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RESEARCH

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The prevalence of headache disorders among medical students in Vietnam: a cross-sectional study

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Abstract

Background Headache disorders are among the leading causes of disability worldwide, especially in young adults. However, no data on the burden of these disorders in Vietnam have been published to date. This study is the first to assess the prevalence of headache disorders among Vietnamese medical students.

Methods This study was conducted in accordance with the recommended methodology of the Global Campaign. Data were collected through interviews using the HARDSHIP structured questionnaire, translated into Vietnamese, with diagnostic assessments based on ICHD-3 criteria. Participants were recruited from two medical universities in Vietnam. The 1-year prevalence rates of headache disorders of public health significance (migraine, tension-type headache [TTH], and probable medication-overuse headache [pMOH]) were estimated. Logistic regression analyses were performed to evaluate the associations between headache disorders and sociodemographic/anthropometric variables.

Results A total of 1,362 participants (42.7% males and 57.3% females) with a mean age of 21.1 ± 1.6 years were included. The overall 1-year prevalence of any headache was 82.6% [95% CI: 80.5–84.6], with a prevalence of 74.7% [71.0–78.2] among males and 88.5% [86.0–90.6] among females. The 1-year prevalences for specific headache types were as follows: migraine 21.8% [19.6–24.1], TTH 54.0% [51.3–56.7], pMOH 0.4% [0.2–1.0], and other headaches on ≥ 15 days/month 3.7% [2.7–4.8]. The one-day prevalence of any headache was 12.1%. Female gender (adjusted OR = 1.77 [1.32–2.36]; $p < 0.001$) was independently associated with a higher prevalence of migraine, while older age (aOR = 0.84 [0.77–0.91] per year increase) was associated with a lower prevalence. In contrast, TTH was more common among older participants (aOR = 1.07 [1.005–1.15] per year increase).

Conclusions This study highlights the high prevalence of headache disorders, particularly migraine and TTH, among medical students in Vietnam. These findings underscore the critical need for public health initiatives to improve early diagnosis and effective management of headache disorders within this population.

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Keywords Epidemiology, Prevalence, Headache, Migraine, Tension-type headache, Medication-overuse headache, Young Adult, Student, Vietnam, Global campaign against headache

Background

Headache disorders rank among the most prevalent neurological conditions, affecting an estimated 40% of the global population, equivalent to 3.1 billion individuals as of 2021 [1]. These disorders impose a significant burden on individuals, often resulting in substantial personal and societal challenges, including pain, disability, reduced quality of life, and financial strain [1]. Recently, a global report identified headache disorders as one of the top three leading causes of years lived with disability (YLDs) across all ages and sexes combined [2, 3].

Migraines, tension-type headaches (TTH), and medication-overuse headaches (MOH) hold significant public health importance due to their substantial contribution to population-wide disability and ill health [1]. Recent studies indicate that the incidence, prevalence, and disability-adjusted life years (DALYs) associated with migraine and TTH have steadily increased globally from 1990 to 2019 [4]. The highest prevalence and DALYs for both disorders were observed in individuals aged 20–24 years, a group that includes a significant number of university students [4].

Medical students represent a vulnerable group due to the rigorous demands of their training, which expose them to various headache triggers, including elevated levels of psychological stress, excessive consumption of caffeine, irregular meal patterns, and inadequate sleep [5, 6]. Several prior studies have reported that the 1-year prevalence of migraine, TTH, and MOH among medical students can reach as high as 40–60% [5]. Moreover, these disorders are associated with compromised academic performance and diminished daily functioning [5].

To date, no studies have assessed headache disorders among students in Vietnam. This study aims to address this gap by evaluating the prevalence and some associated factors of headache types of public health significance, including migraine, TTH, and MOH in Vietnamese medical students.

Methods

Study design and setting

This study was a cross-sectional investigation of headache disorders conducted at Hanoi Medical University (HMU) and the University of Medicine and Pharmacy, Vietnam National University, Hanoi (VNU–UMP), from March 2024 to August 2024. Both institutions are leaders in medical education and research in Vietnam. As part of Vietnam National University, one of the country's most prestigious universities, VNU–UMP is dedicated to advancing medical education, research, and healthcare services. It offers a comprehensive range of programs in medicine, pharmacy, and other health-related fields, fostering a solid academic and clinical environment. On the other hand, HMU, established in 1902, is Vietnam's oldest medical school. Renowned for its long-standing tradition of excellence, HMU has played an essential role in shaping Vietnam's healthcare landscape.

