children sustained severe injuries from falling debris and collapsed buildings, including fractures, head trauma, and even amputations (UNICEF, 2015). Displacement was another major issue, with families forced into temporary shelters, exposing children to harsh weather conditions and increased risk of disease (World Health Organization, 2015). The destruction of homes and farmland also led to food insecurity, causing malnutrition among children, which weakened their immune systems (UNICEF, 2015). Limited access

to healthcare, due to damaged infrastructure, further compounded the situation, leaving many children without proper medical treatment for both physical injuries and infections (Government of Nepal, 2015). The poor sanitation in overcrowded shelters contributed to the spread of infectious diseases, posing a serious health risk for children (WHO, 2015). Educational disruptions were another consequence, as many schools were damaged or destroyed, preventing children from continuing their education (Bhatta, 2015).

To mitigate these challenges, immediate emergency healthcare, mental health support, and long-term efforts to rebuild infrastructure and restore education are crucial (Save the Children, 2015). The earthquake's impact on children in Jajarkot highlights the need for a comprehensive response that addresses both immediate needs and the long-term recovery of affected children (UNICEF, 2015). Moreover, the Jajarkot Earthquake represents a warning for the anticipated larger disaster. Swift action of retrofitting buildings and upgrading infrastructure in the region has provided significant lessons in post-disaster reconstruction and managerial aspects. Post-disaster reconstruction and damage evaluation represent an initial pace to building a flexible community, aiming to avoid the mistakes and shortcomings observed in the aftermath of the 2015 Gorkha Earthquake. While residents will remember this earthquake as one that caused loss of life, building damage, landslides, and destroyed heritage structures, earthquake professionals/practitioners see it as a warning before the big one strikes (Bhandari et al., 2020).

Earthquakes often cause significant physical injuries to children, including fractures, lacerations, and burns (WHO, 2016) and mental disorders including acute stress, anxiety, and post-traumatic stress disorder (PTSD) in children (World Vision, 2015). Moreover, socioeconomic hardships in disaster-affected areas exacerbate health inequities; with children from poorer households being disproportionately affected (UNICEF, 2016). Therefore, earthquakes have profound and multifaceted impacts on physical, mental, emotional and developmental aspects of child due to the high risk of physical injuries (Save the Children, 2016). Moreover, earthquake produces various diseases such as diarrhea, fever, and coughs (Khanal 2022), and disrupt food supply chains, leading to malnutrition among children under five years' age group, who depend on consistent nutritious food for their growth and development. The disaster should be seen not only as a local humanitarian crisis but also as a warning for possible future earthquakes (Bhandari et al., 2020).

This research aims to examine the physical health outcomes, psychological effects, access to healthcare services among children during the earthquake and possible solutions to mitigate earthquake impacts on children. It is intended to inform policymakers and stakeholders to design targeted programs that address both immediate and long-term health needs of children in disaster-prone regions. Therefore, it is imperative to investigate the multifaceted impact of earthquakes on child health in Jajarkot district. The study entitled "The Earthquake's Impact on Child Health in Jajarkot District' primarily aims to explore the physical and psychological consequences of the earthquake on children in the region. The general objective of the study is to assess overall impact of the earthquake on the physical and psychological health of children in Jajarkot District and the specific objectives are to evaluate the physical consequences of the earthquake, such as injuries, malnutrition and the accessibility of healthcare services, and how these factors have affected children's health post-disaster and to assess the psychological toll on children, including the Prevalence of Post-traumatic Stress Disorder (PTSD), anxiety, depression and other emotional challenges, examining how these mental health issues disrupt their daily lives and development. While the immediate effects of an earthquake are devastating, the psychological toll on children is often far-reaching and long-lasting. The study on the impact of the earthquake on children's health in Jajarkot is crucial due to the unique vulnerabilities of children during and after natural disasters. The impact of earthquakes on children's long-term development is particularly concerning, as the trauma they experience can hinder both cognitive and emotional development. The loss of homes, schools, and loved ones can result in learning disruptions

Conceptual Framework

The framework highlights the various impacts of earthquakes and how they collectively contribute to a low quality of life among affected children. It categorizes the consequences into two main types: physical and psychological. Physical impacts include injuries, trauma, fractures, disabilities, death, displacement, and amputation, which are the immediate and visible effects caused by the disaster. On the other hand, psychological impacts refer to emotional and mental health issues such as depression, anxiety, fear, insomnia, aggressive behavior, isolation, and difficulty in concentration, which may not be immediately visible but can have long-lasting effects, particularly on vulnerable groups like children. Together, these physical and psychological impacts deteriorate the overall quality of life, emphasizing the

importance of comprehensive disaster response strategies that address both physical injuries and mental well-being.

