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The Relationship Between Chronic Urticaria Development and Sensitization to House Dust Mites After the 2023 Kahramanmaraş Earthquakes in Türkiye

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ABSTRACT

Objective: Chronic spontaneous urticaria (CSU) is a skin disease often seen after earthquakes. Sensitization to house dust mites is a frequently seen condition in CSU patients in clinical practice. This study aims to determine the frequency of house dust mites sensitization in CSU patients who underwent a skin prick test (SPT) with aeroallergens after earthquakes that occurred in Türkiye in 2023.

Materials and Methods: The study included 408 CSU patients aged ≥18 years who presented at our clinic between January 2022 and May 2025, and underwent SPT. The patients were separated into two groups according to the time of CSU onset: patients whose complaints began before the earthquake (n=233, 57%), and patients whose complaints began for the first time after the earthquake (n=175, 43%).

Results: HDM sensitization was determined to be higher in the CSU patients diagnosed after the earthquake compared to those diagnosed before (45.7%, 29.1%, p<0.001). House dust mites sensitization was determined to be higher in the CSU patients living in temporary housing compared to those living at home (60.9%, 41.0%, p=0.025). The risk of developing CSU after the earthquake was increased approximately 2-fold by house dust mites sensitization and approximately 6-fold by living in temporary housing.

Conclusion: This study suggests a significant association between house dust mites sensitization and CSU following an earthquake.

Keywords: Chronic spontaneous urticaria, earthquake, house dust mites, skin prick test

INTRODUCTION

On 6 February 2023, two earthquakes occurred in the south-east of Türkiye, of 7.7 Mw magnitude at Pazarcık (Kahramanmaraş) and 7.6 Mw with the epicenter in Elbistan (Kahramanmaraş). A total of 11 cities, primarily Kahramanmaraş, were affected by these earthquakes. According to the official figures, 50,783 lives were lost, 115,353 individuals were injured, and 37,984 buildings were destroyed in these earthquakes (1).

It has been determined that sensitization to house dust mites (HDM) increases following environmental changes caused by natural disasters such as earthquakes and floods (2,3). HDM is a common environmental aeroallergen, and HDM sensitization is frequently encountered in clinical practice among chronic spontaneous urticaria (CSU) patients (4-8).

Although the dermatological consequences of earthquakes have not yet been comprehensively studied, existing evidence suggests that skin diseases increase after earthquakes. Following the 2015 Nepal earthquake, acute urticaria was reported as the most common dermatological disease (9). Similar results were obtained in studies in Türkiye after the Marmara earthquake on 17 August 1999 and the Düzce earthquake on 12 November 1999 (10,11). However, these studies did not investigate the relationship between earthquake, CSU, and HDM sensitization.

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This study aims to determine the frequency of HDM sensitization in CSU patients who underwent skin prick test (SPT) with aeroallergens after earthquakes in our region. A secondary objective is to identify risk factors for CSU after an earthquake.

MATERIALS and METHODS

Study Population

This retrospective study included CSU patients aged ≥18 years who presented at the allergy unit of our clinic between January 2022 and May 2025, and underwent SPT. Patients were separated into two groups according to the time of the onset of CSU: patients whose complaints began before the earthquake (regardless of post-earthquake persistence) (n=233, 57%) and patients whose complaints began after the earthquake (with no history of CSU before the earthquake) (n=175, 43%).

Exclusion Criteria

Patients <18 years of age, patients unable to undergo SPT due to dermographism, and patients with isolated chronic inducible urticaria (CIndU) were excluded from the study. SPT was performed at least 7 days after the last dose of antihistamines, systemic corticosteroids, and topical corticosteroids applied to the test area, while patients were asymptomatic.

Data Collection

Patients were evaluated in respect of CSU etiology, medical history, physical examination findings, and laboratory test results. Information for each patient was obtained retrospectively from archived patient records in the clinic and the hospital electronic medical records. This included demographic data (age, sex, housing status [housing, temporary housing]), clinical data (comorbidities, atopy, disease duration [the period from the onset of signs or symptoms to the last attack], concomitant angioedema or CIndU), and laboratory data (serum total immunoglobulin [Ig] E levels, serum eosinophil count [if glucocorticoids had not been taken recently], C-reactive protein [CRP] levels, antithyroid peroxidase antibody [anti-TPO Ab], antinuclear antibody, and SPT).

