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# The Silent Burden of Migraine Among Nursing Officers in Punjab, India: A Cross-Sectional Study

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## Abstract

### Background and aim

Migraine is a recurring neurological condition marked by moderate to severe headache episodes, often accompanied by nausea, sensitivity to light and sound, and visual disturbances. Nursing officers face an elevated burden of long duty hours, rotating shifts, heavy patient loads, and interrupted sleep, which erode their health and can affect both work output and the standard of patient care. This exploratory study aimed to determine the proportion of nursing officers without a prior headache diagnosis who met questionnaire-based International Classification of Headache Disorders, 3rd edition (ICHD-3) criteria for migraine without aura and to explore its association with selected occupational, lifestyle, and clinical variables.

### Materials and methods

A descriptive cross-sectional study was conducted among 100 nursing officers recruited through purposive sampling from two hospitals (one government and one private) in Mohali, Punjab, India. Nursing officers working in intensive care units, emergency departments, operating theaters, and general wards who met the inclusion criteria were approached in person by the investigator during duty hours. Data were collected through a self-structured questionnaire covering baseline, occupational, lifestyle, and clinical data. Migraine without aura was assessed using an investigator-assembled self-report questionnaire based on the ICHD-3 criteria, without clinical confirmation. A participant was classified as having migraine only if all mandatory criteria were fulfilled. Data were analyzed using IBM SPSS Statistics for Windows, version 21.0 (released 2012; IBM Corp., Armonk, NY, USA); categorical variables were summarized as frequencies and percentages (n (%)), and associations were examined using Pearson's chi-square, Fisher's exact, or Fisher-Freeman-Halton exact tests, with $p < 0.05$ considered significant.

### Results

Of the 100 nursing officers, 35 (35.0%) answered yes to the headache screening question (recurrent headaches in the past year); of all 100 participants, 21 (21.0%; exact 95% CI, 13.5-30.3%) met questionnaire-based ICHD-3 criteria for migraine without aura. In exploratory unadjusted analyses, migraine was associated with years of nursing experience ($\chi^2 = 15.026$, df = 4; Fisher-Freeman-Halton exact $p = 0.003$), night shift frequency ($\chi^2 = 16.546$, df = 3; exact $p = 0.003$), smoking (Fisher's exact test, OR = 9.06, 95% CI, 1.53-53.55, $p = 0.017$), and frequency of tea/coffee consumption ($\chi^2 = 10.699$, df = 3; exact $p = 0.022$). Stress (19/21, 90.5%), inadequate sleep (15/21, 71.4%), and fasting (11/21, 52.4%) were the most common headache triggers among participants with migraine. Relief after sound sleep was significantly more frequent among participants with migraine (14/21, 66.7% vs. 1/14, 7.1%; Fisher's exact test, OR = 26.00, 95% CI, 2.80-241.11, $p = 0.001$). Most participants meeting the criteria reported relief with over-the-counter medication (16/21, 76.2%) or sound sleep (14/21, 66.7%); consultation history was not assessed.

### Conclusions

Among nursing officers without a prior headache diagnosis, about one in five met questionnaire-based criteria for migraine without aura. Exploratory unadjusted analyses suggested differences by night shift frequency and experience group, without a consistent dose-response pattern; stress and inadequate sleep were the most frequently reported triggers. These findings warrant confirmation in larger studies with clinical diagnosis.

**Categories:** Occupational Health, Other, Neurology
**Keywords:** ichd-3 criteria, inadequate sleep, migraine without aura, night shift work, nursing officers, occupational stress

## Introduction

Headache ranks among the most common reasons people seek medical help, yet it remains one of the most underrecognized and undertreated clinical conditions in health care [1]. Its principal primary forms,

migraine, tension-type headache, and cluster headache, spare no population: they occur in every age group, in men and women, and in high- and low-income settings alike, and together they rank among the leading causes of years lived with disability [1]. The burden extends well beyond the pain itself. People with recurrent attacks lose working days, perform below their capacity when they do attend, and often report coexisting anxiety or low mood, while uncertainty about when the next episode will strike affects their lives with family, friends, and colleagues [2].

About half of adults worldwide (52%) have an active headache disorder [3], and headache disorders affected an estimated 3.1 billion people in 2021 [1]. In the United States, around 15% of adults report migraine or severe headache within a three-month period, and headache is among the leading causes of emergency department visits [4]. India alone carried an estimated 213 million migraine cases in 2019 [5], and a community-based study from the Punjab region reported migraine in 22.4% of urban adults, considerably more often in women (26.1%) than in men [6]. A population-based survey in Karnataka estimated a one-year migraine prevalence of 25.2% [7]. Migraine also imposes substantial productivity costs on employers [8].

A range of occupational and environmental exposures contributes to headache disorders. Toxic substances [9], tobacco smoke [10], air pollutants [11], workplace stress [8], poor lighting, heat, cold air drafts, odors, and indoor air quality [12], shift-based scheduling [13], and prolonged screen use [14] have each been linked to a higher risk of headache. For working adults, the toll extends beyond physical pain: cognitive slowing [15], mood disturbances, insomnia [16], light and sound sensitivity, and nausea collectively erode job performance and push people toward social withdrawal [12]. Heavy job demands, low control over one's work, role conflict, bullying, effort-reward imbalance [12,13], unsupportive or authoritarian leadership by supervisors, and unequal treatment at work add further risk [17]. The COVID-19 pandemic intensified these challenges among health care professionals through infection-related complications [18], prolonged mask wearing [19], and extreme psychological strain [20].

Nurses, in particular, report headache disorders, including migraine, far more often than the general population (primary headache disorders, 45.3% vs. 23.8%) [21], and a nationwide cohort from Taiwan found that nurses had about 1.6 times higher odds of migraine than the general population [22]. Much of this gap can be attributed to heavy workloads, irregular and rotating shifts, sustained job stress, and chronic short sleep associated with extended working hours. These findings emphasize the need for occupational health interventions tailored to nurses, particularly the regulation of shift work, stress management, and adequate rest, to reduce the burden of migraine in this group.

### Research gap

Most studies concerning migraine among nursing officers have focused primarily on night shift work, sleep disturbances, and occupational stress as contributors to a higher headache burden, and most of this evidence comes from China, Europe, and Hong Kong [21,23,24]. Reported prevalence varies widely across these studies, partly because some used screening questionnaires while others applied full International Classification of Headache Disorders (ICHD) criteria. In India, population-based studies have shown that migraine is highly prevalent in the general adult population [6,7], but they did not examine occupational groups. Indian data on nurses remain scarce: the available study from a South Indian tertiary center described migraine prevalence, triggers, and relieving factors among nursing students [25] but did not assess bedside nurses or occupational exposures such as years of clinical experience, shift duration, or night shift frequency.

Furthermore, no region-specific research from North India, including Punjab, has examined migraine among nursing officers alongside occupational demands such as clinical experience, shift duration, and night shift frequency; lifestyle factors such as smoking and frequency of tea/coffee consumption; and clinical factors such as family history, self-reported triggers, and self-management. Understanding these factors is essential for estimating how often migraine occurs and developing targeted workplace health measures to support affected nursing professionals.

### Objectives

The objectives of this study are to assess the occurrence of migraine among nursing officers working in selected hospitals in Mohali, Punjab, and to determine the associations between migraine and selected occupational, lifestyle, and clinical variables among nursing officers.

