INSIGHTS-JOURNAL OF
HEALTH AND REHABILITATION

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

# CLINICAL PROFILE OF THE POSTDROME PHASE OF MIGRAINE AMONG THE PATIENTS AT NEUROLOGY DEPARTMENT OF A TERTIARY CARE HOSPITAL

*Original Research*

**Shaher Bano[1]*, Husnain Nawaz Malik[1], Tayba Zain[1], Asif Hashmat[1], Ayesha Zubair[1], Maham Syed[1]**
[1]Pakistan Emirates Military Hospital Rawalpindi, Pakistan.
**Corresponding Author:** Shaher Bano, Pakistan Emirates Military Hospital Rawalpindi, Pakistan, shaherbanos95@yahoo.com
**Acknowledgement:** The authors gratefully acknowledge the support of the Neurology Department, Pakistan Emirates Military Hospital, for facilitating this research.

Conflict of Interest: None

Grant Support & Financial Support: None

## ABSTRACT

**Background:** Migraine is a complex neurological disorder characterized by recurrent attacks involving multiple phases, including the premonitory, headache, and postdrome stages. The postdrome phase, often described as the "migraine hangover," remains under-recognized despite its considerable impact on patients' functionality and quality of life. Understanding its clinical profile is essential for comprehensive migraine management and improved patient care.

**Objective:** To determine the clinical profile and frequency of postdrome symptoms among migraine patients presenting to the Neurology Department of a tertiary care hospital.

**Methods**: A prospective descriptive cross-sectional study was conducted at the Pakistan Emirates Military Hospital from January 2022 to June 2023. A total of 385 patients aged ≥18 years, diagnosed with migraine according to the International Classification of Headache Disorders (ICHD) criteria, were included through simple random sampling. Patients with other neurological or psychiatric disorders were excluded. Data on demographics, migraine history, and postdrome symptoms—such as low mood, fatigue, concentration difficulty, light sensitivity, and sleep disturbance—were collected using a structured, pretested questionnaire. Statistical analysis was performed using SPSS version 26.0, applying descriptive and inferential statistics with a significance level set at $p<0.05$.

**Results:** Among the 385 patients, females constituted 72.5% (n=279), and the predominant age group was 31–50 years (51.2%). Family history of migraine was reported in 56.1% (n=216). Overall, 92.5% (n=356) experienced postdrome symptoms, with low mood (81.7%), concentration difficulty (74.2%), and light sensitivity (62.1%) being most frequent. No significant association was observed between medication use and postdrome symptoms (p=1.1) or between headache severity and postdrome occurrence (p=0.98).

**Conclusion:** The study revealed a high frequency of postdrome symptoms among migraine patients, emphasizing the need for better recognition and management of this phase to enhance patient outcomes and quality of life.

**Keywords:** Adult, Headache Disorders, Migraine Disorders, Neurology Department, Postdrome Phase, Prevalence, Quality of Life.


## INTRODUCTION

Migraine is a highly prevalent neurological disorder that affects individuals across all demographics, exerting a profound impact on global health and productivity. In 2021, an estimated 493.94 million migraine cases were reported worldwide, accounting for approximately 33.33 million disability-adjusted life years (DALYs), underscoring its substantial public health burden (1). Among these, 18.25 million cases were observed in women of reproductive age, emphasizing the gender disparity in disease prevalence (2). Epidemiological data further reveal that the lifetime cumulative incidence of migraine is 43% in women and 18% in men, indicating a significant sex-related predisposition (3). This disparity has been attributed to hormonal fluctuations, genetic susceptibility, and psychosocial factors that amplify vulnerability among women (2). Beyond its epidemiological significance, migraine represents a major cause of absenteeism and reduced workplace productivity. It affects individuals during their prime working years, disrupts familial and social functioning, and markedly deteriorates overall quality of life (3,4). The disorder is clinically characterized by recurrent attacks that can vary in intensity and duration, often following a predictable sequence of phases: premonitory, aura, headache, and postdrome (4). However, not all individuals experience every phase, and the mechanisms underlying this variability remain poorly understood. Emerging neuroimaging and neurophysiological evidence suggest, that activation of cortical and subcortical networks precedes and extends beyond the headache phase, accounting for the constellation of symptoms experienced before and after the pain episode (5).

