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Seasonal Patterns in Bipolar Disorder: A Retrospective Analysis of the Relationship Between Psychiatric Inpatient Admissions and the Weather

Bipolar Bozuklukta Mevsimsel Örüntüler: Psikiyatrik Yatan Hasta Başvuruları ile Hava Durumu Arasındaki İlişkinin Retrospektif Analizi

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Seasonal Patterns in Bipolar Disorder: A Retrospective Analysis of the Relationship Between Psychiatric Inpatient Admissions and the Weather

ABSTRACT

Objective: Understanding seasonal patterns in bipolar disorder can help predict episodes earlier and guide timely interventions. Tailoring treatment and monitoring to these patterns may also improve stability and reduce the risk of relapse. This study aimed to retrospectively evaluate the seasonal distribution of hospital admissions due to bipolar disorder (BD) episodes and to investigate the potential associations between these admissions and monthly meteorological variables.

Material and Method: This retrospective study was conducted between December 2024 and May 2025 at our hospital. Patients who were hospitalized in the psychiatry ward due to BD episodes during the years 2018, 2019, 2023 and 2024 were examined. We assessed the relationship between monthly hospitalization rates and meteorological parameters in the province (temperature, wind speed, sunlight duration, and the number of rainy, foggy, snowy, cloudy, overcast and clear days).

Results: The number of hospitalizations was consistent throughout all years examined. Admissions due to BD were markedly increased between April and November (*p=0.005*). During months with higher hospitalization rates, average temperature (*p=0.004*), wind speed (*p=0.034*) and sunlight duration (*p=0.013*) were significantly higher, whereas the number of rainy (p=0.033) and foggy days (*p=0.012*) was lower. Average temperature was found to be a significant predictor of hospitalization frequency (*p=0.004*), with a cut-off value of 8.85 °C demonstrating high sensitivity and specificity (*p=0.011*).

Conclusion: Bipolar disorder episodes appear to cluster during warmer months, with temperature emerging as a significant discriminatory factor. These findings suggest that proactive clinical monitoring and preventive strategies during high-risk periods—particularly between April and November—may be beneficial. Further long-term, prospective, and multi-center studies are needed to confirm and extend these results.

Keywords: Bipolar disorder, Climate, Hospitalization, Seasons, Sunlight, Temperature.

Bipolar Bozuklukta Mevsimsel Örüntüler: Psikiyatrik Yatan Hasta Başvuruları ile Hava Durumu Arasındaki İlişkinin Retrospektif Analizi

ÖZ

Amaç: Bipolar bozuklukta mevsimsel örüntülerin anlaşılması, atakların daha erken öngörülmesine ve zamanında müdahalelerin planlanmasına katkı sağlayabilir. Tedavi ve izlemin bu örüntülere göre düzenlenmesi, hastalık seyrinin stabilizasyonunu destekleyerek relaps riskini azaltabilir. Bu çalışmada bipolar bozukluk (BB) atakları nedeniyle hastaneye yatışların mevsimsel dağılımının retrospektif olarak değerlendirilmesi ve bu yatışlar ile aylık meteorolojik değişkenler arasındaki olası ilişkilerin araştırılması amaçlandı.

Gereç ve Yöntem: Bu retrospektif çalışma Aralık 2024-Mayıs 2025 tarihleri arasında hastanemizde gerçekleştirildi. Psikiyatri servisinde 2018, 2019, 2023 ve 2024 yıllarında BB atağı nedeniyle yatarak tedavi gören hastalar incelendi. Aylık yatış oranları ile meteorolojik parametreler (sıcaklık, rüzgar hızı, güneşlenme süresi ile yağmurlu, sisli, karlı, bulutlu, kapalı ve açık gün sayıları) arasındaki ilişki değerlendirildi.

