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Post-Traumatic Symptoms and Sleep Problems in Children and Adolescents after Twin Earthquakes in Turkey

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Abstract

Objectives: Earthquakes cause great destruction due to their suddenness and intensity. Although all people are affected by earthquakes, children are among those most affected. Every year, millions of children and young people are exposed to many natural disasters and are affected differently. Earthquakes can cause physical, mental, and sleep disorders in children. The aim of this study is to investigate the post-traumatic response and its effects on sleep on child and adolescent earthquake survivors living in the earthquake zone in Turkey.

Methods: This research was carried out between June and August 2023 as a descriptive and cross-sectional study. A total of 230 earthquake survivor children from Adıyaman were included in the study. Personal information forms, the Child Posttraumatic Stress Reaction Index (CPTS-RI), and the Sleep Disturbance Scale for Children (SDSC) were used to collect data.

Results: It was determined that the scale scores of the children who were financially affected by the earthquake, who were injured, and who were under the rubble were higher ($P < 0.05$).

Conclusions: It was observed that more than half of the children had severe trauma and had sleep disorders. Children who experience trauma from an earthquake have more sleep disorders. For this reason, in addition to emergency aid and interventions in earthquakes, arrangements should be made for the mental health of children and social and psychological support should be provided.

An earthquake is a natural event that is unpredictable in terms of the area it will affect and the severity of the impact and can cause loss of life and property. Our country was shaken by 2 earthquakes with a magnitude of 7.7 at 04.17 in the morning and 7.6 at 13.24 on February 06, 2023. As a result of the earthquakes, at least 50 783 people died in Turkey, at least 8476 people in Syria, according to official figures, and more than 122 000 people were injured. More than 38 000 aftershocks of up to 6.7 Mw occurred after the earthquakes. The highest emergency alert was issued by the Turkish government, demanding a call for help from international organizations in cases of natural disasters and epidemics. In addition, while a state of emergency was declared for 3 months in 10 provinces affected by earthquakes, the World Health Organization (WHO) declared a level 3 emergency for the earthquakes that shook Turkey. Later, the number of provinces that declared a state of emergency rose to 17.[1]

The region where the earthquake occurred is comprised of 11 provinces where approximately 16 million of the 85 million of the Turkish population lived at the time of the earthquake.[2] This population constitutes 16.43% of Türkiye's population. It is known that there are approximately 1 million children between the ages of 6-19 in this region and 10 of 100 children in the age of compulsory education (6-18 years old) living in our country live in this region.[3]

Childrenare the most innocent individuals affected by natural disasters. Every year, millions of children and young people are exposed to many natural disasters and are affected differently. These disaster experiences, which are quite abnormal for childhood, can cause physical and mental disorders in children.[4] Post traumatic syndrome is a psychiatric disorder seen after physical, psychological, or social trauma. Although it can be seen at any age, it is more common in adolescents and children.[5,6] Insomnia, nightmares, frequent recollection of the memories of the event, being constantly alert with the fear of repetition of the event, feeling easily startled and very quick anger, alienation, feeling uneasy in situations that remind one of the event, and avoiding these situations are seen after trauma.[7] Complaints often occur in the days following the trauma and resolve spontaneously within a few weeks without the need for any intervention. Symptoms, which are seen in most people in the days following the trauma and usually resolve spontaneously within a few weeks, may persist for months or even years in some people.[8]

Some of the problems seen in children after the earthquake are not wanting to return to school, being dependent on their parents and being afraid of being separated, fear of experiencing the

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earthquake again, constant and recurring nightmares, sleep problems and disorders, secondary incontinence, anxiety, lack of attention, behavioral problems at home or at school, previously unseen physical complaints (headache, dizziness, etc.), distancing from family and friends, introversion, etc. In addition to these problems, some studies have reported problems such as depression, panic attacks, and sleep problems in children and adolescents after the earthquake.[9–11] In the case of post-traumatic stress, it can therefore have a significant impact on sleep.

In this study, it was aimed to investigate the effects of earthquakes that occurred in Kahramanmaraş and Gaziantep on February 6, 2023, which caused great destruction in more than 11 provinces, especially in Hatay, Gaziantep, Adıyaman, and Kahramanmaraş, on the post-traumatic response and sleep on child and adolescent earthquake survivors living in Adıyaman.

Materials and Methods

This study is descriptive and cross-sectional. It was held in Adıyaman, one of the provinces most affected by the earthquake in the Southeastern Anatolia region of Turkey. Permission was obtained from the ethics committee and the hospital where the study was conducted. The population of the study consisted of earthquake survivors under the age of 18 who experienced an earthquake in the center or districts of Adıyaman due to the earthquake that occurred in Kahramanmaraş and Gaziantep on February 6, 2023. Power analysis was performed to determine the sample size. According to the analysis, the sample size was determined as 220 earthquake victims.[12] During the data collection phase, 230 children were reached. The data of the study were collected by face-to-face survey method from children under the age of 18 who were living in Adıyaman Center or its districts, who were in Adıyaman at the time of the earthquake, and who applied to the Adıyaman Training and Research Hospital pediatric health and diseases polyclinic for any reason; the survey was also administered to their parents. Surveys were collected between June and August 2023. Individuals who were not in Adıyaman at the time of the earthquake, even if they stayed in tents or containers, were excluded from the study.