Study participants and sampling

The research subjects were medical students from HMU and VNU–UMP. Eligible participants were Vietnamese medical students aged 18 years or older. We excluded students who withdrew from the study midway or those who were unable to complete the data collection process within one week of commencing participation. All students who met the criteria for eligibility and consented to the study were included in our study.

The required sample size n was calculated using the formula estimating a prevalence: $n = n_1/(1 + (n_1 - 1)/N)$, where $n_1 = Z_{\alpha/2}^2 \cdot p \cdot (1 - p)/E^2$ (with $Z_{\alpha/2}$ is the Z-value corresponds to the confidence level α; p is the estimated prevalence of migraine/TTH among HMU and VNU-UMP medical students; E is the margin of error; N is the total number of medical students [7]. Choose a confidence interval (CI) of 95%, an estimated E of 2.2%, $p = 22.4\%$, $N = 9038$; the required sample size was 1198 students [8]. An additional 20% was added to the required sample size to account for potential non-responses or withdrawals, yielding a final estimated sample size of 1,438.

The simple random sampling method was employed to select the study participants. We utilized random number generation software to select individual students from the complete list of all medical students currently enrolled at both universities until a total of 1,438 students was reached. Based on the contact information provided by class instructors, we invited selected medical students to participate in the study via phone calls and emails. Those who agreed were subsequently scheduled for an in-person meeting to conduct interviews and sign a consent form.

Data collection

All study participants were required to take part in an in-person interview based on the Headache-Attributed Restriction, Disability, Social Handicap and Impaired Participation (HARDSHIP) questionnaire [9]. The questionnaire was culturally adapted and translated into Vietnamese by two Vietnamese neurology experts following a recommended protocol [10]. Additionally, it

was validated in a pilot survey before being used in this study. In the pilot study, we randomly selected 33 medical students from two universities (HMU and VNU–UMP), of whom 30 agreed to participate and successfully completed the study. The study protocol required the students to be randomly assigned to one of two groups. In Group 1, students underwent face-to-face interviews, while in Group 2, students participated in online interviews, with both groups using the Vietnamese version of the HARDSHIP questionnaire. Subsequently, within one week of the initial interview, all participants in both groups were asked to undergo a second face-to-face interview with Vietnamese headache experts from the research team, who had clinical experience in diagnosing headaches according to the ICHD criteria and were unaware of the students' diagnoses following the first interview. The results revealed that in both groups, the diagnoses from the initial interview were 100% consistent with those made by the headache experts during the second interview. Based on these findings, we decided to retain the current version of the HARDSHIP questionnaire for the main study without further modifications.

In cases where participants were unable to schedule an in-person interview, they were given the option to complete the online survey through the web-based platform [11]. The online survey was developed and managed using the REDCap application, based on our validated questionnaire. Participants who chose this interview method were provided the flexibility to schedule their interviews based on the availability of the interviewers. At the beginning of the online interview, participants received a link directing them to the online interview platform, where they subsequently read and responded to the interview questions displayed sequentially. Throughout the online survey process, participants were monitored and supported by interviewers via phone or video call. The data collection process involved eight interviewers, including four physicians and four final-year medical students. All interviewers were required to undergo training to ensure they met the necessary standards of skill before being allowed to participate in the official study. The training process was conducted over three days, with two neurology specialists highly skilled in headache diagnosis serving as instructors to meet the objectives outlined by the Global Campaign [11]. On the first day, interviewers were trained on the nature and objectives of the survey, methods for interpreting and accurately recording participant responses, ensuring familiarity with the cultural and contextual background of the study population, and identifying questions of particular importance or those requiring further clarification. On the second day, the interviewers engaged in supervised practice interviews under the guidance of the instructors, using volunteers (medical students from VNU–UMP and HMU undergoing clinical practice at Bach Mai Hospital) to ensure uniformity in data collection across all interviewers. On the third day, interviewers were evaluated by conducting independent interviews with volunteers, followed by a secondary interview conducted by the instructors. The responses recorded by the interviewers were then compared to those recorded by the instructors. Interviewers were deemed to have completed the training if their interview results were 100% consistent with those of the instructors. For those who did not achieve this benchmark, retraining was provided on the questions with discrepancies, and the assessment process was repeated. In addition, study participants were required to undergo weight and height measurements using calibrated equipment, following a standardized procedure conducted by pretrained medical students.

