▪ Headache Medicine 2026, 17(3):195-204 ▪ p-ISSN 2178-7468, e-ISSN 2763-6178

Headache Medicine

▪ DOI: 10.48208/HeadacheMed.2026.26

Original

Prevalence and characteristics of migraine and tension-type headache in preclinical medical students at Universitas Indonesia: a cross-sectional study

Tiara Aninditha[1], Irma Savitri Madjid[1], Mexithania Golda Bindia Nadhila Hermawan[2], Adinda Aisya Kamila[2], Ahmad Rafi Faiq[1], Nadya Salsabila Elkarasjzi[1], Putri Azzahra Nur Azrina[1], Henry Riyanto Sofyan[1]

[1]Universitas Indonesia – Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia
[2]Universitas Indonesia, Jakarta, Indonesia

Tiara Aninditha
anindith@gmail.com

Edited by:
Marcelo Moraes Valença

Abstract

Introduction
Headache is one of the most common neurological disorders worldwide, affecting up to 50% of adults, with medical students being particularly vulnerable. Migraine and tension-type headache (TTH) are highly prevalent in this population due to academic stress, sleep deprivation, and demanding schedules. This study aims to determine the prevalence and characteristics of migraine and TTH, including their precipitating factors, among preclinical medical students at Universitas Indonesia.

Method
A cross-sectional study was conducted in May 2024 involving first- to third-year medical students of both sexes who had experienced headaches in the previous three months. Participants completed a questionnaire comprising the Headache Screening Questionnaire (HSQ), Migraine Disability Assessment (MIDAS), demographic data, headache characteristics, and precipitating factors.

Results
The prevalence of migraine and TTH was 40.2% and 59.7%, respectively. Most participants were 17–19 years old (54.5%), predominantly female (71.4%), and in their third year (38.9%). The most common precipitating factors perceived by participants for migraine were long working hours and inadequate sleep (93.5%). For TTH, the leading perceived triggers were long working hours (86.9%), fatigue (80.4%), sleep deprivation (78.2%), anxiety (71.7%), and stress (54.3%).

Conclusion
Migraine and TTH are highly prevalent among preclinical medical students, with stress, workload, and inadequate sleep emerging as major contributing factors. These findings underscore the need for targeted preventive strategies, including stress management, sleep regulation, and lifestyle modification programs, to reduce headache burden and support students' academic performance and well-being.

Keywords:
Migraine
Tension-type headache (TTH)
Medical students
Prevalence

Received: December 24, 2025
Revised: March 3rd, 2026
Accepted: August 23, 2026

© Copyright 2026

Introduction

Headache is among the most common neurological symptoms worldwide, with current estimates indicating a prevalence of approximately 14–15% in the general population (1). According to the Global Burden of Disease (GBD) study, headache disorders represent one of the leading causes of disability and a major public health concern globally (2,3). Individuals of all ages, ethnic backgrounds, and socioeconomic statuses may be affected, although headache disorders occur more frequently in women than in men (4). Primary headache disorders, particularly tension-type headache (TTH), migraine, and cluster headache, account for nearly 98% of all headache cases. In contrast, secondary headaches, although less common, are often associated with potentially life-threatening conditions (5). In Indonesia, the prevalence of primary headache disorders varies considerably, ranging from 2.2% for chronic tension-type headache to 65.2% for tension-type headache overall, while the prevalence of migraine has been reported to range from 15% to 18% (6–8). Migraine has been shown to be significantly high especially in early adulthood and adolescence. In the 15- to 49-year-old age group, migraine was the most debilitating disease according to the 2016 GBD study (9). Despite having a lower severity, TTH is far more prevalent than migraine, with a 1-year prevalence of 26.8% compared to 15.2% (10,11).The lifetime prevalence of TTH in a study in Denmark was high (78%), but the prevalence reported by several studies varies from 30% to 78% (12,13). Around 42% of the general adult population is thought to be affected by TTH and migraine globally (14).

Migraine and TTH can be triggered by multiple factors, including stress, sleep deprivation, exhaustion, and anxiety, and may vary considerably in their clinical characteristics (12,15). Medical students are particularly vulnerable to primary headache disorders, likely because of a demanding curriculum, frequent examinations, sleep deprivation, family and financial pressures, prolonged study hours, and associated psychological distress (12,16). Many of these factors are recognized as headache triggers, and their occurrence may negatively affect academic performance and overall well-being (16,17).