Bulgular: İncelenen yıllar boyunca hastaneye yatış sayıları benzerdi. BB nedeniyle yatışların Nisan-Kasım ayları arasında belirgin olarak arttığı saptandı (p=0,005). Hastaneye yatış oranlarının daha yüksek olduğu aylarda ortalama sıcaklık (p=0,004), rüzgar hızı (p=0,034) ve güneşlenme süresi (p=0,013) anlamlı olarak daha yüksekken; yağmurlu (p=0,033) ve sisli gün sayılarının (p=0,012) daha düşük olduğu görüldü. Ortalama sıcaklığın hastaneye yatış sıklığını öngören anlamlı bir değişken olduğu belirlendi (p=0,004). Ayrıca 8,85 °C kesim değerinin yüksek duyarlılık ve özgüllük gösterdiği saptandı (p=0,011).

Sonuç: Bipolar bozukluk ataklarının daha sıcak aylarda kümelendiği ve sıcaklığın anlamlı bir ayırt edici faktör olduğu görülmektedir. Bu bulgular, özellikle Nisan-Kasım döneminde proaktif klinik izlemin ve önleyici stratejilerin yararlı olabileceğini düşündürmektedir. Sonuçların doğrulanması ve genişletilmesi için daha uzun süreli, prospektif ve çok merkezli çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Bipolar bozukluk, iklim, hastaneye yatış, mevsimler, güneş ışığı, sıcaklık

Introduction

Weather conditions can cause complex biological and psychological changes that can influence a wide range of biochemical, physiological and behavioral characteristics that have implications for human health (1). The worsening of climate change-related health issues, particularly due to rising temperatures, extreme weather events and deteriorating air quality (2), raise growing concerns about a substantial increase in health risks soon (3). In addition to risks involving extreme weather events that can increase infectious disease spread, deaths due to injury, and adverse events associated with chronic diseases and pregnancy, weather conditions also have mental health implications (2,4).

Since the introduction of Seasonal Affective Disorder (SAD) by Rosenthal and colleagues in 1984, the phenomenon of seasonal variability in mental health disorders, including depressive, manic and psychotic episodes, has continued to attract significant interest (5,6). Absolute temperature, temperature fluctuations and extreme heat events have been linked to suicide, mental health disorders, and negative impacts on mental well-being (7). While the relationship between weather conditions and mental illnesses is widely discussed, the underlying mechanisms remain incompletely understood. Alterations in the immune system in relation with sex, age, and other features may provide some explanation (8). During winter, the dominance of T-helper 1 (Th1) responses disrupts prefrontal cortex control and might exacerbate depression and anxiety symptoms. On the contrary, Th2 response is suggested to be elevated in summer, potentially activating cortical and mesolimbic centers, which might increase symptoms associated with mania, psychosis and impulsivity (9). Additionally, changes in circadian rhythm and an inability to adapt to seasonal changes can cause mood and behavioral disturbances, negatively influencing the clinical course of psychiatric conditions (10).

Individuals with bipolar disorder (BD) are particularly vulnerable to mood changes due to weather conditions (11). According to the Global Burden of Disease 2019 data, mental disorders remain among the top ten leading causes of disease burden globally (12). BD affects approximately 2% of the global population and is characterized by recurrent or sometimes chronic mood disturbances that extend from severely elevated mood (mania) to depressive episodes (13). It leads to significant disability and mortality due to suicide and cardiovascular diseases (14). The disease demonstrates a seasonal pattern in 15-25% of BD patients, meaning that emotional relapses are more common during certain times of the year. Previously, seasonal pattern was thought to only apply to depressive moods and episodes; however, DSM-V recognized that it can also influence (hypo)manic episodes (15,16). Clarifying the seasonal patterns of BD may facilitate the prediction of episodes and enhance opportunities for early intervention.

The aim of this study was to investigate the seasonal distribution of hospital admissions due to BD episodes in the psychiatry department and to retrospectively evaluate possible relationships between these admissions and monthly meteorological variables.

