


The Utilization of Emergency Department and Outpatient Clinics among Evacuated Victims after the 2023 Turkey Earthquake

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Abbreviations:

ED: emergency department
ICD-10: International Statistical Classification of Diseases and Related Health Problems-10th Revision

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Abstract

Background: After the 2023 Turkey earthquake, thousands of people evacuated to different fields. Earthquake victims still need health care in the evacuation location. This study aims to determine the emergency department (ED) and outpatient clinic utilization characteristics of the evacuated earthquake victims outside the earthquake zone and to provide suggestions for planning the health care facilities in the regions where the evacuated earthquake victims will be placed.

Methods: This retrospective, observational study was conducted in a tertiary university hospital from February 7, 2023 through February 20, 2023. All evacuated earthquake victims who presented to the study hospital were included in the study. Non-victim patients were included as the control group. Missing medical records were excluded. Demographic characteristics of the patients, outpatient clinics, International Statistical Classification of Diseases and Related Health Problems-10th Revision (ICD-10) codes, and outcomes were recorded.

Results: A total of 15,128 patients were included in the final analysis. Six-hundred-nine (4.0%) of the patients were evacuated victims. Three-hundred forty-six (56.8%) evacuated victims used the ED. One-hundred fifty-six (25.6%) earthquake victims were in the pediatric age group. Earthquake victims used the ED more than the control group in adult and pediatric age groups (22.5% versus 51.7% and 30.2% versus 71.8%; $P < .001$, respectively). Earthquake victims frequently presented to the hospital during night shifts in both age groups ($P < .05$). Pediatric victims were more hospitalized than the control group (4.8% versus 10.9%; $P = .001$). Diseases of the respiratory system were the most common emergency diagnosis of the victims in both age groups (26.5% and 57.1%, respectively). The most frequently used outpatient clinic was ophthalmology in both age groups (14.6% and 20.5%, respectively).

Conclusions: Evacuated victims, especially pediatric victims, used the ED more than other outpatient clinics. Diseases of the respiratory system were the most common emergency diagnosis of the victims, and the most frequently preferred outpatient clinic was ophthalmology. The most common diseases and frequently preferred clinics should be considered in planning health care for the evacuated earthquake victims.

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Introduction

On February 6, 2023, the Pazarcık and Elbistan districts of Turkey were struck by two earthquakes with a magnitude of 7.6 and 7.7 on the Richter scale. The quake was felt in a wide region including Northern Syria. Eleven cities and more than 13 million people in Turkey were affected. More than 50,000 deaths and 100,000 injuries were reported by the Ministry of Interior Disaster and Emergency Management Presidency (Ankara, Turkey).¹ Many of the survivors lost their resident homes and became homeless.

After the 2023 Turkey earthquake, approximately 10,000 victims were placed in temporary residences (ie, dormitories, guesthouses, and charity houses) in Kırıkkale province. The board of Kırıkkale University Hospital (Kırıkkale, Turkey) has made



Adult Patients	Outpatients (n = 9,549)			Emergency (n = 2,948)		
	n (%)	Control (n = 9,330)	Victim (n = 219)	P Value	Control (n = 2,714)	Victim (n = 234)
Age (median, IQR)	50 (35-63)	43 (32-59)	.009 ^a	46 (30-63)	39 (27-52)	<.001 ^a
Gender, Female	5,884 (63.1)	134 (61.2)	.569 ^b	1,402 (51.7)	127 (54.3)	.442 ^b
Visit Time, Nightshift	0 (0.0)	0 (0.0)	NA	1,102 (40.6)	106 (45.3)	.161 ^b
Disposition						
Discharge	9,307 (99.8)	217 (99.1)	.056 ^b	1,757 (64.7)	203 (86.8)	<.001 ^b
Ward Admission	23 (0.2)	2 (0.9)		925 (34.1)	29 (12.4)	
ICU Admission	0 (0.0)	0 (0.0)		32 (1.2)	2 (0.9)	
In-Hospital Mortality	0 (0.0)	0 (0.0)	NA	16 (0.6)	2 (0.9)	.617 ^b
Pediatric Patients	Outpatients (n = 1,772)			Emergency (n = 859)		
	n (%)	Control (n = 1,728)	Victim (n = 44)	P Value	Control (n = 747)	Victim (n = 112)
Age (median, IQR)	7 (2-12)	4 (0-10)	.041 ^a	5 (2-10)	5 (1-9)	.514 ^a
Gender, Female	861 (49.8)	21 (47.7)	.783 ^b	367 (49.1)	55 (49.1)	.996 ^b
Visit Time, Nightshift	0 (0.0)	0 (0.0)	NA	388 (51.9)	58 (51.8)	.976 ^b
Disposition						
Discharge	1,725 (99.8)	44 (100.0)	.782 ^b	632 (84.6)	95 (84.8)	.953 ^b
Ward Admission	3 (0.2)	0 (0.0)		115 (15.4)	17 (15.2)	
ICU Admission	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
In-Hospital Mortality	0 (0.0)	0 (0.0)	NA	0 (0.0)	0 (0.0)	NA