A cross-sectional study in Egypt reported that 17.9% of undergraduate medical students had migraine, most of whom experienced moderate disability (3). In a 2022 study conducted in Nepal, 26.9% of medical students were diagnosed with headache disorders, of whom the majority had TTH (69.2%), followed by migraine (21.5%) (16). A study at Syarif Hidayatullah State Islamic University in Jakarta reported that 26.9% of preclinical students suffered from migraine, with a higher prevalence in female than male students (18).

Medical education in Indonesia is divided into preclinical and clinical phases, each with distinct academic demands. Preclinical students generally follow a more uniform schedule than clinical students. The Faculty of Medicine, Universitas Indonesia (Fakultas Kedokteran Universitas Indonesia; FKUI) is among the leading medical schools in Indonesia, and its heavy academic workload may contribute to stress and sleep deprivation, both of which are recognized risk factors for TTH.

The distinction between TTH and migraine should be based on established diagnostic criteria rather than on trigger factors alone. According to the International Classification of Headache Disorders, 3rd edition (ICHD-3) (19), TTH is characterized by bilateral, pressing or tightening pain of mild to moderate intensity, not aggravated by routine physical activity, and typically without nausea or vomiting, although photophobia or phonophobia may be present in some cases. In contrast, migraine is defined by recurrent attacks of moderate to severe, usually unilateral, pulsating headache lasting 4–72 hours, commonly aggravated by routine physical activity and accompanied by nausea and/or vomiting, photophobia, and phonophobia. While stress can act as a trigger for both conditions, it is not a defining diagnostic feature. Because migraine and TTH can substantially impair daily activities and quality of life, it is important to characterize their prevalence and clinical features among medical students.

The primary objective of this study was to determine the prevalence of migraine and TTH among preclinical medical students at the Faculty of Medicine, Universitas Indonesia. The secondary objectives were to describe the clinical characteristics of both headache types and to identify the perceived precipitating factors reported by affected students.

Methods

We conducted a cross-sectional study of preclinical medical students at the Faculty of Medicine, Universitas Indonesia, in May 2024, to determine the prevalence and clinical characteristics of migraine and TTH. The study was carried out on the Universitas Indonesia campus in Depok, Indonesia. Eligible participants were first-, second-, or third-year preclinical medical students who provided written informed consent and had experienced at least one headache episode within the previous three months. Exclusion criteria were: (1) a history of head or neck injury; and (2) hospitalization for brain-related conditions within the previous three months.

The questionnaire was distributed electronically to all preclinical medical students in the target cohort, with total invited students of 200 students. Of these, 123 students returned completed responses, yielding an effective response rate of 61.5%. Seventy-seven respondents met the eligibility criteria and were included in the final analysis.

Data were collected using the Headache Screening Questionnaire (HSQ), which assesses the frequency and duration of headaches, the level of pain, the extent to which headaches interfere with daily activities, and the presence of associated symptoms (20). Sus-

pected migraine is indicated by a total score of more than 6 but less than 8, and a definite migraine is indicated by a score of 8 or above (20). For TTH, a total score of 8 using ICHD-3 TTH criteria indicates TTH, while a total score of ≥6 indicates probable TTH and <6 means no TTH. From this, the prevalence of TTH was calculated.

The Migraine Disability Assessment Test (MIDAS) was also used to evaluate the degree of disability caused by migraines. re-sponses are scored to categorize the level of migraine-related disability into 1–5 grades, ranging from little or no disability to severe disability (21). Additionally, the Depression, Anxiety, and Stress Scale (DASS-21) was used to measure negative emotions, including depression, anxiety, and stress. Items with a score of ≥15 indicate stress (22).

The study size was determined based on the total number of eligible preclinical medical students who agreed to participate during the study period. A formal sample size calculation was not performed. Instead, a convenience sampling approach was used to include all consenting first-, second-, and third-year preclinical students who reported experiencing headaches within the past three months. All variables had complete data, and no imputation was required. No complex sampling strategy or weighting adjustments were necessary in the analysis.

