



## ORIGINAL ARTICLE

# The Clinical Burden of Migraine: Insights from Patients in Uttarakhand, India

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## Abstract

**Background:** Migraine is a neurological disorder characterized by severe, throbbing, unilateral headaches, affecting approximately 1.1 billion people globally (prevalence 14.4%, higher in women at 18.9%). In India, over 213 million cases occur, with Delhi-NCR reporting 26.3% prevalence; Uttarakhand lacks specific data. This study assessed migraine's clinical burden in Uttarakhand, evaluating prevalence, risk factors, triggers, and daily life. **Methods:** This prospective observational cross-sectional study was conducted over six months (28 October 2024–28 April 2025) at a tertiary care hospital in Dehradun, Uttarakhand (IEC-approved, ID #SGRR/IEC/26/24). One hundred adults ( $\geq 18$  years) with ICHD-3 migraine (episodic/chronic) were enrolled via consecutive sampling (n calculated at 95% confidence). Data on demographics, symptoms, triggers, and disability (MIDAS) were collected using validated questionnaires and headache diaries. Statistics included t-tests,  $\chi^2$  tests ( $p < 0.05$ ), and SPSS v27. **Results:** Among 100 patients (78% female, mean age  $40.41 \pm 12.62$  years), mean attacks were  $10.1 \pm 4.41$  days/month (duration  $17.42 \pm 10.21$  hours). Symptoms: nausea (84%), photophobia/phonophobia (76%), aura (74%). Triggers: stress (55%), hormonal (29%); significant associations with gender ( $\chi^2 = 14.512$ ,  $p = 0.002$ ) and occupation ( $\chi^2 = 26.981$ ,  $p = 0.029$ ). No gender difference in frequency ( $t = 0.990$ ,  $p = 0.990$ ). Treatments: OTC (50%), low efficacy (5% effective). **Conclusion:** Migraine imposes substantial midlife burden in urban Uttarakhand, with female predominance, stress/hormonal triggers linked to occupation/gender. Poor treatment outcomes highlight care gaps. Region-specific interventions targeting stress and access are essential.

## Key Words

Migraine, Headache, Clinical Burden, Stress, Migraine Duration, Migraine Frequency.

## Introduction

Migraine is a neurological disorder characterized by severe, throbbing, unilateral headaches. Globally, it affects approximately 1.1 billion people, with a prevalence of 14.4%, higher in women (18.9%) than men (9.8%)<sup>[1]</sup>. Attacks last hours to days, impairing daily activities, and involve diverse symptoms beyond headache, such as aura (e.g., visual zigzags or sparkles), mood changes, fatigue,

and sensory sensitivities (e.g., to odors).<sup>[2]</sup> In India, over 213 million cases occur, predominantly in women aged 40–44 years and men aged 35–39 years, with lifetime prevalence of 97.4% in women and 84.5% in men. Delhi-NCR reports 26.3% prevalence, akin to Karnataka's 25.2%. Pathophysiology involves aberrant neuronal signaling, chemical imbalances, and vascular changes,

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triggered by hormones, stress, diet, or environment.<sup>[4]</sup> One-year tension-type headache prevalence in NCR is 34.1%, with females prone to migraine and probable medication-overuse headache. This study assesses migraine's clinical burden in Uttarakhand, India, evaluating prevalence, risk factors, triggers, and daily life impact.

## Methodology

### Study Design and Setting

This prospective observational cross-sectional study was conducted over six months (28 October 2024 to 28 April 2025) at a tertiary care multispecialty hospital in Patel Nagar, Dehradun, Uttarakhand. It was approved by the Institutional Ethics Committee (IEC ID #SGRR/IEC/26/24). All participants provided written informed consent.

### Participants

A total of 100 adults ( $\geq 18$  years) diagnosed with migraine as per International Classification of Headache Disorders, 3rd edition (ICHD-3, 2018)<sup>[22]</sup> were enrolled.

**Inclusion criteria** encompassed episodic migraine ( $< 15$  headache days/month) or chronic migraine ( $\geq 15$  headache days/month). **Exclusion criteria** included significant neurological disorders (e.g., epilepsy, dementia) or severe psychiatric conditions that could confound assessments.

### Sample Size Determination and Sampling Technique

A sample size of 100 was calculated using the formula:  $n = z^2 (pq) / d^2$  with the confidence level of 95%. Consecutive sampling method was used to recruit the subjects into the study.

