

# Analysis of Patient Presentations to the Emergency Department Due to Anxiety Associated with the Lunar Cycle and Seasonality

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## Abstract

**Aim:** To analyze the distribution of patients who presented to the emergency department (ED) because of anxiety according to the lunar cycle and seasons.

**Materials and Methods:** Patients who presented to the ED because of anxiety over 1 year were identified. Patients' age and sex, date and time of emergency presentation, presence of psychiatric history, and clinical outcomes were obtained by screening patients' epicrisis. Using the date and time information, the lunar cycle during which each presentation occurred was determined using a website. The recorded characteristics of the patients were then analyzed according to the lunar cycle and seasonality.

**Results:** The study included a total of 1,179 patients, of whom 58.6% were women. The mean age was  $39.1 \pm 15.2$  years. Most patients (69.9%) were aged 18-44 years. It was found that 58.6% (n=691) of all patients were female, 25.4% (n=300) presented to the ED during the last quarter phase of the lunar cycle, and 36.7% (n=433) during the summer season. It was determined that patients diagnosed with psychiatric diseases visited the hospital at a higher rate during the winter, and the hospitalization rate was higher in the winter season ( $p < 0.05$ ). The hospitalized patients were mostly young, male patients diagnosed with psychiatric diseases ( $p < 0.05$ ).

**Conclusion:** The results showed that the number of ED presentations due to anxiety was the highest in the last quarter of the lunar cycle, during the summer season, and among women. Patients with a history of psychiatric diseases and young male patients were hospitalized more frequently during the winter.

**Keywords:** Anxiety, lunar cycle, seasonality

## Introduction

Anxiety is a psychiatric disorder that is mostly associated with fear, nervousness, anxiety, and panic but can also affect the cardiovascular, respiratory, gastrointestinal, and nervous systems, either individually or in combination (1). Although anxiety disorders (e.g., generalized anxiety disorder, panic disorder/agoraphobia, and social anxiety disorder) vary according to age, sex, and race, they constitute the most common mental disorders according to US data (1,2). It has been reported that 19% of the population in the USA experiences an anxiety attack at least once during six months (1).

Psychiatric complaints constitute a significant portion of emergency department (ED) presentations. Because of the

frequent co-occurrence of anxiety with new and rapid-onset symptoms, patients tend to first refer to emergency services. Anxiety accounts for 20% of patient visits to the ED with psychiatric complaints and 1.1% of all ED presentations (3). If patients who receive their initial interventions here are not accurately diagnosed, appropriately treated, or properly referred, repeated presentations to the ED occur, which leads to an increase in the burden on the health system and the cost of mental health services (1).

Today, even in developed countries, there is a prevailing belief that diseases are associated with the zodiac signs and certain phases of the moon. Therefore, the possible relationship between the lunar cycle and many diseases has been the subject of research



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(4). The potential effects of celestial bodies on human existence have been a topic of investigation since the advent of lunar cycle exploration (5). It is believed that the lunar cycle changes the behavior, emotions, and health of individuals through its effects on sleep and human physiology (5,6). Similarly, there is a widespread belief among healthcare professionals and a considerable portion of society that seasonality and the lunar cycle are linked to psychological symptoms. Studies conducted on this subject have shown that while seasonal changes affect psychological symptoms, the lunar cycle significantly affects mental health (7).

The full moon affects human behavior. Many studies have been conducted to investigate the relationship between the full moon and violence, suicides, murders, and ED presentations due to psychiatric disorders. Although the majority of these investigations failed to establish a statistically significant correlation between the lunar cycle and psychiatric ED visits or suicides, a few studies did identify a relationship between crimes committed and the full moon (6,8). Similarly, studies have shown that bipolar disorders and the lunar cycle are related (9).

Despite the availability of many publications exploring the relationship between the lunar cycle and various diseases, to the best of our knowledge, there is a scarcity of research investigating the relationship between anxiety and the lunar cycle. Therefore, in our study, we aimed to analyze the distribution of adult patients who presented to the ED and were diagnosed with anxiety according to the lunar cycle and seasonality and to compare the data obtained with those of the existing literature.

## Materials and Methods

This study was conducted in the ED of a tertiary hospital. The hospital where the study was conducted is the only official healthcare institution in the province and serves approximately 25-30,000 patients monthly. The study was initiated after receiving approval from the Adiyaman University Training and Research hospital non-invasive clinical research ethics committee (ethical decision number: 2021/10-12, date: 14.12.2021).