Diagnosis and definitions

Participants who reported no headaches in the past year were classified as headache-free. Those who experienced headaches within the past year were further assessed based on the number of headache days in the preceding month. Participants with a headache frequency of fewer than 15 days per month were diagnosed using the diagnostic algorithm for migraine, tension-type headache (TTH), probable migraine, and probable TTH, which primarily depends on the characteristics of the headache type that bothers them the most [9, 12]. In contrast, individuals with headaches occurring on 15 or more days per month (H15+), who also used headache-relief medication on 10 or more days per month, were classified as having "probable medication overuse headache" (pMOH) according to the International Classification of Headache Disorders 3rd edition (IHCD-3) [9, 12]. If their headache-relief medication use was less than 10 days per month, they were categorized as having "other headaches with ≥15 days/month" (other H15+). All remaining cases were categorized as unclassified. Migraine and probable migraine cases, along with TTH and probable TTH, were combined for the purposes of prevalence estimation and subsequent analysis, following the recommendations from the Global Campaign against Headache [11]. Body mass index (BMI) was calculated by dividing weight (kg) by height squared (m^2). Using the WHO diagnostic criteria for Asian adults, a BMI of 18.5–22.9 kg/m^2 was classified as normal weight, <18.5 kg/m^2 as underweight, 23–24.9 kg/m^2 as overweight, and ≥25 kg/m^2 as obese [13, 14].

Statistical analysis

Descriptive summaries were used for the population's sociodemographic and clinical characteristics. All continuous variables were presented as mean±standard deviation (SD) or median (interquartile range), as appropriate,

Table 1 Baseline characteristics of study participants by headache types

Characteristic	Total (n = 1362)	Migraine (n = 297)	TTH (n = 736)	pMOH (n = 6)	other H15+ (n = 50)
Age (mean ± SD)					
Years	21.1 ± 1.6	20.7 ± 1.5	21.1 ± 1.6	20.7 ± 2.3	21.0 ± 1.6
Gender [n (%)]					
Male	582 (42.7)	99 (33.3)	307 (41.7)	2 (33.3)	13 (26.0)
Female	780 (57.3)	198 (66.7)	429 (58.3)	4 (66.7)	37 (74.0)
Marital status [n (%)]					
Single	1358 (99.7)	295 (99.3)	735 (99.9)	6 (100)	49 (98.0)
Married	4 (0.3)	2 (0.7)	1 (0.1)	0 (0)	1 (2.0)
BMI (mean ± SD)					
kg/m^2	21.0 ± 2.9	20.8 ± 3.1	21.1 ± 2.9	20.4 ± 3.2	19.8 ± 2.9
BMI classification [n (%)]					
Underweight	266 (19.5)	68 (22.9)	124 (16.9)	1 (16.7)	18 (36.0)
Normal Weight	805 (59.1)	168 (56.6)	452 (61.4)	4 (66.7)	24 (48.0)
Overweight	157 (11.5)	33 (11.1)	80 (10.9)	0 (0)	7 (14.0)
Obesity	134 (9.8)	28 (9.4)	80 (10.9)	1 (16.7)	1 (2.0)

H15+: headache on ≥15 days/month, pMOH: probable medication-overuse headache, SD: standard deviation, TTH: tension-type headache

and were compared using either the t-test or the Wilcoxon rank-sum test, depending on their distribution. Categorical variables were expressed as numbers (percentages) and were compared using the Chi-square (χ^2) test or Fisher's exact test, as appropriate. Prevalences of headache disorders were estimated and presented as proportions (%) with 95% confidence intervals (CIs). Logistic regression was used to evaluate the associations between headache types and sociodemographic/anthropometric variables among participants using the odds ratio (OR) with a 95% CI.

All statistical analysis was performed by the Stata MP version 18.0 (Stata, College Station, TX, USA). All comparisons were two-tailed, and p-values < 0.05 were considered statistically significant.

Results

Description of the study population

Finally, a total of 1362 medical students (582 male [42.7%] and 780 female [57.3%]) were included in the study (participation proportion 94.7%). Among them, 227 participants underwent face-to-face interviews, and 1,157 participated in online interviews. The detailed recruitment process is presented in Supplementary Figure S1. The overall mean age of the study participants was 21.1 ± 1.6 years, and the mean BMI was 21.0 ± 2.9. Among the participants, 21.3% were classified as overweight or obese, while 19.5% were underweight. The vast majority (99.7%) were single. The baseline characteristics of the overall population and stratified by headache type are presented in Table 1.