Low IgE level was accepted as <100 IU/mL, eosinopenia as $<0.05x10^9$/L, high CRP as >5 mg/dL, and anti-TPO Ab positivity as ≥35 IU/mL.

Skin Prick Test

A clinically standardized SPT panel (Lofarma®, Milano, Italy) was performed for all patients with suspected sensitization to aeroallergens; HDM (Dermatophagoides farinae, Dermatophagoides pteronyssinus), Grass mix 5 (Timothy, Orchard, Meadow fescue, Italian ryegrass, Kentuchy bluegrass), Artemisia vulgaris, Parietaria judaica, Plantago lanceolata, Betulacea mix (Grey alder, Silver birch), Cupressus arizonica, White pine (Pinus sylvestris), Olive tree (Olea europea), Aspergillus fumigatus, Alternaria alternata, Cockroach (Blattella germanica), Dog, Cat. Histamine (10 mg/mL) and saline (0.9% NaCl) were used as positive and negative controls, respectively. The swelling diameter was measured in millimetres after 20 minutes. A reaction at least 3 mm larger than the negative control was considered positive. SPT was performed by the same trained nurse on both forearm flexor surfaces, applying both positive and negative control to both arms.

Allergen sensitization was grouped as HDM, Pollens (Grass mix, Weeds [Artemisia vulgaris, Parietaria judaica, Plantago lanceolata], Tree mix (Betulacea mix, Cupressus arizonica, White pine, Olive tree), Molds (Aspergillus fumigatus, Alternaria alternata), Animal epithelium (Dog, Cat), and Cockroach.

Ethics Approval

This study protocol was reviewed and approved by the Ethics Committee of Kahramanmaraş Sütçü İmam University Faculty of Medicine (approval number; 2025/12-12 [07.04.2025]) and Republic of Türkiye Ministry of Health Kahramanmaraş Provincial Health Directorate Ethics Commission (approval date; 01.07.2025). This retrospective review of patient data did not require written informed consent from participants in accordance with local guidelines.

Statistical Analysis

Data obtained in the study were analyzed statistically using IBM SPSS v. 27.0 software. The normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Variables following a normal distribution were summarized as mean ± standard deviation (SD), whereas those not normally distributed were presented as median values with min-max. Categorical variables were displayed as absolute numbers (n) and corresponding percentages (%). The Pearson $\chi 2$ test was applied in the comparisons of categorical variables. For comparisons of continuous variables,

the independent samples t-test and the Mann-Whitney U-test were used. The level of statistical significance was accepted as p <0.05.

Univariate and multivariate logistic regression analyses were used to identify risk factors for CSU after the earthquake. All variables with p values <0.1 in univariate analyses were included in multivariate logistic regression analyses. A value of p <0.05 was considered to be statistically significant.

RESULTS

Patient Population

Evaluations were made of a total of 408 patients, comprising 290 (71%) females and 118 (29%) males with a mean age of 37.2±13.3 years. The diagnosis of CSU had been made before the earthquake in 233 (57%) patients and after the earthquake in 175 (43%) patients. The median duration of the disease was found to be 10 (2-480) months, and it was determined to be shorter in CSU patients diagnosed after the earthquake (6 months vs. 18 months, p <0.001) (Table I).

The Clinical and Laboratory Characteristics of The CSU Patients Diagnosed Before and After the Earthquake

Comorbidities were determined in 93 (22.8%) patients and atopy in 99 (24.2%). Angioedema was present in 134 (32.8%) patients and CIndU in 37 (9.0%). The presence of CIndU was determined at a significantly lower rate in the CSU patients diagnosed after the earthquake compared to those who were diagnosed before the earthquake (5.7% vs. 11.5%, p=0.041) (Table I).

The serum total IgE level was determined to be higher in the CSU patients diagnosed after the earthquake compared to those diagnosed before (138.5 IU/mL vs. 93.8 IU/mL, p <0.001) (Table II).

HDM sensitization was determined to be higher in the CSU patients diagnosed after the earthquake compared to those diagnosed before (45.7% vs. 29.1%, p <0.001) (Figure 1).

Table I: Clinical characteristics of patients with chronic spontaneous urticaria before and after the earthquake.