Material and Method

Design and Ethics

This retrospective study was conducted between December 2024 and May 2025 at our hospital. The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the local ethics committee. The research examined the number of patients hospitalized due to any episode (manic, hypomanic, depressive, mixed) of BD over a four-year period (2018 [12 months], 2019 [12 months], 2023 [12 months], 2024 [11 months]) in the psychiatry department inpatient service. Data from 2020, 2021, and 2022 were excluded from the primary analysis due to the well-documented disruption of psychiatric inpatient admission patterns during the COVID-19 pandemic, including reductions in help-seeking behavior, changes in healthcare access, and

hospital restructuring to accommodate pandemic response. Monthly admission data for these three years are presented in Supplementer Table I for transparency. As illustrated therein, these years showed markedly lower and more irregularly distributed admission counts compared to the included years, further supporting their exclusion from the primary seasonal analysis.

Supplementary Table I. Monthly Distribution of Bipolar Disorder–Related Inpatient Admissions During the COVID-19 Pandemic Years (2020–2022) and the Study Years Included in Primary Analysis (2018, 2019, 2023, 2024)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	Study years (included in primary analysis)												
2018	5	4	3	3	3	7	6	7	10	9	11	5	**73**
2019	5	6	5	8	9	10	10	10	8	11	5	8	**95**
2023	2	4	8	6	11	11	14	7	5	9	12	10	**99**
2024	13	22	8	9	7	5	9	10	8	15	1	0	**107**
COVID-19 pandemic years (excluded from primary analysis)													
2020	10	7	**4**	**3**	**5**	10	**3**	6	**2**	**4**	**3**	**3**	**60**
2021	**3**	6	8	7	**4**	**4**	7	**4**	**4**	**3**	8	**0**	**58**
2022	8	10	8	12	8	6	9	10	8	9	10	9	**107**

Note: Bolded cells indicate months with ≤5 admissions during pandemic years. The 2024 data covers January through November only (11 months). Pandemic years (2020–2022) showed substantially lower and more irregularly distributed admission counts compared to the included study years, consistent with documented disruptions to psychiatric inpatient services during the COVID-19 pandemic.

Data Acquisition

Patients hospitalized due to bipolar episodes were divided into two groups: those with fewer than or equal to 5 hospitalizations per month and those with more than 5 hospitalizations per month. To assess the relationship between hospitalizations due to bipolar episodes and climate parameters, the following meteorological variables were examined: average temperature (°C), average wind speed (m/s), daily sunlight duration (hours), and the counts of rainy, foggy, snowy, cloudy, overcast and clear days. Meteorological data were obtained through a request made by our University Rectorate to the General Directorate of Meteorology. Monthly averages for Çorum Province were calculated for each parameter during the months when hospitalization data were included. Monthly hospitalization counts were dichotomized into two groups (≤5 and >5) based on the median value of monthly admissions across the study period, as recommended by the study statistician. This approach was selected to enable group-level comparisons of meteorological variables and to facilitate ROC-based threshold analysis. We acknowledge that dichotomizing a continuous variable may reduce statistical power, and this is noted as a limitation of the study. Analyses using hospitalization count as a continuous variable were considered; however, the distributional properties of the data and the exploratory nature of the study supported the use of a median-based binary categorization.

Hospitalizations were counted as individual admission episodes rather than unique patients. Given the retrospective nature of the data extraction, it was not feasible to determine the number of unique individuals, as patients with BD frequently require multiple hospitalizations over time. This represents an inherent limitation of administrative-based retrospective designs and may have influenced the total count of admissions.

Statistical Analysis

Two-tailed p-values less than *0.05* were considered statistically significant. All analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). The normality of the distribution of variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Descriptive statistics are presented as mean ± standard deviation for normally distributed continuous variables, median (minimum - maximum) for non-normally distributed continuous variables, and as frequency (percentage) for categorical variables. Between-group quantitative comparisons were performed using the Student's t-test or the Mann-Whitney U test, depending on the normality of distribution. Between-group comparisons of categorical variables were performed using chi-square tests. The cut-off value was investigated using the ROC curve.