## Materials And Methods

### Study design and setting

A descriptive cross-sectional study was carried out among nursing officers at two hospitals in Mohali, Punjab, India (one government hospital and one private hospital), where registered nursing officers were actively engaged in direct patient care across diverse clinical units involving extended hours and continuous patient monitoring. Nursing officers working in intensive care units (ICU/CCU/NICU), emergency departments, operating theaters, and general wards who met the inclusion criteria were approached in person by the investigator during duty hours and invited to participate. At the study hospitals, a morning

shift ran from 8 AM to 2 PM, and a night duty lasted 12 hours, from 8 PM to 8 AM; shift duration refers to each participant's usual duty shift in hours. Ethical approval was obtained from the Institutional Ethics Committee, Chitkara University, Punjab (approval no. IHEC/DHR/CU/PB/23/219), and written informed consent was obtained from all participants before data collection. The study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies.

## Study participants

Participants were recruited using a nonprobability purposive sampling technique. Inclusion criteria included registered nursing officers actively engaged in direct patient care with at least three months of experience in the current ward, so that the three-month recall period used for the ICHD-3 items reflected their current working conditions. No upper or lower age limit was applied; participants were aged 21-50 years. The exclusion criteria were nursing officers previously diagnosed with migraine or any other primary headache disorder; those with chronic medical conditions, such as hypertension, diabetes mellitus, tumors, or renal disease; those currently taking regularly prescribed medications; and those unwilling to participate in the study.

## Sample size

A single population proportion formula was used to estimate the sample size:

$$n = \frac{Z^2 \times p \times (1-p)}{d^2},$$

where n is the minimum required sample size, Z = 1.96 (95% confidence level), p = 0.252 (the one-year prevalence of migraine reported in a large population-based study in India [7]), and d = 0.09 (absolute precision). Thus, the sample size was calculated as follows:

$$n = \frac{1.96^2 \times 0.252 \times 0.748}{0.09^2} = 89.4$$

The calculated sample size was rounded up to 90. A total of 100 participants were recruited, keeping in mind the potential for nonresponse.

## Assessment tools and data collection

The self-administered questionnaire collected baseline data, including age, gender, marital status, qualification, nursing experience, shift duration, night shift frequency, lifestyle factors, BMI, and family medical history, together with self-reported headache triggers and usual relief measures. Triggers (including inadequate sleep) and relief measures (including sound sleep and over-the-counter medication) were recorded as self-reported tick-box items; sleep quality was not measured with a standardized instrument. To assess the main outcome, participants completed an investigator-assembled self-report questionnaire based on the ICHD-3 criteria for migraine without aura (code 1.1) [26] (Appendix A). This questionnaire was not validated as a diagnostic instrument, and no clinical confirmation was performed; aura symptoms were not assessed, so migraine with aura and probable migraine (code 1.5) could not be identified. These criteria comprised headache occurrence, number of attacks, duration, pain characteristics, associated symptoms, and exclusion of other possible causes. The content of the baseline section, developed by the investigators, was reviewed by three senior nursing experts. Data were collected from October 2024 to January 2025, following an explanation of the study procedures and obtaining informed consent. Of the 150 nursing officers approached, 100 returned the questionnaire (response rate, 66.7%); the remaining 50 did not return it. All returned questionnaires were complete, so no missing data handling or imputation was required. The study focused on migraine without aura; participants were classified as cases only if they fulfilled the ICHD-3 criteria for migraine.

## Participant-level diagnostic algorithm

A participant was classified as having migraine only if all mandatory ICHD-3 diagnostic criteria (A to E) were satisfied. The algorithm was applied to each participant in three steps.

*Step 1 (Headache Screening)*

All 100 participants answered the item, "Have you experienced recurrent (repeated) episodes of headache during the past year?" (yes/no). Those answering no were classified as not having migraine, and those answering yes completed the ICHD-3 diagnostic items in Step 2.

*Step 2 (Criterion A to E Assessment)*

Participants who answered yes completed the ICHD-3 items, with the instruction to consider headaches experienced over the past three months. The questionnaire captured each mandatory criterion as follows. Criterion A: the number of headache attacks experienced during the past three months (at least five). Criterion B: the usual duration of an untreated or unsuccessfully treated attack (four to 72 hours). Criterion C: four pain characteristics, namely, unilateral location, pulsating quality, moderate or severe intensity, and aggravation by or avoidance of routine physical activity (at least two present). Criterion D: associated symptoms (nausea and/or vomiting, or both photophobia and phonophobia). Criterion E: headache not better accounted for by another ICHD-3 diagnosis, assessed by a single self-report item worded "Not attributed to another disorder" (yes/no); no clinical history review, red flag assessment, physical examination, or referral was performed, and the classification was not reviewed by a headache specialist. Participants could tick more than one characteristic; criterion C was considered met when at least two of C1-C4 were ticked, and criterion D when at least one of D1-D2 was ticked.

*Step 3 (Classification)*

Participants whose headaches fulfilled criteria B to D, with at least five such attacks (criterion A), and were not better accounted for by another diagnosis (criterion E) were classified as having migraine. The remaining participants, whose headaches did not meet all criteria, remained diagnostically unclassified. The proportion meeting the criteria was calculated as the number of participants meeting the criteria divided by the total sample (N = 100).

### Statistical analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 21.0 (released 2012; IBM Corp., Armonk, NY, USA). Fisher-Freeman-Halton exact p-values, the exact Clopper-Pearson 95% CI, and Woolf 95% CIs for ORs were calculated separately from the SPSS output. All data analyses were performed using appropriate descriptive and inferential statistical methods. Frequencies and percentages (n (%)) were used to summarize baseline data and clinical characteristics. The proportion meeting the questionnaire-defined criteria was calculated with its exact Clopper-Pearson 95% CI. Associations between migraine and selected categorical variables were tested using Pearson's chi-square test (reported as the test statistic $\chi^2$ with df and the p-value) and Fisher's exact test; because several contingency tables had sparse expected counts, p-values for tables larger than 2 × 2 were obtained from the Fisher-Freeman-Halton exact test. Fisher's exact test calculates the p-value directly and does not produce a test statistic; therefore, for each Fisher's exact test, the OR with its 95% CI (Woolf method) is reported alongside the p-value as the measure of effect size. Headache triggers and relief measures, which were asked only of participants with recurrent headache (n = 35), were compared between participants with migraine (n = 21) and those with unclassified headache (n = 14) using Fisher's exact test, and ORs with 95% CIs were calculated; the menstrual cycle trigger was compared among women only. No t-test or F-test (ANOVA) was required because all study variables were categorical. All tests were two-sided, and a p-value of < 0.05 was considered statistically significant. All associations were examined in exploratory, unadjusted bivariate analyses; multivariable adjustment was not performed because of the small number of participants meeting the criteria (n = 21), and no correction was made for multiple comparisons (18 variables tested), although a Bonferroni sensitivity analysis is reported.

