

## ORIGINAL ARTICLE

### Epilepsy and Meteorological Impact: Unani/Persian Medicine Perspective

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#### Abstract

Epilepsy is one of the most commonly prevalent neurological diseases. Some patients reveal cold weather as one of the typical triggers for epilepsy. Although data has been collected in support of it, it is not yet confirmed. However, we have a lot of supportive data in the literature of Unani/Persian medicine in favor of this relationship between weather and frequency of Seizures. In addition, a detailed explanation of the reasons behind it is elucidated. It will also try to evaluate the relationship between weather (especially winter) and the frequency of seizures in epileptic patients. This is an integrative literature review, with a descriptive approach. The classical Unani/Persian literature database was surveyed for the impact of seasons on human health, especially in patients predisposed to epilepsy.

This literature survey has shown that there is a relationship between the frequency of seizures and the season mentioned in Unani/Persian literature, which is also evidenced by the present reports on the disease.

**Key words:** Epilepsy, Unani/Persian Medicine, Season, Meteorology, Disease

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## Introduction

Nature and causation of disease are as diverse as the complexity of the level of organization in humans. In Unani/Persian medicine, the primary causes of disease are abnormal changes in temperament (*Mizaj*), the structure of the organ, or any breach in the continuity of the surface of organs. (Alamah Burhanuddin Nafees translated by Hakeem Kabiruddin, 1934) These factors when acted individually cause simple (*Mufrad*) diseases otherwise cause compound (*Murakkab*) diseases. These factors are reinforced by several other factors like built, food, occupation, place of dwelling, and seasons. (Alamah Burhanuddin Nafees translated by Hakeem Kabiruddin, 1934)

When the season is harmonious for a person of healthy temperament, it is appropriate for him, but if there exists a marked deviation from equipoise, it will lead to the debilitation of the person. Whereas if the season is appropriate for an unhealthy temperament, it would prove beneficial for the person bearing it. The effects of the changing seasons are not due to the season itself, but due to the quality of essential factors along with them, for it exerts a marked effect upon the states of the body. A change from heat to cold over a single day produces a sudden change in the body accordingly and hence leads to disturbance in internal bodily environment from equipoise.

Hot weather produces dispersion of the body fluids and has a relaxing effect on the organs. It induces sweating, diminishes the quality of urine, impairs digestion, and increases thirst. On the contrary, cold weather makes the body firm, strengthens digestion, and increases the quality of urine by imprisoning the humors in the body and by reducing the evaporation from sweating.

In view of this, every season has its own characteristic diseases, provided it remains in its own quality. Normal spring is the best season as its temperament is in favor of the vital force; it, however, may cause a comparative increase in the arousal of blood. During the spring, chronic diseases are activated by the movement of humors that had been lying dormant. For the spring season, bleeding from the bowels, epistaxis, agitated forms of melancholia resulting from the excess of black bile, inflammation, carbuncles, rupture of vessels, hemoptysis, and troublesome cough are some of its characteristic maladies. (Avicenna, 1999, pp. 202–215)

In summer, the duration of the course of diseases is usually shorter because, if the general vitality is good, it helps in the elimination by the dispersal of matured humors, but when the vitality is low, the summer heat (with its relaxing effect) debilitates the body further and thus hastens death. A hot and dry summer shortens the course of disease while a moist summer tends to prolong it. Excessive heat is in favour of diseases such as tertian fever, continuous fever, wasting fever, painful affection of eye and ear. A southerly type of summer, which is hot and moist, predisposes individuals to the epidemics of measles, smallpox, etc. Whereas a northerly type of summer, which is particularly dry benefits phlegmatic people. Those of bilious temperament are apt to suffer from dry type of conjunctivitis and chronic fevers. (Avicenna, 1999, pp. 202–215)

In autumn fevers, skin diseases like impetigo, excoriating scabies and pustules; diseases of throat; diseases of lung; diseases of brain include apoplexy; diseases of intestines include the bowels which tend to become loose as the cold diverts the thin



humors towards them; are common. Pains in joints, sciatica, pains in the back and hips accentuate in this season.