Results

During the 47-month period studied, the average temperature in Çorum province was 12.5±7.5°C and the average wind speed was 1.4±0.4 m/s. The distributions of other climate parameters for Çorum are presented in Table I.

Table I. Distribution of Climatic Parameters in Çorum Province for the Years 2018, 2019, 2023 and 2024

	Median (Min-Max)	**Mean±SD**
Average temperature (°C)	12.2 (-1.0 - 24.5)	12.5±7.5
Average wind speed (m/s)	1.5 (0.6 - 2.1)	1.4±0.4
Daily average sunlight duration (hours)	6.0 (1.4 - 10.9)	6.2±2.8
Monthly number of rainy days	8.8 (0.5 - 18.8)	9.0±4.3
Monthly number of foggy days	0.0 (0.0 - 4.0)	0.5±0.9
Monthly number of snowy days	0.0 (0.0 - 12.0)	0.7±2.2
Monthly number of cloudy days	3.2 (0.0 - 14.0)	4.1±4.0
Monthly number of overcast days	18.9 (6.4 - 29.0)	19.4±4.7
Monthly number of sunny days	8.5 (0.5 - 18.8)	8.9±4.4

*The data was calculated from a 47-month period, with 12 months for the years 2018, 2019 and 2023 and 11 months for the year 2024

No significant difference was found in the distribution of monthly hospital admissions due to bipolar episodes across the examined years (*p=0.345*). The frequency of patients with >5 hospitalizations in a single month was higher during the April–November period (*p=0.005,* Table II).

Table II. Distribution of Patients Hospitalized due to Bipolar Episodes by Year and Season

	Monthly number of hospitalized patients ≤ 5 (*n* = 14) n (%)	Monthly number of hospitalized patients > 5 (*n* = 33) n (%)	*p**
Years			
2018	6 (42.9 %)	6 (18.1 %)	*0.345*
2019	3 (21.4 %)	9 (27.3 %)	
2023	3 (21.4 %)	9 (27.3 %)	
2024	2 (14.3 %)	9 (27.3 %)	
Season			
April-November	4 (28.6 %)	24 (72.7 %)	***0.005***
December-March	10 (71.4 %)	9 (27.3 %)	

*Chi-square test

In comparison to months with five or fewer hospital admissions due to bipolar episodes, months with more than five hospitalizations had higher average temperature (p=0.004, Figure I), average wind speed (p=0.034), and average daily sunlight duration (p=0.013). The number of foggy days (p=0.033) and snowy days (p=0.012) was significantly lower in months with more than five hospitalizations, whereas the number of rainy days did not differ significantly between the groups (p=0.545). No significant relationship was found between the number of hospitalizations due to bipolar episodes and the number of rainy days (p=0.545), cloudy days (p=0.081), overcast days (p=0.223), or clear/sunny days (p=0.862) (Table III).

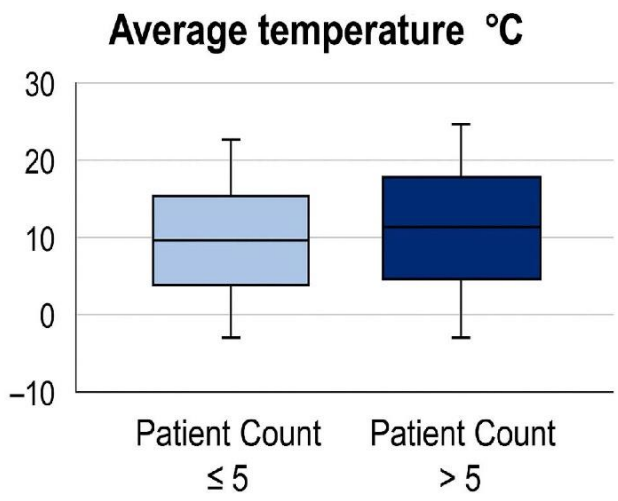

Figure I. Distribution of Mean Temperature Values According to the Number of Monthly Hospitalizations

Table III. Distribution of the Number of Hospitalizations Due to Bipolar Episodes According to Climate Parameters