	Total, n (%)	Before the earthquake, n (%)	After the earthquake, n (%)	p[a]
	408 (100)	233 (57)	175 (43)	
Age, years, means ± SD	37.2 ± 13.3	36.4 ± 13.0	38.2 ± 13.7	0.167[b]
Sex				
Female	290 (71)	172 (73.8)	118 (67.4)	0.159
Male	118 (29)	61 (26.2)	57 (32.6)	0.159
Disease duration, months, median (min-max)	10 (2-480)	18 (2-480)	6 (2-20)	**<0.001**[c]
Comorbidity	93 (22.8)	50 (21.4)	43 (24.5)	0.458
Hypertension	38 (9.3)	16 (6.8)	22 (12.5)	0.050
Diabetes mellitus	25 (6.1)	10 (4.3)	15 (8.5)	0.074
Hypothyroidism	20 (4.9)	11 (4.7)	9 (5.1)	0.845
Psychiatric disease	18 (4.4)	14 (6.0)	4 (2.3)	0.070
Rheumatologic disease	2 (0.5)	2 (0.8)	-	-
Asthma	18 (4.4)	12 (5.1)	6 (3.4)	0.402
Atopy	99 (24.2)	63 (27.0)	36 (20.5)	0.132
Allergic rhinitis	74 (18.1)	43 (18.4)	31 (17.7)	0.848
Angioedema	134 (32.8)	79 (33.9)	55 (31.4)	0.598
Concomitant CIndU	37 (9.0)	27 (11.5)	10 (5.7)	**0.041**

CIndU: Chronic inducible urticaria. [a]$\chi 2$ test (data were shown as number and percentages). [b]Independent samples t-test (data were shown as mean with standard deviation). [c]Mann-Whitney U-test (data were shown as medians with min-max)

Table II: Laboratory characteristics of patients with chronic spontaneous urticaria before and after the earthquake.

	Total, n (%)	Before the earthquake, n (%)	After the earthquake, n (%)	p[a]
	408 (100)	233 (57)	175 (43)	
Total IgE levels (IU/mL), median (min-max)	107.5 (10.8-1620)	93.8 (10.8-1620)	138.5 (16.9-1320)	**<0.001**[b]
Low IgE	196 (48.0)	142 (60.9)	54 (30.8)	**<0.001**
Eosinopenia	30 (7.3)	17 (7.3)	13 (7.4)	0.960
Elevated CRP	61 (14.9)	37 (15.8)	24 (13.7)	0.544
Anti-TPO Ab positivity	40 (9.8)	22 (9.4)	18 (10.2)	0.777
ANA positivity	53 (13.0)	27 (11.6)	26 (14.8)	0.331
SPT positivity	223 (54.6)	113 (48.4)	110 (62.8)	**0.004**

Ig: Immunoglobulin, **anti-TPO Ab:** Antithyroid peroxidase antibody, **ANA:** Antinuclear antibody, **SPT:** Skin prick test. [a]$\chi 2$ test (data were shown as number and percentages). [b]Mann-Whitney U-test (data were shown as medians with min-max).