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Table 1. Characteristics of the Outpatient and Emergency Patients

Note: P <.05 considered significant.

Abbreviation: ICU, intensive care unit.

^aMann-Whitney U test.^bChi-square test.

necessary arrangements that include all health care needs of the evacuated earthquake victims free of charge and without an appointment.

Events such as war and natural disasters can cause mass migration. The mass migration brings an additional burden to health care facilities, especially emergency departments (EDs).²⁻⁴ Studies in the literature were mostly carried out on health services utilization by patients who migrated from other countries.^{2,3,5} Studies on the health care utilization of evacuated natural disaster victims are limited.

Post-earthquake studies mostly include trauma patients in the earthquake zone or patients transferred from the earthquake zone.⁶⁻⁹ Studies on the health care utilization of earthquake survivors are limited. To the best of the authors' knowledge, this is the first study in the literature that evaluates the health care utilization of evacuated victims after the 2023 Turkey earthquake. Understanding the utilization characteristics of ED and outpatient clinics among evacuated victims will give further insight into how to improve disaster preparedness and recovery plans for health care facilities.

This study aims to determine the ED and outpatient clinic utilization characteristics of the evacuated earthquake victims outside the earthquake zone and to provide suggestions for planning the health care facilities in the regions where the evacuated earthquake victims will be placed.

Material and Methods

Study Design

This retrospective, observational study was conducted in a tertiary university hospital from February 7, 2023 through February 20,

2023. The study hospital is located in Kırıkkale province and the distance between the Kırıkkale province and the earthquake epicenter is approximately 550 kilometers. The study hospital is the only tertiary hospital in the province and serves as a Level 3 trauma, thrombolytic, and primary percutaneous coronary intervention center for trauma, stroke, and acute coronary syndrome patients. The study hospital's annual patient volume is approximately 450,000 and the ED's annual patient volume is approximately 115,000 patients. The average daily hospital visits are 1,233 [95% confidence interval [CI], 1,167-1,298] patients (outpatient clinics: 898 [95% CI, 809-986] and ED: 316 [95% CI, 309-324]). Institutional ethics committee approval was obtained before the study; the study protocol was approved by the Ethics Committee of Kırıkkale University Faculty of Medicine (Kırıkkale, Turkey; Approval ID: 2023.09.01, 06/09/2023). This study was conducted in line with the Declaration of Helsinki.

Patient Selection and Groups

All evacuated earthquake victims presented to the study hospital during the study dates were included in the study. Non-victim patients were included as the control group. Patients with missing medical records were excluded. Demographic characteristics of the patients, outpatient clinics, International Statistical Classification of Diseases and Related Health Problems-10th Revision (ICD-10) codes, and outcomes were recorded. The patient records were extracted from the hospital automation system and recorded on standard forms. A standardized data collection instrument was used that was pilot-tested and previously used

several times. All the victims must have an ICD-10 code of X34 (victim of earthquake). It is a strict legal obligation and, in this regard, none of the victims' records were missing or were not included in the control group.

Disease diagnoses were recorded in line with ICD-10 version 2019. The ICD-10 main categories were used for the diagnosis of the patients. The patients were divided into groups as victims and control group and analyzed. Informed consent was waived due to the retrospective design of the study.