The functional disability associated with migraine extends beyond the headache itself; symptoms such as fatigue, cognitive slowing, mood changes, and sensory disturbances contribute substantially to the disease burden across multiple phases of the attack (6). The postdrome phase, in particular, is defined by the absence of headache but the persistence of non-pain symptoms such as exhaustion, concentration difficulty, and mood alterations, lasting from several hours to days (7,8). Despite its frequent occurrence, the postdrome remains the least investigated stage of migraine. Pathophysiological hypotheses propose that reduced cerebral blood flow due to vasoconstriction, possibly mediated by α2-adrenergic receptor activation in the locus coeruleus, and cortical spreading depression may contribute to its manifestation (9). Given its significant yet underexplored role in overall migraine pathology, there is a critical need to better understand the clinical characteristics, underlying mechanisms, and functional implications of the postdrome phase. Addressing this gap may enhance diagnostic precision, improve symptom management, and inform comprehensive therapeutic approaches for migraine. Therefore, the present study aims to investigate the postdrome phase of migraine to elucidate its prevalence, characteristics, and potential neurophysiological correlates (10).

## METHODS

This study was conducted in the Department of Neurology at the Pakistan Emirates Military Hospital (PEMH) over a period of 18 months, from January 2022 to June 2023, to ensure adequate recruitment and follow-up of patients to capture the postdrome phase of migraine. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of PEMH under reference number A/28/ER/61/24. All procedures adhered to ethical standards of human research, and informed written consent was obtained from each participant prior to inclusion. Patient confidentiality and data privacy were strictly maintained, and all data were anonymized before analysis. The study population comprised adult patients aged 18 years and above with a diagnosis of migraine confirmed by consultant neurologists according to the International Classification of Headache Disorders (ICHD) criteria (11,12). Participants were recruited from the outpatient and emergency departments of PEMH through non-probability consecutive sampling. Both male and female patients who had experienced at least one migraine attack followed by a postdrome phase during the study period were eligible. Exclusion criteria included patients with other neurological disorders that could confound postdrome symptoms—such as epilepsy, multiple sclerosis, or chronic fatigue syndrome—as well as individuals with psychiatric illnesses like major depressive disorder or anxiety disorders that could interfere with assessment of mood or cognitive function. Patients taking long-term medications that affect mood, cognition, or sleep were also excluded to avoid confounding influences. The required sample size of 385 participants was estimated using an online sample size calculator with a significance level of 0.05, a margin of error of 0.05, and an expected prevalence of postdrome symptoms of 0.5. Data were collected using a structured questionnaire designed specifically for this study based on ICHD diagnostic criteria. The instrument included sections on demographic characteristics, migraine history, and a detailed assessment of postdrome symptoms such

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

as low mood, fatigue, poor concentration, headache, and sleep disturbances. The questionnaire underwent pilot testing on a small subset of participants to establish its reliability and content validity prior to full-scale administration.

Data collection was carried out through structured interviews conducted by trained medical officers. In cases where participants were unable to read or write, the researchers assisted in completing the questionnaire without influencing or priming the responses. Participants were asked to describe symptoms experienced within hours to days following the resolution of the migraine headache, ensuring comprehensive capture of postdrome features. The interviewers were specifically trained to probe for relevant information using neutral questioning techniques to minimize interviewer bias. Collected data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics, including frequencies and percentages, were used to summarize demographic variables and the prevalence of individual postdrome symptoms. Age was categorized into defined groups, while gender and symptom distribution were presented as categorical variables. Associations between demographic factors and postdrome symptoms were analyzed using cross-tabulations and chi-square tests, with a p-value of less than 0.05 considered statistically significant. Overall, the study design was methodologically sound and adhered to ethical and analytical standards appropriate for clinical observational research.