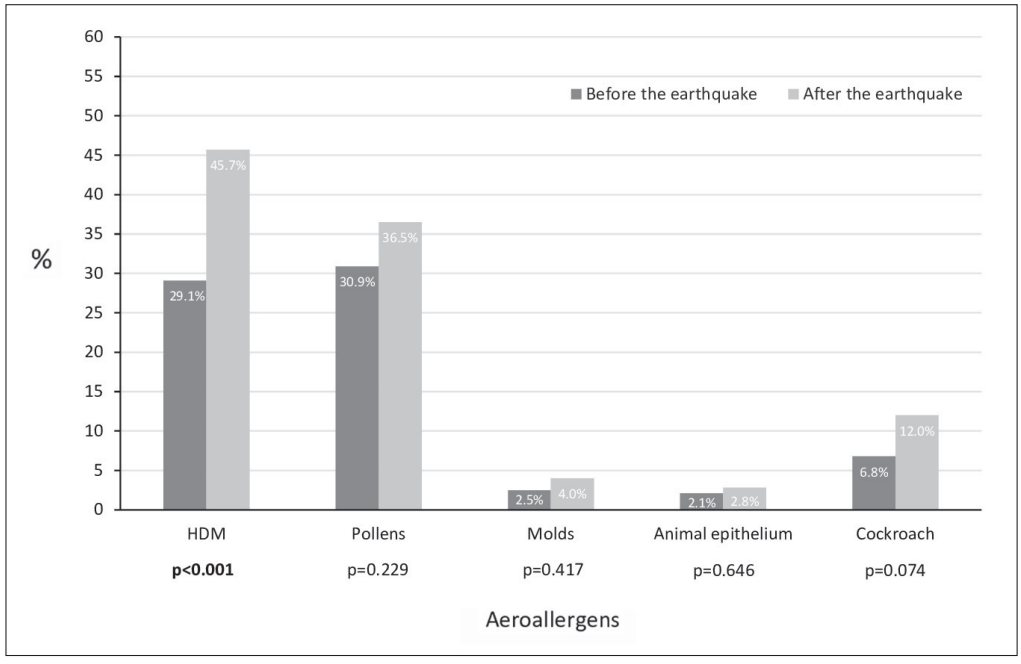

Figure 1: Distribution of aeroallergen sensitivity in chronic spontaneous urticaria patients before and after the earthquake.
HDM: *House dust mites.*

The Skin Prick Test Results in Patients Living in Temporary Housing and at Home After the Earthquake

HDM and mold sensitization was determined to be higher in the CSU patients living in temporary housing compared to those living at home (p=0.025, p=0.032, respectively) (Figure 2).

Risk Factors for CSU After the Earthquake

The results of the univariate logistic analyses revealed that living in temporary housing (OR, 6.823; 95% CI, 3.309-14.070, p <0.001), HDM positivity (OR, 2.043; 95% CI, 1.356-3.079, p <0.001), and cockroach positivity (OR, 1.849; 95% CI, 0.935-3.659, p=0.077) were associated with CSU after the earthquake (Table III).

Multivariate logistic regression analysis was then performed and the results showed that living in temporary housing (OR, 6.374; 95% CI, 3.064-13.259, p <0.001) and HDM positivity (OR, 1.871; 95% CI, 1.188-2.946, p=0.007) were associated with CSU after the earthquake (Table III).

DISCUSSION

This study is the first to have examined this subject and the results obtained demonstrated that there were signifi-

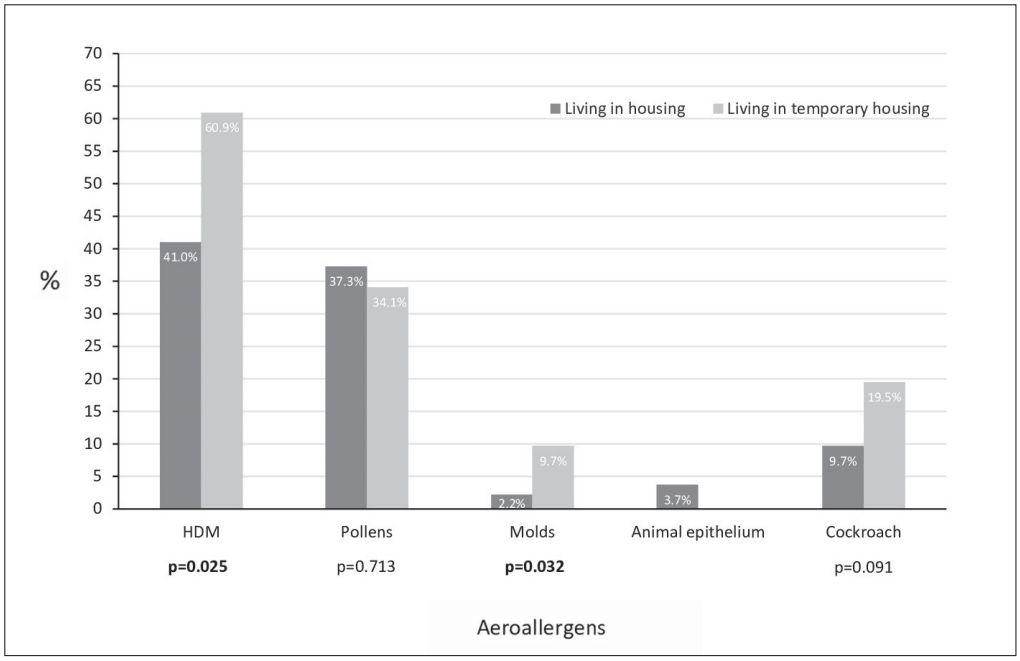

Figure 2: Distribution of aeroallergen sensitization in patients living in temporary housing and at home after the earthquake.
HDM: *House dust mites.*

Table III: Logistic regression analysis results of risk factors for chronic spontaneous urticaria after the earthquake.

