

The Impact of the 2023 Kahramanmaraş (Türkiye) Earthquakes on Asthma Control in Adults: A Single Center Cross-Sectional Study

2023 Kahramanmaraş (Türkiye) Depreminin Erişkinlerde Astım Kontrolü Üzerine Etkisi: Tek Merkez Kesitsel Çalışma

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Our study was presented at the The National Lung Health Congress 2024 on 08.03.2024, in Antalya.

ABSTRACT Objective: On 6 February 2023, 2 earthquakes with magnitudes of 7.8 and 7.6 Mw occurred in Kahramanmaraş. Earthquakes have caused catastrophic damage in an area of approximately 350,000 km². We aimed to establish the effect of earthquakes on asthma control. **Material and Methods:** The data of 116 asthma patients were assessed between May 1 and December 1, 2023. The use of inhaled corticosteroids (ICS), short-acting beta-agonists (SABA), and numbers of asthma exacerbations were compared in pre- and post-earthquake periods. In addition, patients were divided into 2 groups according to asthma control status. Both groups were compared for demographic data, medication, exacerbations, anxiety, and quality of life. **Results:** In the post-earthquake period, ICS use decreased significantly ($p<0.001$), while SABAs use and exacerbation rate increased significantly ($p<0.001$, $p<0.001$). Approximately 2/3 (66.4%) of patients were uncontrolled. Exacerbations were significantly higher in the uncontrolled group ($p=0.011$). ICS use was also lower in the uncontrolled group (uncontrolled: 28.6% vs 53.8% controlled, $p=0.008$). However, no significant difference was found between the groups for SABAs use. There was no difference between the two groups in terms of housing status ($p=0.497$), quality of life ($p>0.05$ for all quality-of-life scales), and anxiety level ($p=0.686$). **Conclusion:** We found that the earthquake significantly impaired asthma control. The main reason for the lack of asthma control in the post-earthquake period seems to be the difficulty in accessing ICS. Therefore, disaster management plans should be developed to provide timely medical supplies and optimal health services in areas vulnerable to disasters.

Keywords: Earthquakes; asthma; quality of life; anxiety

ÖZET Amaç: 6 Şubat 2023 tarihinde Kahramanmaraş'ta 7,8 ve 7,6 Mw büyüklüğünde 2 deprem meydana gelmiştir. Depremler yaklaşık 350.000 km²'lik bir alanda yıkıcı hasara neden olmuştur. Çalışmamızda depremlerin astım kontrolü üzerindeki etkisini belirlemeyi amaçladık. **Gereç ve Yöntemler:** 1 Mayıs-1 Aralık 2023 tarihleri arasında 116 astım hastasının verileri değerlendirilmiştir. Hastaların inhale kortikosteroid (İKS) kullanımı, kısa etkili beta agonist [short-acting beta-agonist (SABA)] kullanımı ve astım alevlenme sayıları deprem öncesi ve sonrası dönem için karşılaştırılmıştır. Ayrıca, hastalar astım kontrol durumuna göre 2 gruba ayrılmıştır. Her iki grup demografik veriler, ilaç kullanımı, alevlenmeler, anksiyete ve yaşam kalitesi açısından karşılaştırılmıştır. **Bulgular:** Deprem sonrası dönemde İKS kullanımında anlamlı düzeyde azalma saptanırken ($p<0,001$), SABA kullanımı ve alevlenme sayısında anlamlı olarak artışı saptandı ($p<0,001$, $p<0,001$). Deprem sonrası dönemde hastaların yaklaşık 2/3'ü (%66,4) kontrolsüzdü. Alevlenmeler kontrolsüz grupta anlamlı düzeyde yüksekti ($p=0,011$). İKS kullanımı da kontrolsüz grupta daha düşüktü (kontrolsüz: %28,6'ya karşı %53,8 kontrollü, $p=0,008$). Ancak, SABA kullanımını açısından gruplar arasında anlamlı bir fark yoktu. İki grup arasında barınma durumu ($p=0,497$), yaşam kalitesi (tüm yaşam kalitesi ölçekleri için $p>0,05$) ve anksiyete düzeyi ($p=0,686$) açısından anlamlı fark yoktu. **Sonuç:** Depremin astım kontrolünü önemli ölçüde bozduğunu tespit ettik. Deprem sonrası dönemde astım kontrolünün sağlanamamasının ana nedeni İKS'ye erişimdeki zorluk gibi görünmektedir. Bu nedenle, afetlere riski yüksek olan bölgelerde ilaç temini ve optimal sağlık hizmetleri sağlamak adına afet yönetim planları geliştirilmesi gerektiğini düşünüyoruz.