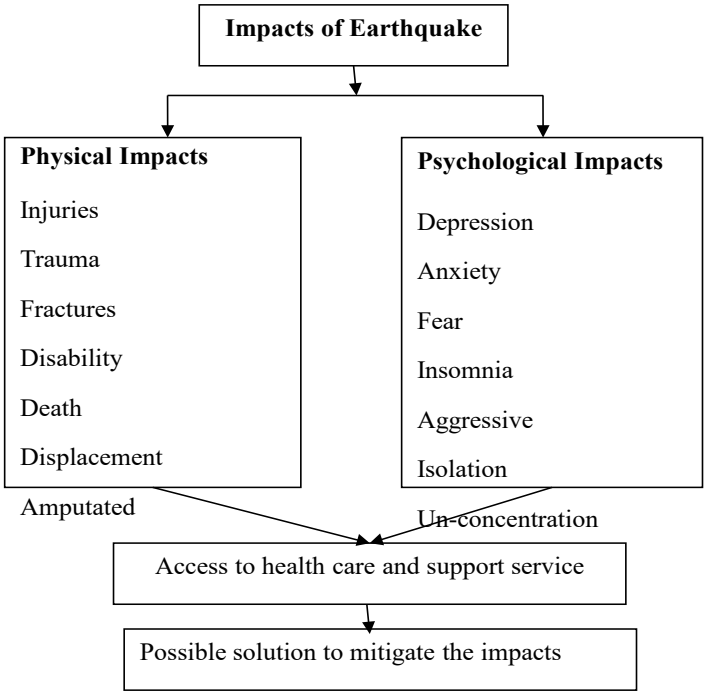

Figure No. 1: Conceptual Framework of the Study

The total number of affected households having at least one child was the population of the study area. Beri Municipality was selected as a study area situated in the Jajarkot district of Karnali province, western Nepal. It shares its border with East Rukum District to the east, Chhedagad Municipality to the west, Nalgad Municipality and Kuse Rural Municipality to the north, and Salyan District to the south. The municipality lies at a latitude of 28.6986° N, and a longitude of 82.1914° with an altitude of approximately 900 meters to 2,500 meters above sea level. It covers an area of approximately 219.77 square kilometers. The Bheri River, a significant watercourse in the region, flows through the municipality, contributing to its agricultural and ecological landscape. According to the census 2021 Nepal, Bheri Municipality has a population of 37,892 individuals, comprising 12,833 children aged 0 to 14 years, constituting approximately 33.9 percent of the Municipality's population. This municipality was among the severely affected areas

where 45 people died and 3278 houses were completely destroyed and 5073 were partially destroyed (Municipality's official earthquake Report on Post-2023 Jajarkot Earthquake 2080 BS).

Methodology

A quantitative research approach was employed in this study to systematically investigate the impact of the disaster on households with children affected by it. Quantitative research, characterized by its focus on numerical data and statistical analysis, enables researchers to measure variables, test hypotheses, and draw generalizable conclusions (Creswell, 2014). For the sample selection, a total of 110 households were identified as the study population. Each selected household had at least one child who was infected during the disaster, ensuring that the data collected would be directly relevant to understanding the disaster's effect on child health outcomes. The purposive sampling technique was applied to select these households. Purposive sampling is a non-probability sampling method, which allows the researcher to intentionally select units that are most likely to provide rich, relevant, and diverse information for the study objectives (Etikan, Musa, & Alkassim, 2016). This method falls under the non-sampling framework, implying that the selection of participants was guided by specific inclusion criteria rather than by randomization, which is common in probability sampling approaches. In addition to the quantitative data, qualitative primary information was collected to complement the numerical findings and provide a deeper understanding of the household experiences. Interviews were conducted with the heads of the selected households, using both structured and unstructured questionnaires. Structured questionnaires allowed for consistent and comparable responses across households, while unstructured questionnaires enabled participants to express their experiences, perceptions, and concerns in their own words, thereby capturing the nuanced social and emotional impacts of the disaster (Bryman, 2016). This mixed-method approach, combining quantitative and qualitative techniques, enhanced the validity and comprehensiveness of the study. While quantitative data offered measurable insights into the prevalence and patterns of child infections, qualitative data provided contextual information that helped interpret the findings in light of household experiences and coping mechanisms during and after the disaster.