## Results

Table *1* shows the baseline characteristics of the 100 participants. Most participants were female (81, 81.0%), and the remaining 19 (19.0%) were male. The majority were aged 21-30 years (77, 77.0%), followed by those aged 31-40 years (22, 22.0%), with only one (1.0%) participant in the 41-50-year age group. Nearly two-thirds were unmarried (64, 64.0%), and 36 (36.0%) were married. With regard to educational qualification, 62 (62.0%) held a B.Sc. Nursing degree, 31 (31.0%) held a Diploma in Nursing, and seven (7.0%) held an M.Sc. Nursing degree. Overall, 35 (35.0%) participants answered yes to the headache screening question (recurrent headaches in the past year), whereas 65 (65.0%) answered no; only these 35 participants were assessed for migraine.

| Variables | Options | n | % |
|---|---|---|---|
| Suffering from headaches | No | 65 | 65.0 |
| | Yes | 35 | 35.0 |
| Age (in years) | 21-30 | 77 | 77.0 |
| | 31-40 | 22 | 22.0 |
| | 41-50 | 1 | 1.0 |
| Gender | Male | 19 | 19.0 |
| | Female | 81 | 81.0 |

| | | | |
|---|---|---|---|
| Marital status | Unmarried | 64 | 64.0 |
| | Married | 36 | 36.0 |
| Highest qualification | Diploma in Nursing | 31 | 31.0 |
| | B.Sc. Nursing | 62 | 62.0 |
| | M.Sc. Nursing | 7 | 7.0 |
| Working hospital | Government | 40 | 40.0 |
| | Private | 60 | 60.0 |
| Designation | Ward nurse | 16 | 16.0 |
| | Preceptor | 5 | 5.0 |
| | Nursing officer | 79 | 79.0 |
| Total experience in nursing | 3-11 months | 8 | 8.0 |
| | 1-5 years | 63 | 63.0 |
| | 6-10 years | 20 | 20.0 |
| | 11-15 years | 5 | 5.0 |
| | >15 years | 4 | 4.0 |
| Working hours | 6 | 49 | 49.0 |
| | 8 | 42 | 42.0 |
| | 9 | 1 | 1.0 |
| | 12 | 8 | 8.0 |
| Night shift per month | 3 | 15 | 15.0 |
| | 6 | 32 | 32.0 |
| | 8 | 43 | 43.0 |
| | 10 | 10 | 10.0 |
| Food habits | Vegetarian | 65 | 65.0 |
| | Nonvegetarian | 27 | 27.0 |
| | Eggetarian | 6 | 6.0 |
| | Vegan | 2 | 2.0 |
| Cigarette smoking | No | 94 | 94.0 |
| | Yes | 6 | 6.0 |
| Alcohol consumption | No | 96 | 96.0 |
| | Yes | 4 | 4.0 |
| How often do you consume alcohol in a month? | 3 times | 2 | 2.0 |
| | 6 times | 2 | 2.0 |
| Preferred beverages | Tea | 72 | 72.0 |
| | Coffee | 28 | 28.0 |
| Frequency of tea/coffee consumption per day | Once | 23 | 23.0 |
| | Twice | 41 | 41.0 |
| | Three times | 20 | 20.0 |
| | Four times | 16 | 16.0 |
| | Going out with family and friends | 14 | 14.0 |

| | | | |
|---|---|---|---|
| Utilizing weekend and leisure time | Spending time with family | 19 | 19.0 |
| | Reading books, resting, and sleeping | 27 | 27.0 |
| | Household activities | 8 | 8.0 |
| | Watching TV and using mobile devices | 32 | 32.0 |

**TABLE 1: Frequency and percentage distribution of baseline characteristics of participants.**

Data are presented as n (%); N = 100. Suffering from headaches refers to recurrent headaches.

Regarding occupational characteristics (Table *1*), 60 (60.0%) participants worked in a private hospital, and 40 (40.0%) worked in a government hospital. Most were designated as nursing officers (79, 79.0%), followed by ward nurses (16, 16.0%) and preceptors (5, 5.0%). Total nursing experience was one to five years for 63 (63.0%) participants, six to 10 years for 20 (20.0%), three to 11 months for eight (8.0%), 11-15 years for five (5.0%), and more than 15 years for four (4.0%). Regarding shift duration, 49 (49.0%) worked six-hour shifts, and 42 (42.0%) worked eight-hour shifts, whereas eight (8.0%) worked 12-hour shifts and one (1.0%) worked nine-hour shifts. The largest group worked eight night shifts per month (43, 43.0%), followed by six (32, 32.0%), three (15, 15.0%), and 10 (10, 10.0%) night shifts per month.

With respect to lifestyle factors (Table *1*), most participants were vegetarian (65, 65.0%), whereas 27 (27.0%) were nonvegetarian, six (6.0%) were eggetarian, and two (2.0%) were vegan. Six (6.0%) participants reported cigarette smoking, and 94 (94.0%) did not. Alcohol was consumed by four (4.0%) participants, of whom two (2.0%) reported drinking three times a month and two (2.0%) reported drinking six times a month. Tea was the preferred beverage for 72 (72.0%) participants, and coffee was preferred by 28 (28.0%). Tea or coffee was consumed twice daily by 41 (41.0%) participants, once daily by 23 (23.0%), three times daily by 20 (20.0%), and four times daily by 16 (16.0%). Regarding weekend and leisure activities, 32 (32.0%) participants spent their time watching television or using mobile phones, 27 (27.0%) read books, rested, or slept, 19 (19.0%) spent time with family, 14 (14.0%) went out with family and friends, and eight (8.0%) engaged in household activities.

Table *2* presents the clinical variables of the participants. Most participants (80, 80.0%) had a BMI within the normal range (18.5-24.9), 16 (16.0%) were in the 25-29.9 range, three (3.0%) had a BMI of 18.5 or less, and one (1.0%) had a BMI of 30 or above. A family history of diabetes mellitus was reported by 48 (48.0%) participants, hypertension by 25 (25.0%), stroke by five (5.0%), and migraine by only two (2.0%).

| Clinical variables | Options | n | % |
|---|---|---|---|
| BMI | 18.5 and less | 3 | 3.0 |
| | 18.5-24.9 | 80 | 80.0 |
| | 25-29.9 | 16 | 16.0 |
| | 30 and above | 1 | 1.0 |
| Family history of hypertension | Yes | 25 | 25.0 |
| Family history of migraine | Yes | 2 | 2.0 |
| Family history of brain stroke | Yes | 5 | 5.0 |
| Family history of DM | Yes | 48 | 48.0 |
| Triggering factor for headache | Stress | 30 | 30.0 |
| | Inadequate sleep | 23 | 23.0 |
| | Fasting | 15 | 15.0 |
| | Menstrual cycle | 5 | 5.0 |
| Headache attack relieved | Over-the-counter drug | 24 | 24.0 |
| | After sound sleep | 15 | 15.0 |
| | After having food | 14 | 14.0 |
| | Subsides on its own | 7 | 7.0 |

**TABLE 2: Frequency and percentage distribution of clinical variables.**

Data are presented as n (%); N = 100. Triggers and relief measures were reported by the 35 participants with recurrent headaches; multiple responses were allowed. Over-the-counter medication refers to medication taken by participants on their own during a headache episode, not regular medication.