Anahtar Kelimeler: Depremler; astım; yaşam kalitesi; anksiyete

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On 6 February 2023, Pazarcık and Elbistan districts of Kahramanmaraş were struck by two successive earthquakes with magnitudes of 7.8 Mw and 7.6 Mw on the Richer scale, respectively. The earthquakes destroyed approximately 350,000 square kilometers and affected a total of 14 million people. Based on official announcements, 53,373 people in Türkiye and approximately 7,000 people in Syria died in these earthquakes. More than 120,000 people were also injured. Many hospitals in the affected areas were out of use. As a result, effective health services could not be provided in many areas.¹

Following earthquakes, people must struggle not only with the injuries caused by the destruction but also the access to essential needs such as housing, clean water, food, and basic sanitation. In areas affected by an earthquake, both the impact of earthquake exposure and impaired quality of life may result in a variety of respiratory diseases.^{2,3}

Asthma exacerbations have been among the leading causes of hospital admissions after natural disasters. Therefore, asthma control is crucial for the management of healthcare crisis in disaster areas where health services are less efficient.⁴ However, there are studies showing that both asthma incidence and asthma exacerbations increase in disaster regions.⁴⁻⁶ Different factors such as heavy dust exposure, increased respiratory infections, inadequate inhaler therapy, and psychosocial stress have been associated with asthma exacerbations.^{5,7}

There are limited data on asthma control, and access to medicines in patients with asthma following Kahramanmaraş earthquakes. The aim of this study was to determine the control status of asthma patients and factors associated with asthma control in the earthquake zone. The data obtained will guide what needs to be done before and during a natural disaster.

MATERIAL AND METHODS

This study was designed as a retrospective cross-sectional study and approved by the Ethics Committee of the İzmir Bakırçay University, on the 24th of May 2023 (no: 1055). The study was conducted in line with the ethics standards of the Helsinki Declaration, updated in 2000.

STUDY POPULATION

The study included patients with asthma who attended Pulmonary Outpatient Clinics of Hatay Samandağ Public Hospital between June 1, 2023, and December 1, 2023. The diagnosis of asthma was confirmed through the patient's medical history and spirometric data in the Health Information System of the Ministry of Health of the Republic of Türkiye. Patients who were newly diagnosed with asthma, who were under the age of 18 years, and who were pregnant were excluded from the study. Patients' medical records were collected from the hospital and national databases. Demographics, comorbidities, smoking status, housing status, laboratory data, inhaler use, numbers of asthma exacerbations, asthma control status, level of anxiety, and quality of life parameters were recorded in the evaluation.

Comparative analyses were conducted to compare the data obtained from controlled asthma and uncontrolled asthma groups. Furthermore, a comparative analysis was performed to compare the use of inhaled corticosteroids (ICS) and short-acting beta-agonists (SABA) and asthma exacerbations in the pre- and post-earthquake periods.

EVALUATION OF ASTHMA CONTROL

Turkish version of the Asthma Control Test (ACT) was used to assess asthma control status. An ACT score of 19 or less indicated uncontrolled asthma whereas asthma is considered under control if the ACT score was 20 or higher. Study populations were divided into uncontrolled asthma and controlled asthma groups based on ACT scores.

QUALITY OF LIFE ASSESSMENT

Patients' quality of life was assessed using the Turkish version of the Short Form-36 (SF-36) which has been validated by several studies for use in various conditions. The SF-36 is a 36-item scale that measures 8 scales of health-related quality of life, including physical functioning (PF), social functioning, role limitations due to physical health problems (role physical-RP), role limitations due to emotional problems (role emotional-RE), mental health (MH), energy and vitality (VT), bodily pain (BP) and general health perception (GH).⁸

ASSESSMENT OF EMOTIONAL STATUS

Patients' anxiety levels were measured by the validated Turkish version of the Beck's Anxiety Inventory that consists of 21 items. Beck's Anxiety Inventory scores of 0-15 indicated mild anxiety, scores of 16-25 indicated moderate anxiety, and scores of 26-63 indicated severe anxiety.

STATISTICAL ANALYSIS

The IBM SPSS software for Windows® (IBM Corp., Armonk, NY, US) version 27.0 was used to analyze study data. Descriptive statistics were used to summarize continuous variables as mean±standard deviation and categorical variables as numbers and frequencies. The chi-square test was used to compare categorical variables, and The Mann-Whitney U and Student's *t*-independent tests were used to compare continuous variables between independent groups. The McNemar and Student's *t*-paired tests were used for the comparisons of pre-earthquake and post-earthquake data from this population.