Data Collection

This study was carried out in 1 step as a descriptive study. Data were collected with a personal information form, Child Posttraumatic Stress Reaction Index (CPTS-RI), and Sleep Disturbance Scale for Children (SDSC).

Personal Information Form

In this form, prepared by the researcher, there are 23 questions to determine the demographic information of the children and their experiences during and after the earthquake.

Child Posttraumatic Stress Reaction Index (CPTS-RI)

Developed by Pynoos et al. (1993), the validity and reliability study of the scale in our country was carried out by Erden et al. (1999). The scale consists of 20 items and is in the form of a 5-point Likert type varying from "Never" to "Most of the time." Each item is evaluated between 0-4 points according to the severity of the symptom. The scale can be applied by the clinician or filled by the child as a self-report scale. The total score of the scale is obtained by summing the scores of all items, with the seventh and twelfth items being scored in reverse. Scores between "12-24" obtained from the scale are "Mild Post Traumatic Stress Disorder," points between "25-39" are "Moderate Post Traumatic Stress Disorder," points between "40-59" are "Severe Post Traumatic Stress Disorder," and scores of 60 and above are evaluated as "Very Severe Post-Traumatic Stress Disorder."[13] The reliability of the scale, whose consistency over time was tested with the test-retest method, was found to be 0.86, and Cronbach's Alpha was 0.75. In this study, the CPTS-RI Cronbach's alpha value was determined as 0.747.

Sleep Disturbance Scale for Children (SDSC)

The Sleep Disturbance Scale for Children (SDSC) was used to collect data to determine sleep behavior. SDSC, which was developed by Bruni et al. in 1996, is a Likert-type scale that investigates sleep disorders in children aged 6-16 years, which have occurred in the last 6 months. Scoring 1-5 will be given as 1: Never, 2: Occasionally, 3: Sometimes, 4: Often 5: Always. In the scale, the child's sleep disorders are questioned in 26 items and 6 sub-dimensions. 1, 2, 3, 4, 5, 10, and 11 items were questioned on disorders of initiating and maintaining sleep (DIMS), while sleep breathing disorders (SBD) were questioned with items 13, 14, and 15. While disorders of arousal and nightmares (DAN) are questioned with items 17, 20, and 21, sleep-wake transition disorders (SWTD) are questioned with items 6, 7, 8, 12, 18, and 19. While disorders of excessive somnolence (DOES) are questioned with items 22, 23, 24, 25, and 26, sleep hyperhidrosis (nighttime sweating) (SH) sub-dimensions are questioned with items 9 and 16. A minimum of 26 and maximum of 130 points can be obtained from the scale. High scores are interpreted in favor of sleep disturbance. 34 points was accepted as the cut-off value, and scores of 34 and above indicate sleep disorder in the child.[14] In this study, the SDSC scale Cronbach's alpha value was determined as 0.875.

Data Analysis

Data were evaluated with SPSS 22.0 software. Frequency, percentage, and arithmetic mean values of demographic data were given. The normal distribution was evaluated with the Kolmogorov-Smirnov. The independent 2-sample t test was used to examine the difference between the 2 groups, and the one-way analysis of variance (ANOVA) test was used to examine the difference between more than 2 groups. Regression analysis was performed to determine the relationship between parameters. The significance level was 0.05.

Ethical Approval

The required permission was obtained prior to the study in order to meet the ethical requirements of clinical research. Ethical approval was obtained from XXX Clinical Research Ethics Committee (Reference No: 2023/ 09- 21). Written approval was obtained from the hospital administration where the study was conducted. Informed consent was obtained from the parents of the children. Participants were informed that they could withdraw at any time, without providing a reason, and that all information and opinions given would be confidential and anonymous.