The diseases of wintertime are generally phlegmatic. In early winter, catarrhal conditions are more frequent. However, when winter is established, chest pains, loin pains and nervous disorders, such as headaches, apoplexy, epilepsy are common due to the congelation of phlegm.

Epilepsy (*Sar* ) is a disease that completely disables an organ's sensory and motor functions and its ability to stand straight unconscious fall, convulsions, and froth mouth. (Khan, 1906, Vol. 2, pp. 238–256) Epilepsy is the cessation of all sensory faculties of a person and the person suddenly falls on the ground with involuntary movement of the face and spasm of both upper and lower limbs accompanied by a frothy salivary discharge from the mouth. The disease shows different patterns in different persons with episodes occurring at known intervals and in known conditions in some while being without any pattern in others. (Khan, 1906, Vol. 2, pp. 238–256)

Since the seasons are grossly observed to impact human health and data available endorses the relationship between human health and seasons. One such instance being changed is the frequency of epileptic episodes with change in seasons. In our study, we aim to decipher the relationship between the frequency of epileptic episodes and the different seasons mentioned in the literature of Unani/Persian medicine.

## Methods

This is an integrative literature review, with a descriptive approach. The classical Unani/Persian literature database was surveyed for the impact of seasons on human health, especially in patients predisposed to epilepsy. The search for this was carried out by surveying Unani/Persian medicine literature which included *Kulliyat-i-Nafeesi*, *Iksir-i-Azam*, *Kamil us Sana*, and *Al-Qanun fi'l-Tibb*. The reports related to the frequency of seizures and the season involved were noted from various indexed research articles using keywords like 'epilepsy seizures', 'season and epilepsy', etc. The findings were summarized in the form of an analytical review.

## Results

### 1- Incidence and prevalence of epilepsy

Epilepsy is one of the most frequent neurological diseases. It affects approximately 1% of the world population and its incidence varies according to age, gender, race, type of epilepsy syndrome, and socioeconomic conditions. There is a higher prevalence of epilepsy in developing countries compared to developed countries, with 1.5 to 2.0% more cases in the former (Ren, 2009). Regarding the predominance of epilepsy in developed countries, idiopathic and developmental epilepsy are the most common among children, and degenerative and vascular processes predominate among older adults. In developing countries, on the other hand, most cases are related to infections, parasites, and traumatic brain injuries, which demonstrates etiological differences (Costa, Brandão and Segundo, 2020). As per the classical Unani/Persian literature also, epilepsy is frequently observed in children, attributed to the higher moisture levels in their brain tissue and the underdeveloped resilience of their nerves.



(Qamri, 2008) Furthermore, Unani/Persian literature reports a higher incidence of epilepsy in women who experience early menopause. Additionally, epilepsy can occasionally develop in pregnant women, with symptoms often subsiding gradually following childbirth. (Avicenna, 1999, pp. 202-215)

## 2- Burden of Epilepsy as per recent reports

Epilepsy accounts for a significant proportion of the world's disease burden, affecting around 50 million people worldwide. The estimated proportion of the general population with active epilepsy (i.e., continuing seizures or with the need for treatment) at a given time is between 4 and 10 per 1000 people. (World Health Organization, 2023)

According to the 2016 Global Burden of Disease Collaborators (GBD 2016 Neurology Collaborators, 2019), epilepsy represents a relevant fraction of the worldwide disease burden, accounting for about 46 million people. Nearly 80% of people with epilepsy reside in LMIC, where rates of epilepsy prevalence and incidence are higher than in HIC (Meyer, et al., 2010). The differences are likely due to differing causes, a higher incidence of injuries, and lack of access to health care.