For model building, patient's demographics and clinical data that may play a role in controlled in patients with asthma were using univariable regression analysis. When scanning variables for regression, the alpha level was accepted at 0.1. Variables with an alpha level <0.1 were analyzed with multivariable logistic regression. Model suitability and data matches were checked with Hosmer and Lemeshow tests. The results are presented with 95% confidence intervals (CI). *p* value <0.05 was considered statistically significant of all tests.

RESULTS

During the study period, 179 asthma patients were admitted to the pulmonary outpatient clinic. 44 patients with newly diagnosed asthma and 19 patients with missing data were excluded from the study. 116 out of 179 patients were included in the study (Figure 1). Approximately two-thirds of the patients had uncontrolled asthma (*n*=77, 66.4%). 39 patients (33.6%) were controlled. Several data on demographic features, comorbidities, and laboratory findings of the patients at the time of admission are summarized in Table 1. The mean age was 43.29±15.57 years. There was no significant difference in age between the un-

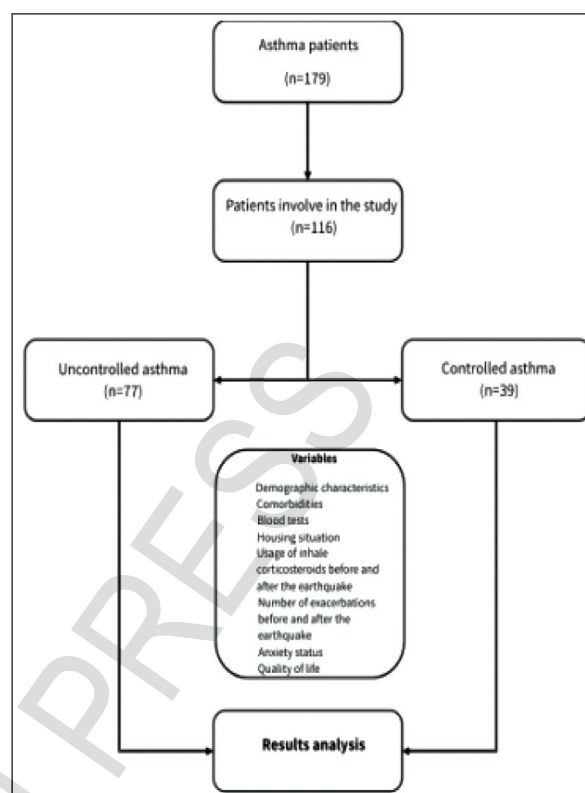


FIGURE 1: Flow chart.

controlled and controlled groups (44.18±15.93 years vs. 42.84±15.46 years, respectively; *p*=0.665). There was a female predominance in the study population (*n*=90, 77.6%). The rate of female patients in the controlled asthma group was significantly higher than uncontrolled asthma group. (*p*=0.007). Hypertension was the most common comorbidities in both groups, without a significant intergroup difference (10.2% vs. 14.3%; *p*=0.541). Approximately half of the patients (50.9%) live in temporary housing areas. Most of them were living in tents (32.8%) or containers (15.5%). No significant association was found between housing status and asthma control (*p*=0.497). Hemoglobin and hematocrit values were significantly higher in the uncontrolled group (*p*=0.037 and *p*=0.028, respectively). No statistically significant intergroup differences were found in any other laboratory parameters.

Thirty-two (27.6%) of the patients had at least one exacerbation between the earthquake and the day of admission. In the same population, the number of patients who had exacerbations in the 1-year period before the earthquake was 11 (9.5%). This difference

TABLE 1: Comparison of the demographic and clinical features and laboratory findings of controlled and uncontrolled asthma patients.