Triggers and relief measures were reported by the 35 participants with recurrent headaches, and multiple responses were allowed; the percentages in Table *2* are expressed as proportions of the total sample (N = 100). The most frequently reported triggers were stress (30, 30.0%) and inadequate sleep (23, 23.0%), followed by fasting (15, 15.0%) and the menstrual cycle (five, 5.0%); 29 participants reported more than one trigger. Expressed as proportions of the 35 participants with recurrent headaches, these triggers corresponded to 30/35 (85.7%), 23/35 (65.7%), 15/35 (42.9%), and 5/35 (14.3%), respectively. The most common relief measures were over-the-counter medications (24, 24.0%), sound sleep (15, 15.0%), and eating (14, 14.0%), whereas the headache subsided on its own in seven (7.0%) participants; 21 participants used more than one relief measure. Among those with recurrent headaches, these relief measures corresponded to 24/35 (68.6%), 15/35 (42.9%), 14/35 (40.0%), and 7/35 (20.0%), respectively.

## Questionnaire-defined migraine without aura

Of the 100 nursing officers, 35 (35.0%) reported recurrent headaches and were assessed against each self-reported ICHD-3 criterion using the diagnostic algorithm. Of these 35 participants, 21 (60.0%) fulfilled all five mandatory criteria (Table *3*); thus, 21 of the 100 participants (21.0%) met the questionnaire-defined criteria for migraine without aura (exact binomial 95% CI, 13.5-30.3%). This interval reflects sampling variation only and does not account for purposive recruitment, the exclusion of nursing officers with diagnosed headache disorders, nonresponse, or classification error. The remaining 14 (40.0%) participants with recurrent headaches did not meet the questionnaire-defined criteria for migraine without aura and remained diagnostically unclassified; this group may include probable migraine, migraine with aura, tension-type headache, or other headache disorders. Questionnaire-defined migraine without aura was identified in 8/40 (20.0%) participants from the government hospital and 13/60 (21.7%) from the private hospital (Fisher's exact test, p = 1.00).

| Diagnostic criteria | Category | n | % |
|---|---|---|---|
| A: At least five headache attacks fulfilling criteria B-D | Yes | 21 | 100.0 |
| B: Attacks lasting four to 72 hours (untreated or unsuccessfully treated) | Yes | 21 | 100.0 |
| C: At least two of the following characteristics (more than one could be ticked) | C1: Unilateral location | 12 | 57.1 |
| | C2: Pulsating quality | 18 | 85.7 |
| | C3: Moderate or severe pain intensity | 17 | 81.0 |
| | C4: Aggravation by or avoidance of routine activity | 3 | 14.3 |
| D: At least one of the following associated symptoms | Nausea and/or vomiting only | 14 | 66.7 |
| | Photophobia and phonophobia only | 4 | 19.0 |
| | Both symptoms | 3 | 14.3 |
| E: Not better accounted for by another ICHD-3 diagnosis (self-reported) | Yes | 21 | 100.0 |

**TABLE 3: Frequency and percentage distribution of migraine among nursing officers using ICHD-3 criteria.**

Percentages are based on the 21 participants meeting the questionnaire-defined criteria. Participants could select more than one characteristic for criteria C and D; criterion C was met if at least two of C1-C4 were selected, and criterion D if at least one of D1-D2 was selected. Criterion E was self-reported.

ICHD-3: International Classification of Headache Disorders, 3rd edition

Table 3 shows the questionnaire responses of the 21 participants who met the criteria. All reported at least five attacks (criterion A) lasting four to 72 hours (criterion B) and self-reported that their headaches were not attributable to another disorder (criterion E). Among the criterion C characteristics, pulsating quality was the most common (18, 85.7%), followed by moderate or severe intensity (17, 81.0%), unilateral location (12, 57.1%), and aggravation by routine activity (three, 14.3%). The most frequent pairs were pulsating quality with moderate or severe intensity (seven, 33.3%) and unilateral location with pulsating quality (four, 19.0%). For criterion D, 14 (66.7%) reported nausea and/or vomiting only, four (19.0%) reported photophobia and phonophobia only, and three (14.3%) reported both. Thus, nausea and/or vomiting was reported overall by 17 (81.0%) participants, and photophobia and phonophobia were reported by seven (33.3%).

Table 4 presents the associations between migraine and selected baseline and clinical variables (N = 100), tested using Pearson's chi-square, Fisher's exact, or Fisher-Freeman-Halton exact tests, as indicated.

| Variable | Category | Migraine present, n (%) | Migraine absent, n (%) | $\chi^2$/Fisher's exact test | df | p-value |
|---|---|---|---|---|---|---|
| Total experience in nursing | 3-11 months | 3 (14.3) | 5 (6.3) | 15.026 | 4 | 0.003* |
| | 1-5 years | 7 (33.3) | 56 (70.9) | | | |
| | 6-10 years | 8 (38.1) | 12 (15.2) | | | |
| | 11-15 years | 3 (14.3) | 2 (2.5) | | | |
| | >15 | 0 (0.0) | 4 (5.1) | | | |
| Working hours per shift | 6 | 8 (38.1) | 41 (51.9) | 1.670 | 3 | 0.597 |
| | 8 | 11 (52.4) | 31 (39.2) | | | |
| | 9 | 0 (0.0) | 1 (1.3) | | | |
| | 12 | 2 (9.5) | 6 (7.6) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Night shifts per month | 3 | 2 (9.5) | 13 (16.5) | 16.546 | 3 | 0.003* |
| | 6 | 4 (19.0) | 28 (35.4) | | | |
| | 8 | 8 (38.1) | 35 (44.3) | | | |
| | 10 | 7 (33.3) | 3 (3.8) | | | |
| Cigarette smoking | Yes | 4 (19.0) | 2 (2.5) | Fisher's exact test | - | 0.017* |
| | No | 17 (81.0) | 77 (97.5) | | | |
| Frequency of tea/coffee consumption per day | Once | 2 (9.5) | 21 (26.6) | 10.699 | 3 | 0.022* |
| | Twice | 8 (38.1) | 33 (41.8) | | | |
| | Three times | 3 (14.3) | 17 (21.5) | | | |
| | Four times | 8 (38.1) | 8 (10.1) | | | |
| Family history of hypertension | No | 14 (66.7) | 61 (77.2) | 0.985 | 1 | 0.321 |
| | Yes | 7 (33.3) | 18 (22.8) | | | |
| Family history of migraine | No | 20 (95.2) | 78 (98.7) | Fisher's exact test | - | 0.378 |
| | Yes | 1 (4.8) | 1 (1.3) | | | |
| Family history of diabetes mellitus | No | 10 (47.6) | 42 (53.2) | 0.204 | 1 | 0.651 |
| | Yes | 11 (52.4) | 37 (46.8) | | | |
| Family history of stroke | No | 18 (85.7) | 77 (97.5) | Fisher's exact test | - | 0.061 |
| | Yes | 3 (14.3) | 2 (2.5) | | | |
| Headache trigger: stress | No | 2 (9.5) | 3 (21.4) | Fisher's exact test | - | 0.369 |
| | Yes | 19 (90.5) | 11 (78.6) | | | |
| Headache trigger: inadequate sleep | No | 6 (28.6) | 6 (42.9) | Fisher's exact test | - | 0.477 |
| | Yes | 15 (71.4) | 8 (57.1) | | | |
| Headache trigger: fasting | No | 10 (47.6) | 10 (71.4) | Fisher's exact test | - | 0.296 |
| | Yes | 11 (52.4) | 4 (28.6) | | | |
| Headache trigger: menstrual cycle (women only, n = 28) | No | 15 (88.2) | 8 (72.7) | Fisher's exact test | - | 0.353 |
| | Yes | 2 (11.8) | 3 (27.3) | | | |
| Headache relief measure: subsides on its own | Yes | 1 (4.8) | 6 (42.9) | Fisher's exact test | - | 0.010* |
| Headache relief measure: over-the-counter medication | Yes | 16 (76.2) | 8 (57.1) | Fisher's exact test | - | 0.283 |
| Headache relief measure: after sound sleep | Yes | 14 (66.7) | 1 (7.1) | Fisher's exact test | - | 0.001* |
| Headache relief measure: after eating | Yes | 10 (47.6) | 4 (28.6) | Fisher's exact test | - | 0.311 |