Results

The mean age of the children was 10.81±0.23 years, the number of siblings was 2.04±0.09, and the number of people living in the

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Table 1. Distribution of the participants by sociodemographic characteristics

Average age (X ± SD) (years)	10.81 ± 0.23	
Number of siblings	**2.04 ± 0.09**	
Number of people living in the family	**4.59 ± 0.08**	
Variable	***n***	**%**
Gender		
Female	123	53.5
Male	107	46.5
Education level attending		
Primary school	115	50.0
Secondary school	72	31.3
High school	43	18.7
Education level of mother		
illiterate	11	4.8
literate	7	3.0
Primary education	56	24.3
High school	64	27.8
University	92	40.0
Education level of father		
illiterate	3	1.3
literate	4	1.7
Primary education	44	19.1
High school	56	24.3
University	123	53.5
Family type		
Nuclear family	220	95.7
Non-nuclear family	10	4.3
Income expense balance		
Income less than expenses	92	40.0
Income equals expense	91	39.6
Income more than expenses	47	20.4
The child's previous psychiatric diagnosis		
Yes	7	3.0
No	223	97.0
Presence of chronic disease in the child		
Yes	14	6.1
No	216	93.9
Impact of earthquake on family economy		
Affected	215	93.5
Not affected	15	6.5
Location where earthquake was experienced		
House	221	96.1
Open area	8	3.5
car etc. vehicle	1	0.4
Damage status of the house		
undamaged	16	7.0
slightly damaged	92	40.0
moderately damaged	32	13.9
Heavily damaged	70	30.4
Collapsed during earthquake	9	3.9
Collapsed after earthquake	11	4.8
Child's state of being under the rubble		
Have been under the rubble	9	3.9
Have not been under the rubble	221	96.1
Family member's state of being under the rubble		
Have been under the rubble	59	25.7
Have not been under the rubble	171	74.3
The situation of staying in the tent after the earthquake		
Yes	139	60.4
No	91	39.6
Change of shelter after earthquake		
Yes	134	58.3
No	96	41.7
Injury status of a relative in the earthquake		
Yes	199	86.5
No	31	13.5
The situation of losing a relative in an earthquake		
Yes	203	88.3
No	27	11.7
Emotion felt during an earthquake		
I've never been scared	4	1.7
I was a little scared	4	1.7
I was scared	13	5.7
I was so scared	65	28.3
I was too scared	144	62.6
Child's injury status in the earthquake		
İnjured	34	14.8
Not injured	196	85.2
The presence of sleep problems in the child		
Yes	100	43.5
No	130	56.5
Total	**230**	**100.0**

family was 4.59±0.08. 53.5% of the children are female, 50% attend primary school, and 40% of the children's mothers and 53.5% of their fathers are university graduates. It was determined that 95.7% of the children lived in a nuclear family, 40% had less income than expenditure, 3% had been diagnosed with a psychiatric illness before, 6.1% had a chronic illness, and 93.5% were economically affected by the earthquake. It was determined that 96.1% of the

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Table 2. Distribution of the Child Posttraumatic Stress Reaction Index (CPTS-RI) and Disturbance Scale for Children (SDSC) mean scores

Trauma level	n	%	X±SD	Min-max
No trauma (0–11)	3	1.3	3.67±2.08	2.00–6.00
Mild trauma (12–24)	9	3.9	19.11±4.56	13.00–24.00
Moderate trauma (25–39)	38	16.5	33.39±4.18	25.00–39.00
Severe trauma (between 40–59)	112	48.7	50.24±5.75	40.00–59.00
Very severe trauma (between 60–80)	68	29.6	66.12±5.55	60.00–80.00
CPTS-RI mean score	**230**	**100.0**	**50.33±14.73**	**2.00–80.00**
SDSC Sub-dimensions		**X±SD**	**Min-max**	
DIMS: disorders of initiating and maintaining sleep		18.66±0.43	7.00–35.00	
SBD: sleep breathing disorders		5.52±0.20	3.0–15.00	
DAN: disorders of arousal and nightmares		5.63±0.23	3.00–15.00	
SWTD: sleep-wake transition disorders		14.03±0.40	6.00–30.00	
DOES: disorders of excessive somnolence		10.37±0.34	5.00–25.00	
SH: sleep hyperhidrosis		4.70±0.18	3.00–15.00	
SDSC mean score		**58.93±1.47**	**26.00–116.00**	

children were at home during the earthquake, 30.4% of them had severe damage in the houses they lived in, and 3.9% were under debris during the earthquake. It was determined that 25.7% of the children had a family member under the rubble during the earthquake, 60.4% stayed in a tent or container after the earthquake, and 58.3% started living elsewhere after the earthquake. It was determined that 86.5% of the children were injured during the earthquake, 88.3% had a relative who died in the earthquake, 62.6% were extremely afraid during the earthquake, 14.8% of the children were injured during the earthquake, and 43.5% of the children had sleep problems (Table1).

Table 2 shows the distribution of Child Posttraumatic Stress Reaction Index (CPTS-RI) and Sleep Disturbance Scale for Children (SDSC) scores. It was determined that 48.7% of the children had a trauma score between 40-59 and the mean CPTS-RI score was 50.33±14.73. The mean SDSC score of the children was determined to be 58.93±1.47 (Table 2).