	Monthly number of hospitalized patients ≤5 *n* = 14 Mean ± SD, Median	Monthly number of hospitalized patients >5 *n* = 33 Mean ± SD, Median	*p**
Average temperature (°C)	7.5±6.7, 6.7	14.6±6.9, 14.5	***0.004***[m]
Average wind speed (m/s)	1.2±0.3, 1.3	1.5±0.4, 1.5	***0.034***[t]
Daily average sunlight duration (hours)	4.6±2.7, 4.0	6.8 ±2.7, 6.6	***0.013***[t]
Monthly number of rainy days	9.6±4.7, 8.8	8.8±4.2, 8.8	***0.545***[t]
Monthly number of foggy days	1.0±1.4, 0.4	0.2±0.5, 0.0	***0.033***[m]
Monthly number of snowy days	1.5±3.2, 0.1	0.4±1.5, 0.0	*0.012*[m]
Monthly number of cloudy days	5.8±4.5, 5.3	3.5±3.7, 2.0	*0.081*[m]
Monthly number of overcast days	18.1±4.9, 16.8	19.9±4.6, 20.2	*0.223*[t]
Monthly number of sunny days	9.1±4.4, 8.3	8.8±4.5, 8.7	*0.862*[t]

[t] Independent samples t-test, [m] Mann-Whitney U test

The average temperature was found to be a significant distinguishing factor between groups with ≤5 and >5 hospitalizations (Area under the curve = 0.766, 95% CI: 0.621-0.912; *p=0.004*). Furthermore, in the distinction between hospitalization groups, the cutoff value of average temperature at 8.85°C was found to demonstrate significance, with a considerably high accuracy (Area under the curve = 0.736, 95% CI: 0.573-0.898; *p=0.011*). Evaluation of discriminatory performance with this threshold yielded the following metrics: sensitivity = 75.8%, positive predictive value = 86.2%, specificity = 71.4%, negative predictive value = 55.6% (Table IV, Figure II).

Table IV. Discriminative Ability of Mean Monthly Temperature for the Number of Hospitalizations Due to Bipolar Disorder

	Monthly number of hospitalized patients ≤ 5 (*n* = 14) n (%)	Monthly number of hospitalized patients > 5 (*n* = 33) n (%)	*p*
Average temperature (°C)			
≤8.85	10	8	***0.011***
>8.85	4	25	

Sensitivity: 75.8%, Specificity: 71.4%, Positive Predictive Value: 86.2%, Negative Predictive Value: 55.6%

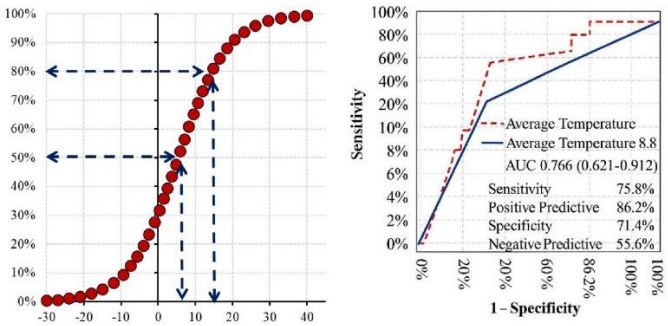

Figure II. ROC Curve Analysis of Mean Temperature in Distinguishing the Number of Hospitalizations due to Bipolar Disorder (≤5 vs. >5)

Discussion

Fluctuations in mood, social activity, body weight and sleep patterns are commonly observed in individuals with BD and the presence of a seasonal pattern in the course of the illness—affecting approximately 25% of depressive episodes and 15% of manic episodes—has been linked to a more severe clinical presentation (17). In this study, the relationship between the monthly distribution of hospital admissions to the psychiatry department due to BD episodes and meteorological variables was evaluated

retrospectively. Our findings reveal that, despite no significant increase or decrease on a yearly basis, episodes tend to cluster during certain periods of the year, and certain meteorological factors may be associated with this clustering. Notably, an increase in hospitalization frequency was observed between April and November, during which environmental factors such as temperature, sunlight duration and wind speed were at higher levels. Although many other factors may have contributed to this variation, such as the social and personal impacts of the summer season, the ROC analysis indicated that temperature demonstrated a moderate discriminatory association with hospitalization frequency. These results indicate that patients may benefit from closer assessments and a readiness for interventions during the summer and relatively hot periods of the year. Given the retrospective and ecological design of the present study, these findings reflect temporal and environmental associations rather than causal relationships and should be interpreted accordingly.

