Effects of the Lunar Cycle, Seasons and the Meteorological Factors on Peripheral Vertigo

Original Investigation

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Abstract

Objective: This study aimed to determine whether peripheral vertigo is related to the lunar cycle, the seasons, or meteorological factors, in patients who presented to the ear, nose, and throat clinic.

Methods: All the patients, diagnosed with vertigo between January 2020 and January 2022, were identified through a retrospective review of our hospital database. The clinical and demographic data of the patients were recorded. Daily humidity (minimum, average, and maximum; %), daily temperature (minimum, average, and maximum; ˚C), daily average and maximum wind speed (m/min), daily air pressure (minimum and average maximum; hPa) and wind direction (degrees) values were noted. Also, the phases of the moon, i.e., first quarter, new moon, last quarter, and full moon periods were determined.

Results: A total of 5,432 patients were included in the study. No statistically significant differences were noted among them with respect to the lunar cycle (p=0.233). However, patient density was found to increase in the winter months.

Conclusion: This study concluded that the frequency of diseases is related to meteorological factors, nonetheless, no statistical relationship was found between the lunar cycle and the frequency of patient entries.

Keywords: Vertigo, meteorological factors, lunar cycle, season, benign paroxysmal positional vertigo

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Introduction

Dizziness is a general term for a feeling of disorientation. Vertigo is a subtype of dizziness arising from an imbalance in the vestibular system, and autonomic symptoms such as pallor, sweating, vomiting, and nausea are generally related to vertigo (1). Vertigo occurs as episodes in decreasing density, and gradually with age becomes a reason for frequently presenting to hospital. The most common reasons for this are acute vestibular neuronitis, benign paroxysmal positional vertigo (BPPV), labyrinthitis, migraine, anxiety disorders and Ménière's disease (2). Vertebrobasilar

ischemia and retrocochlear tumors are the less common reasons (3). BPPV causes more than 40% of vertigo diagnoses seen in the first phase and is the most frequent cause of lifetime vertigo. In BPPV, patients usually complain about short vertigo episodes triggered by position changes. Incidents usually take only seconds and last less than a minute (4).

The thought of the effects of the lunar cycle on human health goes way back. In a study conducted in 1987, 64% of the doctors and 80% of the nurses working in the emergency room expressed that they believed the moon had an effect on humans health (5).

The effort of trying to identify a connection between human health and the lunar cycle by both the society and the healthcare professionals led to academical studies on this topic. Many of these studies revealed the absence of any relationship between many diseases and the lunar cycle; however, it is known that the lunar cycle may have an effect on sleep and other physiological processes (6, 7). This relationship is basically explained by the decrease in melatonin secretion and the change in body fluid balance due to the brightness in the full moon period (8). There are limited numbers of studies examining otorhinolaryngological diseases and lunar cycle (9). Since the lunar cycle changes liquid balance, we think that it might have effects on endolymph in semicircular canals.

The effects of meteorological factors on otorhinolaryngological diseases have been supported with the results of scientific studies. These revealed that temperature, humidity, atmospheric air pressure changes, and wind and precipitation could affect the occurrence of many otorhinolaryngological diseases and that the frequency of presenting with otorhinolaryngological diseases varied seasonally. The patient populations examined in these studies show differences as they were conducted in different geographical regions and under different climate conditions. This has brought about of different results as well as results that supported each other (9, 10).

In our study, we aimed to reveal any possible relationship between the lunar cycle, the seasons and meteorological factors in patients who presented to our otorhinolaryngology outpatient clinic with peripheral vertigo.

Methods

Study Population and Ethics

The study protocol was approved by the Ethical Committee of Adıyaman University (decision date: 16.02.2022, decision no: 2022/2-14). The database of our hospital was retrospectively reviewed, and all the patients diagnosed with vertigo between January 2020 and January 2022 were identified. Clinical and demographical data of the patients were recorded.

Method of Measurement

Seasons were defined as: summer, June 1–August 31; autumn September 1–November 30; winter December 1–February 28, and spring, March 1–May 31.