Results and Discussion

The study presents the effects of the earthquake on children, focusing on both their health and access to services. The results are organized under five main areas:

physical impacts on child health, psychological and behavioral impacts, and the situation of healthcare for children post-earthquake and possible solutions to mitigate the impacts of the earthquake on children. This structured presentation highlights the extent of the disaster's effects on children and informs potential strategies for improving their safety, health, and well-being in post-disaster contexts.

Physical Impacts on Child Health Due to Earthquake

Earthquakes can significantly impact a child's physical health in several ways. Immediately, children may suffer from injuries like broken bones, cuts, or head trauma due to falling debris or collapsing buildings. Displacement after an earthquake often leads to poor living conditions, such as overcrowded shelters with inadequate sanitation, increasing the risk of malnutrition, dehydration, and infectious diseases. Psychological stress from the trauma can manifest physically through sleep disruptions, stomach problems, or fatigue. Additionally, the destruction of healthcare infrastructure may delay necessary medical care for children with preexisting health conditions. Overcrowding in shelters can also spread infectious diseases quickly, further threatening children's health. Long-term, children may experience developmental delays and nutritional deficiencies due to food insecurity. Overall, the physical impact on children after an earthquake extends beyond immediate injuries to include long-term health challenges related to displacement, poor living conditions, and psychological trauma.

Table 1 presents a statistical overview of the physical impacts experienced by children in the aftermath of an earthquake. The data, based on the responses of 110 affected children, reveal a diverse distribution of injuries, with significant variations in frequency and severity across different types of physical trauma. The mean number of cases per category is 15.71, with a standard deviation of 7.04, indicating a moderate spread in the data.

The results of the study indicate that children affected by the earthquake experienced a range of physical impacts, with death emerging as the most severe and frequent outcome. Among the 110 children surveyed, 30 deaths were reported, which is significantly higher than the mean of 15.71, with a positive deviation of 14.29 and a substantial squared deviation of 204.19—the highest in the dataset. This highlights death not only as a tragic outcome but also as a statistical outlier, reflecting the extreme toll of the earthquake on child mortality. Such a high frequency

underscores critical deficiencies in emergency preparedness, structural safety, and medical response during the disaster.

In contrast, less severe categories, such as injuries (10 cases), fractures (11), trauma (12), and displacement (12), were all below the mean, with negative deviations ranging from -3.71 to -5.71. Their relatively low frequencies, despite high squared deviations—particularly injuries (32.63)—suggest either under-reporting or that these outcomes were overshadowed by more catastrophic events such as fatalities and amputations. This raise concerns that non-fatal but serious conditions may have received less attention during immediate post-disaster assessments. Notably, amputations (19 cases) occurred at a higher-than-average frequency, with a deviation of 3.29, indicating that a concerning number of children suffered limb loss, likely due to crush injuries or delayed rescue operations. Disability (16 cases), closest to the mean with a deviation of only 0.29, suggests a consistent occurrence that may be a consequence of fractures, amputations, or other trauma.

Table 1

Distribution of Physical Impacts of the Children after the Earthquake

Symptom	**Respondents (x_i)**	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
Amputated	19	3.29	10.82
Trauma	12	-3.71	13.76
Fractures	11	-4.71	22.18
Disability	16	10.29	0.08
Death	30	14.29	204.19
Displacement	12	-3.71	13.76
Injuries	10	-5.71	32.63s
Total	110		
	Mean ($\bar{x}$) = 15.71		
	Standard Deviation (σ) = 7.04		

Overall, the data show that a substantial proportion of children suffered severe physical consequences, with over a quarter enduring extreme hardship. The distribution of the data is right-skewed, primarily due to the high number of fatalities, which highlights the disproportionate impact of the most severe outcomes. These findings emphasize the urgent need for immediate emergency healthcare, long-term medical support, rehabilitation, and psychosocial assistance for affected children. Moreover, the relatively lower numbers of displacement and general

injuries suggest potential gaps in documentation or prioritization, indicating that some non-fatal conditions may have been under-addressed. In conclusion, the findings highlight the widespread and devastating physical toll of the earthquake on children, emphasizing the importance of comprehensive disaster management strategies that address both immediate fatalities and the long-term consequences of injury and disability. Preventive measures, improved emergency preparedness, and targeted interventions are essential to reduce the impact of future disasters on vulnerable children.