## 3- Pathophysiology

Although the modern medical literature explains the pathophysiology of epilepsy as the hyperexcitability of neurons due to intrinsic and extrinsic neuronal causes. Intrinsic neuronal mechanisms include ion channel conductance, membrane receptor responses, cytoplasmic buffering, second-messenger systems, and protein expression regulated by gene activity. Extrinsic factors involve neurotransmitter levels at the synapse, receptor modulation by external ions or molecules, and the timing and location of synaptic input. Non-neuronal cells, like astrocytes and oligodendrocytes, also play essential roles in these processes. (Jameson, et al., 2022) But the ancient scholars of Unani/Persian medicine have mentioned that epilepsy is known to occur due to incomplete occlusions in ventricles of brain and nerves (Al-Majusi, 2010, pp. p. 558-561) which may occur as a result of humour (*khilt*), viscous vapours (*Raddī Bukharat*) or any toxicity leading to an inability of psychic pneuma (*Rūh Nafsānī*) to perfuse into organs of nervous system (*A'dā' Nafsāniyya*) with ease. (Khan, 1906, Vol. 1, pp. 153–154) However, most often the cause is viscous Phlegm (*Ghaleez Pahalgam*). Rarely it can be melancholic humour (*Sawdā'*) or phlegm mixed with melancholic humour or bilious humour (*Safra*). Similarly, epilepsy due to Sanguinous humour (*Dam*) is extremely rare. (Khan, 1906, Vol. 2, pp. 238–256) In Unani/Persian medicine, apoplexy (*Sakta*) and epilepsy have the same cause that is, occlusion to the perfusion of psychic pneuma; however, there is a difference in quality (*kaifiyat*) and quantity (*mīqdār*) of morbid matter accumulated. (Al-Majusi, 2010, pp. 458-461)

Epilepsy of various types is summarized with their etiology in the Unani/Persian perspective and their correlation with modern aspects is given below (Khan, 1906, Vol. 2, pp. 238–256; Jamil, et al., 2012; Waseem, et al., 2020):

- Primary epilepsy (*Sar' Dimaghi or Sar' Asli*) - A condition where the cause of epilepsy lies in the brain itself.



- *Sar' Shirki* - A condition when epilepsy occurs due to other diseases of the body.
- *Sar' Hissi* - It is a type of epilepsy in which seizures occur due to the increased sensitivity of the brain.
- Traumatic epilepsy (*Sar' Darbi*) - A type of epilepsy that occurs due to head injury.
- Reflex epilepsy (*Sar' Badani*) - Seizures in this type of epilepsy occur when *Radi bukharat* (putrefied gases) from the body get collected in the brain.
- Epileptic aura (*Sar' Atrafi*) - Epilepsy of this type occurs when *Radi* (putrified gases) from the hand and legs get collected in the brain.
- Sting epilepsy (*Sar' Las'i*) - Epileptic seizures that occur due to a scorpion bite or any other neurotoxic venom.
- Hysterical epilepsy (*Sar' Rahimi*) - A type of secondary epilepsy that occurs due to the involvement of the uterus.
- Cardiac epilepsy (*Sar' Qalbi*) - A type of epilepsy associated with some cardiac diseases.
- Hypochondriacal epilepsy (*Sar' Maraqi*) - It is a type of epilepsy associated with the peritoneal ailment.
- Petit mal Epilepsy (*Sar' Khafif*) - In this type of epilepsy, intensity of convulsions is mild. Seizures are usually accompanied by tinnitus, congestion, and tension but with the heaviness of the head.
- Grand mal seizures (*Sar' Shadid*) - In this type of epilepsy, intensity of convulsions is severe.
- Infantile epilepsy (*Sar' al-Atfal*) - Epilepsy that occurs in infants/children. The affected child experiences convulsions with frothing the mouth. Most physicians think that *Umm al-Sibyan* and *Rih al-Sibthe* are the same as *Sar' al-Atfal*, but some physicians do not support this statement. They think that *Umm al-Sibyan* is a type of epilepsy which is accompanied with high fever (febrile convulsion).
- Procursive epilepsy (*Sar' Khababi*) - In this type of epilepsy, episode of convulsion occurs due to fast running or exercise.
- Nocturnal epilepsy (*Sar' Layli*) - A type of epilepsy in which seizures occur at night.
- Diurnal epilepsy (*Sar' Nahari*) - In this type of epilepsy episodic convulsions occur in the daytime.