Table 3 shows some characteristics of children and the distribution of the Child Posttraumatic Stress Reaction Index (CPTS-RI) and Sleep Disturbance Scale for Children (SDSC) sub-dimensions and total scores. It was determined that there was a significant difference between the genders of the children and the Sleep Disturbance Scale for Children SBD sub-dimension, and the SBD sub-dimension score of girls was higher ($P < 0.05$). It was observed that there was a significant relationship between the family type of the children and the DIMS, DAN, DOES, and SH sub-dimensions of the sleep disorder scale for children and the total score, and the scores were higher in single-parent families ($P < 0.05$). There is a significant relationship between the economic impact of the earthquake and the Child Posttraumatic Stress Reaction Index score,

Table 3. Distribution of some characteristics of children; Child Posttraumatic Stress Reaction Index (CPTS-RI) and Sleep Disturbance Scale for Children (SDSC) sub-dimensions and total mean scores

		CPTS-RI total	Disturbance Scale for Children (SDSC) sub-dimensions and total score						
			DIMS	SBD	DAN	SWTD	DOES	SH	Total Score
	n	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD
Gender									
Male	107	49.58 ± 1.48	18.23 ± 0.61	5.07 ± 0.28	5.49 ± 0.32	13.77 ± 0.57	9.61 ± 0.45	4.59 ± 0.28	56.78 ± 2.05
Female	123	50.98 ± 1.28	19.03 ± 0.60	5.92 ± 0.29	5.74 ± 0.31	47.27 ± 0.56	11.04 ± 0.48	4.79 ± 0.24	60.79 ± 2.07
t		0.716	–0.927	**–2.069**	–0.541	–0.626	–2.148	–0.547	–1.371
p		0.475	0.355	**0.040**	0.589	0.532	0.033	0.585	0.172
Education level attending									
Primary school	115	50.72 ± 1.35	18.54 ± 0.58	5.59 ± 0.30	5.57 ± 0.32	13.92 ± 0.55	10.07 ± 0.44	4.82 ± 0.26	58.53 ± 2.04
Secondary school	72	49.92 ± 1.78	18.72 ± 0.82	5.50 ± 0.28	5.47 ± 0.37	14.59 ± 0.71	10.00 ± 0.59	4.97 ± 0.33	59.26 ± 2.67
High school	43	49.95 ± 2.30	18.88 ± 0.93	5.39 ± 3.05	6.02 ± 0.55	13.39 ± 0.95	11.79 ± 0.87	3.93 ± 0.35	59.42 ± 3.48
F		0.082	0.048	0.065	0.375	0.568	2.075	2.190	0.037
p		0.921	0.953	0.937	0.688	0.567	0.128	0.114	0.964
Family type									
Nuclear family	220	50.22 ± 0.99	18.45 ± 0.43	5.46 ± 0.20	5.51 ± 0.22	13.86 ± 0.40	10.23 ± 0.33	4.61 ± 0.18	58.15 ± 1.46
Non-nuclear family	10	52.60 ± 5.12	23.20 ± 2.03	6.80 ± 1.10	8.10 ± 1.26	17.80 ± 2.04	13.40 ± 2.16	6.60 ± 1.02	75.90 ± 8.49
t		–0.498	**–2.273**	–1.328	**–2.365**	**–2.024**	–1.935	**–2.254**	**–2.497**
p		0.619	**0.024**	0.186	**0.019**	**0.044**	0.054	**0.025**	**0.013**

(*Continued*)

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Table 3. (*Continued*)