Outcomes

The primary outcome of the study is the ED utilization characteristics of evacuated earthquake victims. The secondary outcome is the outpatient utilization characteristics of the evacuated victims.

Statistical Analysis

The categorical variables are presented as numbers and percentages. The numerical variables are presented as mean (standard deviation/SD) or median (interquartile range/IQR). The Kolmogorov-Smirnov test was used to evaluate the distribution of the groups. The student-t test or Mann-Whitney U test was used according to the distribution of the data to evaluate the numerical variables. The chi-square test was used to evaluate the categorical variables. The statistical significance level was set as $P < .05$. SPSS for Windows version 23.0 (IBM Corp; Armonk, New York USA) was used for statistical analysis.

Results

A total of 15,128 patients were presented to the study hospital during the study dates. There were no missing data, and all the patients were included in the final analysis. The median age of the patients was 43 years (interquartile range/IQR: 23-60), and 8,851 (58.5%) were female. Six-hundred-nine (4.0%) of the patients were evacuated victims. Three-hundred forty-six (56.8%) evacuated victims used the ED and 263 (43.2%) used outpatient clinics. One-hundred fifty-six (25.6%) earthquake victims were in the pediatric age group. The average daily ED and outpatient visits during study dates were similar to the previous two week's visits (mean [standard deviation/SD]: 292.2 [SD = 43.8] versus 310.7 [SD = 43.2]; 1401.2 [SD = 160.7] versus 1,448.9 [SD = 154.2]; student-t-test; $P > .05$, respectively).

Earthquake victims used the ED more than the control group in adult and pediatric age groups (22.5% versus 51.7% and 30.2% versus 71.8%; $P < .001$, respectively). In both age groups, earthquake victims were younger than the control group (adult: 49 [IQR 33-63] versus 42 [IQR 30-58]; pediatric: 6 [IQR 2-11] versus 5 [IQR 1-9]; $P < .05$). Earthquake victims frequently presented to the hospital during night shifts in both age groups (adult: 9.1% versus 23.4%; pediatric: 15.7% versus 37.2%; $P < .05$). Pediatric victims were more hospitalized than the control group (4.8% versus 10.9%; $P = .001$).

Adult victims presented to the ED were younger than the control group (39 [IQR 27-52] versus 46 [IQR 30-63]; $P < .001$) and were less hospitalized than the control group (12.4% versus 34.1%; $P < .001$). The characteristics of pediatric victims who used the ED were similar to the control group ($P > .05$). The characteristics of victims who used outpatient clinics were similar to the control group in both age groups, except for age. The utilization characteristics of the patients are presented in Table 1.

The top three outpatient clinics used by adult victims were ophthalmology, obstetrics/gynecology, and orthopedics. In the pediatric age group, victims most frequently preferred

Adult Patients (n = 9,549), n (%)	Control	Victim	P Value ^a	
Ophthalmology	959 (10.3)	32 (14.6)	<.001	
Obstetrics & Gynecology	773 (8.3)	27 (12.3)		
Orthopedics	455 (4.9)	23 (10.5)		
Otolaryngology	679 (7.3)	19 (8.7)		
Psychiatry	316 (3.4)	16 (7.3)		
Internal Medicine	686 (7.4)	13 (5.9)		
Cardiology	837 (9.0)	10 (4.6)		
Neurosurgery	330 (3.5)	9 (4.1)		
Infectious Diseases	109 (1.2)	8 (3.7)		
Gastroenterology	594 (6.4)	7 (3.2)		
Pulmonology	431 (4.6)	7 (3.2)		
Neurology	443 (4.7)	7 (3.2)		
Physical Medicine & Rehabilitation	403 (4.3)	7 (3.2)		
Endocrinology	606 (6.5)	6 (2.7)		
Medical Oncology	147 (1.6)	6 (2.7)		
Urology	348 (3.7)	6 (2.7)		
Anesthesiology	257 (2.8)	6 (2.7)		
General Surgery	371 (4.0)	5 (2.3)		
Pediatric Patients (n = 1,772), n (%)				.435
Ophthalmology	324 (18.8)	9 (20.5)		
Otolaryngology	324 (18.8)	8 (18.2)		
General Pediatrics	213 (12.3)	6 (13.6)		
Allergy & Immunology	64 (3.7)	5 (11.4)		
Newborn	63 (3.6)	3 (6.8)		
Cardiology	93 (5.4)	3 (6.8)		
Neurology	85 (4.9)	3 (6.8)		
Gastroenterology	77 (4.5)	2 (4.5)		
Nephrology	122 (7.1)	2 (4.5)		
Neurosurgery	14 (0.8)	1 (2.3)		
Orthopedics	93 (5.4)	1 (2.3)		
Plastic Surgery	7 (0.4)	1 (2.3)		