**TABLE 4: Association of migraine with selected baseline and clinical variables (Pearson's chi-square test or Fisher's exact test).**

Data are presented as n (%); percentages are column percentages within the migraine-present (n = 21) and migraine-absent (n = 79) groups (for trigger and relief rows, within the migraine (n = 21) and unclassified headache (n = 14) groups; for the menstrual cycle, women only). * $p < 0.05$ indicates statistical significance (two-sided). For 2 × 2 tables, Fisher's exact test was applied when the expected cell count was <5 and Pearson's chi-square test was applied otherwise. For tables larger than 2 × 2, Pearson's $\chi^2$ is presented for reference, whereas p-values were obtained using the Fisher-Freeman-Halton exact test because more than 20% of the expected cell counts were <5. Trigger and relief rows include only the 35 participants with recurrent headaches; multiple responses were allowed, and each item was analyzed as a yes/no response.

Among occupational factors, migraine differed across categories of nursing experience (Pearson's $\chi^2$ = 15.026, df = 4; Fisher-Freeman-Halton exact test, p = 0.003). Migraine was present in 3/8 (37.5%) nursing officers with three to 11 months of experience, 7/63 (11.1%) with one to five years, 8/20 (40.0%) with six to 10 years, 3/5 (60.0%) with 11-15 years, and 0/4 (0.0%) with more than 15 years of experience. These proportions did not follow a consistent dose-response pattern, and several categories contained very few participants.

The number of night shifts per month was also significantly associated with migraine (Pearson's $\chi^2$ = 16.546, df = 3; Fisher-Freeman-Halton exact test, p = 0.003): 7/10 (70.0%) nursing officers working 10 night shifts per month had migraine, compared with 2/15 (13.3%), 4/32 (12.5%), and 8/43 (18.6%) of those working three, six, and eight night shifts, respectively. Shift duration was not associated with migraine (Pearson's $\chi^2$ = 1.670, df = 3; Fisher-Freeman-Halton exact test, p = 0.597); migraine was present in 8/49 (16.3%), 11/42 (26.2%), 0/1 (0.0%), and 2/8 (25.0%) of those working six-, eight-, nine-, and 12-hour shifts, respectively.

Among lifestyle factors, cigarette smoking was more common among participants with migraine (4/21, 19.0%) than among those without migraine (2/79, 2.5%; Fisher's exact test, OR = 9.06, 95% CI, 1.53-53.55, p = 0.017). Frequency of tea/coffee consumption was also associated with migraine (Pearson's $\chi^2$ = 10.699, df = 3; Fisher-Freeman-Halton exact test, p = 0.022), with eight of the 16 (50.0%) participants consuming tea/coffee four times daily having migraine, compared with 2/23 (8.7%), 8/41 (19.5%), and 3/20 (15.0%) of those consuming it once, twice, and three times daily, respectively.

Family history of hypertension (7/21, 33.3% vs. 18/79, 22.8%; Pearson's chi-square test, $\chi^2$ = 0.985, df = 1, p = 0.321), diabetes mellitus (11/21, 52.4% vs. 37/79, 46.8%; $\chi^2$ = 0.204, df = 1, p = 0.651), migraine (1/21, 4.8% vs. 1/79, 1.3%; Fisher's exact test, OR = 3.90, 95% CI, 0.23-65.11, p = 0.378), and stroke (3/21, 14.3% vs. 2/79, 2.5%; Fisher's exact test, OR = 6.42, 95% CI, 1.00-41.27, p = 0.061) were not significantly associated with migraine.

Among the 35 participants with recurrent headaches (Table *4*), stress (19/21, 90.5% vs. 11/14, 78.6%; Fisher's exact test, OR 2.59, 95% CI 0.37-17.98, p = 0.369), inadequate sleep (15/21, 71.4% vs. 8/14, 57.1%; OR 1.88, 95% CI 0.45-7.76, p = 0.477), and fasting (11/21, 52.4% vs. 4/14, 28.6%; OR 2.75, 95% CI 0.65-11.62, p = 0.296) were reported more often by nursing officers with migraine than by those with unclassified headache. In contrast, among women (n = 28), the menstrual cycle was reported less often as a trigger by those meeting the migraine criteria (2/17, 11.8% vs. 3/11, 27.3%; OR 0.36, 95% CI 0.05-2.59, p = 0.353). None of these differences was statistically significant (Fisher's exact test). Relief after sound sleep was significantly more common among participants with migraine (14/21, 66.7% vs. 1/14, 7.1%; Fisher's exact test, OR 26.00, 95% CI 2.80-241.11, p = 0.001), whereas headache subsiding on its own was more common among those with unclassified headache (6/14, 42.9% vs. 1/21, 4.8%; Fisher's exact test, OR 0.07, 95% CI 0.01-0.65, p = 0.010). The use of over-the-counter drugs (16/21, 76.2% vs. 8/14, 57.1%; OR 2.40, 95% CI 0.56-10.32, p = 0.283) and relief after eating (10/21, 47.6% vs. 4/14, 28.6%; OR 2.27, 95% CI 0.54-9.61, p = 0.311) did not differ significantly (Fisher's exact test).

Table *5* shows the ORs with 95% CIs for headache triggers and relief measures among the 35 participants with recurrent headaches, comparing the 21 participants with migraine with the 14 with unclassified headache (reference group). The p-values were obtained using Fisher's exact test, which does not yield a test statistic.

| Variables | OR | 95% CI | p-value |
|---|---|---|---|
| Triggers for headache | | | |
| Stress | 2.59 | 0.37-17.98 | 0.369 |
| Inadequate sleep | 1.88 | 0.45-7.76 | 0.477 |
| Fasting | 2.75 | 0.65-11.62 | 0.296 |
| Menstrual cycle (women only, n = 28) | 0.36 | 0.05-2.59 | 0.353 |
| Relief measures for headache | | | |
| Over-the-counter drugs | 2.4 | 0.56-10.32 | 0.283 |
| After sound sleep | 26 | 2.80-241.11 | 0.001* |
| After having food | 2.27 | 0.54-9.61 | 0.311 |
| Subsides on its own | 0.07 | 0.01-0.65 | 0.010* |

**TABLE 5: ORs for triggers and relief measures among nursing officers with migraine compared with those with unclassified headache (95% CI; Fisher's exact test).**

Reference group: unclassified headache (n = 14); migraine group, n = 21 (menstrual cycle: women only, 17 vs. 11). * p < 0.05. All p-values are from Fisher's exact test, which calculates the p-value directly and does not yield a test statistic.