### Data Collection

Demographic and clinical data, including migraine burden profile (prevalence, factors, triggers, impact), were gathered via a validated questionnaire based on ICHD-3 guidelines, approved by the IEC and physicians. Participants maintained headache diaries; disability was assessed using the Migraine Disability Assessment Score (MIDAS).

### Statistical Analysis

Continuous and ordinal variables (e.g., age, migraine frequency, attack duration) were summarized as means  $\pm$  standard deviations (SD) and ranges, analyzed using independent samples t-tests for gender comparisons (Levene's test for equality of variances; Cohen's  $d$ /Hedges'/Glass's delta effect sizes with 95% CI). Categorical variables (e.g., sociodemographic, symptoms, triggers, treatments) were reported as frequencies (n, %) and examined via Pearson chi-square tests (Likelihood Ratio, Fisher-Freeman-Halton exact, linear-by-linear association where appropriate) for associations (e.g., gender/triggers  $\times$  occupation). Significance was set

at  $p < 0.05$  (2-tailed). Analyses were performed using IBM SPSS v27.0.0; Microsoft Excel/Word for tabulation/graphs.

## Result

### (A) Sociodemographic measures

Among 100 migraine patients (22 males, 78 females), females predominated ( $\chi^2$  test for gender imbalance,  $p < 0.001$ ). Mean age was  $40.41 \pm 12.62$  years. Education levels: no schooling (5%),  $<$  high school (6%), high school (45%), bachelor's (33%), postgraduate (11%). Social habits: none (61%), alcohol (13%), smoking (18%), both (8%). Diet: non-vegetarian (53%), vegetarian (47%). Occupation: private workers (38%), housewives (34%), students (17%), others (11%) (Figure 2). Residence: Dehradun (63%), Haridwar (15%), Uttarkashi (9%), Chakrata (13%). Marital status: married (76%), single (21%), widowed (3%). **Table 1**

### (B) Clinical Characteristics

Patients averaged  $10.1 \pm 4.41$  migraine days/month (mostly 5–10 days). Attack duration averaged  $17.42 \pm 10.21$  hours (mostly 4–24 hours). Common symptoms: nausea/vomiting (84%), photophobia/phonophobia (76%), aura (74%). Triggers: stress (55%), hormonal changes (29%), bright lights (10%), sleep issues (6%) (Figure 1; often post-activity (53%) or seasonal (31%)). Triggers  $\times$  occupation showed significant association (Pearson  $\chi^2 = 26.981$ ,  $df = 15$ ,  $p = 0.029$ ). Gender  $\times$  triggers revealed significant differences (Pearson  $\chi^2 = 14.512$ ,  $df = 3$ ,  $p = 0.002$ ; Likelihood Ratio = 20.337; Fisher exact  $p < 0.001$ ), with females reporting more stress (36/78 vs. 19/22 males) and hormonal triggers (29/78 vs. 0/22). No significant gender difference in monthly frequency (males:  $2.68 \pm 0.716$ ,  $n = 22$ ; females:  $2.68 \pm 0.747$ ,  $n = 78$ ; independent t-test  $t = 0.990$ ,  $df = 98$ ,  $p = 0.990$ ; Cohen's  $d = 0.003$ , 95% CI -0.47–0.48; Levene's  $p = 0.472$ ). Treatments: OTC analgesics (50%), prescriptions (34%), alternatives/lifestyle (16%). Effectiveness: somewhat (61%), ineffective (34%), effective (5%). **Table 1**

## Discussion

**Gender Disparity:** Female predominance (78%,  $\chi^2 p < 0.001$ ) mirrors global patterns (F:M ratio 2-3:1) and Indian studies from Karnataka (25.2% prevalence, OR = 2.03 females) and North India (Delhi-NCR 26.3%).<sup>[5]</sup> In Uttarakhand's urban Dehradun setting, gender  $\times$  triggers analysis ( $\chi^2 = 14.512$ ,  $p = 0.002$ ; Fisher  $p < 0.001$ ) revealed females' excess stress (36/78 vs. 19/22 males) and exclusive hormonal triggers (29/78 vs. 0/22), likely reflecting estrogen-mediated trigeminovascular activation during menstrual/perimenopausal fluctuations prevalent in midlife Uttarakhand women amid household (34%) and private

