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Assessment of Post-Traumatic Stress Disorder in Children and Adolescents Surviving the El Haouz Earthquake: A Study of 69 Cases

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Abstract **Original Research Article**

Psychological stress following a natural disaster is common. Despite numerous earthquakes worldwide, data on acute stress assessment in child victims early in the post-disaster period are scarce. Immediately after the devastating earthquake (6.9 Richter) in El Hawz, Marrakech region, on September 8, 2023, at 11:07 PM, the child psychiatry department mobilized through an emergency response team that went to the site to support children and adolescents affected by the earthquake. At the end of our intervention, we conducted a cross-sectional study over a week, including 69 children presenting unusual physical or behavioral symptoms. The Children Impact of Event Scale (CIES) was used for stress screening. This study represents the first Moroccan data showing a statistically significant psychological impact and various forms of physical stress symptoms in young children (1-8 years) following the Marrakech earthquake.

Keywords: Psychological stress, Earthquake, Children, Morocco, CIES (Children Impact of Event Scale).

INTRODUCTION

On September 8, 2023, at around 11:08 PM, Morocco was struck by a strong earthquake with a magnitude of 6.8. The epicenter was located in Ighil, 72 km from Marrakech. This earthquake is considered the deadliest in the country's history, with over 3,000 injuries, hundreds of deaths, and numerous cases of psychological trauma. In response, the child psychiatry service mobilized several teams from the third day of the disaster, providing emergency psychological support.

Psychological stress is a common consequence of natural disasters, particularly among children and adolescents who may experience emotional distress due to various factors such as the loss of family members, structural damage, or witnessing terrifying events. These stress responses can manifest as acute or chronic conditions, such as post-traumatic stress disorder, depression, and anxiety.

Despite the prevalence of earthquakes worldwide, there is a lack of data on the assessment of acute stress in child victims in the immediate aftermath of such disasters. Recognizing this gap, a cross-sectional study was conducted in the days following the earthquake to assess acute stress symptoms in children aged 11 to 17 exhibiting unusual physical or behavioral symptoms.

The study found that among the 69 children assessed, 52 exhibited symptoms of stress. Most of these children sought medical attention within the first three days following the earthquake, with attendance gradually decreasing afterward. Notably, more than half of the children (69.6%) tested positive for psychological stress using the Children's Impact of Event Scale (CIES), with no gender preference observed. Younger children exhibited various physical symptoms of stress, including static posture, sleep disturbances, decreased appetite, recurrent vomiting, excessive crying, and nighttime awakenings.

The results of this study provide valuable insights into the psychological impact of the Marrakech earthquake on children and adolescents, highlighting the need for prompt recognition and management of acute stress symptoms following such disasters. This research underscores the importance of further studies to better understand and address the psychological needs of children affected by natural disasters.

OBJECTIVES

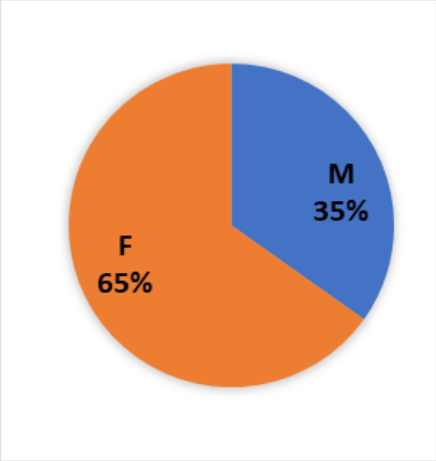
The objective of this study is to evaluate the occurrence of acute stress disorder among children and adolescents aged 11 to 18 who survived the earthquake.

PATIENTS AND METHODS

This is a descriptive and analytical study that focused on analyzing the epidemiological and clinical data of children who survived the El Haouz earthquake. Data collection was conducted through psychiatric interviews with children and adolescents, involving voluntary interviews and active screening. Diagnostic evaluations were based on DSM-5 criteria. Socio-demographic data were obtained through assessments of lived experiences. The tool used was the National Stressful Events Survey Acute Stress Disorder Short Scale – Child Age 11–17 (NSESSS).