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Table 2. Most Common Preferred Outpatient Clinics

^a Chi-square test; $P < .05$ considered significant.

ophthalmology, otolaryngology, and general pediatrics outpatient clinics. The most preferred outpatient clinics are presented in Table 2.

Diseases of the respiratory system were the most common emergency diagnosis of the victims in the adult and pediatric age groups (26.5% and 57.1%, respectively). Diseases of the eye and adnexa were the most common outpatient diagnosis of the victims in the adult and pediatric age groups (14.6% and 20.5%, respectively). The most common diagnoses of the patients are presented in Table 3.

Discussion

This study revealed that evacuated earthquake victims used the ED more than outpatient clinics. The most common ED diagnosis was respiratory system diseases for both age groups. The most preferred outpatient clinic was ophthalmology.

ICD-10 Codes	Outpatient			Emergency		
	Control	Victim	P ^a	Control	Victim	P ^a
Adult Patients, n (%)						
Endocrine, nutritional, and metabolic disease	1136 (12.2)	13 (5.9)	<.001	29 (1.1)	1 (0.4)	<.001
Diseases of the eye and adnexa	966 (10.4)	32 (14.6)		218 (8.0)	4 (1.7)	
Diseases of the circulatory system	1035 (11.1)	14 (6.4)		200 (7.4)	9 (3.8)	
Diseases of the respiratory system	785 (8.4)	18 (8.2)		565 (20.8)	62 (26.5)	
Diseases of the digestive system	682 (7.3)	12 (5.5)		329 (12.1)	16 (6.8)	
Diseases of the musculoskeletal system and connective tissue	944 (10.1)	28 (12.8)		249 (9.2)	44 (18.8)	
Symptoms, signs, and abnormal clinical and laboratory findings - not elsewhere classified	785 (8.4)	23 (10.5)		347 (12.8)	34 (14.5)	
Injury, poisoning, and certain other consequences of external causes	116 (1.2)	11 (5.0)		58 (2.1)	17 (7.3)	
Pediatric Patients, n (%)						
Diseases of the eye and adnexa	327 (18.9)	9 (20.5)	<.001	25 (3.3)	4 (3.6)	<.001
Diseases of the ear and mastoid process	195 (11.3)	4 (9.1)		13 (1.7)	4 (3.6)	
Diseases of the respiratory system	251 (14.5)	7 (15.9)		226 (30.3)	64 (57.1)	
Diseases of the digestive system	67 (3.9)	2 (4.5)		91 (12.2)	2 (1.8)	
Symptoms, signs, and abnormal clinical and laboratory findings - not elsewhere classified	116 (6.7)	6 (13.6)		208 (27.8)	17 (15.2)	
Injury, poisoning, and certain other consequences of external causes	24 (1.4)	0 (0.0)		19 (2.5)	2 (1.8)	

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Table 3. Most Common Diagnosis of the Patients

Abbreviation: ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision.

^a Chi-square test; P <.05 considered significant.

Irvin and Atas stated that at the Evacuee Center established for victims evacuated after Hurricane Katrina (USA 2005), 88% of evacuated victims requested medical evaluation, and less than one percent were referred to the local EDs.¹⁰ Yorifuji, et al concluded that the earthquake victims mostly presented with mild injuries and common diseases in the medical clinic at the earthquake epicenter.¹¹ In the current study, most evacuated victims presented to the ED, and while most were discharged after appropriate evaluation, few were hospitalized. Considering these results, establishing a first medical evaluation center for evacuated victims could meet the medical needs of most victims and reduce the additional burden on the ED.