Table 2 Observed 1-year prevalences (%) by headache type and gender

Headache type	Overall (n = 1362)	Male (n = 582)	Female (n = 780)
	% [95% confidence interval]		
All headache	82.6 [80.5–84.6]	74.7 [71.0–78.2]	88.5 [86.0–90.6]
Migraine (total)	21.8 [19.6–24.1]	17.0 [14.0–20.3]	25.4 [22.4–28.6]
definite	6.8 [5.5–8.3]	5.0 [3.4–7.1]	8.2 [6.4–10.4]
probable	15.0 [13.1–17.0]	12.0 [9.5–14.9]	17.2 [14.6–20.0]
TTH (total)	54.0 [51.3–56.7]	52.7 [48.6–56.9]	55.0 [51.4–58.5]
definite	35.6 [33.1–38.2]	35.9 [32.0–40.0]	35.4 [32.0–38.9]
probable	18.4 [16.4–20.6]	16.8 [13.9–20.1]	19.6 [16.9–22.6]
H15+ (total)	4.1 [3.1–5.3]	2.6 [1.46–4.2]	5.3 [3.8–7.1]
pMOH	0.4 [0.2–1.0]	0.3 [0.04–1.2]	0.5 [0.1–1.3]
other H15+	3.7 [2.7–4.8]	2.2 [1.2–3.8]	4.7 [3.4–6.5]

H15+: headache on ≥15 days/month, pMOH: probable medication-overuse headache, TTH: tension-type headache

Headache

In total, 1125 participants (82.6% [95% CI: 80.5–84.6%]) reported experiencing headaches in the preceding year. The 1-year prevalence of all headaches was higher in females (88.5% [86.0-90.6]) than in males (74.7% [71.0-78.2]). Table 2 shows the 1–year prevalence of each headache type in the overall study population and by gender. TTH was the most common type overall (54.0% [51.3–56.7], compared to migraine (21.8% [19.6–24.1]), and this pattern was consistent across both genders. Headaches occurring on ≥15 days/month (H15+) were reported by 4.1% of participants, the majority of whom were classified as other H15+ (3.7%), while there were only 6 cases (0.4%) of probable MOH. Unclassified headaches accounted for 2.6% of the sample.

Headache yesterday (HY) was reported by 165 participants (14.7%) with any headache, accounting for 12.1% of the entire study population. The numbers and proportions of HY by headache type are shown in Table 3. The proportions of participants reporting HY by diagnosed headache type were 15.5% for migraine and 10.7% for TTH. Headache on ≥15 days/month (H15+), including pMOH and other H15+, had the highest proportion of HY reports (>50%), as expected due to their definition. Specifically, HY was reported by 66.7% of those with pMOH and 56.0% of those with other H15+. The mean reported headache frequencies and predicted 1-day prevalence of headache are also presented in Table 3. Overall, the reported rate of HY was slightly higher than predicted, with the most significant discrepancy observed

Table 3 Proportions and predicted proportions of those with headache reporting headache yesterday, overall and by headache type (N = 1362)

Headache type	Headache yesterday		
	Reported proportion	Predicted proportion	
		Mean reported headache frequency (F) (days/month)	Predicted headache yesterday* (%)
	n (%)	mean ± SD	%
All diagnosed headache	165 (14.7)	3.6 ± 4.2	12.0
Migraine	46 (15.5)	3.1 ± 2.8	10.3
TTH	79 (10.7)	2.8 ± 2.7	9.3
pMOH	4 (66.7)	16.7 ± 2.6	55.7
Other H15+	28 (56.0)	17.3 ± 4.0	57.7

H15+: headache on ≥15 days/month, pMOH: probable medication-overuse headache, SD: standard deviation, TTH: tension-type headache; *: calculated as F/30

Table 4 Logistic regression analysis of associations between sociodemographic/anthropometric variables and common headache types