Nursing officers with migraine had higher, but statistically nonsignificant, odds of reporting fasting (OR 2.75, 95% CI 0.65-11.62; Fisher's exact test, p = 0.296), stress (OR 2.59, 95% CI 0.37-17.98; p = 0.369), and inadequate sleep (OR 1.88, 95% CI 0.45-7.76; p = 0.477) as headache triggers. However, all CIs included 1. Among women, the menstrual cycle was less likely to be reported as a trigger (OR 0.36, 95% CI 0.05-2.59; p = 0.353).

Regarding relief measures, participants with migraine had markedly higher odds of reporting relief after sound sleep (OR 26.00, 95% CI 2.80-241.11; Fisher's exact test, p = 0.001), whereas headache subsiding on its own was significantly less likely to be reported (OR 0.07, 95% CI 0.01-0.65; Fisher's exact test, p = 0.010).

The odds of using over-the-counter drugs (OR 2.40, 95% CI 0.56-10.32; p = 0.283) and reporting relief after eating (OR 2.27, 95% CI 0.54-9.61; p = 0.311) were higher in the migraine group but did not differ significantly. The wide CI for relief after sound sleep (2.80-241.11) reflects the small number of participants in the unclassified headache group; therefore, the magnitude of this association should be interpreted with caution.

After Bonferroni correction for 18 comparisons (p < 0.0028), only relief after sound sleep remained statistically significant. The associations with total nursing experience and night-shift frequency (both p = 0.003) were just above this threshold.

## Discussion

In this sample of nursing officers without a prior headache diagnosis, 21 of 100 (21.0%) met the questionnaire-defined ICHD-3 criteria for migraine without aura. For context, population-based studies in India have reported migraine in 22.4% of adults in an urban community in Ludhiana, Punjab [6] and a one-year prevalence of 25.2% in Karnataka [7], while a prevalence of 14.8% has been reported among nursing staff in North China [21]. Because of differences in case definitions and the exclusion of previously diagnosed cases in the present study, these figures are not directly comparable.

In exploratory unadjusted analyses, migraine differed across categories of nursing experience (Fisher-Freeman-Halton exact test, p = 0.003), but the proportions did not follow a consistent dose-response pattern, and several categories had small sample sizes. The proportion was 11/25 (44.0%) among those with six to 15 years of experience, compared with 7/63 (11.1%) among those with one to five years of experience. A similar pattern was reported in North China, where seniority of five years or more was an independent risk factor for migraine among nurses (OR 2.28) [21]. This pattern may reflect the compounded strain of adapting to clinical responsibilities in midcareer roles and irregular shift schedules [17]. However, more experienced nurses are also older and may work a different number of night shifts. Because experience, age, and night-shift exposure overlap, this study cannot establish which factor explains the observed difference.

The number of night shifts per month was also significantly associated with migraine (Fisher-Freeman-Halton exact test, p = 0.003), with the proportion affected increasing sharply from 12.5%-18.6% (2/15, 13.3%; 4/32, 12.5%; and 8/43, 18.6% among nurses working three, six, and eight night shifts, respectively) to 70.0% (7/10) among those working 10 night shifts. This finding is consistent with evidence linking rotating and night-shift work to disrupted circadian rhythms, chronic sleep debt, and increased migraine frequency among healthcare workers [23]. It also supports reports that sleep disorders are closely linked to migraine [27]. Notably, total shift duration itself was not significantly associated with migraine in this sample (Fisher-Freeman-Halton exact test, p = 0.597), suggesting that the frequency and irregularity of night duty, rather than the duration of any single shift, may be the more relevant occupational exposure.

Among lifestyle factors, smoking was associated with migraine (4/6, 66.7% of smokers vs. 17/94, 18.1% of nonsmokers; Fisher's exact test, OR 9.06, 95% CI 1.53-53.55, p = 0.017), consistent with evidence linking tobacco smoke to headache [10]. Only six (6.0%) participants reported using nicotine, so this estimate is imprecise. Nevertheless, given the broader health harms of tobacco, these findings support a zero-tolerance approach to smoking among healthcare staff, with cessation support offered to those who smoke. The frequency of tea/coffee consumption was also associated with migraine (Fisher-Freeman-Halton exact test, p = 0.022), with half of those consuming tea/coffee four times a day reporting migraine (8/16, 50.0%). This finding is consistent with established literature suggesting that frequent consumption may contribute to attacks through irregular intake and withdrawal. Alternatively, nurses with migraine may consume tea/coffee more often to relieve headaches or remain alert during night duty [28].

Stress, inadequate sleep, and fasting were the most frequently reported triggers among nursing officers with migraine and were reported more often than among participants with unclassified headache (e.g., fasting: OR 2.75, 95% CI 0.65-11.62; Fisher's exact test, p = 0.296). However, the differences were not statistically significant in this small subgroup (n = 35). These are among the most commonly reported migraine triggers in systematic reviews [28,29] and are consistent with previous findings in nursing populations. Lack of sleep was the leading trigger among nursing students in Hong Kong [24], and 95% of nursing students with headache in South India reported at least one trigger [25]. Irregular mealtimes during busy or night shifts may explain the prominence of fasting as a trigger in this group [28].

Most participants meeting the criteria reported relief with over-the-counter drugs (16/21, 76.2%) or sleep (14/21, 66.7%). Over-the-counter drug use was recorded as a single tick-box item; therefore, the specific medications used and any use of Ayurvedic (AYUSH) or home remedies were not recorded. Whether participants had consulted a physician or received adequate treatment was not assessed. However, self-management of headache has been described in a community-based study from Punjab [6]. Relief after sound sleep was far more common among participants with migraine than among those with unclassified headache (14/21, 66.7% vs. 1/14, 7.1%; Fisher's exact test, OR 26.00, 95% CI 2.80-241.11, p = 0.001). Easy access to analgesics in hospital settings could increase the risk of medication-overuse headache, but the frequency of analgesic use was not recorded in this study.

Together, these exploratory findings suggest that migraine in nursing officers may be associated with modifiable features of nursing work, particularly the frequency of night duty, as well as sleep loss, stress, and irregular meals. In this sample, most nursing officers worked six- or eight-hour shifts, whereas night duty lasted 12 hours. Shift duration was not associated with migraine (p = 0.597), whereas the number of night shifts per month was. International guidance for nursing personnel recommends limits on working hours (a maximum of 40 hours per week), at least 36 hours of uninterrupted weekly rest, and regulation of shift work [30]. Weekly working hours were not recorded in this study, so compliance with these recommendations could not be assessed. Because there is a global shortage of nurses, estimated at 5.8 million in 2023 [31], measures that do not require additional staff may be the most feasible. If these findings are confirmed in larger studies, hospitals could distribute night duties evenly among staff, avoid long runs of consecutive night shifts, schedule rest days after night duty, provide protected meal and rest breaks during 12-hour night shifts, offer stress-management and sleep-hygiene sessions, support smoking cessation, and refer nurses with recurrent headaches to a physician for diagnosis.

## Strengths and limitations

This study adds to the limited Indian literature on migraine in nurses. Through the evaluation of various occupational, lifestyle, and clinical factors, it describes the frequency of questionnaire-defined migraine and its associated factors in a workforce that has received little research attention. Migraine-related disability, however, was not measured.

