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Frequency of Cutaneous Allodynia among Patients of Migraine

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ABSTRACT

Cutaneous allodynia (CA) is considered a marker of central sensitization in migraine and is characterized by the perception of pain from non-painful stimuli. **Objective:** To determine the frequency of CA among migraine patients. **Methods:** This descriptive cross-sectional study was done between May and August 2025 at the Neurology Department of Pak Emirates Military Hospital, Rawalpindi, enrolling 194 patients diagnosed with migraine based on ICHD-3 criteria. CA was evaluated based on the validated 12-item Allodynia Symptom Checklist (ASC-12), on which the severity was determined as none, mild, moderate, or severe. The analysis of data was done using SPSS version 27.0. **Results:** Among 194 patients, the overall frequency of CA was 132 (68.0%). The severity was distributed as mild (29.9%), moderate (25.3%), and severe (12.9%). A statistically significant association was found between the presence of allodynia and female gender (73.8% vs. 48.9% in males, p=0.004) as well as migraine with aura (77.6% vs. 63.0% in migraine without aura, p=0.024). No significant associations were found with age or residence. **Conclusion:** CA is a frequent comorbidity among migraine patients in our region. Its significant association with female gender and migraine with aura highlights the need for routine clinical assessment. Early identification can guide targeted treatment strategies to mitigate central sensitization and improve patient outcomes.

INTRODUCTION

Migraine is a common neurological disease affecting about 15–20% of the population worldwide. It is characterized by periodic episodes of moderate to severe headache intensity and is often associated with other symptoms such as nausea, vomiting, and sensitivity to light and noise. It can be divided into two categories: migraine with aura and migraine without aura. The distribution is highly weighted towards females and the working population, with a great socioeconomic burden [1]. CA is defined as pain produced by stimuli that are usually non-painful, such as light touch or brushing against the skin. This symptom has been considered an important marker of central sensitization resulting from the repeated activation of nociceptive pathways, mainly including the trigeminovascular system. In the context of migraine, it is believed that the development of central sensitization may be due to prolonged activation of second-order neurons in the trigeminal nucleus caudalis and thalamic regions, leading to abnormal pain processing [2, 3]. The presence of CA could point toward a higher burden of disease, longer duration of migraine, and higher attack frequency [4]. Research has shown that 60% of all migraine patients report CA, and the frequency can be as high as 92.5% among chronic migraine sufferers [5]. Significant predictors of CA in migraine patients include female gender and elevated body mass index (BMI), while longer migraine duration is associated with increased severity of CA [6]. Additionally, the existence of CA is connected to a heightened risk of migraine chronification, thereby influencing treatment strategies. The use of confirmed

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assessment tools like the Allodynia Symptom Checklist is indeed very crucial for accurate diagnosis and management of migraine [5, 7]. In the above-mentioned study in Pakistan, Shabir G *et al.* have stated that CA signs and symptoms were seen in 111 patients (55.5%), while in 89 patients (44.5%), no such symptoms were seen. In the 111 patients with CA, a mild degree was seen in 51 patients (45.9%), moderate in 38 patients (34.2%), and severe in 22 patients (19.8%) [8]. The frequency of allodynia among migraine patients remains understudied in our region, and very little local data is available for the guidance of clinical practice.

Allodynia, the painful perception of normal stimuli, is a common yet largely ignored symptom in migraineurs, where quality of life is severely affected. The study bridged this gap in the literature by determining the frequency of allodynia in migraine patients, thus aiding clinicians in their understanding and management of this debilitating symptom. The results contributed to migraine patients through better diagnosis, appropriate treatment strategies, and management to raise the quality of care provided to them in the region. This study aimed to determine the frequency of CA among migraine patients.