Lo, et al found that hospitalization rates were higher in victims than in non-victims after the 1999 Chi-Chi earthquake.¹² In the current study, hospitalization rates of evacuated victims were higher than the control group in pediatric patients and similar in adult victims. Emergency hospitalization rates were lower than the control group in adult patients and similar in pediatrics. Contrary to the study of Lo, et al, the hospital in the current study was far from the earthquake epicenter.¹² This difference in the region may have caused the difference in the results. However, hospital beds are still needed even if it is in the earthquake epicenter or far away for earthquake victims. Therefore, it should be considered in disaster preparedness planning and post-disaster medical care delivery.

Lo, et al found that victims' outpatient care was similar to non-victims after the 1999 Chi-Chi earthquake.¹² In the current study, most victims presented to the ED rather than outpatient clinics. The majority of hospitalized victims were admitted via ED, and all pediatric victims were admitted via ED. Besides, most of the victims presented to the hospital on night shifts. According to these

results, EDs are still crucial in the health care delivery of earthquake victims. The EDs in the regions where the evacuated victims are placed should be supported.

Although earthquake victims could present to all outpatient clinics without an appointment and free of charge, they preferred the ED for various complaints. The majority of them were discharged after appropriate evaluation. This situation might be associated with inappropriate use of the ED. Since the appropriate use of the ED was not evaluated, no further comments could be made. However, establishing a first medical evaluation or primary care center for evacuated victims before the hospital presentation may reduce the additional burden on the ED.

In the study of Yorifuji, et al in the medical clinic at the earthquake epicenter, the most common diagnosis was injury, poisoning, and certain other consequences of external causes (25.9%) and respiratory system diseases (24.3%).¹¹ In the study of Lo, et al, the most common outpatient diagnosis in both victims and non-victims after the earthquake was respiratory system diseases.¹² Sepehri and Meimandi found that respiratory medications were the most commonly prescribed drugs to earthquake victims after the earthquake.¹³ In the current study, the most common emergency diagnosis was respiratory system diseases for adult and pediatric age groups (26.5% and 57.1%, respectively). The whole country was under the effect of winter at the earthquake time. Thus, evacuated victims may be at risk for respiratory system diseases outside the earthquake epicenter as in the earthquake epicenter. Seasonal illnesses should be considered in planning health care for earthquake victims.

The most common diagnosis of victims using outpatient clinics was diseases of the eye and adnexa. The most frequently used outpatient clinic was ophthalmology in both age groups. It was

followed by otolaryngology and general pediatrics in pediatric victims and obstetrics/gynecology and orthopedics in adult victims. Frequently used outpatient clinics should be considered during the planning and establishment of outpatient clinics of hospitals that will provide health care to earthquake victims.

Understanding the utilization characteristics of ED and outpatient clinics among evacuated victims will give further insight into how to improve disaster preparedness and recovery plans for health care facilities and governmental organizations.

Limitations

The present study had several limitations. First, the study is single-centered and retrospective. Despite the retrospective design, there were no missing data. Second, the evacuated victims started to return to their resident cities after two weeks. Thus, the study dates remained limited to two weeks. Third, since the appropriate use of the ED was not evaluated, no comment could be made on this issue. Fourth, the ICD-10 main categories were used for disease diagnosis. Thus, detailed diagnoses of the patients could not be presented.

Conclusions

Emergency departments are still crucial for the evacuated earthquake victims outside the earthquake zone. Evacuated victims, especially pediatric victims, used the ED more than other outpatient clinics. Earthquake victims frequently presented to the hospital during night shifts. Diseases of the respiratory system were the most common emergency diagnosis of the victims, and the most frequently preferred outpatient clinic was ophthalmology. The most common diseases and frequently preferred clinics should be considered in planning health care for the evacuated earthquake victims.

Authors Contributions

Study concept and design: Bİ, OE, TD; acquisition of the data: Bİ, HÇ, AA, MS; analysis and interpretation of the data: Bİ, OE, ST, TD; drafting of the manuscript: Bİ, OE, TD; critical revision of the manuscript for important intellectual content: Bİ, OE, HÇ, AA, MS, ST, TD.

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