Astronomic data were taken from www.timeanddate.com (11). The lunar phases were defined as the new moon, the first quarter, the full moon, and the last quarter. The relationship of the lunar cycle and seasonality with the incidence of vertigo, its severity, epidemiological data and accompanying diseases were reviewed. In addition, meteorological data such as temperature (°C), daily humidity (%), daily maximum and average wind speed (m/min), wind direction (degrees) and daily air pressure (hPa) were obtained from the Adıyaman provincial directorate of meteorology and examined.

Statistical Analysis

Data were analyzed with the Statistical Software for Social Sciences IBM SPSS v25 (Armonk, NY: IBM Corp., USA). The compliance of the variables to normal distribution was examined using histogram graphics and the Kolmogorov-Smirnov test. Mean, standard deviation and median values were used to present descriptive analyses. Categorical variables were compared with the Pearson's chi-square test and these variables were presented as frequency (n) and percentage (%). Numerical variables were compared between the groups using the independent samples t-test. A p-value of less than 0.05 was evaluated as statistically significant.

Results

Patients who presented to the Otorhinolaryngology outpatient clinic with a complaint of peripheral vertigo between January 2020 and January 2022 were statistically compared with respect to the lunar cycle and the seasons. A total of 5,432 cases, 3,382 (62.3%) female and 2,050 (37.7%) male, were included in the study. The average age of females was 45.05±16.78 years and average age of males was 47.10±17.10 years. Statistically significant differences were found when female and male patients were compared by age (p=0.000) (Table 1). By lunar cycle, 25.0% of the female patients had presented during the first quarter, 26.3% during full moon, 25.4% during the third quarter, and 23.2% during

Table 1. Descriptives and demographics of the patients

		Male n=2,050 (37.7%)	Female n=3,382 (62.3%)	p-value*
Age	Mean ± SD	47.10±17.10	45.05±16.78	0.000
	Median (min-max)	47.0 (18–67)	44.0 (18–61)	

*Independent samples t-test was used, SD: Standard deviation, min-max: Minimum-maximum

new moon. For the male patients 24.3% had presented during the first quarter, 24.5% during full moon, 27.5% during the third quarter, and 23.7% during new moon. No statistically significant differences were found with respect to gender (p=0.233) (Table 2).

When compared by seasons, 16.8% of female patients were found to have presented in spring, 25.8% in summer, 25.5% in autumn, and 31.9% in winter. For the male patients, 20.3% were found to have presented in spring, 25.3% in summer, 25.1% in autumn, and 29.3% in winter. Statistically significant differences were found between the genders in terms of the seasons they presented to the clinic (p=0.009) (Table 3). Patient admissions were seen to have increased in winter. In terms of the distribution of the patients, the highest number of patient admissions was in February with 637 (11.72%) patients, followed by January with 601 (11.06%) patients. The month with the least patient admissions was May with 226 (4.16) patients (Table 4). When the number of patients were reviewed with respect to temperature, humidity, pressure and wind, no significant correlations were found, however, an increase was seen in the number of patients as a negative correlation with the decrease in temperature (Figure 1). The patients had mostly presented in winter.

Discussion

Human physiology is affected by yearly rhythms, e.g., by the lunar cycle and the seasons. The frequency of emergency presentations for reasons such as birth, sleep, rupture of abdominal aorta and intracranial aneurysm, acute coronary events, gastrointestinal bleeding, psychiatric episodes in children and adults, post-surgical bleeding and complications, stroke, epileptic and psychogenic seizures, kidney transplant results, trauma are the common cases associated with the lunar cycle (6, 7, 12-15). The belief that some parts of the body are related to some positions of the moon is expressed with "zodiacal constellations". According to this belief system, the success of surgical procedures on the body part that is thought to be related to the special phases of the moon is lower during full moon. It was reported that this phase had an effect on patients' decision for their day of surgery (16). The effects of the lunar cycle on human health are said to be mainly based on the changes in the full moon. In the full moon phase, the Earth stands between the sun and