	Controlled (n=39)		Uncontrolled (n=77)		Total (n=116)		p value
	n	%	n	%	n	%	
Gender							
Female	36	92.3	54	70.1	90	22.4	0.007*
Male	3	7.7	23	29.9	26	77.6	
Age ($\bar{X}\pm$ SD)	44.18 \pm 15.93		42.84 \pm 15.46		43.29 \pm 15.57		0.665 [†]
Smoking							
Nonsmoker	33	84.6	63	81.8	96	82.8	0.457*
Exsmoker	0	0.0	3	3.9	3	2.6	
Smoker	6	15.4	11	14.3	17	14.6	
Comorbidities							
Hypertension	4	10.2	11	14.3	15	12.9	0.541*
Diabetes Mellitus	3	7.7	8	10.4	11	9.5	0.748*
CAD	4	10.3	7	9.1	11	9.5	1.000*
CVD	0	0	0	0	0	0	-
Malignancy	1	2.6	1	1.3	2	1.7	1.000*
Others	4	10.3	12	15.6	16	13.8	0.432*
Housing status							
Tent	15	38.5	23	29.9	38	32.8	0.497*
Container	5	12.8	13	16.9	18	15.5	
House	19	48.7	38	49.3	57	49.1	
Others	0	0	3	3.9	3	2.6	
Education level							
Illiterate	4	10.3	2	2.6	6	5.2	0.423*
Primary school	5	12.8	9	11.7	14	12.1	
Middle school	8	20.5	23	29.9	31	26.7	
High school	16	41.0	30	38.9	46	39.7	
University	6	15.4	13	16.9	19	16.4	
Blood tests							
Hbg (g/dL)	12.71 \pm 1.64		13.42 \pm 1.57		13.19 \pm 1.62		0.030[‡]
Htc (cells/mm ³)	38.98 \pm 3.87		40.91 \pm 4.54		40.28 \pm 4.41		0.028[‡]
Eos (cells/mm ³)	140 (20-490)		160 (20-1290)		160 (20-1.290)		0.663 [‡]
CRP (mg/dL)	3.95 (0.00-34.5)		2.00 (0.00-49.7)		2.50 (0.0-49.70)		0.500 [‡]

*Chi-squared test; [†]Independent samples t-test; [‡]Mann-Whitney U test; SD: Standard deviation; CAD: Coronary artery diseases; CVD: Cerebrovascular diseases; Hbg: Hemoglobin; Htc: Hematocrit; Eos: Eosinophil; CRP: C-reactive protein.

was statistically significant ($p<0.001$) (Figure 2a). Monthly SABAs use increased significantly in the post-earthquake period (pre-earthquake: 0.35 ± 0.59 /month vs. 1.02 ± 0.84 /month post-earthquake, $p<0.001$), while ICS use decreased significantly (pre-earthquake: 81.0% vs. 37.1% post-earthquake, $p<0.001$) (Figure 2b and Figure 2c). The most preferred treatment both pre- and post-earthquake was salmeterol fluticasone (pre-earthquake: 48.9% vs post-earthquake: 55.8%). The use of ICS and preferred agents month in the post-earthquake period are presented in Figure 3.

In the post-earthquake period, the number of patients with exacerbation was significantly higher in the uncontrolled group ($p=0.011$). Use of ICS was also significantly lower in the uncontrolled group (uncontrolled: 28.6% vs. 53.8% controlled, $p=0.008$). There was no difference between ICS in terms of asthma control status ($p=0.721$). Although monthly SABAs use was found to be higher in the uncontrolled group, this difference was not significant ($p=0.699$) (Table 2).

The quality of life and anxiety levels of asthma patients and their effects on asthma control were eval-

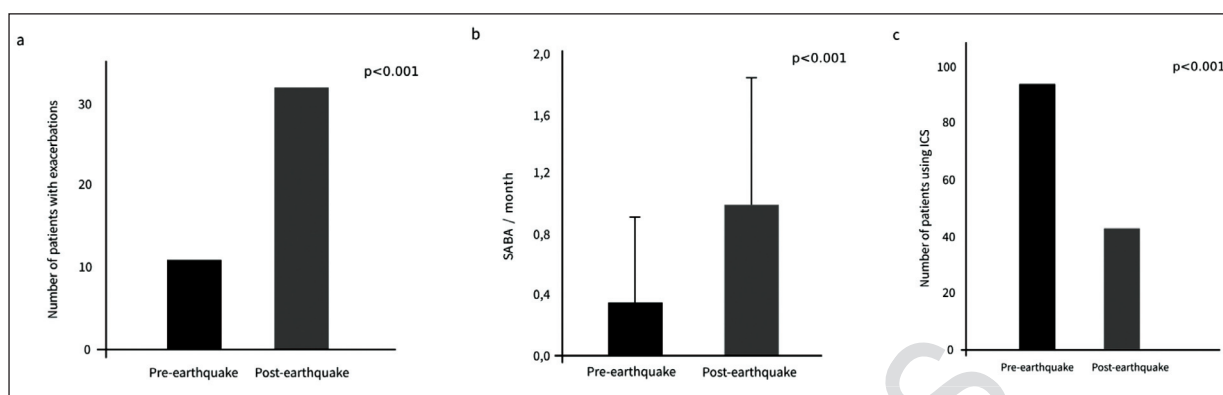


FIGURE 2: a) Number of exacerbations before and after the earthquake; b) Number of using short-acting beta-agonist before and after the earthquake; c) Number of using inhaled corticosteroids before and after the earthquake.