In this study, the similarities in annual admission numbers for BD episodes across years agrees with existing literature (18). There exist studies that have reported year-to-year variations, including one that spanned fourteen years which reported a significant linear increase in cases associated with manic episodes (19). Although this could be associated with improving diagnostic and treatment processes or better awareness of symptoms throughout such an extensive period, it appears that long-term data could provide a clearer understanding of the seasonal effects of BD in relation to annual and season-based incidences of BD episodes. Considering that climate change has already caused notable impacts on population health (2,4), it may be reasonable to expect an increasing trend of BD episodes throughout the next decades, which might be partially explained by higher temperatures according to our results.

Seasonal changes can influence various biological and environmental factors associated with BD, including microbiota, metabolic processes, vitamin D levels, lifespan, suicide risk and treatment goals. The pathophysiological mechanism underlying seasonal variability is thought to be shaped by the interaction of three main factors: the suprachiasmatic nuclei, melatonergic systems and photoperiodism. In this context, seasonal patterns in BD behavior may represent a complex neurobiological state resulting from the interaction of environmental stimuli (particularly light) with circadian rhythms and the biological clock, leading to neuroplastic changes. The seasonal effects of light in BD are primarily being explored through neuroendocrine pathways that regulate serotonin transporter systems and melatonin synthesis (17).

The inability to adapt the circadian rhythm according to seasonal changes can lead to adverse clinical outcomes such as exacerbations of mood disorders and treatment resistance (10). Temperature is one of the most pronounced factors that varies based on season. Increased temperatures have been hypothesized to contribute to changes in brain serotonin levels and peripheral blood flow, potentially impacting neurophysiological processes. Additionally, sleep disturbances and disruptions in functional brain connectivity due to high temperatures may negatively affect cognitive functions. On a social level, temperature-related increases in aggression, feelings of being left out of society, and personal characteristics can be detrimental in terms of psychiatric symptoms (7). Studies examining seasonality in BD have shown that manic episodes tend to peak during the spring and summer months (9,19-23), depressive episodes increase at the beginning of winter (20,22) and mixed episodes are more frequent at the onset of spring (20,22). According to the studies examined in a systematic review, higher temperatures may trigger relapses of BD requiring hospitalization and increased sunlight exposure could raise the risk of manic episodes (24). These weather-related influences have been noted by some prior studies in patients with BD, showing associated with high temperatures (9,19,20), prolonged sunlight exposure (9,20,23), increased ultraviolet

radiation and low snow cover, while rainfall does not appear to have a significant effect (20). In the present study, the observed increase in hospitalizations between April and November is consistent with previous findings reporting that manic episodes typically intensify during the spring and summer, creating a seasonal pattern (9,19-23). However, since our data does not include episode subtypes, we can only speculate that the increased hospitalizations were primarily due to manic episodes.

In the present study, the average temperature was found to be a significant determinant in distinguishing between months with and without >5 hospitalizations. The observed increase in hospitalizations during periods with higher average temperatures, sunlight exposure and wind speed, as well as fewer rainy and foggy days, suggests that episodic variations in environmental variables can also influence seasonal variation in BD. Indeed, previous literature has suggested triggering of episodes due to temperature and sunlight (9,19,20,23). The results could guide future studies aimed at investigating the effects of climate on the psychopathology of patients with BD and the underlying mechanisms. In this context, biological mechanisms such as circadian rhythm disturbances, light-induced suppression of melatonin secretion and the Th2-dominated immune response may serve as potential mediators. The findings also have clinical significance for planning preventive strategies. In particular, during periods of significant temperature increases, proactive monitoring and intervention strategies can be developed for individuals with a history of episodes. We believe that these results could contribute not only to the early management of episodes but also to the effective allocation of resources to support patients, thereby enhancing the efficiency and effectiveness of healthcare services by forecasting future case numbers.