**Table 1: Migraine Patients Sociodemographic and Clinical Assessment Data (n=100)**

| Sociodemographic and Clinical Variable's  | No. of patients<br>n=100 | (%) | Mean ± SD   | P value |
|-------------------------------------------|--------------------------|-----|-------------|---------|
| <b>Gender</b>                             |                          |     |             | <0.001  |
| Male                                      | 22                       | 22  |             |         |
| Female                                    | 78                       | 78  |             |         |
| <b>Age</b>                                |                          |     |             | <0.001  |
| 18-20                                     | 6                        | 6   | 40.41±2.62  |         |
| 21-30                                     | 20                       | 20  |             |         |
| 31-40                                     | 23                       | 23  |             |         |
| 41-50                                     | 29                       | 29  |             |         |
| 51-60                                     | 16                       | 16  |             |         |
| 61-70                                     | 6                        | 6   |             |         |
| <b>Educational background</b>             |                          |     |             |         |
| Not educated                              | 5                        | 5   |             |         |
| Less than higher school                   | 6                        | 6   |             |         |
| High school                               | 45                       | 45  |             |         |
| Bachelor's degree                         | 33                       | 33  |             |         |
| Graduate degree                           | 11                       | 11  |             |         |
| <b>Occupational status</b>                |                          |     |             | <0.001  |
| Student                                   | 17                       | 17  |             |         |
| Government employee                       | 2                        | 2   |             |         |
| Business                                  | 4                        | 4   |             |         |
| Housewife                                 | 34                       | 34  |             |         |
| Private worker                            | 38                       | 38  |             |         |
| Retired                                   | 5                        | 5   |             |         |
| <b>Geographical region</b>                |                          |     |             | <0.001  |
| Dehradun, uttrakhand                      | 63                       | 63  |             |         |
| Haridwar, uttrakhand                      | 15                       | 15  |             |         |
| Uttarkashi, uttrakhand                    | 9                        | 9   |             |         |
| Chakrata, uttrakhand                      | 13                       | 13  |             |         |
| <b>Marital status</b>                     |                          |     |             | <0.001  |
| Married                                   | 76                       | 76  |             |         |
| Unmarried                                 | 21                       | 21  |             |         |
| Widow                                     | 3                        | 3   |             |         |
| <b>Days per month of migraine attacks</b> |                          |     |             | <0.001  |
| 1-4                                       | 6                        | 6   | 10.1±4.41   |         |
| 5-10                                      | 54                       | 54  |             |         |
| 11-15                                     | 30                       | 30  |             |         |
| > 15 days                                 | 10                       | 10  |             |         |
| <b>Time duration of migraine attacks</b>  |                          |     |             | <0.001  |
| <4 Hrs.                                   | 10                       | 10  | 17.42±10.21 |         |
| 4-24 Hrs.                                 | 69                       | 69  |             |         |
| >24 Hrs.                                  | 21                       | 21  |             |         |

sector (38%) stressors.

**Age Peak:** Mean age  $40.41 \pm 12.62$  years aligns with Indian peaks (35-45 years, Karnataka study) and Global Burden data, where midlife stressors amplify attacks.<sup>[6]</sup> Uttarakhand's Himalayan climate, seasonal changes (31% trigger), and urban pollution in Dehradun (63% patients) exacerbate this, compounding work-family pressures in this transitional demographic.

**Frequency and Burden:** High frequency ( $10.1 \pm 4.41$  days/month) exceeds global episodic migraine (4-14 days) toward chronic thresholds, matching Karnataka's median 24 days/year lost productivity.<sup>[5]</sup> Duration ( $17.42 \pm 10.21$  hours) parallels North Indian reports, imposing substantial economic strain in Dehradun's service economy (private

workers predominant).<sup>[7]</sup> No gender difference ( $t=0.990$ ,  $p=0.990$ ) contrasts female severity elsewhere, possibly due to Uttarakhand's male trekking/outdoor exposure mitigating attacks.