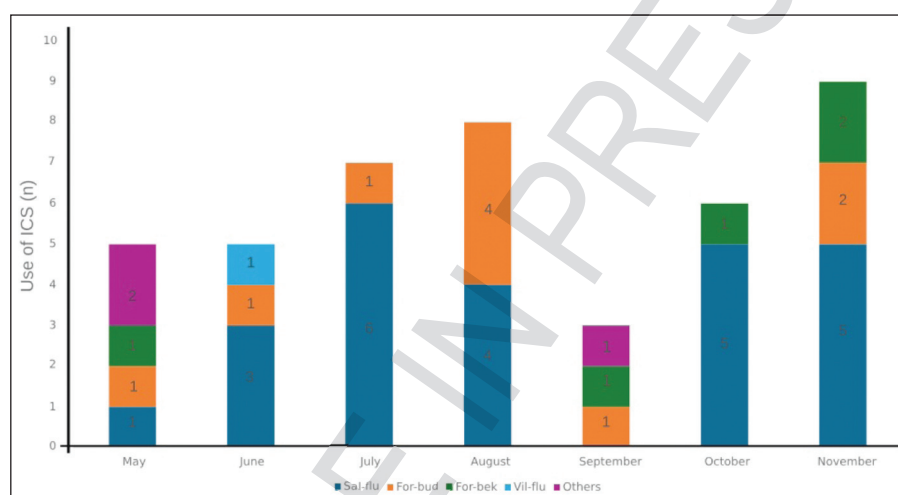


FIGURE 3: Use of inhaled corticosteroids by month in the post-earthquake period.

uated. The comparison of SF-36 parameters and mean Beck's anxiety score between the groups is presented in Table 3. All parameters of the SF-36 quality of life questionnaire were lower than the mean values of the Turkish urban population.⁸ The mean Beck anxiety score of the study population was 17.12 ± 11.09 , but it varied by month. The analysis of anxiety levels by month is presented in Figure 4.

In the multivariate regression analysis, ICS use was found to be independently associated with asthma control. It was identified that the probability of asthma control increased 3.70 times in patients using ICS compared to non-users. The presence of exacerbation in the post-earthquake period was also independently associated factor. In patients with exacerbations in the post-earthquake period, the possi-

bility of uncontrolled asthma increased by 0.24 times. Gender and hematocrit variables, which were significantly different between the groups, did not reach significance in multivariate regression analysis. The general health and role limitations due to emotional problems parameters of SF-36, which were included in the multivariate regression analysis did not reach significance either (Table 4).

DISCUSSION

Asthma, along with pneumonia and chronic obstructive pulmonary disease (COPD), is one of the most common respiratory diseases leading to hospital admissions in areas affected by natural disasters. Many risk factors have been associated with the deterioration of asthma. Discontinuation of ICS use, accom-

TABLE 2: Comparison of controlled and uncontrolled asthma groups in terms of asthma exacerbation and inhaler use.

	Controlled (n=39) n (%)	Uncontrolled (n=77) n (%)	Total (n=116) n (%)	p value
Exacerbation in the post-earthquake period				
Yes	5 (12.8)	27 (35.1)	32 (27.5)	0.011*
No	34 (87.2)	50 (64.9)	84 (72.5)	
Exacerbation in the pre-earthquake period				
Yes	2 (5.1)	9 (11.7)	11 (10.5)	0.255*
No	37 (94.9)	68 (88.3)	105 (89.5)	
ICS usage in the post- earthquake period				
Yes	21 (53.8)	22 (28.6)	43 (37.1)	0.008*
No	18 (46.2)	55 (71.4)	73 (62.9)	
ICS usage in the pre- earthquake period				
Yes	34 (87.2)	60 (77.9)	94 (81.0)	0.230*
No	5 (12.8)	17 (22.1)	22 (19.0)	
SABA/mounth in the post-earthquake period ($\bar{X}\pm SD$)	0.97 \pm 0.93	1.04 \pm 0.80	1.02 \pm 0.84	0.699†
SABA/mounth in the pre-earthquake period ($\bar{X}\pm SD$)	0.38 \pm 0.59	0.34 \pm 0.59	0.35 \pm 0.59	0.689†

*Chi-squared test; †Independent samples t-test; SD: Standard deviation; ICS: Inhaled corticosteroids, SABAs: Short-acting beta-agonists.

TABLE 3: SF-36 Quality of life scales and Beck's anxiety level of the patients in the post-earthquake period.