		CPTS-RI total	Disturbance Scale for Children (SDSC) sub-dimensions and total score						
			DIMS	SBD	DAN	SWTD	DOES	SH	Total Score
	n	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD	X ± SD
Impact of earthquake on family economy									
Affected	215	51.04 ± 0.98	18.76 ± 0.44	5.60 ± 0.21	5.78 ± 0.23	14.34 ± 0.41	10.62 ± 0.35	4.78 ± 0.18	59.91 ± 1.52
Not affected	15	40.00 ± 3.73	17.13 ± 1.57	4.33 ± 0.81	3.33 ± 0.21	9.60 ± 1.21	6.73 ± 0.70	3.60 ± 0.59	44.73 ± 3.98
t		**-2.850**	0.939	1.542	**2.726**	**2.985**	**2.913**	1.618	**2.589**
p		**0.005**	0.349	0.124	**0.007**	**0.003**	**0.004**	0.107	**0.010**
Child's state of being under the rubble									
Have been under the rubble	9	62.44 ± 2.83	25.33 ± 2.56	7.66 ± 1.47	8.22 ± 1.55	17.55 ± 2.45	14.88 ± 2.53	6.55 ± 1.02	80.22 ± 10.26
Have not been under the rubble	221	49.83 ± 0.99	18.38 ± 0.42	5.43 ± 0.20	5.52 ± 0.22	13.89 ± 0.40	10.19 ± 0.32	4.62 ± 0.18	58.05 ± 1.44
t		**2.547**	**3.197**	**2.124**	**2.349**	1.788	**2.755**	**2.080**	**2.982**
p		**0.012**	**0.002**	**0.035**	**0.020**	0.075	**0.006**	**0.039**	**0.003**
Family member's state of being under the rubble									
Have been under the rubble	59	53.77 ± 1.50	20.22 ± 0.88	5.79 ± 0.44	6.35 ± 0.52	15.59 ± 0.80	11.38 ± 0.76	4.98 ± 0.35	64.33 ± 3.21
Have not been under the rubble	171	49.13 ± 1.18	18.12 ± 0.48	5.43 ± 0.22	5.37 ± 0.24	13.49 ± 0.45	10.02 ± 0.36	4.60 ± 0.21	57.05 ± 1.61
t		**2.103**	**2.149**	0.775	1.914	**2.315**	1.787	0.905	**2.187**
p		**0.037**	**0.033**	0.439	0.057	**0.022**	0.075	0.367	**0.030**
The situation of staying in the tent after the earthquake									
Yes	139	53.61 ± 1.09	19.55 ± 0.55	5.96 ± 0.25	6.28 ± .030	15.11 ± 0.51	11.18 ± 0.44	5.07 ± 0.23	63.18 ± 1.88
No	91	45.30 ± 1.67	17.29 ± 0.66	4.85 ± 0.32	4.61 ± 0.29	12.38 ± 0.60	9.13 ± 0.47	4.13 ± 0.28	52.41 ± 2.16
t		**4.339**	**2.602**	**2.677**	**3.732**	**3.422**	**3.049**	**2.592**	**3.690**
p		**0.000**	**0.010**	**0.008**	**0.000**	**0.001**	**0.003**	**0.010**	**0.000**
Child's injury status in the earthquake									
İnjured	34	58.52 ± 1.82	21.67 ± 1.14	6.41 ± 0.62	6.67 ± 0.70	16.79 ± 1.07	12.47 ± 1.07	5.50 ± 0.49	69.52 ± 4.24
Not injured	196	48.90 ± 1.06	18.13 ± 0.45	5.37 ± 0.21	5.44 ± 0.23	13.55 ± 0.42	10.01 ± 0.34	4.56 ± 0.19	57.08 ± 1.52
t		**3.608**	**2.973**	1.809	1.954	**2.926**	**2.637**	1.841	**3.067**
p		**0.000**	**0.003**	0.072	0.052	**0.004**	**0.009**	0.067	**0.002**
Damage status of the house									
undamaged	16	34.31 ± 5.52	13.56 ± 1.55	4.56 ± 0.71	4.18 ± 0.75	10.75 ± 1.44	8.31 ± 1.28	3.18 ± 0.60	44.56 ± 5.57
slightly damaged	92	50.33 ± 1.46	18.40 ± 0.66	5.03 ± 0.28	5.23 ± 0.30	13.34 ± 0.54	9.80 ± 0.48	4.43 ± 0.26	56.26 ± 1.99
moderately damaged	32	53.96 ± 2.22	18.09 ± 1.11	6.28 ± 0.64	7.09 ± 0.70	15.37 ± 1.18	11.68 ± 0.94	5.46 ± 0.52	64.00 ± 4.31
Heavily damaged	70	51.47 ± 1.51	19.74 ± 0.71	5.88 ± 0.38	5.77 ± 0.43	14.91 ± 0.79	10.84 ± 0.60	4.97 ± 0.33	62.12 ± 2.72
Collapsed during earthquake	9	50.11 ± 4.37	19.88 ± 3.35	4.77 ± 0.82	5.55 ± 1.34	14.11 ± 2.28	10.88 ± .2.54	4.66 ± 1.06	59.88 ± 10.15
Collapsed after earthquake	11	55.81 ± 4.32	22.00 ± 1.63	7.18 ± 1.09	5.81 ± 0.97	15.00 ± 1.65	10.90 ± 1.56	5.27 ± 0.71	66.18 ± 6.41
F		**4.955**	**3.213**	2.116	2.065	1.880	1.355	1.917	**2.545**
p		**0.000**	**0.008**	0.064	0.071	0.099	0.243	0.092	**0.029**

and the Child Posttraumatic Stress Reaction Index score of the economically affected children is higher ($P < 0.05$). There is a significant relationship between earthquake exposure and the Sleep Disturbance Scale for Children DAN, SWTD, SH sub-dimension, and total score ($P < 0.05$). It was observed that the children who were economically affected by the earthquake had higher DAN, SWTD, SH sub-dimensions, and total scores. It was determined that there was a significant relationship between the Child Posttraumatic Stress Reaction Index score of the children under the debris of the earthquake, the Sleep Disturbance Scale for Children total score and the DIMS, SBD, DAN, DOES, SH sub-dimensions, and the scale scores were higher in the children who were under the debris ($P < 0.05$). A significant relationship was found between the child's family being under the rubble and the Child Posttraumatic Stress Reaction Index score. This score was higher for those whose family was trapped under the rubble. A