Several potential sources of bias were addressed in this study. Recall bias may have occurred because headache characteristics were self-reported for events within the past three months; to minimize this, participants received clear instructions and standardized definitions during questionnaire administration. Selection bias was possible due to voluntary participation; however, recruitment was offered to all eligible preclinical students to reduce imbalance. Misclassification bias could arise from the use of self-administered screening instruments (HSQ, MIDAS, DASS-21) rather than clinical diagnostic interviews. This was mitigated by using standardized cut-off values. Information bias was minimized by ensuring anonymity, which helped promote honest and accurate reporting.

It should be emphasized that the precipitating factors examined in this study were subjective variables, obtained from participants' self-reported perceptions of what they believed might trigger their headache attacks. These factors therefore reflect perceived rather than objectively confirmed triggers.

Statistical analysis

All variables of interest were categorical; therefore, tests of normality (e.g., Kolmogorov–Smirnov) were not required and were not performed. Descriptive statistics are reported as frequencies and percentages. Bivariate analyses of associations between potential precipitating factors and the occurrence of migraine or TTH were performed using the chi-square test; Fisher's exact test was applied when the expected frequency in any cell was less than 5. Variables that showed a statistically meaningful association on bivariate analysis were subsequently entered into a multivariable binomial logistic regression model to identify independent associations with migraine and TTH, respectively; results of the multivariable analyses are presented in Tables 5 and 6. A p-value <0.05 was considered statistically significant. All analyses were performed using IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA).

Results

Demographic characteristics sample

A total of 77 students met the eligibility criteria and completed the questionnaire. All completed responses were included in the analysis. Information on non-responders or reasons for non-participation was not available.

Most respondents in the study of preclinical medical students at the University of Indonesia were aged 17 to 19 years (54.5%), predominantly female (71.4%), and in their third year (38.9%). Details of the study respondents can be found in Table 1. Among them, 17 (40.2%) suffered from migraines, while 25 (59.7%) had TTH. Of those with TTH, 34 (73.9%) were classified as having probable TTH based on the Headache Screening Questionnaire (HSQ). The most common subtype of TTH experienced was frequent episodic TTH, presents in 39 students (84.7%).
There was no shift in dominance with regard to age and sex for migraine and TTH. However, the majority of individuals suffering from migraine and TTH were in their third year of study (43.3% and 56.6%, respectively). Most migraine cases occurred without aura, present in 22 students, in accordance with the ICHD-3 criteria (70.9%).

Migraine characteristics

Table 2 shows that most migraines had a pulsatile character (51.6%), occurred bitemporally (51.6%), and were accompanied by vomiting (58.0%). Attacks occurred more than 5 times (71.0%), with a duration lasting from 30 minutes to 4 hours (64.5%). Migraine intensity was moderate–severe (90.3%), with no disability (41.9%) reported in most cases.

Tension-type headache characteristics

Among students who experienced TTH, 71.7% experienced attacks lasting 30 minutes to 4 hours (Table 3). The frequency of TTH was mostly ≥1 to <15 times per month (84.8%). Moderate–severe TTH was the most commonly experienced severity level (63.0%). Most students reported bilateral pain (76.1%) with a tight or pressing character (71.7%). Accompanying symptoms were reported by 56.5%, and 63.0% reported that their headaches were not worsened by daily activities. Additionally, 63.0% felt that their headaches interfered with their daily activities, although 58.7% did not experience disability due to the headaches.

Table 1. Demographic characteristics of subjects (n=77) with migraine and tension-type headache (TTH)

Subjects Characteristic	Migraine (n = 31) n (%)	Tension Type Headache (n = 46) n (%)
Age		
17 – 19	17 (40.4)	25 (59.5)
20 – 23	14 (40.0)	21 (60.0)
Sex		
Male	8 (36.3)	14 (63.6)
Female	23 (41.8)	32 (58.1)
Academic Year		
First	10 (38.4)	16 (61.5)
Second	8 (38.0)	13 (61.9)
Third	13 (43.3)	17 (56.6)
Migraine		
Definite	25 (80.6)	
Probable	6 (19.3)	
Subtype		
With Aura	9 (29.0)	
Without Aura	22 (70.9)	
TTH		
Definite		12 (26.0)
Probable		34 (73.9)
Subtypes		
Infrequent episodic		7 (15.2)
Frequent episodic		39 (84.7)