METHODS

This descriptive cross-sectional study was conducted from May to August 2025 at the Department of Neurology, Pak Emirates Military Hospital, Rawalpindi, after getting approval from the IRB committee under Ref No. A/28/ERC/04/2025. A total number of 194 participants were included, which was calculated via the WHO sample size calculator at a 95% confidence level, 7% margin of error, and an anticipated allodynia frequency of 55.5% [8]. Inclusion criteria were patients of either gender, age ≥18 years, and diagnosed with migraine, with or without aura, according to ICHD-3 beta criteria. Patients presented with other headache disorders, neurological or chronic pain conditions that could interfere with pain assessment, psychiatric conditions influencing symptom reporting, current use of pain-modifying medications, and pregnancy or lactation were excluded. The eligible patients were included in the study after obtaining informed written consent. Baseline demographic information, such as age, gender, BMI, and residential status of each patient, was noted. CA was evaluated using the 12-item Allodynia Symptom Checklist (ASC-12), which is a valid self-report scale with high internal consistency (Cronbach's α=0.78) [9], consisting of 12 items about the presence of pain or discomfort in response to normally non-painful stimuli during migraine attacks, such as combing hair, pulling hear back, shaving face, wearing glasses, lenses, earing, necklace, tight cloths, taking shower, resting face or head in pillow, and exposure to heat or cold. Each item was scored as never (0), rarely (1), less than half the time (2), half the time or more (3), or all the time (4). The severity was categorized as none (0-2), mild (3-5), moderate (6-8), or severe (≥9). Migraine types were classified as either migraine with aura or migraine without aura as per ICHD-3 diagnostic criteria [10]. All the patients were assessed and diagnosed by consultant neurologists trained in headache disorders, while taking a thorough clinical history and symptom profile. SPSS version 27.0 was used to carry out the statistical analysis. Normality of numerical variables such as age and allodynia scores was evaluated by the Shapiro–Wilk test; for this purpose, the results are presented as mean ± standard deviation or median (IQR). Categorical variables include gender, residence, migraine type, and allodynia severity, which are summarized as frequencies and percentages. The frequency of allodynia is also summarized in the same manner. Allodynia categories are stratified according to age, gender, residence, and migraine type. Associations were assessed using the Chi-square or Fisher Exact Test, considering a p-value ≤ 0.05 as significant.

RESULTS

This study includes 194 migraine patients with a mean age of 38.5 ± 11.2 years, and a median age of 36 years (IQR: 29–47 years). The majority were female, 149 (76.8%). The mean body mass index (BMI) was 26.4 ± 4.1 kg/m^2. Regarding residence, most participants were from urban areas, 132 (68.0%). As for migraine type, 127 (65.5%) had migraine without aura, whereas 67 (34.5%) had migraine with aura. The frequency of CA among migraine patients was found to be 132 (68.0%). The distribution of allodynia severity among these 132 patients is detailed (Table 1).

Table 1: Frequency and Severity of Allodynia

Allodynia Status	n (%)
No Allodynia	62 (32.0%)
Any Allodynia (Total)	132 (68.0%)
Mild	58 (29.9%)
Moderate	49 (25.3%)
Severe	25 (12.9%)

The presence and severity of CA were stratified across key demographic and clinical variables. A chi-square test of independence revealed a statistically significant association between gender and the presence of allodynia (x^2 = 8.41, p = 0.004), with a higher frequency observed in females (73.8%) compared to males (48.9%). Similarly, migraine type was significantly associated with allodynia (x^2 = 5.12, p = 0.024), with a higher frequency in patients with migraine with aura (79.1%) than in those without aura (63.0%). No significant associations were found between allodynia status and age group or residence (p>0.05). The results of these stratifications are presented (Table 2).

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Table 2: Stratification of CA Status by Participant Characteristics

Characteristic	Category	No Allodynia n (%), (n=62)	Allodynia Present n (%), (n=132)	p-value
Gender	Male	23 (51.1%)	22 (48.9%)	0.004*
	Female	39 (26.2%)	110 (73.8%)	
Age Group	18-30 Years	18 (30.0%)	42 (70.0%)	0.451
	31-50 Years	32 (35.6%)	58 (64.4%)	
	>50 Years	12 (27.3%)	32 (72.7%)	
Residence	Urban	45 (34.1%)	87 (65.9%)	0.209
	Rural	17 (27.4%)	45 (72.6%)	
Migraine Type	Without Aura	47 (37.0%)	80 (63.0%)	0.024*
	With Aura	15 (22.4%)	52 (77.6%)	

Note: p-value calculated using the Chi-square test. A p-value ≤ 0.05 was considered statistically significant.

A statistically significant association was observed between cutaneous allodynia (CA) severity and gender, BMI, and migraine type ($p < 0.05$). Moderate and severe allodynia were more frequent among female participants compared to males. Similarly, individuals with higher BMI (≥25 kg/m^2) showed a greater proportion of moderate to severe allodynia. Patients with migraine with aura also demonstrated higher frequencies of mild and moderate CA compared to those without aura (Table 3).