Several limitations should be considered. Migraine was identified using an investigator-assembled self-report questionnaire without clinical confirmation, and aura was not assessed. Therefore, the findings apply only to questionnaire-defined migraine without aura and do not capture all migraine subtypes. No laboratory or imaging test can confirm migraine, which is diagnosed clinically. In this study, no neurologist assessed the participants. Because the participants were nurses with clinical knowledge, their responses may also have been subject to reporting bias. Participants were not screened for refractive errors or other ophthalmic conditions that can cause headaches, and sleep was assessed using only a self-reported item rather than a validated sleep-quality instrument. Breaks during duty were not recorded.

Exclusion of secondary headache (criterion E) relied on participants' self-reports; therefore, headaches due to other causes cannot be ruled out. In particular, medication-overuse headache could not be excluded because the frequency of analgesic use was not recorded. Questionnaire-based classification also cannot distinguish migraine from secondary headache disorders that may mimic or coexist with it. For example, a large propensity-matched electronic health record cohort found that diagnosed migraine, with or without aura, was associated with a higher subsequent risk of cervical artery dissection, although such associations do not establish causation or validate questionnaire-only headache classification [32]. Because nursing officers with diagnosed headache disorders or chronic conditions were excluded, this study cannot estimate the overall prevalence of migraine among nursing officers. The exact 95% CI reflects sampling variation only. Furthermore, the screening item referred to the past year, whereas the ICHD-3 items referred to the past three months; therefore, the observed proportion does not correspond to a standard point, annual, or lifetime prevalence estimate.

The cross-sectional design and bivariate analyses do not allow causal inference or identification of independent predictors, and several categories had small sample sizes. The analyses were unadjusted and involved multiple comparisons, with only 21 participants meeting the criteria. Age, sex, hospital, and correlated occupational exposures may explain some of the observed associations, which should therefore be regarded as hypothesis-generating. Purposive sampling from two hospitals limits generalizability, and one-third of the nursing officers approached did not return the questionnaire, which may have introduced nonresponse bias.

## Conclusions

In this exploratory cross-sectional study, 21 of 100 (21.0%) nursing officers without a prior headache diagnosis met the questionnaire-based ICHD-3 criteria for migraine without aura. By study design, none had a prior diagnosis of migraine or another primary headache disorder. In unadjusted analyses, questionnaire-defined migraine differed by night-shift frequency, experience group (without a consistent dose-response pattern), smoking, and tea/coffee consumption frequency. However, confounding, sparse categories, and multiple testing limit the interpretation of these findings. Stress, inadequate sleep, and fasting were the most frequently reported triggers, and relief after sound sleep was more commonly reported by participants meeting the criteria. Sixteen of the 21 participants reported using over-the-counter medication, although consultation history and treatment adequacy were not assessed. Larger studies involving clinical diagnosis and multivariable analysis are needed before specific workplace measures, such as limits on monthly night shifts, can be recommended.

## Appendices

### Appendix A: Study questionnaire

A. Baseline data

Code no.: _____

Instructions: Please read each question carefully and place a tick (✓) against the most appropriate response. The information collected will be kept confidential and used for research purposes only.

Have you experienced recurrent (repeated) episodes of headache during the past year?

☒ Yes

☒ No

1. Age (in years)

☒ 21-30

☒ 31-40

☒ 41-50

2. Gender

☒ Male

☒ Female

3. Marital status

☒ Unmarried

☒ Married

☒ Widow/Widower

☒ Divorced

4. Highest qualification

☒ Diploma in Nursing

☒ B.Sc. Nursing/PB B.Sc. Nursing

☒ M.Sc. Nursing

5. Type of hospital where you are currently working

☒ Government hospital

☒ Private hospital

6. Ward where you are currently working

☒ ICU/CCU/NICU

☒ Emergency department

☒ Operation theater

☒ General ward

☒ Any other (please specify): _____

7. Duration of posting in the current ward

☒ 3 months-1 year

☒ 2-4 years

☒ 5-7 years

☒ 8-10 years

☒ More than 10 years

8. Designation

☒ Ward nurse

☒ Nursing officer/staff nurse

☒ Nurse preceptor

☒ Any other (please specify): _____

9. Total professional experience in nursing

☒ 3-11 months

☒ 1-5 years

☒ 6-10 years

☒ 11-15 years

☒ More than 15 years

10. Working hours per shift

☒ 6 hours

☒ 8 hours

☒ 9 hours

☒ 12 hours

11. Number of night shifts per month

☒ 3

☒ 6

☒ 8

☒ 10

12. Food habits

☒ Vegetarian

☒ Nonvegetarian

☒ Eggetarian

☒ Vegan

13. Do you smoke cigarettes?

☒ Yes

☒ No

14. Do you consume alcohol?

☒ Yes

☒ No

If yes, please specify how often you consume alcohol in a month: _____

15. Which of the following beverages do you consume?

☒ Tea

☒ Coffee

16. Frequency of tea/coffee consumption per day

☒ Once

☒ Twice

☒ Three times

☒ Four times

17. How do you spend your weekends and leisure time?

☒ Going out with family and friends

☒ Spending time with family

☒ Reading books, resting, and sleeping

☒ Household activities

☒ Watching television or using a mobile phone

18. Body mass index (BMI)

☒ 18.5 or below

☒ 18.5-24.9

☒ 25-29.9

☒ 30 or above

19. Family history of any of the following medical conditions

☒ Hypertension

☒ Migraine

☒ Stroke

☒ Diabetes mellitus

20. Under what circumstances do you experience a headache?

☒ Stress

☒ Inadequate sleep

☒ Fasting

☒ Menstrual cycle

21. What helps relieve your headache?

☒ Over-the-counter medications

☒ After getting adequate sleep

☒ After eating food

☒ Subsides on its own

B. Criteria for assessment of migraine according to the ICHD-3 criteria (1.1)

| Item code | Content | Yes | No |
|---|---|---|---|
| ICHD_A | At least five attacks fulfilling criteria B-D | | |
| ICHD_B | Headache attacks lasting 4-72 hours (when untreated or unsuccessfully treated) | | |
| ICHD_C | Headache has at least two of the following four characteristics: | | |
| C1 | Unilateral location | | |
| C2 | Pulsating quality | | |
| C3 | Moderate or severe pain intensity | | |
| C4 | Aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs) | | |
| ICHD_D | During headache, at least one of the following: | | |
| D1 | Nausea and/or vomiting | | |
| D2 | Photophobia and phonophobia | | |
| ICHD_E | Not attributed to another disorder | | |

**TABLE 6: ICHD-3 criteria for migraine without aura.**

Instructions: Please consider your experiences over the past three months and select the most appropriate response. You may select more than one answer, where applicable.

Do you meet the criteria for migraine diagnosis based on criteria B to D?

□ Yes, I fulfil criteria B to D.

□ No, I do not fulfil criteria B to D.