Table 2. Migraine characteristics (n=31)

Characteristics of Migraine	n (%)
Pulsatile	
Yes	16 (51.6)
No	15 (48.4)
Location	
Unitemporal	15 (48.4)
Bitemporal	16 (51.6)
Vomiting	
Yes	18 (58.1)
No	13 (41.9)
Frequency	
≥5 times	22 (71.0)
<5 times	9 (29.0)
Duration	
0 – 30 minutes	5 (16.1)
30 minutes – 4 hours	20 (64.5)
>4 hours	6 (19.4)
Intensity	
Mild	3 (9.7)
Moderate–Severe	28 (90.3)
Impact	
No disability	13 (41.9)
Mild disability	4 (12.9)
Moderate–Severe disability	14 (45.2)

Precipitating factors of migraine

The most frequently perceived precipitating factors of migraine (Table 4) were long working hours (93.5%) and inadequate sleep (93.5%), followed by stress (70.9%), menstruation (65.2%), and weather change (41.9%). Multivariable binomial logistic regression analysis, shown in Table 5, identified statistically significant associations of stress, workload, menstruation, and weather with migraine occurrence.

Precipitating factors of tension-type headache

Table 6 illustrates the most prevalent perceived precipitating factors among students with TTH. The most common factors were long working hours, defined as ≥8 hours per day (86.9%), followed by fatigue (80.4%), sleep deprivation or sleeping <7 hours per day (78.2%), anxiety (71.7%), stress (54.3%), and physical activities (50.0%). Multivariable analysis identified a statistically significant association between stress and TTH.

Students with TTH spent an average of 6 hours per day studying and 9 hours per day using gadgets. Among students with TTH, 54.3% reported experiencing stress, and among those, the majority had a moderate level of stress (36.0%). The association between stress and TTH was statistically significant, with a p-value <0.05.

Table 3. Tension-type headache (TTH) characteristics (n=46)

Characteristics of TTH	n (%)
Duration	
0–30 min	6 (13.0)
30 min – 4 h	33 (71.7)
4 h – 3 days	7 (15.2)
Frequency	
<1 per month	7 (15.2)
≥1 – <15 per month	39 (84.8)
≥15 per month	0 (0.0)
Severity	
Mild	17 (37.0)
Moderate–Severe	29 (63.0)
Pain location	
One-sided	11 (23.9)
Two-sided	35 (76.1)
Pain characteristics	
Pulsating	13 (28.3)
Tight or pressing	33 (71.7)
Burning or stabbing	0 (0.0)
Others	0 (0.0)
Accompanying symptoms	
Yes	26 (56.5)
Sensitivity to light	10 (21.7)
Sensitivity to sound	8 (17.4)
Nausea and/or vomiting	14 (30.4)
Worsened by daily activities	
Yes	17 (37.0)
Headaches interfere with daily activities	
Yes	29 (63.0)
Disability due to headache	
Yes	19 (41.3)

Table 4. Perceived precipitating factors of migraine (in the 31 subjects with migraine)

Variables	n (%)
Long working hours	29 (93.5)
Fatigue	28 (90.3)
Inadequate sleep	29 (93.5)
Anxiety	25 (80.6)
Stress	22 (71.0)
Hunger	22 (71.0)
Menstruation	17 (65.2)
Physical activities	22 (71.0)
Noise	23 (74.2)
Weather	13 (41.9)
Specific food	14 (45.2)

Discussion

Prevalence of migraine and TTH in preclinical medical students

The prevalence of migraine was 40.2% among preclinical medical students at Universitas Indonesia, including both definitive and probable migraine based on ICHD-3 criteria. This prevalence is similar to that reported by Raju and Geetha (23) among South Indian medical students (30%) and by Menon et al.(24) (28%). Ragab et al.(4) reported a lower prevalence in medical students (17.3%), whereas Thiagarajan et al.(5) reported a substantially higher prevalence (61.8%).

The prevalence of migraine among medical students aged 17–19 years was 40.4%, consistent with Gu and Xie's (25) study, which found was migraine occurred predominantly between 15–20 years, suggesting that recent high-school graduates require time to adapt to their new academic environment.

The total prevalence of TTH among preclinical students of The Faculty of Medicine, Universitas Indonesia was 59.7%. This result is higher than that reported by Shrestha et al.(26) (40.3%) and by Dabilgou et al.(27) (33%).