The impact of seasonality on mental health is just one of many biopsychosocial mechanisms and it should be noted that this effect may vary among individuals. Temperamental differences shape emotional responses to environmental changes, potentially influencing the effects of weather conditions and seasonal transitions on symptoms. For example, cyclothymic individuals may be more sensitive to these changes, while the impact may be less evident in individuals with hyperthymic temperament (9). Understanding the mechanisms responsible for inter-individual differences in seasonality is critical, as it could lead to the development of personalized prevention and treatment for other psychiatric disorders as well as BD (10). Since sociodemographic and personality-related variables were not assessed in this study, the findings cannot be directly linked to individual experiences in different seasons. Future research that considers these factors will contribute to a more comprehensive understanding of the underlying causes of inter-individual variability in seasonal patterns. Climate-related health inequalities have been recognized to be an important factor in medical research (3) and these imbalances can result in unattainable treatment goals and varying outcomes in different parts of the globe; therefore, it is crucial to develop research and intervention strategies with this imbalance in mind. The development of seasonally sensitive treatment and monitoring plans, particularly during the April–November period identified in this study, could benefit patients by stabilizing disease progression and reducing relapse risk. Clinicians may consider intensifying outpatient follow-up during warmer months for patients with a history of episodic relapses.

The retrospective and single-center design limits the generalizability of the findings. In a country like Turkey, which has a vast geography and different climate regions, including data from various provinces and regions could have allowed for a broader national evaluation. Furthermore, the short time frame of the study has hindered the opportunity to examine the relationship between climate and bipolar episodes over a longer period. We excluded 2020, 2021 and 2022 due to the impact of the COVID-19 pandemic, which improved the consistency of our data, but shortened the

examined period and restricted year-on-year analyses. A long-term assessment could have allowed for a deeper understanding of this relationship, especially in the context of climate change. Another limitation is the lack of separate analyses based on the subtype of bipolar episodes; however, available evidence points to stronger relationships between temperature and manic episodes. Furthermore, regardless of episode type, it is evident that the present data calls for closer monitoring during the April-November period, which is a crucial finding that merits further discussion. Additionally, the study analyzed hospitalization episodes rather than unique patients. Due to the retrospective administrative data structure, it was not possible to ascertain the exact number of unique individuals hospitalized, which is a recognized limitation in ecological analyses of this type. Furthermore, formal time-series analyses—such as autoregressive integrated moving average (ARIMA) modeling—were not performed, which limits the ability to account for temporal autocorrelation in monthly admission data and to model lagged effects of meteorological variables. Future studies with longer observation windows should consider such approaches to more rigorously assess temporal patterns. The absence of episode subtype data (manic, hypomanic, depressive, or mixed) is a notable limitation, as existing evidence suggests that the relationship between weather and BD episodes may differ by subtype—particularly with temperature and sunlight being more strongly associated with manic episodes. Additionally, clinical variables such as medication type, treatment adherence, and psychiatric comorbidities were not available for analysis. Potential confounding by healthcare system factors, including seasonal variations in staffing or bed availability, cannot be excluded in this single-center retrospective design.

Our data reveals that BD episodes were more common between April and November, and were associated with environmental factors such as temperature, sunlight duration and wind speed. It therefore appears that climatic factors may play a role in the seasonal distribution of BD episodes, which is a crucial point to consider in the clinical setting. Closer monitoring of patients with BD under these climatic conditions and implementing preventive and control measures for episodes could be beneficial. Further prospective, community-based studies covering longer time periods and larger geographical areas are needed to validate the results of this study.

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