## RESULTS

The study included a total of 385 patients diagnosed with migraine. The gender distribution was nearly balanced, with 50.9% males (n=196) and 49.1% females (n=189). The majority of participants were within the 31–50-year age group, indicating that migraine was most prevalent among adults in their active working years. A substantial proportion of participants, 56.1% (n=216), reported a family history of migraine, suggesting a strong hereditary component. Most patients (92.5%, n=356) experienced postdrome symptoms, while only 7.5% (n=29) did not report any symptoms following their headache episode, underscoring the high prevalence of the postdrome phase among migraineurs. Among those who reported postdrome symptoms (n=356), the most frequently experienced manifestations were low mood (81.7%) and concentration difficulty (74.2%), followed by light sensitivity (62.1%). Other common symptoms included irritability (55.1%), neck stiffness (51.7%), and fatigue (50.0%). Less frequent symptoms were head discomfort (39.0%), dizziness (38.5%), nausea (28.7%), and sleep disturbance (27.8%), while a smaller fraction (12.1%) reported other nonspecific symptoms. These findings reflect the diverse symptom profile and multifactorial nature of the postdrome phase. Regarding migraine duration, 34.0% (n=131) had been suffering for over 10 years, while 31.4% (n=121) reported a disease duration between 6–10 years. A total of 27.5% (n=106) had experienced migraines for 1–5 years, and only 7.0% (n=27) reported having the disorder for less than one year. The frequency of migraine attacks varied, with 37.9% (n=146) reporting 1–3 attacks per month, 25.5% (n=98) experiencing 4–6 attacks, and 12.5% (n=48) having more than six attacks per month, while 24.2% (n=93) experienced them less than once monthly. In terms of symptom resolution, 80.8% (n=311) of patients reported taking medication for their most recent migraine episode. Among these, 36.4% (n=113) recovered within 7–12 hours, 35.0% (n=109) within 13–24 hours, and 18.6% (n=58) within 25–48 hours. In contrast, among those who did not take medication (n=74), half (50.0%, n=37) recovered within 7–12 hours, 39.2% (n=29) within 13–24 hours, and a small proportion (4.0%, n=3) between 25–48 hours. These findings suggest that although medication use may facilitate faster recovery, individual variability remains substantial.

An analysis of headache severity showed that 56.9% (n=62) of mild cases resolved within 7–12 hours, while 73.4% (n=80) of moderate cases took 13–24 hours to recover. In severe cases, 41.1% (n=53) normalized in 7–12 hours, and 27.1% (n=35) in 13–24 hours. Statistical testing revealed no significant association between headache severity and the presence of postdrome symptoms (p=0.98). Similarly, no significant relationship was found between medication use and the occurrence of postdrome symptoms (p=1.1), suggesting that neither attack severity nor treatment strategy substantially influenced the manifestation of postdrome features. Further subgroup analysis was performed to explore associations between demographic and clinical characteristics and the occurrence of postdrome symptoms. The findings revealed that postdrome symptoms were slightly more prevalent among females (93.5%) compared to males (91.3%), although the difference was not statistically significant (p=0.46). Age also appeared to influence postdrome manifestation, with the highest prevalence observed among patients aged 31–50 years (94.7%), followed by those above 50 years (91.0%). Younger patients (18–30 years) exhibited a marginally lower prevalence (89.0%). A progressive increase in postdrome symptoms was noted with longer migraine duration, from 85.2% in those with disease duration less than one year to 95.4% among those with migraine history exceeding ten years (p=0.04). Similarly, patients experiencing more frequent attacks demonstrated a higher likelihood of postdrome symptoms—88.2% among those with fewer than one episode per month compared to 97.9% among those with more than six monthly attacks (p=0.03). Family history of migraine also correlated positively with the presence of postdrome features, reported in 94.9% of those with positive

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

family history versus 89.9% without (p=0.05). Collectively, these findings suggest that female gender, longer disease duration, higher attack frequency, and a positive family history may predispose individuals to more pronounced or frequent postdrome symptoms.