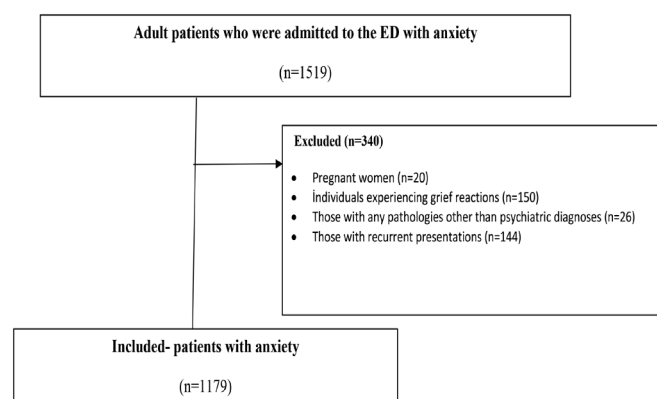
In this study, patients who presented to the ED between November 1 and October 30, 2021 and were diagnosed with anxiety were retrospectively examined. These patients were identified using the International Classification of Diseases codes F41 (anxiety disorders), F41.0 (panic disorder), and F41.1 (generalized anxiety disorder) from the hospital registry system. For the identified patients, age and sex, and the date and time of presentation to the ED, were recorded. In addition, the patients'

epicrisis and drug histories were examined, and any diagnosed psychiatric diagnosis and outcome after presentation to the ED (hospitalization or discharge) were recorded. The seasons were defined as follows: summer, June 1-August 31; autumn, September 1-November 30; winter, December 1-February 28; and spring, March 1-May 31. The lunar cycle was classified as the new moon, the first quarter moon, the full moon, and the last quarter moon. Using the date and time when the patients were registered in the ED, it was determined during which phase of the moon each patient presented to the ED. For this purpose, a website ([www.timeanddate.com](http://www.timeanddate.com)) was used (10). Using this information, changes in the characteristics of the patients were examined according to the lunar cycle, seasonality, and outcomes.

Pediatric patients (<18 years), pregnant women, individuals experiencing grief reactions due to the death of a relative, those with any pathologies other than psychiatric diagnoses (heart attack, stroke, etc.), and those with recurrent presentations were excluded from the study (Figure 1).

## Statistical Analysis

The SPSS program version 22 was used in this study. The suitability of continuous data for normal distribution was determined using the Kolmogorov-Smirnov test. The data that conformed to the normal distribution were analyzed using Student's t-test, and those that did not comply with the normal distribution were analyzed using the Mann-Whitney U test. The chi-square test was used to compare qualitative data. Numerical data that complied with the normal distribution were expressed as mean  $\pm$  standard deviation, and those without a normal distribution were shown as median (minimum-maximum) values. Categorical variables are expressed as numbers and percentages. p values of <0.05 were considered statistically significant.



**Figure 1.** Patient flow chart  
ED: Emergency department

## Results

During the 1-year study period, 293,500 patients visited the ED. The number of patients diagnosed with anxiety was 1,519. Of these patients, 340 were excluded from the study because they did not meet the eligibility criteria; therefore, the study was conducted with the remaining 1,179 patients. The mean age of these patients was 39.1±15.2 years, and 69 percent of patients were aged 18-44 years. It was observed that 58.6% (n=691) of all patients were female, 25.4% (n=300) presented to the ED during the last quarter phase of the lunar cycle and 36.7% (n=433) during the summer season, 91.9% (n=1084) were discharged from the ED, and 54% (n=637) had a previous psychiatric diagnosis.

Most patients were discharged from the ED (91.9%), with the highest discharge rate being observed during the first quarter moon (93.9%) and among female patients (60.3%). Examinations

of age, gender, season of presentation, presence of psychiatric diagnosis, and patient outcomes indicated no significant change according to the different phases of the month (p>0.05) (Table 1).

Upon analyzing patient presentations according to seasons, we determined that the highest number of presentations occurred during summer (36.7%), whereas patients with psychiatric diagnoses had a higher rate of winter presentations (p<0.001). The hospitalization rate was also higher among those visiting the ED during winter (p=0.008) (Table 2).

It was determined that the hospitalized patients were mostly between the ages of 18 and 44 years (p=0.003). In addition, male gender and the presence of a psychiatric diagnosis were determined to be factors that were highly prevalent among the hospitalized patients (p<0.001) (Table 3).