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Table 4. Regression analysis results for SDSC prediction

	Models	B	Standard Error	Standard Beta	t	P	R	R2	Adj.R2	F	P
1	**(Constant)**	11.433	4.088		2.797	.006					
	CPTS-RI	.944	.078	625	12.104	.000	.625	.391	.389	146.511	.000
2	**Constant**	–4.403	6.943		–.634	.527					
	CPTS-RI	.937	.077	.621	12.185	.000					
	Family type	15.519	5.542	.143	2.800	.006	.642	.412	.406	79.371	.000

significant correlation was found between the status of one of the child's family being under rubble and the Sleep Disturbance Scale for Children DIMS, SWTD sub-dimensions, and total score ($P < 0.05$). The post-traumatic stress scale and sleep disorder sub-dimension and total scores of the children who stayed in the tent after the earthquake were higher, and this difference was statistically significant ($P < 0.05$). The Child Posttraumatic Stress Reaction Index score of the children who were injured during the earthquake was found to be higher, and this difference was found to be statistically significant ($P < 0.05$). A statistically significant difference was found between the injury status during the earthquake and the Sleep Disturbance Scale for Children DIMS, SWTD, DOES subscale, and total score ($P < 0.05$). Children who were injured during the earthquake had higher scores. A significant correlation was found between the damage status of the houses where the children lived during the earthquake and the Child Posttraumatic Stress Reaction Index score ($P < 0.05$). There was a significant difference between the damage status of the house where the children lived during the earthquake and the Sleep Disturbance Scale for Children DIMS sub-dimension and the total scale score ($P < 0.05$).

According to the regression analysis (stepwise), it was determined that the first predictor affecting SDSC was CPTS-RI 38%; CPTS-RI total score and family type together affected 41% ($P < 0.05$) (Table 4).

Discussion

Earthquakes reveal many problem areas due to their sudden occurrence, unpredictability, the destruction they cause, death, and injuries. In addition, earthquakes differ from other disasters because they can create chronic effects due to aftershocks.[15] Earthquakes are among the natural disasters that cause the most deaths, and 92% of our country's lands, 95% of its population, and 75% of its industrial investments are on the seismic belt.[12] The February 6, 2023 earthquake, one of the rarest earthquakes to be recorded and experienced by our country, was one of the largest terrestrial earthquakes in the world in terms of its destructiveness and affected area. It is rare to see 2 earthquakes with a magnitude greater than 7 occurring on the same day and in the same region of the world, and the effects in this region have been devastating. Approximately one sixth of the country's population and 1 in 10 school-age children live in this region.[16] The most vulnerable and fragile individuals affected by earthquakes are children and young people.[17] Posttraumatic Stress Disorder (PTSD) is a phenomenon that can occur after severe traumatic events, such as a real death or threat of death, serious injury, a situation that threatens the physical integrity of the individual, or witnessing such a situation. PTSD manifests itself with symptoms such as re-experiencing the event, unwanted thoughts and images, avoidance, and excessive physiological arousal (DSM-IV TR, 2007).[18] Every individual who encounters a sufficiently threatening event may experience post-traumatic stress disorder.[12] In this study, it was determined that the Child Post-traumatic Stress Reaction Index score of the children who experienced an earthquake was 50.33±14.73 and 48.7% of the children experienced severe trauma. It is stated that the level of trauma after the earthquakes in children varies widely between 2.5% and 60.0%, depending on age, gender, severity of trauma, medical history, cultural factors, measurements, and evaluation time.[19] Reported trauma experiences after natural disasters range from 15% in a population affected by Hurricane Andrew[20] to 74% in Armenian earthquake victims.[21] Raj Dahal (2017) stated that the prevalence of trauma among the survivors after the Barpak earthquake was 18.5%,[22] while Xu et al. (2018) stated that the prevalence of PTSD was 14.1% among all participants.[23] While it was stated that this rate was 15.9% in those who were exposed to the 2008 and 2013 earthquakes, Liu et al. (2016) found the trauma prevalence rate to be 17.8% in their study.[24] While Marthoenis et al. (2019) stated that trauma occurred in 58.3% of adolescents,[25] in 2 different studies examining post-traumatic stress following an earthquake in our country, it was determined that 45.8% and 31.4% of children experienced moderate trauma.[12,26] In this study, it is seen that the Child Posttraumatic Stress Reaction Index score of children is higher than in other studies. We think that the size of the area affected by the earthquake and the fact that 2 major earthquakes occurred 9 hours apart were effective in this situation. At the same time, it is stated in the literature that children whose parents have higher education have higher PTSD scores.[27] Likewise, the education level of the parents of the children included in the study is above the Turkey average (40% of mothers and 53.5% of fathers are university graduates, respectively).