	Controlled (n=39)	Uncontrolled (n=77)	Total (n=116)	Average of Turkish population ^a	p value
Physical functioning	61.15 \pm 26.11	68.57 \pm 23.65	66.07 \pm 24.65	83.80 \pm 20.00	0.126†
Role limitations due to physical health	46.15 \pm 39.95	55.19 \pm 37.90	52.15 \pm 38.66	86.30 \pm 24.90	0.236†
Role limitations due to emotional problems	45.29 \pm 28.09	56.71 \pm 30.14	52.87 \pm 29.84	90.10 \pm 19.40	0.051†
Pain	45.0 (0.0-100.0)	57.5 (10.0-225.0)	58.10 \pm 29.51	82.9 \pm 18.90	0.114‡
Energy/fatigue	45.12 \pm 23.21	48.96 \pm 21.38	47.67 \pm 21.99	64.50 \pm 12.90	0.378†
Emotional well-being	59.69 \pm 17.34	58.02 \pm 18.39	58.58 \pm 17.99	71.00 \pm 11.00	0.640†
Social functioning	51.28 \pm 25.93	57.30 \pm 25.99	55.28 \pm 26.02	91.00 \pm 12.90	0.241†
General health	38.94 \pm 23.84	45.64 \pm 18.32	43.40 \pm 20.48	71.60 \pm 16.10	0.098†
Health change	39.74 \pm 21.24	43.50 \pm 22.72	42.24 \pm 22.21	83.80 \pm 20.00	0.391†
Becks' anxiety	17.71 \pm 12.40	16.83 \pm 10.43	17.12 \pm 11.09		0.686†

†Independent samples t-test; ‡Mann-Whitney U test.

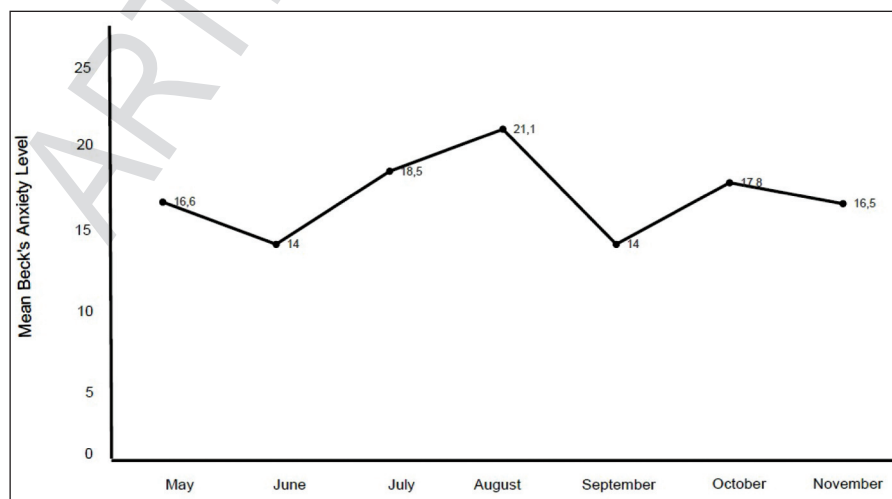
**FIGURE 4:** The analysis of anxiety levels by month in the post-eathquake period.

TABLE 4: Multivariable regression analysis for asthma control.

	OR	95% CI	p value
Female gender	2.320	0.49-10.95	0.288
ICS use in the post-earthquake period	3.707	1.44-9.54	0.007
Exacerbation in the post-earthquake period	0.245	0.069-0.86	0.029
Hematocrit (cells/mm ³)	0.924	0.81-1.04	0.219
General health	0.977	0.95-1.01	0.056
Role limitations due to emotional problems	0.992	0.97-1.08	0.23

ICS: Inhaled corticosteroids; OR: Odds ratio; CI: Confidence intervals.

modation in temporary homes, psychosocial stress, and increased respiratory infections are among them.^{6,7,9} Such differences may be originated from several variables, including the scale of the devastation, the quality of post-earthquake health services, the season of the occurrence of the earthquake. Our study has provided data on the level of disease control and factors affecting disease control in patients with asthma who survived the 7.8 Mw and 7.6 Mw earthquakes that occurred on February 6, 2023, in Kahramanmaraş, Türkiye.