**Table 1. Demographic and clinical characteristics of the patients presenting to the emergency department with anxiety**

Variables		Total (n=1.179)	New moon (n=292, 24.8%)	First quarter moon (n=293, 24.9%)	Full moon (n=294, 24.9%)	Last quarter moon (n=300, 25.4%)	p value
Age (years)	18-44	799 (69%)	205 (71.9%)	197 (69.1%)	199 (68.4%)	198 (66.7%)	0.19
	45-65	280 (24.2%)	69 (24.2%)	62 (21.8%)	69 (23.7%)	80 (26.9%)	
	>65	79 (6.8%)	11 (3.9%)	26 (9.1%)	23 (7.9%)	19 (6.4%)	
Gender	Female	691 (58.6%)	183 (62.7%)	157 (53.6%)	175 (59.5%)	176 (58.7%)	0.162
	Male	488 (41.4%)	109 (37.3%)	136 (46.4%)	119 (40.5%)	124 (41.3%)	
Season	Winter	206 (17.5%)	55 (18.8%)	44 (15%)	54 (18.4%)	53 (17.7%)	0.357
	Spring	289 (24.5%)	73 (25%)	71 (24.2%)	73 (24.8%)	72 (24%)	
	Summer	433 (36.7%)	108 (37%)	106 (36.2%)	118 (40.1%)	101 (33.7%)	
	Autumn	251 (21.3%)	56 (19.2%)	72 (24.6%)	49 (16.7%)	74 (24.7%)	
Diagnosed	Yes	637 (54%)	154 (52.7%)	165 (56.3%)	170 (57.8%)	148 (49.3%)	0.159
	No	542 (46%)	138 (47.3%)	128 (43.7%)	124 (42.2%)	152 (50.7%)	
Outcome	Hospitalized	95 (8.1%)	30 (10.3%)	18 (6.1%)	27 (9.2%)	20 (6.7%)	0.197
	Discharged	1084 (91.9%)	262 (89.7%)	275 (93.9%)	267 (90.8%)	280 (93.3%)	

**Table 2. Seasonal distribution of the patients**

Variables		Winter (n=206 17.5%)	Summer (n=433, 36.7%)	Spring (n=289, 24.5%)	Autumn (n=251, 21.3%)	p value
Age (years)	18-44	146 (72.3%)	293 (68.9%)	189 (65.6%)	171 (70.4%)	0.532
	45-65	43 (21.3%)	108 (25.4%)	73 (25.3%)	56 (23%)	
	>65	13 (6.4%)	24 (5.6%)	26 (9%)	16 (6.6%)	
Gender	Female	107 (51.9%)	263 (60.7%)	162 (56.1%)	159 (63.3%)	0.053
	Male	99 (48.1%)	170 (39.3%)	127 (43.9%)	92 (36.7%)	
Diagnosed	Yes	133 (64.6%)	204 (47.1%)	167 (57.8%)	133 (53%)	<0.001
	No	73 (35.4%)	229 (52.9%)	122 (42.2%)	118 (47%)	
Outcome	Hospitalized	24 (11.7%)	20 (4.6%)	27 (9.3%)	24 (9.6%)	0.008
	Discharged	182 (88.3%)	413 (95.4%)	262 (90.7%)	227 (90.4%)	

Variables		Hospitalized (n=95)	Discharged (n=1.084)	p value
Age (years)	18-44	78 (82.1%)	721 (67.8%)	0.003
	45-65	17 (17.9%)	263 (24.7%)	
	>65	0 (0%)	79 (7.4%)	
Gender	Female	37 (38.9%)	654 (60.3%)	<0.001
	Male	58 (61.1%)	430 (39.7%)	
Diagnosed	Yes	80 (84.2%)	657 (51.4%)	<0.001
	No	15 (15.8%)	527 (48.6%)	

## Discussion

Anxiety is the most common psychiatric disorder in the general population. Patients with anxiety frequently present to the emergency services. In a study by Dark et al. (2017) (11), 0.93% of ED presentations were reported to be made because of anxiety. The majority of patients presenting to the ED in that study were young patients with psychiatric disorders, and the number of women was higher than that of men. In our study, it was observed that approximately 0.4% of ED presentations were due to anxiety. Similar to the literature, young female patients had a higher rate of anxiety-related ED visits.

Climatic factors such as sunlight, temperature, and humidity have an impact on human health, emotions, and behavior (12). Therefore, seasonal changes affect human psychology. Despite the presence of several studies in this area, the relationship between anxiety and seasons remains unclear. According to a previous study, the severity of anxiety symptoms was lowest in autumn and spring and highest in winter and summer (13). In another study examining the relationship between patient presentations to the psychiatry outpatient clinic due to anxiety and seasonality, Saucedo-Urbe et al. (14) reported an increase in anxiety related presentations during autumn and summer, although they did not detect a significant difference in the frequency of anxiety according to the season. In the same study, it was also determined that the number of women with anxiety presentations was higher than that of men, and psychiatric hospitalizations increased with increasing air temperatures. In the current study, the highest number of ED visits occurred in the summer season, whereas patients with psychiatric diagnoses tended to present to this department more often in the winter season. Unlike the above-mentioned studies, we observed that the hospitalization rate was higher in the winter. A lack of daylight triggers depression. Accordingly, it has been observed that suicide cases increase during the winter. In a study by Meyer-Rochow et al. (6), who examined the relationship between suicide cases and lunar phases and seasons, the number of men who committed suicide was found