Psychological and Behavioral Impacts on Child Health Due to Earthquake

Earthquakes can have profound psychological effects on children, often leading to long-term emotional and behavioral challenges. The severity of these effects varies based on the child's age, coping mechanisms, and the support they receive. One of the most common outcomes is PTSD which can manifest through nightmares, flashbacks, and heightened anxiety. Children may also develop generalized anxiety, fearing future earthquakes or other disasters. Younger children may show regressive behaviors, like bed-wetting or clinging to caregivers, while older children might display irritability or aggression. Similarly, depression is another concern, with children experiencing sadness, withdrawal, and difficulty focusing on schoolwork or social interactions. The loss of their home or community, or witnessing trauma firsthand, can leave children feeling helpless or hopeless. Attachment issues can also arise, especially if a child is separated from their parents during or after the disaster.

Some children exhibit physical symptoms like headaches or stomachaches due to the emotional stress, and sleep disturbance are common. Additionally, the social development of children may be affected, as they might struggle to trust others or form new relationships. Despite these challenges, many children show resilience, especially with proper emotional support. Recovery is often supported by creating a sense of safety and stability, encouraging children to express their feelings, and ensuring that they have access to psychological first aid. Professional intervention, including therapy or counseling, may be needed for children who experience prolonged distress. Ultimately, a supportive environment—both at home and within the community—plays a critical role in helping children overcome the psychological effects of such traumatic events.

The data from Table 2 illustrates the distribution of psychological and behavioral symptoms among respondents after a traumatic event. The symptoms

measured include depression, anxiety, fear, insomnia, aggression, isolation and in-concentration. The number of respondents (xi) for each symptom varied, with anxiety being the most prevalent, reported by 30 respondents followed by depression and fear each with 20 respondents. Insomnia and isolation were reported by 12 respondents, aggression by 10, and in-concentration by the fewest,6 respondents. The mean number of respondents reporting each symptom was calculated to be 15.71. This means that, on average, 15.71 individuals reported each symptom. The standard deviation of 7.51 suggests that the spread of respondents across these symptoms was moderate, with some symptoms like anxiety being more common, while others, such as in-concentration, were less frequent.

When analyzing the deviations from the mean, anxiety had the highest positive deviation of 14.29, indicating it was significantly more prevalent than the average symptom. Conversely, in-concentration had the largest negative deviation of -9.71, reflecting its lower prevalence relative to the mean. The squared deviations revealed that anxiety had the highest variability 204.06 followed by in-concentration 94.33, which suggests that although in-concentration was less common, it affected those who experienced it in a much more intense manner.

Table 2

Distribution of Respondents by Psychological and Behavioral Symptoms

Symptom	**Respondents (x_i)**	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
Depression	20	4.29	18.40
Anxiety	30	14.29	204.06
Fear	20	4.29	18.40
Insomnia	12	-3.71	13.76
Aggressive	10	-5.71	32.65
Isolation	12	-3.71	13.76
Un-concentration	6	-9.71	94.33
Total	110 Mean ($\bar{x}$)= 15.71 Standard Deviation (σ) = 7.51		

As evidenced from the data, anxiety was the most common symptom (30), followed by depression and fear (20). The average number of cases per symptom was 15.71, with a standard deviation of 7.51, indicating moderate variation. Anxiety

was the highest outlier, while death showed the greatest deviation in severity, highlighting the need for focused psychological support. The results indicate that anxiety was the most commonly experienced psychological symptom, with the largest number of respondents (30) reporting it. The high squared deviation for anxiety, 204.06 suggests that while it was the most frequently reported symptom, it also had considerable variability in how it affected those who experienced it. Some respondents likely experienced high levels of anxiety, which could require intensive interventions tailored to the severity of symptoms. On the other hand, in-concentration, while reported by only 6 respondents, had a very high squared deviation of 94.33, indicating that for the few who experienced it, the symptom was severe and likely had a significant impact on their daily functioning. Despite being less common, the severity of in-concentration should not be overlooked, and targeted interventions for these individuals could be crucial in providing effective care. Moreover, symptoms such as depression and fear were reported by more respondents (20 each), with moderate deviations from the mean. These symptoms appear to have a relatively consistent impact on those who experience them. Their moderate squared deviations 18.40 suggest that interventions should focus on providing support for these more prevalent symptoms in a way that addresses both frequency and intensity.