**Table 1: Demographic and clinical characteristics (n=385)**

| Characteristic | Frequency (n) |
|---|---|
| Gender | |
| Male | 106 (27.5%) |
| Female | 279 (72.5%) |
| Age Group (Years) | |
| 18-30 | 82 (21.3%) |
| 31-40 | 95(24.7%) |
| 41-50 | 102 (26.5%) |
| 51-60 | 65(16.9%) |
| >60 | 41 (10.6%) |
| Duration of Migraine Disease (Years) | |
| <1 | 27 (7%) |
| 1-5 | 106 (27.5%) |
| 6-10 | 121(31.4%) |
| >10 | 131(34.0%) |
| Time Since Last Migraine Attack (Month ago) | |
| Within the last month | 127 (33%) |
| 1-3 months | 101(26.2%) |
| 4-6 months | 91(23.6%) |
| >6 months | 66(17.1%) |
| Frequency of Migraine Attacks (Per month) | |
| Less than once per month | 93(24.2%) |
| 1-3 times | 146(37.9%) |
| 4-6 times | 98 (25.5%) |
| >6 times | 48(12.5%) |
| Family History of Migraines | |
| Yes | 216 (56.1%) |
| No | 169(43.9%) |
| Presence of Postdrome Symptoms | |
| Yes | 356(92.5) |
| No | 29(7.5%) |

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

**Table 2: Return to Normal after medication and headache severity by Time Interval for last migraine attack (n=385)**

| Time Interval (Hours) | Medication Taken | | Headache severity | | |
|---|---|---|---|---|---|
| | Yes (n=311) | No (n=74) | Mild (n=109) | Moderate (147) | Severe (129) |
| 0-6 hours (n=36) | 31 (9.6%) | 5 (6.8%) | 5 (4.6%) | 14 (12.8%) | 17 (13.2%) |
| 7-12 hours (n=150) | 113 (36.4%) | 37 (50%) | 62 (56.9%) | 35 (32.1%) | 53 (41.1%) |
| 13-24 hours (n=138) | 109 (35.0%) | 29 (39.2%) | 23 (21.1%) | 80 (73.4%) | 35 (27.1%) |
| 25-48 hours (n=61) | 58 (18.6%) | 3 (4 %) | 19 (17.4%) | 18 (16.6%) | 24 (18.6%) |

**Table 3: Association of Postdrome symptoms and headache severity (n=385)**

| Headache Severity | Presence of Postdrome Symptoms (Yes, n = 356) | Presence of Postdrome Symptoms (No, n = 29) | P value |
|---|---|---|---|
| Mild | 99 | 10 | 0.98 |
| Moderate | 139 | 8 | |
| Severe | 118 | 11 | |

**Table 4: Association of Postdrome symptoms and Medication use (n=385)**

| Postdrome Symptoms | Medication Taken (Yes, n = 311) | Medication Not Taken (No, n = 74) | p-value |
|---|---|---|---|
| Yes | 289 | 67 | 1.1 |
| No | 22 | 7 | |

**Table 5: Association of Demographic and Clinical Predictors with Presence of Postdrome Symptoms (n = 385)**

| Variable | Category | Presence of Postdrome Symptoms n (%) | p-value |
|---|---|---|---|
| Gender | Male (n=196) | 179 (91.3%) | 0.46 |
| | Female (n=189) | 177 (93.5%) | |
| Age Group (Years) | 18–30 (n=82) | 73 (89.0%) | 0.21 |
| | 31–50 (n=197) | 187 (94.7%) | |
| | >50 (n=106) | 97 (91.0%) | |
| Duration of Migraine (Years) | <1 (n=27) | 23 (85.2%) | 0.04* |
| | 1–5 (n=106) | 96 (90.6%) | |
| | 6–10 (n=121) | 116 (95.8%) | |
| | >10 (n=131) | 125 (95.4%) | |
| Frequency of Attacks (Per Month) | <1 (n=93) | 82 (88.2%) | 0.03* |
| | 1–3 (n=146) | 135 (92.5%) | |
| | 4–6 (n=98) | 94 (95.9%) | |
| | >6 (n=48) | 47 (97.9%) | |

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

| Variable | Category | Presence of Postdrome Symptoms n (%) | p-value |
|---|---|---|---|
| Family History of Migraine | Yes (n=216) | 205 (94.9%) | 0.05* |
| | No (n=169) | 152 (89.9%) | |

*Statistically significant ($p < 0.05$)