Variables	Univariate analysis			Multivariate analysis		
	OR	95% CI	p	OR	95% CI	p
Sex (female vs. male)	0.734	0.477-1.129	0.159			
Comorbidity (yes vs. no)	1.192	0.749-1.898	0.459			
Atopy (yes vs. no)	0.699	0.438-1.115	0.132			
HDM positivity (yes vs. no)	2.043	1.356-3.079	**<0.001**	1.871	1.188-2.946	**0.007**
Pollens positivity (yes vs. no)	1.289	0.852-1.952	0.230			
Molds positivity (yes vs. no)	1.576	0.520-4.776	0.421			
Cockroach positivity (yes vs. no)	1.849	0.935-3.659	**0.077**	1.027	0.474-2.226	0.945
Living in temporary housing (yes vs. no)	6.823	3.309-14.070	**<0.001**	6.374	3.064-13.259	**<0.001**

HDM: House dust mites, **OR:** Odds ratio, **CI:** Confidence interval

cant differences between CSU patients diagnosed before and after the earthquake in respect of clinical presentation, associated conditions, laboratory test results, and SPT positivity. CSU patients diagnosed after the earthquake were determined to have higher rates of SPT positivity and HDM sensitization. Both mold and HDM sensitization were seen to be higher in CSU patients living in temporary housing after the earthquake. HDM sensitization and living in temporary housing were determined to be risk factors for the development of CSU after earthquakes.

Earthquakes have been associated with the exacerbation of some dermatological problems such as stress-origin dermatoses, dermatoses directly due to trauma, and dermatoses due to infrastructure damage and unhygienic living conditions (10,11). In a study following the 1999 Marmara (Kocaeli/Türkiye) earthquake, it was reported that dermatoses due to the direct physical effect of the earthquake were seen most frequently in the first 3 months followed by dermatoses due to stress (10). Similar results were obtained in a study conducted after the 1999 Düzce (Türkiye) earthquake (11). Again, a study conducted in our country after the 2023 Kahramanmaraş (Türkiye) earthquakes has revealed that earthquakes and the stress they cause are significant risk factors for CSU patients living in earthquake zones (12).

CSU is characterized by recurring urticaria, angioedema, or a combination of both for a period of 6 weeks or longer (13). In addition, patients with accompanying angioedema are characterized by a longer disease duration than those without (14). Patients in the current study who were diagnosed before the earthquake were found to have angioedema more often and had a longer disease duration, whereas those diagnosed after the earthquake had accompanying angioedema less often and a shorter disease duration. The lower rate of accompanying angioedema in those diagnosed after the earthquake may be associated with the shorter disease duration, and this finding is consistent with previous studies.

CSU is an autoimmune disease mediated by mast cells. Two endotypes have been defined as Type I autoimmunity (autoallergic) and Type IIb autoimmunity. Both of these two endotypes exhibit similar phenotypic features but there are clinical differences in respect of disease activity, comorbidities, and treatment response (15,16). While CSU is generally seen with high serum total IgE levels, normal or low total IgE levels can also be observed. Normal or high total IgE levels support Type I autoimmunity while low total IgE levels support Type IIb autoimmunity (17). In the current study, the serum total IgE levels were determined to be high in the CSU patients. Despite a history of atopy at a lower rate in the patients diagnosed after the earthquake, the serum total IgE levels were determined to be higher than those of the patients diagnosed before the earthquake, and this could explain the higher rate of SPT positivity in this group.

Although CSU is considered to be a disease associated with autoimmunity, many studies have reported that a relationship has been determined between CSU and HDM sensitization. However, despite this relationship, there are insufficient published data showing the clinical association of HDM sensitization with CSU etiology and treatment (4,18).