The standard deviation of 7.51 indicates that the distribution of symptoms was not excessively variable, but it still suggests that some symptoms, particularly anxiety, were much more commonly reported than others. This moderate variability suggests the need for flexible interventions that can address both the most common symptoms and the severe but less frequent ones, such as in-concentration. In conclusion, the findings highlight the diverse nature of psychological responses following a traumatic event. While anxiety should be a primary target for intervention due to its prevalence and variability, symptoms like in-concentration should not be ignored due to their intensity in the affected individuals. A comprehensive approach that addresses both the frequency and severity of symptoms is recommended for effectively supporting those impacted by such traumatic events.

Situation of Healthcare for Children Post-Earthquake

The table 3 presents the distribution of respondents based on the accessibility of healthcare for children. Among the 110 respondents, 20 perceived healthcare as easily accessible, 54 considered it moderately accessible, 24 reported it as not

accessible, and 12 were unsure or did not know about the accessibility. The mean accessibility score is 2.25, which indicates that, on average, respondents perceive healthcare for children to be slightly above moderately accessible, reflecting a moderate level of accessibility overall. The standard deviation of 0.88 suggests that there is some variation in respondents' perceptions. While a large portion finds healthcare moderately accessible, there are significant differences in experiences, with some respondents considering it easy to access and others perceiving it as difficult. The largest group of respondents viewed healthcare as moderately accessible, highlighting that while services are available, they may not be uniformly reachable or sufficient for all children.

Table 3

Distribution of Respondents by Accessibility of Healthcare for Children

Accessibility Level	**Respondents (x_i)**	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
Easily Accessible	20	17.75	315.06
Moderately Accessible	54	51.75	2678
Not Accessible	24	21.8	475.24
Don't Know	12	9.75	95.06
Total	110		
	Mean ($\bar{x}$)= 2.25 Standard Deviation (σ) = 0.88		

The data imply that healthcare access for children is adequate for many but remains a challenge for a considerable number of respondents. Efforts to improve availability, reduce barriers, and raise awareness could help enhance accessibility, ensuring that more children receive timely and effective healthcare services

Possible Solutions to Mitigate Earthquake Impacts on Children

As shown in table 4 on possible solutions to mitigate earthquake impacts on children highlights a comprehensive framework that encompasses both immediate needs and long-term resilience. The solutions are categorized into seven key themes: emergency preparedness and response, structural safety, healthcare access, reducing long-term disabilities, economic and social support, and documentation and monitoring, and preventive risk reduction. Together, these measures demonstrate a holistic approach, moving from pre-disaster preparedness and immediate emergency response to post-disaster recovery and sustainable resilience-building.

A notable strength of the framework is its child-centered orientation, with explicit consideration of pediatric healthcare, trauma counseling, and rehabilitation services. The inclusion of both structural measures, such as enforcing earthquake-resistant building codes, and social measures, such as financial aid and community networks, ensures a balance between physical safety and social well-being. Furthermore, the emphasis on documentation and monitoring highlights the importance of data-driven decision-making for targeted interventions. By addressing not only survival but also long-term welfare—such as education, health, and social stability—the proposed solutions extend beyond emergency relief to encompass recovery and empowerment. Despite these strengths, several challenges may hinder implementation. Enforcing building codes and retrofitting existing infrastructure may face financial and institutional limitations, particularly in resource-constrained settings. Similarly, long-term interventions like rehabilitation and scholarships require sustainable funding, which can be difficult to maintain in post-disaster contexts. Issues of equity also emerge, as children in rural or marginalized communities may not benefit equally from these measures. Coordination among government agencies, NGOs, and local communities further poses a challenge, while awareness campaigns and counseling services must remain sensitive to cultural and linguistic contexts.

Table 4

Possible Solutions to Mitigate Earthquake Impacts on Children

Themes	Key Solutions
Emergency Preparedness & Response	Community drills, awareness campaigns, training local volunteers, rapid-response medical teams
Structural Safety	Enforce earthquake-resistant codes, retrofit buildings, strengthen community shelters
Healthcare Access & Services	Ensure medicines & pediatric care, mobile medical units, mental health & trauma counseling
Reducing Long-term Disabilities	Rehabilitation services, physical therapy centers, early intervention programs
Economic & Social Support	Financial aid, scholarships, community support networks
Documentation & Monitoring	Registry of affected children, post-disaster surveys, data-driven policies
Preventive & Risk Reduction	Earthquake-resistant construction, evacuation education, regular risk assessments

To strengthen the framework, greater integration with the education system could be pursued, making schools central to awareness programs, preparedness drills, and risk-reduction education. Promoting community ownership by engaging parents, teachers, and local leaders can improve participation and sustainability. Likewise, leveraging technology through early warning systems, mobile health services, and digital child registries could enhance preparedness and monitoring. Aligning these strategies with national disaster risk reduction policies and ensuring child participation in preparedness activities would further reinforce effectiveness. Overall, the proposed solutions offer a multidimensional, child-sensitive approach that addresses both immediate impacts and long-term recovery. While challenges of implementation, equity, and sustainability remain, these can be mitigated through integrated policies, adequate funding, and strong community engagement, thereby enhancing resilience and safeguarding the well-being of children in disaster-prone areas.