#### 4- Predisposing factors for epilepsy

Contemporary medicine has enumerated some of the factors that may influence the occurrence and frequency of seizures or epilepsy in individuals. First, while any normal brain can experience a seizure under specific conditions, individual susceptibility varies due to genetic and developmental factors. For example, some children experience febrile seizures due to high fever, though only a subset is affected, indicating an inherent variability in seizure threshold. Second, certain conditions, like severe head trauma, greatly increase the risk of chronic epilepsy by inducing lasting pathological changes in the brain—a process called epileptogenesis. Other triggers of epileptogenesis include stroke, CNS infections, and genetic abnormalities that promote hyperexcitability. Finally, seizures are episodic, with various internal and external trig-



gers—such as stress, sleep deprivation, hormonal changes, toxins, and certain visual stimuli—potentially inducing episodes in both epileptic and non-epileptic individuals. (Jameson, et al., 2022)

On the contrary, Unani/Persian literature states that it is more common in children than adults and rarely affects the elderly. (Al-Razi, 1997, pp. 106–130) Avicenna mentioned that seizures often occur spontaneously without apparent inciting cause in most individuals and are precipitated by external or internal stimuli like extreme weather, swimming, prolonged bathing, exhaustion, long exposures to bright and shiny objects, euphoria, alcohol intake, hunger, overfeeding, sleep deprivation, seeing the moving objects, helminthiasis, etc. (Avicenna, 1990, pp. 114–123) Winter, being one of the extreme weathers, is characterized by excessive external cold. This cold weather has an impact on the physiology of humans through the quality and ambiance of the air. Seasons of the year are one of the most potent influencers for change in the ambiance of air and hence lead to a change in the functioning of the human body. The type of epilepsy present during this season is usually a primary type of epilepsy, which occurs due to viscous phlegm (Al-Majusi, 2010, pp. 458–461).

The primary type of epilepsy is usually characterized by the following (Al-Majusi, 2010, pp. 458–461):

- The patient is usually plumpy and obese (which is in favor of the cold temperament of the patient itself).
- The skin color is whitish.
- The preceding change in six essentials of life (*Asbaab I Sitah Zarooriya*) towards cold and wet temperament favors the overproduction of phlegm in the body, the primary cause of epilepsy.
- The episode of epilepsy is usually preceded by tinnitus or Paranosmia and/or dizziness.

According to Galen (Jalinoos), winter season results in the congelation of residuum in the body. The temperament of winter air normally cold and wet (*sard wa tarr*) (Al-Majusi, 2010, pp. 458–461), causes closure of external body openings and inward movement of innate heat (*Hararat Ghariziyya*) which leads to:

1. Increase in rate of digestion hence leading to increase in rate of production of residual products or wastes in the body, which tend to accumulate in the human body. (Al-Tabari, 1928; Al-Majusi, 2010, pp. 458–461)
2. Peripheral organs, especially the head, are generally predisposed to accept waste products from all over the body due to their cold temperament. These excessive wastes later get congested due to the impact of external cold weather on the head (or brain) (Al-Majusi, 2010, pp. 458–461)
3. External cold weather decreases the ability of the brain (which itself also bears cold temperament naturally) to allow maturity (*Nuzāj*) of accumulated matters (Al-Majusi, 2010, pp. pp. 458–461), hence predisposing it to the formation of clogs or occlusions in the brain and associated structures.
4. In addition to all this, cold weather leads to an increase in the production of phlegm in the brain (Al-Majusi, 2010, pp. 458–461), which is considered as one of the main causes of epilepsy from the Unani/Persian perspective. (Al-Majusi, 2010,



pp. 458-461)

### 5- Reported findings about Season and frequency of seizures

The frequency of epileptic seizures is stated to be higher during the cold weather (winter) due to the increased production of phlegm (humor with cold and moist temperament)(Nafees, 1934). The following research studies by different field researchers support this statement.