Sleep is the temporary, partial, and periodic loss of the organism's communication with the environment, reversible with stimuli of varying intensity.[28] In addition to psychological reactions after the earthquake, sleep and focus problems may occur. In children, sleep problems due to the earthquake, having terrible dreams and waking up crying, saying that they saw the ghost of the person they lost, decreased desire to be with their friends and play, infantile behaviors, attention deficit, developing excessive dependence on adults, bedwetting, complaints of undiagnosed pain, vomiting, and a decrease in school success can be observed.[17,29] In this study, it was determined that the children's Sleep Disturbance Scale for Children mean score was 58.93±1.47. The cut-off score of the scale used in the study is 34, and it is reported that sleep quality deteriorates in those with values above it.[14] In the study of Geng et al., 12 months after the earthquake, 48.90% of the participants stated that they slept less than 7 hours a day, and 27.68% stated that they had difficulty in starting to sleep.[30] In addition, 8.82% of the participants reported that they had problems in maintaining sleep, 22.60% reported poor sleep quality, and 40.01% had difficulty in

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performing their functions during daylight hours. In the same study, it was determined that half of the sample had sleep problems, while the other half did not.[30] Overall sleep problems, as assessed by the PSQI global scale, remained stable from 18-30 months after the earthquake, with prevalence rates ranging from 28.79%-30.18%. It is known that the prevalence of sleep disorders increases in the short term after disasters.[31] In this study, the continuation of aftershocks may cause more sleep disorders due to problems such as severe damage to children's living spaces and frequent encounters with trauma victims.

Female gender is among the risk factors for post-traumatic stress disorder cases.[31] Various studies have found a relationship between gender and post-traumatic disorder, and it has been reported that being a woman is an important risk factor.[25,26,32-35] While this rate is 10.4% in women, post-traumatic stress disorder is reported as 5% in men.[36] In this study, although girls' post-traumatic scale scores were higher, no significant difference was found. Children of both sexes are already experiencing severe trauma.

In the study of Silwal et al (2018), in which the 7.8 magnitude Sindhupalchok earthquake that occurred in Nepal on April 25, 2015 and the 7.3 magnitude Kathmandu earthquake were the subject, they determined that the participants had sleep difficulties.[27] In this study, it was determined that the Sleep Disturbance Scale for Children (SDSC) SBD sub-dimension was statistically significant according to gender. The fear and sheltering changes experienced by children after the earthquake may have caused this result.

In this study, a significant relationship was found between the family type of the children and the Sleep Disturbance Scale for Children (SDSC) and its sub-dimensions. It was determined that children with single parent family type after the earthquake experienced more sleep disorders. This may be due to the fear children experience. There may be a reason why children have sleep problems – the first earthquake took place at 04:17. After the earthquake, children want to know that both they and their families are safe. The loss or absence of a family member may have exacerbated this disorder. The family's ability to remain calm and reassuring may also be a key factor in preventing trauma disorder.[37]

Social order, economic, and security concerns after natural disasters may cause people to leave the places they live in. In this study, the Child Posttraumatic Stress Reaction Index (CPTS-RI) score and the Sleep Disturbance Scale for Children (SDSC) score were found to be higher for the children who were economically affected by the earthquake and stayed in a tent after the earthquake. Low socioeconomic level is one of the reasons that increase post-traumatic stress.[38] With the loss of loved ones and livelihoods following trauma, survivors are at increased risk of experiencing post-traumatic stress disorder.[39] One in 5 people from the 2021 Piurra earthquake showed signs of post-traumatic stress due to socioeconomic reasons.[40] It is seen that all provinces affected by the February 6 earthquake are lower than Turkey's average Gross Domestic Product (GDP) per capita. In terms of income, the province where the research was conducted is among the 10 provinces with the lowest GDP in Turkey.[16] The earthquake had significant effects on the already weak economy. Children had to leave their homes and sometimes cities. The earthquake and subsequent displacement negatively affected the mental health of adolescents.[41] After natural disasters, sleep disorders may occur in the first weeks of the disaster due to the deterioration of existing living conditions and environmental order.[42] Sharma and Karr (2019) reported in their study that economic problems and relocation to another place are effective in post-traumatic disorder.[43] A study investigating the long-term impact of displacement after a natural disaster found that survivors in the earthquake-affected area had higher levels of trauma compared to those relocated to other areas.[44] Migration from the region and staying in a different residence or temporary settlement in the same region, such as tents, may affect trauma and sleep disorders differently. Those who migrate from the earthquake area are away from the earthquake environment and intense aftershocks. However, this does not apply to those living in tents. Children are deprived of the living spaces and comfort they are used to, and they also experience the destruction and aftershocks of the earthquake every day. This can cause trauma disorder and sleep problems.