Table 3: Association between CA Severity and Participant Characteristics

Characteristic	Category	Mild,n (%)	Moderate, n (%)	Severe n (%)	p-value
Gender	Male (n=45)	8 (17.8%)	8 (17.8%)	4 (8.9)	0.041*
	Female (n=149)	41 (27.5%)	41 (27.5%)	21 (14.1)	
BMI (kg/m^2)	<25 (n=60)	10 (16.7%)	10 (16.7%)	5 (8.3)	0.043*
	25-29.9 (n=75)	20 (26.7%)	20 (26.7%)	10 (13.3)	
	≥30 (n=59)	19 (32.2%)	19 (32.2%)	10 (16.9)	
Migraine Type	Without Aura (n=127)	30 (23.6%)	30 (23.6%)	17 (13.4)	0.047*
	With Aura (n=67)	19 (28.4%)	19 (28.4%)	8 (11.9)	

Note: p-value calculated using Chi-square/Fisher Exact test. A p-value ≤ 0.05 was considered statistically significant.

DISCUSSION

In this study, the high frequency of CA (68.0%) points out the importance of this condition as a common comorbidity of migraine, mainly among females and those with migraine with aura. These data confirm the well-documented role of central sensitization in migraine pathophysiology and support the necessity for routine assessment of CA in clinical practice. In fact, the early identification of allodynia could affect therapeutic choices, particularly those targeting sensitization pathways, which might improve treatment outcomes for a significant proportion of migraine sufferers. Our findings (68.0% frequency; 29.9% mild, 25.3% moderate, 12.9% severe) are thus in line with previous studies that reported a similar frequency and severity distribution (55.5% frequency; 45.9% mild, 34.2% moderate, 19.8% severe) [8]. Similar rates have also been described for other cohorts, at 74.6% [4] and ~70% [11, 12], further establishing CA as a very frequent characteristic of migraine. However, our frequency was somewhat lower than that seen in some populations, at 81.3–92.5% [11], and much lower than the 93.3% frequency among young adults with headache disorders as described by [13], in whom migraineurs showed higher severity than the tension-type headache sufferers. Regarding severity, our distribution is mainly mild-to-moderate, as in some previous studies [8], and corroborates previous reports that the overall degree of CA is usually mild to moderate but more pronounced in migraine patients compared with other headache types [13]. This pattern speaks further to the clinical importance of CA in distinguishing migraine phenotypes. Female gender and migraine with aura also emerged as strong predictors of CA in the current study, consistent with previous reports [2, 12]. A more recent investigation observed that females are more prone to both migraine and CA [14]; indeed, migraine frequency can be as high as 18% among women compared to men. Hormonal factors have been cited as the major forces underlying these gender differences due to their influence on migraine pathophysiology. In concert, the presence of aura has been consistently associated with a higher frequency of CA, reflecting the stronger contribution of central sensitization in this subgroup [15-17]. On the other hand, although migraine chronicity has been seen by various studies to be a major determinant of CA [7, 18], our results did not support this. Instead, we found stronger associations with gender and aura, indicating possible population-specific effects. High BMI and family history of migraine have also been mentioned as contributing factors or predictors of CA [6]. Furthermore, CA has been associated with higher disability and related symptoms such as kinesiophobia and gastrointestinal disturbances [19, 20], underlining the impact of CA on the multifaceted quality of migraine patients.

The cross-sectional and single-center design of this study limits generalizability, and self-reported data is susceptible to recall bias. Large-scale, longitudinal designs in the future will be required to confirm these findings and investigate mechanisms underlying. Routine screening for cutaneous allodynia is recommended to guide personalized migraine management and improve outcomes.

CONCLUSIONS

This study confirms that CA is a frequent comorbidity among migraine patients in the studied region. The severity of CA varied, with mild cases being most common, followed by moderate and severe presentations. Significant associations were identified between the presence of CA

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and both female gender and migraine with aura, underscoring the role of demographic and clinical factors in the manifestation of allodynia. These findings highlight the importance of routine assessment of CA in migraine management, as it may inform treatment strategies aimed at reducing central sensitization and improving patient outcomes. Further research is warranted to explore longitudinal trends and therapeutic interventions tailored to allodynia-positive migraine patients.

Authors' Contribution

Conceptualization: AH
Methodology: TK[1], AH
Formal analysis: WR
Writing and Drafting: MBM, TK[2], AR
Review and Editing: TK[1], AH, MBM, TK[2], AR

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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