This study demonstrates that earthquakes exert profound and multidimensional impacts on children, affecting their physical health, psychological well-being, and access to essential services. Physically, children experienced injuries, illnesses, malnutrition, and, in severe cases, death, reflecting heightened vulnerability due to dependence on adults and limited mobility. Psychologically, anxiety (n = 30), depression and fear (n = 20 each), insomnia and isolation (n = 12 each), aggressiveness (n = 10), and lack of concentration (n = 6) were prevalent, indicating long-term trauma effects and emphasizing the need for integrated mental health support alongside physical recovery. Post-earthquake healthcare accessibility was moderate to limited (mean = 2.25), with notable disparities across displaced and remote households. This aligns with previous research showing that geographic barriers, resource limitations, and low awareness hinder pediatric healthcare utilization in disaster-affected rural areas (Shrestha, 2018; Adhikari et al., 2016). The findings underscore the necessity of resilient healthcare infrastructure, rapid-response medical units, and community-based interventions to mitigate risks of untreated injuries and illnesses (UNICEF, 2019; Noji, 2005).

Mortality and morbidity outcomes were substantial, with deaths (n = 30) exceeding the mean (M = 15.71, SD = 7.04), followed by amputations (n = 19), disabilities (n = 16), and injuries (n = 10). These results corroborate prior evidence that inadequate emergency preparedness and protective infrastructure exacerbate post-disaster mortality and severe injuries among children (Kumar & Singh, 2020; UNICEF, 2019).

The study advocates a comprehensive, child-centered disaster management framework that integrates emergency preparedness, structural safety, healthcare access, reduction of long-term disabilities, and socio-economic support. This approach aligns with international best practices emphasizing multidimensional strategies that address both physical and psychosocial well-being (Peek, 2008; Tol et al., 2013). Community and school-based interventions, including training teachers, health workers, and families to identify and support traumatized children, are critical for enhancing resilience and recovery (Kohrt et al., 2012; UNICEF, 2019). In the context of Jajarkot, prioritizing child-centered disaster risk reduction, improving healthcare accessibility, and strengthening infrastructure are essential to safeguarding children's health, well-being, and resilience in future emergencies. These findings underscore the need for holistic policies that address immediate relief while supporting long-term recovery and sustained welfare of children in disaster-affected regions.

Conclusion

The Jajarkot earthquake revealed the extreme vulnerability of children to both physical and psychological impacts. High incidences of death, injuries, disabilities, and amputations were reported, alongside severe psychological consequences such as anxiety, depression, fear, and isolation. The analysis shows that death and anxiety were critical outliers, highlighting major gaps in emergency healthcare and mental health support. Limited healthcare accessibility, with the mean score only slightly above moderate, further compounded children's risks, reflecting systemic challenges in service availability and equity. The findings underscore the urgent need for child-centered disaster risk management that integrates immediate emergency care with long-term psycho-social and rehabilitation services. Strengthening healthcare accessibility, rapid medical response, trauma counseling, and community-based support must be prioritized. Schools and families can play a pivotal role by integrating disaster preparedness, hygiene, and child protection programs into daily practices. To mitigate the adverse impacts of earthquakes, it is essential to train teachers, health workers, and community leaders on child protection, trauma management, and emergency response, while also strengthening school buildings, health facilities, and community shelters to meet safety standards. Expanding hygiene, sanitation, and nutrition services in post-disaster contexts and establishing child-friendly counseling services in schools and communities are critical. Emergency medical teams and mobile health units should be deployed in high-risk regions, and local disaster management plans must be developed and implemented with a strong focus on children's needs. Ultimately, safeguarding children in disaster-prone areas like Jajarkot requires a dual approach: immediate relief to protect health and

well-being, and long-term strategies to build resilience through safe infrastructure, education, and psycho-social care. Government agencies, NGOs, and international organizations must collaborate to ensure that disaster preparedness, early warning systems, and recovery plans are explicitly child-focused, reducing long-term risks and protecting the future of vulnerable populations.

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