Table 2. Relationship between sex and lunar cycle

		Lunar cycle					
Sex		**First quarter**	**Full moon**	**Third quarter**	**New moon**	**Total**	**p-value***
Female	count	846	891	859	786	3,382	0.233
	% within sex	25.0%	26.3%	25.4%	23.2%	100.0%	
	% within lunar	62.9%	64.0%	60.4%	61.8%	62.3%	
Male	count	498	502	564	486	2,050	
	% within sex	24.3%	24.5%	27.5%	23.7%	100.0%	
	% within lunar	37.1%	36.0%	39.6%	38.2%	37.7%	
Total	count	1,344	1,393	1,423	1,272	5,432	
	% within sex	24.7%	25.6%	26.2%	23.4%	100.0%	
	% within lunar	100.0%	100.0%	100.0%	100.0%	100.0%	

*Pearson chi-square test was used

Table 3. Relationship between sex and season

		Season					
Sex		**Autumn**	**Winter**	**Spring**	**Summer**	**Total**	**p-value***
Female	count	862	1,079	568	873	3,382	0.009
	% within sex	25.5%	31.9%	16.8%	25.8%	100.0%	
	% within lunar	62.6%	64.2%	57.7%	62.7%	62.3%	
Male	count	514	601	416	519	2,050	
	% within sex	25.1%	29.3%	20.3%	25.3%	100.0%	
	% within lunar	37.4%	35.8%	42.3%	37.3%	37.7%	
Total	count	1,376	1,680	984	1,392	5,432	
	% within sex	25.3%	30.9%	18.1%	25.6%	100.0%	
	% within lunar	100.0%	100.0%	100.0%	100.0%	100.0%	

*Pearson chi-square test was used

Table 4. Distribution of patients by year and month

	2020 (n)	2021 (n)	Total (n) (%)
January	394	207	601 (11.06%)
February	425	212	637 (11.72%)
March	266	200	466 (8.57%)
April	85	201	286 (5.26%)
May	73	153	226 (4.16%)
June	210	219	429 (7.39%)
July	247	186	433 (7.97%)
August	227	297	524 (9.64%)
September	217	276	493 (9.07%)
October	173	235	408 (7.51%)
November	170	279	449 (8.26%)
December	183	257	440 (8.10%)

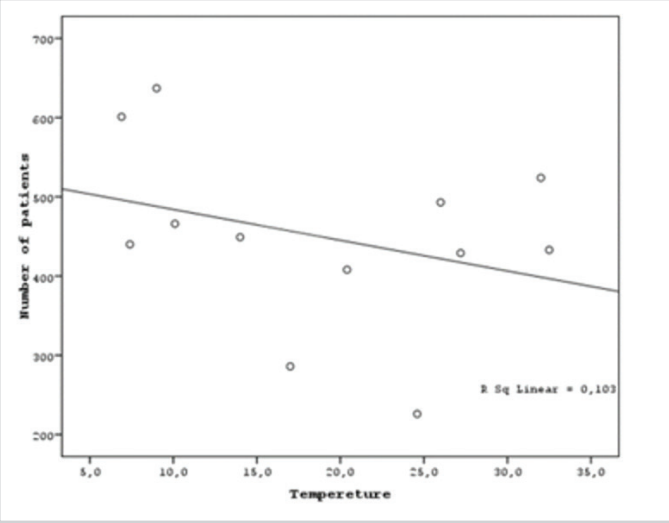

Figure 1. Overall correlation between the average temperature and the number of vertigo patients

the moon. It was asserted that neurohormonal activity may be affected due to electromagnetic changes and gravitational changes in this period (17). It was shown that melatonin levels decreased due to increased light during the full moon phase. Cajochen et al. (7), reported that while a 30% decrease was detected in electroencephalogram delta waves during non-rapid-eye-movement sleep, which is an indicator of deep sleep, during full moon, there was a 5-minute increase in the time to fall asleep and total sleep time decreased by 20 minutes. The authors stated that there were a decrease in the melatonin levels measured during the full moon. In studies reporting that the lunar cycle affected the time of birth, this relationship is explained by the changes in melatonin levels related to the lunar cycle. It was shown that melatonin levels decreased due to increased light during the full moon phase (7). Melatonin levels increased during pregnancy and sharp decreases were observed after delivery (8). Therefore, it was asserted that the decrease in melatonin levels could induce labor.