		Bivariable		Multivariable	
		OR [95% CI]	*p*-value	adjusted OR [95% CI]	*p*-value
		Migraine			
Gender	Male	reference	–	reference	–
	Female	1.66 [1.27–2.17]	< 0.001	1.77 [1.32–2.36]	< 0.001*
Age (increase)	per year	0.85 [0.79–0.93]	< 0.001	0.84 [0.77–0.91]	< 0.001*
Marital status	Single	reference	–	reference	–
	Married	3.60 [0.50–25.7]	0.201	3.65 [0.50–26.5]	0.200
BMI (increase)	per kg/m^2	0.97 [0.93–1.02]	0.007	1.00 [0.96–1.05]	0.864
		Tension-type headache			
Gender	Male	reference	–	reference	–
	Female	1.09 [0.88–1.36]	0.410	1.16 [0.92–1.47]	0.204
Age (increase)	per year	1.08 [1.01–1.15]	0.031	1.07 [1.005–1.15]	0.035*
Marital status	Single	reference	–	reference	–
	Married	0.28 [0.03–2.72]	0.274	0.25 [0.03–2.44]	0.232
BMI (increase)	per kg/m^2	1.03 [0.99–1.07]	0.157	1.04 [0.996–1.08]	0.075
		probable Medication-overuse headaches			
Gender	Male	reference	–	reference	–
	Female	1.49 [0.27–8.19]	0.410	1.42 [0.23–8.65]	0.705
Age (increase)	per year	0.85 [0.51–1.44]	0.554	0.84 [0.50–1.43]	0.528
BMI (increase)	per kg/m^2	0.93 [0.69–1.25]	0.623	0.95 [0.69–1.29]	0.733

BMI: Body mass index, CI: confidence interval, OR: odds ratio; *: significant association

in cases of migraine and pMOH, whereas HY rates were approximately consistent with predictions for both TTH and other H15+cases.

Associations

Logistic regression analyses examining the relationships between common headache types and sociodemographic/anthropometric variables are presented in Table 4. Results from both bivariable and multivariable analyses indicated that gender and age were independently associated with the diagnosis of migraine. Females exhibited approximately 1.8 times higher odds of experiencing migraine compared to males, with this association remaining statistically significant after adjusting for age, BMI, and marital status (adjusted OR = 1.77 [95% CI: 1.32–2.36]; $p < 0.001$). Additionally, a negative association between age and migraine was observed, indicating that each additional year reduced the odds of migraine by 16% (adjusted OR = 0.84 [95% CI: 0.77–0.91]; $p < 0.001$). Conversely, older age was significantly associated with an increased likelihood of TTH diagnosis (adjusted OR = 1.07 [95% CI: 1.005–1.15] per year; $p = 0.035$). In contrast, pMOH did not demonstrate any significant association with age, gender, or BMI ($p > 0.05$).

Discussion

To the best of our knowledge, this is the first study to report the prevalence of headache disorders among students in Vietnam. We employed the standardized methodology and questionnaire of the Global Campaign, enabling direct comparisons with similar research conducted in other regions [9, 11]. In this cross-sectional study, the 1-year prevalence of migraine among medical students was 21.8% (17.0% in males and 25.4% in females, mean age 21.1 ± 1.6 years), comparable to recent findings in the general population in Peru (overall: 22.4%, male: 16.4%, female: 28.2%) [8], Ethiopia (overall: 19.0%, male: 14.1%, female: 22.8%) [15], Kuwait (overall: 24.0%, male: 18.2%, female: 29.3%) [16], Lithuania (overall: 20.7%, male: 18.6%, female: 22.5%) [17], as well as among medical students in Nepal (overall: 21.5%) [18], Saudi Arabia (overall: 23.0%) [19], Pakistan (overall: 28.0%, male: 24.2%, female: 30.1%) [20], and Palestine (overall: 22.0%, male: 19.4%, female: 23.7) [21]. However, this rate is slightly lower than that reported in studies of the general population in Morocco (overall: 31.4%, male: 25.3%, female: 35.5%) [22], Saudi Arabia (overall: 28.7%, male: 24.3%, female: 36.0%) [23], and Zambia (overall: 51.6%, male: 49.6%, female: 53.9%) [24], as well as among medical students in Italy (overall: 39.8%, male: 36.4%, female: 59.1%) [5]. Conversely, it is higher than the prevalence found in studies of medical students in Iran (overall: 14.2%, male: 10.5%, female: 18.5%) [25], India (overall:

7.2%, male: 5.6%, female: 8.6%) [26], and Nigeria (overall: 6.4%, male: 3.2%, female: 10.9%) [27].