HDM are common environmental allergens, which are frequently seen sensitizing aeroallergens in patients with allergic rhinitis or asthma (19). Previous studies have determined that HDM sensitization is increased after disasters such as floods and earthquakes (2,3). In a study conducted following the 2011 Tohoku (Japan) earthquake, there was determined to be an increase in the asthma prevalence of those living in temporary housing. In the same study, it was stated that HDM sensitization was increased in patients with and without asthma, and was even higher in those living in temporary housing (3). It has also been shown that HDM sensitization is often encountered and is a significant exacerbating factor in dermatological diseases such as CSU and atopic dermatitis (20). Although HDM sensitization is known to increase after an earthquake, there are no previous studies in the literature that have evaluated the relationship with CSU. The results of the current study demonstrated that HDM sensitization in CSU patients increased significantly after the earthquake.

The CSU patients diagnosed before the earthquake were found to show HDM sensitization at the rate of 29.1%, and this rate increased to 45.7% for the patients diagnosed after the earthquake. These results are consistent with the findings of previous studies that have shown an increase in HDM sensitization in asthma patients after an earthquake.

As the epicenter of the 2023 earthquakes, the city of Kahramanmaraş was greatly damaged. Following the earthquakes, the majority of residents had to move into temporary housing as their homes were destroyed or damaged. The results obtained in this study show that HDM sensitization was higher in CSU patients living in temporary housing for at least one year than in those who were living at home. Although this study did not focus on living conditions after the earthquake and data about building damage status, the HDM sensitization rates were determined to be 41.0% for the CSU patients living at home and 60.9% for those living in temporary housing. HDM exposure is related to indoor humidity. Temporary housing would probably mean crowding and more humid indoor climate explaining a higher amount of HDMs and thereby a higher exposure and risk of sensitization. This shows that the accommodation conditions are an important factor that should be considered when evaluating CSU patients living in earthquake zones. Moreover, avoidance of allergens through changes in accommodation conditions after an earthquake could reduce HDM sensitization and CSU frequency. In another study conducted after the 2011 Tohoku (Japan) earthquake, it was reported that avoidance of HDMs in those living in temporary housing after the earthquake lowered specific IgE levels and reduced asthma symptoms (21).

The epithelial barrier is accepted as the primary line of defense against irritant agents, pathogens, and allergens. Environmental substances such as air pollutants, detergents, allergens such as HDM, microplastics, and

food additives cause deterioration of the epithelial barrier (22,23). Therefore, disruption of the skin epithelial barrier has been associated with various dermatological diseases such as atopic dermatitis, allergic contact dermatitis, CSU, and psoriasis (24,25). Although HDMs primarily enter the body through inhalation, they can also enter through the digestive tract or directly through the epidermis (18,26). There are no clear data in the literature showing the relationship between HDM sensitization and CSU, but the current study results show that this significant HDM sensitization obtained in CSU patients is not coincidental. The results suggest that HDMs may cause CSU in some sensitive patients.

As earthquake is a relatively rarely experienced disaster, there are insufficient studies evaluating data after an earthquake. In this study, the clinical characteristics, laboratory test results, and SPT positivity rates were reported in CSU patients who were diagnosed before and after an earthquake.

Nevertheless, there were some limitations to this study. The first is that although the study was conducted in the city at the epicenter of the earthquakes, as this was a single center the results may not reflect the data of all earthquake zones. Another limitation is that allergen-specific IgE values could not be included in the study due to difficulties in the post-earthquake registration system. Nevertheless, our large sample obtained from a single center strengthens our study.

CONCLUSION

This study suggests a significant association between HDM sensitization and CSU following an earthquake. These findings support previous evidence pointing to a potential role of HDM in CSU pathogenesis. Further studies are needed to clarify the underlying mechanisms.

Ethics Approval

This study protocol was reviewed and approved by the Ethics Committee of Kahramanmaraş Sütçü İmam University Faculty of Medicine (approval number; 2025/12-12 [07.04.2025]) and Republic of Türkiye Ministry of Health Kahramanmaraş Provincial Health Directorate Ethics Commission (approval date; 01.07.2025). This retrospective review of patient data did not require written informed consent from participants in accordance with local guidelines.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article..

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Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

Author Contributions

The author (**Eray Yildiz**) confirm responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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