# Additional Information

## Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Gagan Sharma, Harmeet K. Kang

**Acquisition, analysis, or interpretation of data:** Gagan Sharma, Harmeet K. Kang

**Drafting of the manuscript:** Gagan Sharma, Harmeet K. Kang

**Critical review of the manuscript for important intellectual content:** Harmeet K. Kang

**Supervision:** Harmeet K. Kang

## Disclosures

**Human subjects:** Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Ethics Committee, Chitkara University, Punjab issued approval IHEC/DHR/CU/PB/23/219. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

# References

1. Migraine and other headache disorders. (2025). Accessed: June 24, 2026: https://www.who.int/news-

room/fact-sheets/detail/headache-disorders.
2. Simić S, Rabi-Žikić T, Villar JR, Calvo-Rolle JL, Simić D, Simić SD: Impact of individual headache types on the work and work efficiency of headache sufferers. Int J Environ Res Public Health. 2020, 17:6918. 10.3390/ijerph17186918
3. Stovner LJ, Hagen K, Linde M, Steiner TJ: The global prevalence of headache: an update, with analysis of the influences of methodological factors on prevalence estimates. J Headache Pain. 2022, 23:34. 10.1186/s10194-022-01402-2
4. Burch R, Rizzoli P, Loder E: The prevalence and impact of migraine and severe headache in the United States: figures and trends from government health studies. Headache. 2018, 58:496-505. 10.1111/head.13281
5. Zhang YJ, Li XY, Guo ZL: Temporal trends of migraine and tension-type headache burden across the BRICS: implications from the Global Burden of Disease study 2019. Front Neurol. 2023, 14:1307413. 10.3389/fneur.2023.1307413
6. Sagar M, Sharma S, Chaudhary A, Girdhar S, Satija M, Kaushal P: Assessment of prevalence of migraine and associated disability in selected urban population of Ludhiana city in Punjab. Natl J Community Med. 2018, 9:140-3.
7. Kulkarni GB, Rao GN, Gururaj G, Stovner LJ, Steiner TJ: Headache disorders and public ill-health in India: prevalence estimates in Karnataka State. J Headache Pain. 2015, 16:67. 10.1186/s10194-015-0549-x
8. Shimizu T, Sakai F, Miyake H, et al.: Disability, quality of life, productivity impairment and employer costs of migraine in the workplace. J Headache Pain. 2021, 22:29. 10.1186/s10194-021-01243-5
9. Curtis L: Low- to moderate-level chemical exposures can trigger migraines and are associated with multiple chemical sensitivity. J Occup Health. 2022, 64:e12348. 10.1002/1348-9585.12348
10. Weinberger AH, Seng EK: The relationship of tobacco use and migraine: a narrative review . Curr Pain Headache Rep. 2023, 27:39-47. 10.1007/s11916-023-01103-8
11. Li W, Bertisch SM, Mostofsky E, Buettner C, Mittleman MA: Weather, ambient air pollution, and risk of migraine headache onset among patients with migraine. Environ Int. 2019, 132:105100. 10.1016/j.envint.2019.105100
12. Magnavita N: Health surveillance of workers in indoor environments. Application of the Italian version of the MM040/IAQ questionnaire [Article in Italian]. Med Lav. 2014, 105:174-86.
13. Magnavita N: Headache in the workplace: analysis of factors influencing headaches in terms of productivity and health. Int J Environ Res Public Health. 2022, 19:3712. 10.3390/ijerph19063712
14. Salvador SK, Sabalo BP, Saez HR, et al.: A correlational study between electronic screen exposure and the frequency and severity of migraine among medicine students of the University of Santo Tomas, Faculty of Medicine and Surgery in Manila under online distant learning in AY 2022-2023. J Med Univ Santo Tomas. 2025, 9:1749-62. 10.35460/2546-1621.2024-0033
15. Vuralli D, Ayata C, Bolay H: Cognitive dysfunction and migraine. J Headache Pain. 2018, 19:109. 10.1186/s10194-018-0933-4
16. Fernández-de-Las-Peñas C, Fernández-Muñoz JJ, Palacios-Ceña M, Parás-Bravo P, Cigarán-Méndez M, Navarro-Pardo E: Sleep disturbances in tension-type headache and migraine. Ther Adv Neurol Disord. 2018, 11:1756285617745444. 10.1177/1756285617745444
17. Urhammer C, Grynderup MB, Appel AM, Hansen ÅM, Hansen JM, Kaerlev L, Nabe-Nielsen K: The effect of psychosocial work factors on headache: results from the PRISME cohort study. J Occup Environ Med. 2020, 62:e636-43. 10.1097/JOM.0000000000002023
18. Caronna E, Ballvé A, Llauradó A, et al.: Headache: a striking prodromal and persistent symptom, predictive of COVID-19 clinical evolution. Cephalalgia. 2020, 40:1410-21. 10.1177/0333102420965157
19. Ong JJ, Bharatendu C, Goh Y, et al.: Headaches associated with personal protective equipment - a cross-sectional study among frontline healthcare workers during COVID-19. Headache. 2020, 60:864-77. 10.1111/head.13811
20. Gil-Almagro F, Carmona-Monge FJ, García-Hedrera FJ, Peñacoba-Puente C: Headache and associated psychological variables in intensive care unit nurses during the COVID-19 pandemic: a prospective study. J Clin Med. 2024, 13:3767. 10.3390/jcm13133767
21. Wang Y, Xie J, Yang F, et al.: The prevalence of primary headache disorders and their associated factors among nursing staff in North China. J Headache Pain. 2015, 16:4. 10.1186/1129-2377-16-4
22. Kuo WY, Huang CC, Weng SF, et al.: Higher migraine risk in healthcare professionals than in general population: a nationwide population-based cohort study in Taiwan. J Headache Pain. 2015, 16:102. 10.1186/s10194-015-0585-6
23. Bjorvatn B, Pallesen S, Moen BE, Waage S, Kristoffersen ES: Migraine, tension-type headache and medication-overuse headache in a large population of shift working nurses: a cross-sectional study in Norway. BMJ Open. 2018, 8:e022403. 10.1136/bmjopen-2018-022403
24. Xie YJ, Lin M, Wong YT, Yan L, Zhang D, Gao Y: Migraine attacks and relevant trigger factors in undergraduate nursing students in Hong Kong: a cross-sectional study. J Pain Res. 2022, 15:701-13. 10.2147/JPR.S337465
25. Menon B, Remadevi N: Migraine in nursing students—a study from a tertiary care center in South India . J Neurosci Rural Pract. 2021, 12:129-32. 10.1055/s-0040-1721556
26. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018, 38:1-211. 10.1177/0333102417738202
27. Tiseo C, Vacca A, Felbush A, et al.: Migraine and sleep disorders: a systematic review . J Headache Pain. 2020, 21:126. 10.1186/s10194-020-01192-5
28. Hindiyeh NA, Zhang N, Farrar M, Banerjee P, Lombard L, Aurora SK: The role of diet and nutrition in migraine triggers and treatment: a systematic literature review. Headache. 2020, 60:1300-16. 10.1111/head.13836
29. Pellegrino AB, Davis-Martin RE, Houle TT, Turner DP, Smitherman TA: Perceived triggers of primary headache disorders: a meta-analysis. Cephalalgia. 2018, 38:1188-98. 10.1177/0333102417727535
30. Decent working time for nursing personnel: critical for worker well-being and quality care . (2018). Accessed:

October 30, 2026: https://www.ilo.org/publications/decent-working-time-nursing-personnel-critical-worker-well-being-and.

31. Nursing workforce grows, but inequities threaten global health goals . (2025). Accessed: October 30, 2026: https://www.who.int/news/item/11-05-2025-nursing-workforce-grows--but-inequities-threaten-global-health-goals.
32. Trager RJ, Cupler ZA, Williamson TJ, Chu EC: Association between migraine with and without aura and cervical artery dissection. Cureus. 2025, 17:e87883. 10.7759/cureus.87883