On the other hand, the 1-year prevalence rate of TTH in our study was 54.6% (52.7% in males and 55.0% in females). This rate is comparable to that reported among medical students in Palestine (overall: 59.8%, male: 55.8%, female: 62.6%) but lower than prevalence rates in India (overall: 70.5%, male: 63.9%, female: 76.1%) [26] and Nepal (overall: 69.2%) [18]. Conversely, it is higher than the rates reported in Italy (overall: 42.0%, male: 63.6%, female: 40.9%) [5] and Iran (overall: 44.2%, male: 49.2%, female: 39.2%) [25]. Furthermore, the TTH prevalence observed in our study is higher than that found in the general population of Peru (overall: 37.7%, male: 37.7%, female: 37.8%) [8], Saudi Arabia (overall: 42.9%, male: 45.3%, female: 39.0%) [23] and Morocco (overall: 32.1%, male: 36.2%, female: 29.3%) [22]. The differences in migraine/TTH prevalence observed between our study and others may stem from various factors. Methodological variations, including sampling techniques, diagnostic criteria, and study design, can significantly affect prevalence estimates. Additionally, the use of distinct self-report questionnaires introduces potential bias in symptom reporting. Environmental factors such as climate, pollution, and geographical location may also influence migraine prevalence. Sociodemographic variables, including age, gender, and socioeconomic status, along with lifestyle choices like diet, physical activity, and stress, further contribute. Lastly, genetic predispositions may account for differences in susceptibility across populations.

There was a high 1-year prevalence of headache on ≥15 days/month among participants in the current study, reported by one participant in every 25 (4.1%). This rate was comparable to those reported in studies conducted in Peru (4.5%) [8], Saudi Arabia (3.9%) [23], Zambia (3.9%) [24] and Ethiopia (3.2%) [15]. Notably, pMOH accounted for only a modest proportion of participants (0.4%) in our study, which was slightly lower than findings from studies in the general population in Ethiopia (0.7%) [15], Peru (1.1%) [8], Saudi Arabia (1.8%) [23], and Zambia (1.1%) [24], as well as a study among non-medical students in Serbia (2.5%) [28]. The lower prevalence of pMOH among medical students in this study can be attributed to several key factors. First, medical students generally possess higher health literacy, making them more cognizant of the risks associated with frequent analgesic use. Additionally, their access to healthcare resources, combined with knowledge of non-pharmacological headache management strategies, further reduces reliance on medications. Finally, their education emphasizes adherence to clinical guidelines, fostering more judicious use of pain relief measures.

The reported proportion of headaches yesterday among study participants was 12.1%, which implied that almost one in eight of the population had a headache on any particular day, reflecting the substantial overall burden of headaches within the population. This result was similar to the published findings from population-based studies conducted in Peru (12.1%) [8] and Saudi Arabia (11.0%) [23], but higher than that reported in Ethiopia (7.1%) [15]. The predicted proportions of HY based on the mean reported headache frequency in the preceding month were slightly lower than the reported proportions for nearly all headache types, except for other H15+. A similar phenomenon was seen in studies from Zambia [24], Ethiopia [15], Iran [29], and Mongolia [30]. This discrepancy suggests that participants may underestimate headache frequency when recalling the number of attacks over the preceding month, highlighting potential limitations in self-reported data.

Consistent with findings from previous studies, our study demonstrated a strong positive association between migraine and female gender (aOR = 1.77 [1.32–2.36]) [8, 15, 16, 22, 23]. Various mechanisms have been proposed to explain this relationship. Hormonal factors, particularly estrogen and progesterone, are thought to play a critical role in modulating neuronal and vascular reactivity [31–33]. These hormones regulate biological functions through both genomic and nongenomic pathways, influencing neurotransmitter systems and contributing to functional and structural differences in brain regions implicated in migraine [31, 33, 34]. Moreover, fluctuations in estrogen, which are believed to modulate pain through their effects on the trigeminovascular system, are considered pivotal in migraine pathophysiology [35]. A widely accepted hypothesis posits that menstrual migraines in reproductive-age women are triggered by the premenstrual decline in estrogen levels (the estrogen withdrawal hypothesis) [35]. However, existing studies supporting these hypotheses remain limited by methodological constraints, including study design, sample size, and inconsistent case definitions [35]. Therefore, further research is essential to fully ascertain the association between sex and migraine.