Earthquakes not only cause deaths, injuries, destruction of buildings, and loss of livelihoods and materials, but also have severe and perhaps permanent psychological consequences on people who experience the trauma.[19] The Child Posttraumatic Stress Reaction Index (CPTS-RI) and Sleep Disturbance Scale for Children (SDSC) scores of the children who were under the debris and injured during the earthquake were found to be high. In different studies, it has been stated that there is a relationship between injury or being under debris in an earthquake and post-traumatic disorder.[24,31,32,37,43,45] It is known that sleep disorders are among the survivors after the earthquake.[46] Before the earthquakes, the COVID-19 pandemic had traumatized children and adolescents in Turkey as well as in the rest of the world. The pandemic brought with it the fear of infection and death, the loss of loved ones, limited communication with peers, quarantine measures, social isolation, and disruption of education. While the COVID-19 pandemic continues to cause psychological distress, recent earthquakes have become a secondary source of trauma for these young people.[19] Past trauma experience can increase trauma disorder. While there is a transition to normalization after the pandemic, it is inevitable to experience trauma disorders and sleep problems in children who were faced with 2 earthquakes with magnitudes greater than 7. Injury of the child and being under the debris seem to have increased these problems.

It was determined that the Child Posttraumatic Stress Reaction Index (CPTS-RI) and Sleep Disturbance Scale for Children (SDSC) scores of the children whose family members were trapped under the rubble were higher. Hsu et al (2002) found that physical injury and experiencing the death of a close family member 6 weeks after the earthquake were the 2 main risk factors for post-traumatic disorder.[47] In different studies, it has been reported that trauma disorder is higher in children who see that a family member is injured and remains under the rubble.[19,25,37,41] Experiencing the death of a family member or friend is one of the factors that increases post-traumatic disorder.[47]

In this study, it was determined that there was a significant relationship between damage to the houses in the earthquake and the Child Posttraumatic Stress Reaction Index (CPTS-RI) and Sleep Disturbance Scale for Children (SDSC) scores of the children, while the scale scores of those whose houses were damaged or destroyed were higher. The destruction of the houses where the children lived likely worsened trauma associated with the earthquake. After an earthquake, the severity of the earthquake, intense trauma exposure, and the child's limited access to resources can increase the severity of trauma.[19] It was determined that witnessing the tragic scenes during the earthquake, more negative life events (such as the destruction of the house in which they lived), and poor social support were associated with the increase and persistence of sleep problems.[31] In one study, it was determined that the destruction of the house increased the level of trauma in children.[25] Witnessing the destruction of the dwelling may be a secondary cause of trauma

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to the child. This situation may cause future anxiety, loss of comfort, abandonment of the usual order, and uncertainty in the child.

In addition to the psychological reactions after the earthquake, sleep problems occur; while some of them get used to this process, the situation worsens and trauma disorder occurs in others.[29] In this study, it was determined that as the trauma level increased in children, sleep disorders were more common. It is known that trauma affects the level of sleep in children. Sleep disorders were reported in children after the Nepal earthquake.[27] It is thought that because the earthquake that took place in our country occurred during the night's sleeping hours, the subsequent aftershocks caused both an increase in the level of trauma and a negative impact on the level of sleep in children. After natural disasters, sleep disorders may occur in the first weeks of the disaster due to the deterioration of existing living conditions and environmental order.[42] The World Health Organization emphasizes that sleep disorder that occurs after exposure to trauma is related to trauma. Children exposed to natural disasters try to adapt to physical, mental, and social changes, causing them to be affected more negatively.[13] The environmental destruction caused by the earthquake increases the trauma in children.[48] Trauma in children causes physical, social, and psychological difficulties due to the destruction and loss in children's living spaces, and the effects of the earthquake have not yet completely disappeared. The increase in trauma affects sleep disorders, and the decrease in sleep quality delays recovery from the traumatic process in the child.

Conclusion

In this study, it was observed that half of the children experienced severe trauma and had sleep disorders. The results of this study are important in showing that the focus should be on not only the physical but also the post-traumatic stress and sleep problems of children in earthquakes. Post-earthquake emergency plans are primarily based on evacuating the injured and protecting the survivors. This approach covers more physical health. At this stage, services such as food, hygiene, clean drinking and utility water, and prevention of infectious diseases are provided. Psychological problems are seen in victims after the earthquake, but they are not given priority. The findings of this study suggest that support should be given to the established practice of integrating mental health and psychosocial support as basic relief in post-earthquake emergency settings in Turkey. This support should cover all age groups. It helps expand our knowledge of post-traumatic stress in children and provides recommendations for specific long-term health interventions in such populations. In order to prevent earthquake-related psychological problems among survivors, social support, psychological assistance, and improvement of living environments are necessary steps for reducing negative post-traumatic stress.

Limitations

The limitations of this study are that it was conducted only with children admitted to the hospital and that the level of trauma before the earthquake is unknown. Another limitation is that we did not measure whether children were receiving psychological support, and that children with high scores were not directed to appropriate psychological care.

Data availability statement. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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