We found that the earthquake significantly impaired asthma control and the frequency of asthma attacks increased in the devastated areas. However, control was not adequately achieved in patients even 9 months after the earthquake. Our data are consistent with data obtained from studies after other earthquakes. A 4.5-fold increase was reported in hospital admissions for respiratory diseases after the earthquake that occurred in Hanshin-Awaji, Japan on January 17, 1995. Asthma was one of the leading causes of hospital admissions, following pneumonia and chronic bronchitis.³ After another earthquake that occurred on March 11, 2011, in the Pacific coasts of Japan, the earthquake was linked to a 3.5-fold increase in hospital admissions for respiratory diseases and a 4- to 7-fold increase in hospital admissions for asthma.^{9,10}

Previous studies have indicated that the increase in the prevalence of asthma exacerbations occurs during the first-month post-earthquake.^{3,7,10} Suggesting that the exposure to intensive dust and noxious particulate matter might be the main causes of impaired asthma control in affected areas. In addition, various risk factors have been suggested to be associated with impaired asthma control in the medium to long term.

Among them, discontinuation of ICS use is one of the most associated factors. In a study by Fukuhara et al., inability to continue treatment with ICS was found to be responsible for the deterioration of asthma.^{8,9} Suzuki et al. reported that none of their patients had experienced earthquake-related exacerbations during the follow-up. The results were attributed to the fact that most of the patients (92%) in the study had access to treatment and education during the follow-up.¹¹ In our study, the use of ICS has markedly decreased following the earthquakes. In line with the literature, discontinuation of the treatment with ICS has been linked to impaired asthma control. All together, these data indicate the importance of inhale corticosteroids in asthma control. Several large studies have demonstrated that the risk for asthma exacerbation might increase with SABAs overuse.¹² Barriers to the access to ICS have driven the study patients to the use of SABAs. Therefore, it is crucial to ensure the supply of ICS to disaster areas in order to keep asthma under control.

Several studies have analyzed the impact of quality of life on asthma control.^{13,14} In these studies, various questionnaires are used to determine quality of life. SF-36 is a general health questionnaire that gives valid and reliable results in asthmatic patients. In a study conducted by Oliveira et al., associations were found between asthma control and three scales of SF-36 quality of life questionnaire whereas Bousquet et al. found associations between asthma control and all the scales of SF-36.^{13,14} Considering mean scores from general population in Türkiye, our results indicate that SF-36 quality of life questionnaire subscale scores were markedly lower in people living in disaster areas, regardless of the level of asthma control. However,

asthma control status was not directly associated with SF-36 subscale scores. This might be explained by the fact that most people living in this area were affected by the catastrophic situation and the impact was long-term. The lack of improvement in the parameters of quality of life over the period after the earthquakes might provide further support to this assumption.

Awareness of the potential role of psychological factors on asthma symptoms has been increasing in recent years. The term “psychogenic asthma” has been used to describe asthma cases in which the severity of the disease is exacerbated by psychological and emotional triggers. The persistence of anxiety is a challenge to overcome to achieve asthma control.¹⁵ However, there are also studies showing that there is no significant relationship between anxiety level and asthma control.¹⁶ In our study, although the mean anxiety level of asthma patients was found to be higher than in the normal population, no relationship was found between anxiety level and asthma control. We believe that quality of life and anxiety scores might be linked to asthma control under optimum conditions, but they may not be independent risk factors for asthma control in natural disasters such as the Kahramanmaraş earthquakes, which affected most people living in the disaster area.

Housing is among the major problems in disaster areas. Survivors of natural disasters might need temporary housing for months due to property damage. The prevalence of asthma and allergen sensitization have been demonstrated to increase in people living in temporary houses compared to the general population. This increase has been linked to increased indoor humidity associated with inadequate insulation and heating problems in temporary houses.⁶ The rate of temporary housing for 9 months was around 50% in the area where this study was conducted. Such a high rate has indicated the enormity of the devastation. However, no differences were found in asthma control between people residing in temporary houses and people living in permanent dwellings.

Our study is valuable because of its large sample size, and the inclusion of an analysis of psychosocial conditions such as quality of life and anxiety in addition to the analysis of asthma data from patients liv-

ing in the disaster area. However, this study has some limitations, most notably the unavailability of pre-earthquake ACT results even though pre-earthquake numbers of asthma exacerbations were available. Moreover, neither pre-earthquake nor post-earthquake pulmonary function parameters were not available. Another limitation was the lack of inhaler technique assessments.