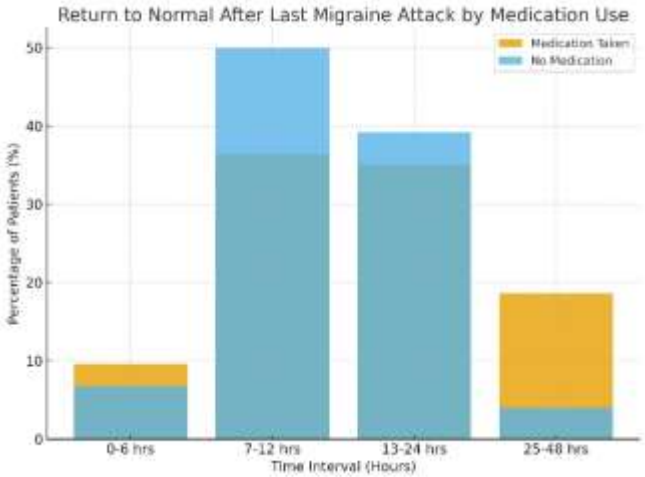


*Figure 1 Return to Normal After Last Migraine Attack by Medication Use*

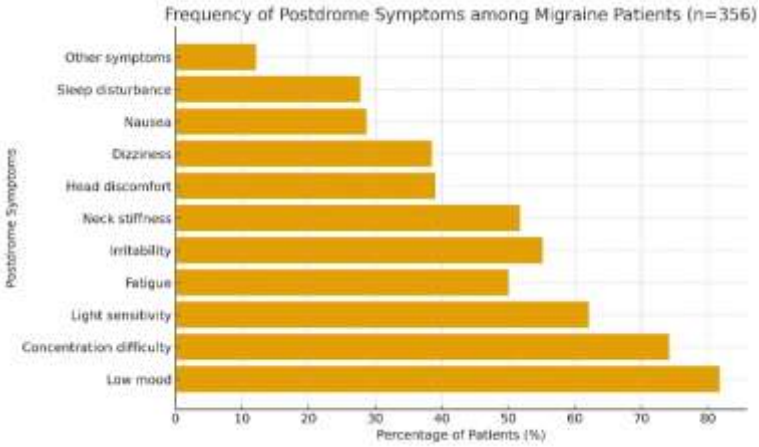


*Figure 2 Frequency of Postdrome Symptoms Among migraine Patients (n=356)*

## DISCUSSION

The findings of the present study demonstrate a remarkably high prevalence of postdrome symptoms among patients with migraine, with 92.5% of participants reporting one or more postdrome manifestations. This observation reinforces previous evidence that the postdrome phase constitutes an integral and frequently encountered component of the migraine cycle (13). The predominance of low mood, concentration difficulty, and light sensitivity as leading postdrome symptoms in this study aligns with prior literature that identifies these features as core elements of the post-headache phase (14–16). The high frequency of these symptoms reflects the substantial neurocognitive and sensory burden that persists beyond headache resolution, further emphasizing the disabling nature of migraine beyond its pain phase. Interestingly, the comparatively lower incidence of nausea (28.7%) and sleep disturbance (27.8%) observed in this study contrasts with previous findings that reported higher prevalence rates of these symptoms (17). Such differences may be attributed to variations in study populations, recall accuracy, or cultural perceptions influencing symptom reporting. These discrepancies highlight the heterogeneity of the postdrome experience and underscore the need for standardized criteria for identifying and quantifying postdrome features in clinical and research settings. The absence of a significant relationship between headache severity and postdrome symptoms (p=0.98) supports the notion that the postdrome phase may occur independently of headache intensity. Several previous investigations have reported similar results, suggesting that neurological and biochemical processes underlying postdrome phenomena—such as altered cortical excitability, brainstem dysregulation, and neurotransmitter imbalance—may not necessarily correspond with headache magnitude (18,19). This indicates that the postdrome phase represents a distinct pathophysiological stage within the migraine continuum rather than a mere extension of the pain episode. The analysis further revealed no significant association between medication use and the occurrence of postdrome symptoms (p=1.1). This finding is consistent with existing research that suggests pharmacologic treatments primarily target the headache phase, with limited efficacy in modifying or preventing postdrome symptoms (20,21).