#### Winter (*Fasl al-Shita'*) and epilepsy

A clinical study by Pedro C. Brás et al. found a statistically significant relation between lower ambient temperatures, higher atmospheric pressure, and higher maximum humidity ways with two or more seizures. They also found a statistically significantly higher incidence of seizures on toner days (p-value: 0.001) and days with lower daylight duration (10.8 vs. 12.7 h; p-value: 0.0001). These findings suggest that winter conditions, such as lower ambient temperatures, higher atmospheric pressure, higher humidity, and reduced sunlight exposure, may have an impact on the occurrence of a higher incidence of seizures in patients with epilepsy (Brás et al., 2018). Their study is consistent with the study of Motta et al. who analyzed electroencephalograph (EEG) recordings in different seasons and showed that the smallest proportion of normal EEG recordings was noted in winter, and epileptiform discharges were noted more frequently in winter (Motta, et al., 2011). Recently, in line with these findings, Rakers et al. found that high ambient temperatures of N20 °C decreased seizure risk by 46% in the overall study population (OR:0.54, 95% CI: 0.32–0.90) (Rakers, et al., 2017). Likewise, Ruegg et al. also described the same protective effect of high temperature in the incidence of status epilepticus (Rüegg, et al., 2008). Baxendale also found that epileptic seizures were less likely to occur on bright sunny days than on dull days (Baxendale, 2009)

### Discussion

In Unani/Persian medicine, meteorological phenomena have been thought of as modifying factors in various health-related conditions including epilepsy (Nafees, 1934) and these relations are being studied currently to benefit health care such as considering preventive measures during different seasons. As demonstrated by our analytical review, there is a considerable relation between different seasons (especially extreme temperatures) and the frequency of epilepsy. An explanation of this relationship is in terms of the causal concepts mentioned in Unani/Persian medicine. There is an inability of psychic pneuma (*Rūh Nafsānī*) to perfuse into organs of the nervous system (*A'dā' Nafsāniyya*) with ease due to obstruction in ventricles of the brain by viscous phlegm mostly or viscous vapors (*Raddī Bukharat*), and Unani/Persian medicine considers Epliptical seizures due to incomplete obstruction of the neural passages/pathways.

The Unani/Persian literature considers that the increase in rate of digestion during exposure to low ambient temperatures [as *Ruhh* (pneuma) and *Hararate Ghariziya* (innate heat) are drawn inwards during exposure to low temperature)] results in the



accumulation of morbid matter in the body which tends to get localized in the brain due to its cold temperament and hence leads to clog formation which in turn hinders the perfusion of psychic pneuma into the organs of nervous system. Also, due to external cold temperatures, the body is predisposed to the increased production of Phlegm, as every season tends to bring changes in the body via changes in the production of humour following its temperament.

Various reports were also found to be in support of this relationship between the two variables i.e., seasons and frequency of epilepsy. Pedro C. Brás et al. found a significant relation between lower ambient temperatures, higher atmospheric pressure, and higher maximum humidity with two or more seizures. They found a significantly higher incidence of seizures on toner days and days with lower daylight duration. (Brás et al., 2018) Motta et al. analyzed electroencephalograph (EEG) recordings in different seasons and showed that the smallest proportion of normal EEG recordings was noted in winter, and epileptiform discharges were noted more frequently in winter (Motta, et al., 2011). Recently, Rakers et al. reported high ambient temperatures of 20 °C decreased seizure risk by 46% in the overall study population (Rakers, et al., 2017), and Ruegg et al. reported the protective effect of high temperature in the incidence of status epilepticus (Rüegg, et al., 2008). Baxendale noted that epileptic seizures were more likely to occur on dull days than on bright sunny days (Baxendale, 2009).

The authors of these research articles consider high atmospheric pressure at low ambient temperatures as one of the responsible factors; however, they are not able to explain the pathophysiology behind it, (Rüegg, et al., 2008) which is potentially explained by Unani/Persian philosophy of medicine.

## Conclusion

Evaluating the impact of seasons on the frequency of seizures was found to be maximum in winter due to cold ambient temperature validating the observations of the Unani/Persian physicians. The quantitative research combining different weather conditions and environments is needed to fully characterize the seasonality of epilepsy considering the anatomical and physiological basis of the nervous system, which would help to apply the findings of such research in preventing frequent epileptic seizures.

## Authors' Contribution

Ishrat Rasool conceptualized and curated the study plan, conducted the literature research, analyzed the collected information, and drafted the original manuscript. Sadique Ali assisted in the literature survey, contributed to manuscript revision, and provided critical editorial input. Ghulamuddin Sofi performed the final review and proofreading of the manuscript. All authors read and approved the final version of the manuscript.



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### Conflict of Interest

None.

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