CONCLUSION

The main reason for the lack of asthma control in the post-earthquake period seems to be the difficulty in accessing ICS. The increased frequency of asthma exacerbations after the earthquakes was also associated with the impaired access to ICS. Therefore, disaster management plans should be developed to timely provide medical supplies and optimal health services in areas vulnerable to disasters. Implementing short, medium, and long-term management plans may be useful to control asthma as well as other respiratory diseases.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

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REFERENCES

- Hussain E, Kalaycıoğlu S, Milliner CWD, Çakir Z. Preconditioning the 2023 Kahramanmaraş (Türkiye) earthquake disaster. *Nat Rev Earth Environ.* 2023;4(5):287-9. PMID: 37168360; PMCID: PMC10123572.
- D'Aloisio F, Vittorini P, Giuliani AR, Scatigna M, Del Papa J, Muselli M, et al. Hospitalization rates for respiratory diseases after l'Aquila earthquake. *Int J Environ Res Public Health.* 2019;16(12):2109. PMID: 31207898; PMCID: PMC6616506.
- Takakura R, Himeno S, Kanayama Y, Sonoda T, Kiriya K, Furubayashi T, et al. Follow-up after the Hanshin-Awaji earthquake: diverse influences on pneumonia, bronchial asthma, peptic ulcer and diabetes mellitus. *Intern Med.* 1997;36(2):87-91. PMID: 9099588.
- Ishiura Y, Fujimura M, Yamamoto H, Shiba Y, Ohkura N, Kasahara K, et al. Asthma exacerbations after the East Japan Disaster. *J Med Invest.* 2013;60(1-2):61-5. PMID: 23614913.
- Lin S, Gomez MI, Gensburg L, Liu W, Hwang SA. Respiratory and cardiovascular hospitalizations after the World Trade Center disaster. *Arch Environ Occup Health.* 2010;65(1):12-20. PMID: 20146998.
- Oshikata C, Watanabe M, Ishida M, Kobayashi S, Kubosaki A, Yamazaki A, et al. Increase in asthma prevalence in adults in temporary housing after the Great East Japan earthquake. *Int. J. Disaster Risk Reduct.* 2020;1:50. <https://doi.org/10.1016/j.ijdr.2020.101696>
- Tomita K, Hasegawa Y, Watanabe M, Sano H, Hitsuda Y, Shimizu E. The Totton-Ken Seibu earthquake and exacerbation of asthma in adults. *J Med Invest.* 2005;52(1-2):80-4. PMID: 15751277.
- Fukuhara A, Sato S, Uematsu M, Misa K, Nikaido T, Inokoshi Y, et al. Impacts of the 3/11 disaster in Fukushima on asthma control. *Am J Respir Crit Care Med.* 2012;186(12):1309-10. PMID: 23250503.
- Demiral Y, Ergor G, Unal B, Semin S, Akvardar Y, Kivircik B, et al. Normative data and discriminative properties of short form 36 (SF-36) in Turkish urban population. *BMC Public Health.* 2006;6:247. PMID: 17029646; PMCID: PMC1615878.
- Yamada S, Hanagama M, Kobayashi S, Satou H, Tokuda S, Niu K, et al. The impact of the 2011 Great East Japan Earthquake on hospitalisation for respiratory disease in a rapidly aging society: a retrospective descriptive and cross-sectional study at the disaster base hospital in Ishinomaki. *BMJ Open.* 2013;3(1):e000865. <https://doi.org/10.1136/bmjopen-2012-000865>
- Suzuki K, Hasegawa T, Iguchi S, Ota K, Sakagami T, Gejyo F, et al. The impact of the Chuetsu earthquake on asthma control. *Allergol Int.* 2007;56(2):179. PMID: 17460446.
- Nwaru BI, Ekström M, Hasvold P, Wiklund F, Telg G, Janson C. Overuse of short-acting β_2 -agonists in asthma is associated with increased risk of exacerbation and mortality: a nationwide cohort study of the global SABINA programme. *Eur Respir J.* 2020;55(4):1901872. PMID: 31949111; PMCID: PMC7160635.
- Oliveira MA, Fernandes AL, Santos LA, Carvalho MA, Faresin SM, Santoro IL. Discriminative aspects of SF-36 and QoL-EPM related to asthma control. *J Asthma.* 2007;44(5):407-10. PMID: 17613639.
- Bousquet J, Knani J, Dhivert H, Richard A, Chicoye A, Ware JE Jr, et al. Quality of life in asthma. I. Internal consistency and validity of the SF-36 questionnaire. *Am J Respir Crit Care Med.* 1994;149(2 Pt 1):371-5. PMID: 8306032.
- Di Marco F, Santus P, Centanni S. Anxiety and depression in asthma. *Curr Opin Pulm Med.* 2011;17(1):39-44. PMID: 20975562.
- Trzcińska H, Przybylski G, Kozłowski B, Derdowski S. Analysis of the relation between level of asthma control and depression and anxiety. *Med Sci Monit.* 2012;18(3):CR190-4. PMID: 22367130; PMCID: PMC3560746