**Occupational-Trigger Links:** Triggers  $\times$  occupation association ( $\chi^2=26.981$ ,  $p=0.029$ ) highlights private workers/housewives' vulnerability stress dominant (55%), amplified post-activity (53%). Uttarakhand studies link high-altitude stress, irregular schedules, and domestic burdens to cortical spreading depression, with Dehradun's urban flux (pollution, traffic) as local amplifiers.<sup>[8]</sup>

**Symptom Concordance:** ICHD-3-concordant profile (nausea 84%, phonophobia 76%, aura 74%) matches Indian cohorts (Karnataka aura ~20-30%, higher

|                                                         |    |    |  |        |
|---------------------------------------------------------|----|----|--|--------|
| <b>Experience of nausea or vomiting</b>                 |    |    |  | <0.001 |
| Yes                                                     | 84 | 84 |  |        |
| No                                                      | 16 | 16 |  |        |
| <b>Experience of sensitivity to light or sound</b>      |    |    |  | <0.001 |
| Yes                                                     | 76 | 76 |  |        |
| No                                                      | 24 | 24 |  |        |
| <b>Experience of Aura symptoms</b>                      |    |    |  | <0.001 |
| Yes                                                     | 74 | 74 |  |        |
| No                                                      | 26 | 26 |  |        |
| <b>Migraine Triggers</b>                                |    |    |  | <0.001 |
| Stress                                                  | 55 | 55 |  |        |
| Hormonal changes                                        | 29 | 29 |  |        |
| Bright lights                                           | 10 | 10 |  |        |
| Sleep disturbances                                      | 6  | 6  |  |        |
| <b>Migraine occurring pattern and time</b>              |    |    |  | <0.001 |
| Time of day                                             | 8  | 8  |  |        |
| Day of the week                                         | 8  | 8  |  |        |
| Seasonal changes                                        | 31 | 31 |  |        |
| After specific activities                               | 53 | 53 |  |        |
| <b>Migraine Treatment and medications used</b>          |    |    |  |        |
| OTC pain relivers                                       | 50 | 50 |  | <0.001 |
| Prescription medications                                | 34 | 34 |  |        |
| Alternative therapies                                   | 8  | 8  |  |        |
| Lifestyle changes                                       | 8  | 8  |  |        |
| <b>Migraine Treatment and medications effectiveness</b> |    |    |  | <0.001 |
| Not effective                                           | 34 | 34 |  |        |
| Effective                                               | 5  | 5  |  |        |
| Somewhat effective                                      | 61 | 61 |  |        |

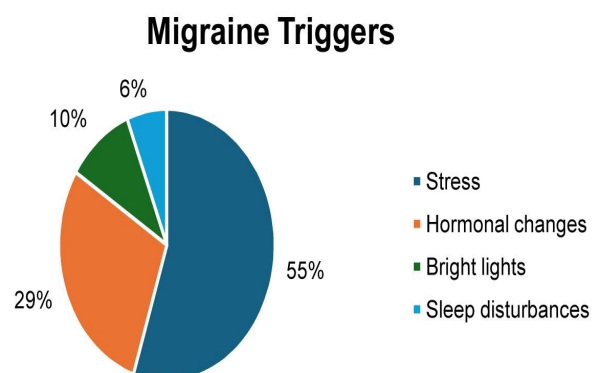
here suggesting cortical hyperexcitability).[6]  
Uttarakhand's bright lights (10%) trigger reflects Himalayan glare/urban lighting.

**Therapeutic Shortfalls:** Poor efficacy (5% effective; OTC 50%) echoes Indian access gaps Delhi-NCR pMOH risk (34.1% TTH)<sup>[9]</sup> with prescriptions underused due to costs in Uttarakhand's mixed public-private healthcare. Alternatives (16%) merit validation locally.

**Regional Insights:** Dehradun bias (63%) limits generalizability versus rural Uttarkashi/Haridwar; pollution/climate likely inflate urban prevalence above India's 25% lifetime rate. Uttarakhand-specific factors (Himalayan weather, diet) warrant community surveys.<sup>[10]</sup>

### Limitations

This hospital-based study (n=100, Dehradun-centric)



**Figure 1: Showing Migraine Triggers of Patients**

limits generalizability beyond urban Uttarakhand settings. Future community-based studies across rural Uttarkashi/Haridwar, larger cohorts (>500), and longitudinal designs should employ MIDAS/HIT-6 scoring alongside genetic-environmental analyses to track migraine progression, validate regional triggers, and assess long-term comorbidities (anxiety, sleep disorders, dementia) for comprehensive public health strategies.

### Conclusion

This Uttarakhand study reveals migraine's marked female predominance (78%), midlife burden (10.1 days/month), and stress/hormonal triggers linked to occupation/gender ( $\chi^2 p < 0.029/0.002$ ). Poor treatment efficacy underscores care gaps in Dehradun's urban context. Region-tailored stress interventions and trials are essential.

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