Besides gender, a negative association between age and migraine was also observed in the current study. Specifically, older students have a lower prevalence of migraine (aOR = 0.84 [0.77–0.91] per year). This finding appears to contrast with the results of several prior studies. For instance, research conducted by Victor et al. demonstrated that the prevalence of migraine increases rapidly from childhood through adolescence and peaks in the mid-twenties for both genders, followed by a slight decline before reaching a secondary peak in the mid-forties [36]. Additionally, some studies have revealed that the highest prevalence of migraine has been observed

among adults in their thirties and forties [8, 15, 22]. The discrepancy observed in our findings may be attributed to the specific population of medical students and the limited age range of our study, with the majority of participants (99.6%) being between 18 and 24 years old. This limitation could hinder an accurate assessment of the relationship between age and migraine prevalence. Moreover, it is plausible that the negative association observed in our study may be a spurious finding influenced by biases associated with self-reported diagnoses. Consequently, this finding should be interpreted with caution, and further well-designed studies are necessary to validate it.

In contrast to migraine, older age was revealed to be related to a higher prevalence of TTH in this population (aOR = 1.07 [1.005–1.15] per year). This result aligns with findings from previous studies that demonstrated a slight increase in the prevalence of TTH with age, peaking in individuals in their 30s [8, 15, 22, 23, 37]. However, TTH did not show a significant association with gender, which is similar to prior published results [8, 15, 22, 23, 37].

Study strengths and limitations

The major strength of our study was that it gathered data on both genders from two of the largest medical universities in Vietnam with an adequate sample size (N = 1,362) and a high participating proportion (94.7%). Another strength of this study is that it was conducted carefully following a standardized and well-validated methodology. However, the current study had some limitations that should be acknowledged. First, as it was cross-sectional, there was inevitable recall bias in the responses. Second, headaches occurring on ≥15 days/month (H15+) could not be further classified beyond identifying whether they were associated with acute medication overuse or not. Third, as our study was limited to a highly specific population of medical students, the findings cannot be generalized to the broader population. Finally, because the diagnostic algorithm was designed to identify only the most bothersome headache, it likely led to an underestimation of the prevalence of less severe headache types. Furthermore, this limitation may have impacted the gender-based analysis of headache types (e.g., TTH), especially if a significant number of females experienced both migraine and TTH concurrently.

Conclusions

This study revealed a high prevalence of headache disorders, particularly migraine and tension-type headache, among medical students in Vietnam. Female gender and younger age were significantly associated with a higher proportion of migraine, whereas older students showed a higher prevalence of TTH. These findings emphasize the importance of implementing public health policies and strategies to improve the diagnosis and treatment of headache disorders among students, which are essential in reducing the associated disability and burden. Further well-designed longitudinal studies are necessary to assess the prevalence of headache types among young adults and explore their associated factors.

Abbreviations

aOR	Adjusted odds ratio
BMI	Body mass index
CI	Confidence interval
CI	Confidence interval
H15+	Headache on ≥ 15 days/month
HARDSHIP	Headache-Attributed Restriction, Disability, Social Handicap and Impaired Participation questionnaire
HMU	Hanoi Medical University
HY	Headache yesterday
ICHD	International Classification of Headache Disorders
MOH	Medication-overuse headache
OR	Odds ratio
pMOH	probable MOH
SD	Standard deviation
TTH	Tension-type headache
UMP	University of Medicine and Pharmacy
VNU	Vietnam National University, Hanoi

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s10194-024-01912-1.

Supplementary Material 1

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Author contributions

KHV, DVN, LTD, LQL and HTV conceived and designed the study. KHV, LTD, LQL, ABH, PHV, TTT, BVP, CQL, TPV, NTV, TTT, QHH, THP, LTM and HTV collected and analyzed the data. DVN, TTT, PHV and HTV interpreted the data. KHV, DVN, and HTV wrote the manuscript and prepared the tables. KHV, DVN, and HTV revised the manuscript. All authors reviewed and approved the final manuscript.

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Data availability

The dataset supporting the conclusions of this article is held securely at the University of Medicine and Pharmacy, Vietnam National University, Hanoi, Vietnam. When analysis and publications are completed, they will be available from the authors upon reasonable request.

Declarations

Ethics and approvals

The study was conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from all subjects and their legal guardian(s). The protocol and questionnaire were reviewed and approved by the Institutional Review Board at the University of Medicine and Pharmacy, Vietnam National University, Hanoi, Vietnam. To protect privacy, any personal information that could be used to identify a specific individual has been removed. Data were collected anonymously and managed in compliance with data protection legislation.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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