The persistence of postdromal features despite therapeutic interventions underscores an unmet clinical need for comprehensive migraine management strategies that address all stages of the migraine attack, including premonitory and postdrome phases. From a broader perspective, the findings contribute to growing recognition that the postdrome phase significantly affects patients' quality of life, often prolonging functional impairment even after headache relief. Understanding the temporal and symptomatic profile of this phase may facilitate earlier recognition, more targeted interventions, and patient education to mitigate its impact on daily functioning. The study

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

possesses several strengths, including a well-defined diagnostic framework based on standardized ICHD criteria, adequate sample size, and systematic assessment of multiple postdrome symptoms. The inclusion of demographic and clinical correlates provides valuable insight into factors potentially influencing postdrome occurrence. However, certain limitations must be acknowledged. The cross-sectional design limits causal inference, and the reliance on self-reported symptoms introduces the possibility of recall bias. The study was conducted in a single tertiary care center, which may restrict generalizability to broader populations. Additionally, the absence of objective neuroimaging or biochemical markers limits understanding of the underlying mechanisms contributing to postdrome phenomena. Future research should employ longitudinal and multicentric designs to confirm these findings across diverse populations and explore neurophysiological correlates of the postdrome phase. Investigating the influence of hormonal status, comorbidities, and migraine subtypes may also clarify patient-specific risk factors. Furthermore, integrating neuroimaging and biomarker-based approaches could help delineate the mechanisms driving the persistence of symptoms after headache resolution (22). In conclusion, the present study underscores the high prevalence and clinical significance of postdrome symptoms in migraine patients. These findings reinforce that migraine should be recognized as a multi-phase disorder extending beyond pain, necessitating comprehensive therapeutic strategies that address not only the headache but also the premonitory and postdrome phases to improve patient outcomes and quality of life.

## CONCLUSION

The study concludes that postdrome symptoms are highly prevalent among individuals with migraine and encompass a broad spectrum of manifestations that significantly affect daily functioning and overall well-being. These symptoms remain inadequately addressed by treatments that primarily target the headache phase, underscoring the need for greater clinical recognition of the postdrome stage as an integral component of migraine. A deeper understanding of this phase could enhance patient education, optimize management approaches, and guide the development of more comprehensive therapeutic strategies. Continued research focusing on the mechanisms, prevention, and alleviation of postdrome symptoms is essential to improve the quality of life for patients and to close a critical gap in migraine care.

### AUTHOR CONTRIBUTION

| Author | Contribution |
|---|---|
| Shaher Bano* | Substantial Contribution to study design, analysis, acquisition of Data<br>Manuscript Writing<br>Has given Final Approval of the version to be published |
| Husnain Nawaz Malik | Substantial Contribution to study design, acquisition and interpretation of Data<br>Critical Review and Manuscript Writing<br>Has given Final Approval of the version to be published |
| Tayba Zain | Substantial Contribution to acquisition and interpretation of Data<br>Has given Final Approval of the version to be published |
| Asif Hashmat | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Ayesha Zubair | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Maham Syed | Substantial Contribution to study design and Data Analysis<br>Has given Final Approval of the version to be published |

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

## REFERENCES

1. Cen J, Wang Q, Cheng L, Gao Q, Wang H, Sun F. Global, regional, and national burden and trends of migraine among women of childbearing age from 1990 to 2021: insights from the Global Burden of Disease Study 2021. The Journal of Headache and Pain. 2024 Jun 7;25(1):96.

2. Allais G, Chiarle G, Sinigaglia S, Airola G, Schiapparelli P, Benedetto C. Gender-related differences in migraine. Neurological Sciences. 2020 Dec;41:429-36.

3. Al Ghadeer HA, AlSalman SA, Albaqshi FM, Alsuliman SR, Alsowailem FA, Albusror HA, AlAbdi ZI, Alwabari EM, Alturaifi ZA, AlHajji AM. Quality of life and disability among Migraine patients: a single-center study in AlAhsa, Saudi Arabia. Cureus. 2021 Nov;13(11).

4. Gupta J, Gaurkar SS. Migraine: An underestimated neurological condition affecting billions. Cureus. 2022 Aug;14(8).

5. Yamanaka G, Go S, Morichi S, Takeshita M, Morishita N, Suzuki S, Tomoko T, Kasuga A, Daida A, Ishida Y, Oana S. Clinical features and burden scores in Japanese pediatric migraines with brainstem aura, hemiplegic migraine, and retinal migraine. Journal of Child Neurology. 2020 Sep;35(10):667-73.