to be higher than that of women. While no relationship was found between suicide events and lunar phases and seasons in male patients, there was an increase in suicide attempts among young women (<44 years of age) during the winter and full moon phases. It is thought that the lunar cycle is associated with the severity of psychiatric findings and frequency of ED visits. In a study evaluating patients presenting to the ED with a psychiatric attack during the full moon phase, the number of men was found to be higher than that of women, but no significant relationship was observed between the lunar cycle and psychiatric ED presentations (8).

In a study examining changes in parasuicides (suicide attempts) according to the lunar cycle and seasonality, the number of women attempting suicide was found to be higher than that of men. Suicide attempts were observed at a higher rate among women at younger ages and during the summer, whereas men had a higher suicide attempt rate at older ages and during the winter. Although the frequency of parasuicide decreased during periods when the temperature increased and increased during rainy periods, no statistically significant difference was found according to seasonality. The majority of presentations resulted in hospitalization, regardless of sex. Considering these results, the authors could not establish a relationship between suicide attempts and the lunar cycle (15).

In another study investigating the effects of seasonality and the lunar cycle on psychological symptoms (panic attack, anxiety disorder, and suicidal ideation) in patients presenting to the ED with chest pain, it was reported that depression and anxiety symptoms were more common in spring and summer, whereas no seasonal effects were found on mood disorders and suicidal ideation. Apart from the low probability of panic disorder in the last quarter phase of the moon, there was no other significant effect of the lunar cycle on the mental health of patients (7).

Studies on the effect of the lunar cycle on psychiatric diseases have yielded diverse results. Wang et al. (16), evaluated the effect of the lunar cycle on schizophrenia and hospital presentations

and found that the presentations of patients with schizophrenia increased during the first quarter and full moon phases and decreased during the new moon phase. The authors determined that the lunar cycle affected the mental health of patients with schizophrenia and that patients' clinical conditions were better during the new moon phase. Although it is believed that the moon affects people's mental health, a study conducted by Gupta et al. (17) showed that the hospitalization or discharge status of psychiatric patients did not differ according to the lunar cycle. In another study evaluating patients with different psychiatric diagnoses, it was observed that the lunar cycle did not have a statistically significant effect on psychiatric presentations, hospitalization, or discharge. It has been reported that all patients with psychotic, mood, or anxiety disorders were hospitalized at a rate independent of the lunar cycle (18). In another study investigating the relationship between the frequency of psychiatric clinic presentations of patients with mental disorders and the phases of the moon, no significant difference was detected (19).

In the current study, most of the patients who presented to the ED due to anxiety were young female patients aged 18-44 years. Although the majority of presentations occurred in the summer and the last quarter phase of the lunar cycle, the rate of hospitalization was higher in the winter months, and the majority of hospitalized patients were men with a psychiatric diagnosis. No significant relationship was found between anxiety-related presentations and the lunar cycle or seasonality. Furthermore, there were no significant differences between the different phases of the moon and the rates of psychiatric presentations, hospitalization, and discharge.

### Study Limitations

This study has several limitations. These include a single-center and retrospective design and a focus on anxiety patients identified through the hospital registry system. A study that examines the association of different anxiety disorders (e.g. generalized anxiety disorder, panic disorder/agoraphobia, and social anxiety disorder) with menstruation and seasonality separately may provide more comprehensive results.

### Conclusion

The results showed that most presentations to the ED due to anxiety occurred in the last quarter phase of the lunar cycle and during the summer season. Individuals diagnosed with psychiatric diseases were more likely to visit the ED during winter, and the highest number of hospitalizations was observed during this season. Finally, the majority of hospitalized patients were young, male individuals with a psychiatric diagnosis.

### Ethics

**Ethics Committee Approval:** The study was approved by the Adiyaman University Training and Research Hospital Non-invasive Clinical Research Ethics Committee (ethical decision number: 2021/10-12, date: 14.12.2021).

**Informed Consent:** Retrospective study.

### Authorship Contributions

Surgical and Medical Practices: E.K., K.T., U.G., İ.A., E.Y., Concept: E.K., K.T., U.G., İ.A., E.Y., Design: E.K., K.T., U.G., İ.A., E.Y., Data Collection or Processing: E.K., E.Y., Analysis or Interpretation: K.T., U.G., Writing: E.K., K.T.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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