Altunisik et al. (18), examining the relationship between strokes and the lunar cycle, saw that ischemic stroke frequency increased during the new moon but could not find any statistically significant relationship. In the literature, there are studies examining the relationship between otorhinolaryngology diseases and meteorological factors and the lunar cycle. In their respective studies, Duvdevani et al. (9) and Walker et al. (19) examined the relationship between emergency room presentations with nose-bleeding and the lunar cycle. Full moon phase and other moon phases were compared in both studies and no significant differences were found in terms of presentation frequency. In a study, Akdoğan et al. (20) examined the distribution of patients with vertigo by the lunar cycle but did not find any statistically significant differences.

In our study, we too, did not find statistically significant differences between the phases of the moon and vertigo patient admissions. In the study conducted by Saeed and Omari (21), negative correlation was found between BPPV presentation frequency and temperature while positive correlation was found with atmospheric pressure. In this study, the positive correlation between relative humidity and BPPV was not considered as statistically significant.

In a similar study, Korpon et al. (22) reported that each unit increment in barometric pressure caused an increase of 6.1 diagnoses in BPPV. Negative correlation was found between temperature and BPPV frequency in this study. In the study conducted by Akdoğan et al. (20) with patients who presented to the emergency room with otorhinolaryngological complaints, the frequency of patients diagnosed with vertigo showed a negative correlation with all temperature values (maximum, minimum and average), daily maximum wind speed and daily average wind speed, but positive correlation with daily minimum pressure, daily maximum humidity and daily average humidity. In our study, although there were no statistically significant differences between heat and wind speed and number of vertigo patients, a negative correlation was found. Similar to this study (20), we found a positive correlation with atmospheric pressure and humidity. Also, when the number of patients were examined by months and seasons, it was seen that the numbers of patients had increased in winter. The studies conducted suggest that changes in atmospheric pressure and humidity rate are associated with exacerbated symptoms and frequency of episodes in Ménière's disease. In the study conducted by Gürkov et al. (23) with 126 patients with Ménière's disease, the authors found a significant relationship between atmospheric pressure increase and the probability of a Ménière's episode on the next day. In our study, even though no statistically significant differences were found in vertigo

patients, positive correlation was found between atmospheric pressure and humidity, and the number of patients.

Conclusion

Our study revealed that meteorological factors, unlike the lunar cycle, were associated with the frequency of the disease in the patients with vertigo. These findings greatly support the previous studies reported on this subject in the literature. However, prospective multi-center studies, including regions with different geographical and climatic characteristics, will more clearly reveal the relationship between otorhinolaryngological diseases and meteorological factors.

Ethics Committee Approval: This study was approved by the Adıyaman University Ethics Committee for Non-interventional Studies (decision date: 16.02.2022, decision no: 2022/2-14).

Informed Consent: The present study was a retrospective analysis study. Therefore, there was no need for any informed consent form.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: M.K., E.E.A., C.Y., Design: M.K., E.E.A., C.Y., M.Ka., Data Collection and/or Processing: M.K., C.Y., E.A., Analysis and/or Interpretation: M.K., M.Ka., Literature Search: M.K., E.A., M.Ka., Writing: M.K.

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Main Points

- The lunar cycle is known to affect fluid balances, such as tides, on Earth. It is known that peripheral vertigo is associated with the fluid balance in the vestibular system. The lunar cycle can affect the vestibular system, as it does the tides.
- When vertigo was considered with respect to the seasons, it was seen that the number of patients increased significantly in winter months.
- It was observed that the lunar cycle did not have a significant effect on vertigo.

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