RESULTS

1/ Descriptive Study:



Age and Gender: Nature of the Damage

NATURE DE DEGATS ?	Quantités	% du Total
1	5	7.2 %
1;2	47	68.1 %
2	17	24.6 %

DEGRE DE PARENTALITE DES DECEDES?	Quantités	% du Total
Very close (father, mother, brother, sister)	5	7.2 %
Very close and close	23	33.3 %
Relatives (uncles, aunts, cousins)	20	29.0 %
others	21	30.4 %

Degree of Parentality of Deaths

PRESENCE D'UN ETAT DE STRESS AIGU?	Quantités	% du Total
NON	21	30.4 %
OUI	48	69.6 %

Presence or absence of an acute stress state

Reported Syndromes

SYNDROME ANXIEUX?	Quantités	% du Total
NON	13	18.8 %
OUI	56	81.2 %

SYNDROME DEPRESSIF?	Quantités	% du Total
NON	33	47.8 %
OUI	36	52.2 %

VERTIGE, ETOURDISSEMENT?	Quantités	% du Total
NON	21	30.4 %
OUI	48	69.6 %

The average values assigned to the items of the CNESSS

Scaling Elements	**Frequency**	
	Yes	**No**
FLASHBACK	88,4%	11,6%
EMOTIONAL DISTRESS	98,6%	1,4%
DISSOCIATION	71%	29%
EVITEMENT	84,1%	15,9%
HYPERVIGILENCE	87%	13%
STARTLE RESPONSE	82,6%	17,4%
IRRITABILITY	97,1%	2,9%

2/ *Analytical Study*

Number of Deaths in the Family				
ITEMS	**SCORE**	**NOMBER**	**Percentage**	**p**
HYPERVIGILENCE	0	9	13%	0.069
	1	13	18,8%	
	2	20	29%	
	3	19	27,5%	
	4	8	11,6%	
DISSOCIATION	0	20	29%	< .001
	1	16	23,2%	
	2	11	15,9%	
	3	12	17,4%	
	4	10	14,5%	

	Number of Deaths by Region			**Number of Deaths by FAMILY**			
	<30%	>30%	p	None	Yes	p	r
Total Score	49,9%	50,1%	< .001	28,9%	71,1%	< .001	0.842

Presence of Acute Stress State					
	NO			**YES**	**p**
Nature of Damage	Physicals	7.2 %	19.0 %	2.1 %	**< .001**
	Materials	24.6 %	47.6 %	14.6 %	
	Physicals and materials	68.1 %	33.3 %	83.3 %	
Degree of Parentality of Deaths	Very Close	7.2 %	4.8 %	8.3 %	**< .001**
	close	29.0 %	14.3 %	35.4 %	
	Close and very close	33.3 %	4.8 %	45.8 %	
	Others	30.4 %	76.2 %	10.4 %	
Number of Deaths in the Family					**< .001**

3/ Binomial Regression Study

VARIABLES		P	OR	RESULTAT
Nature of Damage	Physicals and materials/Physicals	**0,009**	**22.857**	**Risk Factor**
	Materials/Physicals	**0.399**	**2.800**	
Degree of Parental Relationship to the Deaths	Very Close / Other	**0.038**	**12.800**	
	Very Close and Close / Other	**< .001**	**70.400**	
	Close / Other	**< .001**	**18.133**	
Percentage of Deaths in the Region	Less than 30% / More than 30%	**0.007**	**4.88**	

DISCUSSION

Psychological stress after a natural disaster is common. Despite several earthquakes around the world, data on the assessment of acute stress in child victims during the post-disaster period are scarce. Several investigative tools, such as the Trauma Screening Questionnaire, the Depression Self-Assessment Scale, and the Child Post-Traumatic Stress Reaction Index, are being developed to assess the extent of psychological stress. Most research to date has focused on the effectiveness of the Impact of Event Scale (IES). The modified version of the IES is the Revised Impact of Events Scale for Children, available in 8 and 13-item versions. This scale has been well validated in post-traumatic cases with high predictive value. The 8-item IES, the most commonly used short version, is useful for children aged 8 years and older. Stallard et al. found that a cutoff score of 17 on the 8-item IES correctly identified 69.2% of children suffering from stress disorders. It has a sensitivity of 100% and a specificity of 71%. Applying the 8-item IES to children aged 11 and older in our study, 20 children (9 boys, 11 girls) (41.46%; 95% CI 26.38-56.54%) scored at least 17. Our study demonstrated a significant psychological impact ($P < 0.05$) on this age group. Although two previous studies reported a predisposition for girls regarding the psychological impact related to stress, we did not find a statistically significant gender difference.