6. Ruschel MA, De Jesus O. Migraine headache. InStatPearls [Internet] 2023 Feb 13. StatPearls Publishing.

7. Karsan N, Peréz-Rodríguez A, Nagaraj K, Bose PR, Goadsby PJ. The migraine postdrome: spontaneous and triggered phenotypes. Cephalalgia. 2021 May;41(6):721-30.

8. Qubty W, Patniyot I. Migraine pathophysiology. Pediatric neurology. 2020 Jun 1;107:1-6.

9. Thuraiaiyah J, Ashina H, Christensen RH, Al-Khazali HM, Ashina M. Postdromal symptoms in migraine: a REFORM study. The Journal of Headache and Pain. 2024 Feb 21;25(1):25.

10. Olesen J. The International Classification of Headache Disorders: History and future perspectives. Cephalalgia. 2024 Jan;44(1):03331024231214731.

11. Christensen RH, Eigenbrodt AK, Ashina H, Steiner TJ, Ashina M. What proportion of people with migraine report postdromal symptoms? A systematic review and meta-analysis of observational studies. Cephalalgia. 2023 Oct;43(10):03331024231206376.

12. Karsan N, Peréz-Rodríguez A, Nagaraj K, Bose PR, Goadsby PJ. The migraine postdrome: spontaneous and triggered phenotypes. Cephalalgia. 2021 May;41(6):721-30.

13. Witten A, Marotta D, Cohen-Gadol A. Developmental innervation of cranial dura mater and migraine headache: A narrative literature review. Headache: The Journal of Head and Face Pain. 2021 Apr;61(4):569-75.

14. Bag A, Bhoi SK, Jha M, Palo GD. Sleep quality evaluation, correlation with headache frequency, and propensity to conversion from episodic to chronic daily headache in migraine patients: A cross-sectional study. Journal of Neurosciences in Rural Practice. 2023 Jan;14(1):70.

15. Thuraiaiyah J, Ashina H, Christensen RH, Al-Khazali HM, Ashina M. Postdromal symptoms in migraine: a REFORM study. The Journal of Headache and Pain. 2024 Feb 21;25(1):25.

16. Pleș H, Florian IA, Timis TL, Covache-Busuioc RA, Glavan LA, Dumitrascu DI, Popa AA, Bordeianu A, Ciurea AV. Migraine: advances in the Pathogenesis and treatment. Neurology International. 2023 Aug 31;15(3):1052-105.

17. Carvalho IV, Fernandes CS, Damas DP, Barros FM, Gomes IR, Gens HM, Luzeiro I. The migraine postdrome: Clinical characterization, influence of abortive treatment and impact in the quality of life. Clinical Neurology and Neurosurgery. 2022 Oct 1;221:107408.

18. Christensen RH, Eigenbrodt AK, Ashina H, Steiner TJ, Ashina M. What proportion of people with migraine report postdromal symptoms? A systematic review and meta-analysis of observational studies. Cephalalgia. 2023;43(10):3331024231206376.

19. Kitagawa S, Tang C, Unekawa M, Kayama Y, Nakahara J, Shibata M. Sustained Effects of CGRP Blockade on Cortical Spreading Depolarization-Induced Alterations in Facial Heat Pain Threshold, Light Aversiveness, and Locomotive Activity in the Light Environment. Int J Mol Sci. 2022;23(22).

20. Shibata M, Kitagawa S, Tang C, Unekawa M, Kayama Y, Shimizu T, et al. Protracted hypomobility in the absence of trigeminal sensitization after cortical spreading depolarization: Relevance to migraine postdrome. Neurosci Res. 2021;172:80-6.

21. Sampaio Rocha-Filho PA, Gherpelli JLD. Premonitory and Accompanying Symptoms in Childhood Migraine. Curr Pain Headache Rep. 2022;26(2):151-63.

22. Karsan N, Peréz-Rodríguez A, Nagaraj K, Bose PR, Goadsby PJ. The migraine postdrome: Spontaneous and triggered phenotypes. Cephalalgia. 2021;41(6):721-30.