Most previous studies on disasters have assessed the long-term psychological impact on victims rather than their early symptoms. Older children and adolescents, like most adults, may recall and communicate events long after the disaster. Recovery can be delayed and take several months in older victims. In contrast, stress-related symptoms are transient in younger children. These signs and symptoms can only be detected if assessments are conducted immediately after the disaster. These stress symptoms may decrease and become less discernible later, as evidenced by the gradual decrease in consultations in the following weeks. A similar high incidence of acute stress reaction (ASR) in the post-disaster period was reported by Soltados *et al.*,

In this study, the diagnosis of acute stress disorder assessed through DSM-5 criteria-based clinical interviews detected a rate of 69.6% (a rate close to those reported in the literature following earthquakes). The assessment of acute stress symptoms in children after the 2023 earthquake in Turkey reported that 84% of children and adolescents were diagnosed with ASR. A study conducted in India found that 50% of children aged eight years and older had a score above the threshold value for diagnosing stress-induced psychological disorders on the Revised Impact of Events Scale for Children.

Different studies addressing post-earthquake somatic and psychological symptoms have reported a notable increase in the number of patients with vague symptoms resembling dizziness, which cannot be attributed to any defined variant of vestibular disorder. Nomura *et al.*, conducted an epidemiological clinical study and classified dizziness associated with earthquakes as "post-earthquake dizziness syndrome" following a major earthquake in Japan on March 11, 2011.

Our study is one of the few reporting post-earthquake dizziness symptoms in adolescents, and although this phenomenon has been studied and documented in adults, our research sheds new light on its occurrence in younger individuals.

*In our study, we assessed responses using the NSESSS and found that the sixth item, which asked if individuals felt nervous or were easily startled by unexpected noises, had the highest average score, with 58.4% of participants rating this item as "much/extremely." An earlier study using data from 15 studies evaluating acute stress symptoms in children and adolescents aged 5 to 17 reported that 36.3% of participants exhibited hypervigilance symptoms and approximately 24.7% had exaggerated startle reactions. Studies assessing post-traumatic stress symptoms in adolescents in the literature have mainly focused on PTSD, with startle and fear symptoms frequently reported. A previous study examining post-disaster experiences and psychiatric issues in adolescents 13 months after the 1999 Marmara earthquake in Turkey showed that 68% of participants were easily startled. Furthermore, a study describing PTSD symptoms in adolescent survivors three months after the Wenchuan earthquake reported that 49.1% of participants exhibited increased arousal symptoms. Although studies evaluating acute stress symptoms in adolescents have reported varying rates of hypervigilance symptoms, it is evident that many adolescents experience nervousness or are easily startled after a traumatic experience. Zhang et al. demonstrated that the arousal symptom cluster was

one of the most influential predictors of future PTSD in children and adolescents exposed to trauma; thus, recognizing and monitoring children with this symptom cluster could be particularly important. Adolescents assessed in our study will also be closely monitored, and the relationship between this symptom cluster and PTSD will be studied and reported in more detail.

It was determined that the third item was the subscale to which participants in our study gave the lowest average rating in the NSESSS, with only 25% of participants rating the third item—questioning feelings of being detached or distant from oneself, one's physical environment, or memories—as "much/extremely." Consistent with our study's current findings, previous research has shown that the requirement for dissociative symptoms for an acute stress disorder diagnosis in the DSM-IV was stringent, and most patients did not meet the full DSM-IV criteria for acute stress disorder due to the absence of dissociative symptoms. Furthermore, in another study, acute stress disorder without dissociative symptoms was reported to be nearly three times more sensitive in predicting subsequent PTSD in adolescents compared to the full DSM-IV criteria for acute stress disorder. The criteria for acute stress disorder in the DSM-5 were modified due to evidence showing that post-traumatic reactions vary considerably and that the DSM-IV's emphasis on dissociative symptoms was too narrow.

The strength of this study lies in the child population, which is comparatively younger than in previous research. Additionally, detecting stress symptoms in the post-disaster period in children has not yet been explored. There are some limitations to the study. Children who sought consultation at the hospital were assessed, and a significant number of patients are still presumed to remain in the community. Therefore, the studied population is not representative of the total extent of affected children. Children who sustained major physical injuries were also victims of severe psychological trauma, which is operationally difficult to assess in the initial weeks. This study, the first of its kind, on Indian children after an earthquake paves the way for future research directions. Further large-scale community studies on acute stress in young children need to be conducted in different parts of the country.

CONCLUSION

This study provides valuable insights into the psychological impact of earthquakes on adolescents and highlights the need for targeted interventions, such as psychosocial training for staff on trauma-informed care and the use of mobile psychosocial support tools, for this vulnerable population. Understanding acute stress disorder in adolescents, who represent a significant proportion of the general population, following natural disasters is of utmost importance, but information on this topic is currently scarce. We believe that this study, along with further research based on our findings, can guide the development of comprehensive strategies and mental health policies to address the mental health needs of adolescents affected by earthquakes and other traumatic events.

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