Females had a higher prevalence of both migraine (41.8%) and TTH (58.1%), which may be attributed to hormonal influences on neuronal and vascular reactivity, particularly during puberty, consistent with the findings of Sabah et al.(12) (70.4%) (28). Third-year medical students at Universitas Indonesia showed a slightly higher prevalence of both migraine (41.3%) and TTH (56.5%), possibly due to constant tests, thesis preparations, and increased stress and anxiety. Mirghani et al.(29) also reported a comparable pattern, with a TTH prevalence of 28.7% among third-year students. Probable TTH was found in 80.6% of students, supported by the Meer et al.(30) study on HSQ sensitivity (0.92) and specificity (0.48), with further examination by neurologists needed for a definitive diagnosis. Shrestha et al.(26) also found a higher percentage of probable than definite TTH (33.5%). The most prevalent TTH subtype among students was frequent episodic TTH (84.8%), consistent with Mirghani et al.(29) (67.2%).

Table 5. Independent variables associated with migraine occurrence (multivariable binomial logistic regression)

Variable	Migraine		P – value (95% CI)
	Yes	No	
Stress[a]			*0.002 (0.99 – 13.45)
Yes	8 (25.8%)	4 (4.5%)	
Workload (Sequential gadget utilization)[b]			0.069
<6 hours	4 (13.0%)	25 (28.4%)	
6 – 9 hours	10 (32.2%)	34 (38.6%)	
>9 hours	17 (54.8%)	29 (33.0%)	
Workload (Study duration)[b]			*0.011
<3 hours	3 (9.6%)	17 (19.3%)	
<7.5 hours	14 (45.2%)	55 (62.5%)	
>7.5 hours	14 (45.2%)	16 (18.2%)	
Lack of Sleep[a]			0.151
Yes (<7 hours)	29 (93.5%)	72 (81.8%)	
No (≥7 hours)	2 (6.5%)	16 (18.2%)	
Menstruation[b]			*0.006 (0.58 – 3.61)
Yes	13 (41.9%)	13 (14.8%)	
Weather[a]			*0.002 (0.70 – 4.79)
Yes	13 (41.9)	13 (14.8)	

a: Fisher exact test; b: Chi Square; *: p value <0,005

Precipitating factors of migraine

Migraine triggers can be broadly classified into biological factors such as hormone dysregulation, psychological factors such as anxiety, and miscellaneous causes including low socioeconomic status (5). Reviews of the literature have expanded this classification to include lifestyle and external stimuli, such as level of physical activity, stress, emotional state, sensory stimuli, food and drink, hormonal fluctuations, medications, sleep patterns, travel, weather, and environment (31). Globally, stress is the most frequent trigger, followed by sleep issues and food/drink, while in Asia, sleep, fatigue, weather, and food/drink are common triggers (31).

In this study, 93.5% of students identified long working/study hours as a major perceived migraine trigger, which also reduces time for physical activity (24,25). This finding was similar to reports on Indian medical students, where 68% experienced headaches and 28% met the criteria for migraine, with triggers including mental stress, poor sleep hygiene, and prolonged academic activities (24). Stress, with a prevalence of 70.9%, is another significant factor. Medical students often experience high stress due to heavy workloads, as shown by Ragab et al.(4), where 89.6% had high stress levels linked to migraine. Stress activates the HPA axis, releasing hormones that may trigger migraine.

Table 6. Perceived precipitating factors of tension-type headache (multivariable binomial logistic regression)

Precipitating factors	TTH n (%)	No TTH n (%)	p-value (95% CI)
Long working hour			
Yes	40 (86.9)	65 (89.0)	0.775 (0.265-2.539)[a]
Fatigue			
Yes	37 (80.4)	50 (68.5)	0.143 (0.838-4.840)[a]
Sleep deprivation			
Yes	36 (78.2)	65 (89.0)	0.123 (0.818-6.227)[a]
Anxiety			
Yes	33 (71.7)	39 (53.4)	*0.005 (0.147-0.713)[a]
Stress			
Yes	25 (54.3)	25 (34.2)	*0.002 (0.001-0.003)[a]
Mild	3 (12.0)	13 (52.0)	
Moderate	9 (36.0)	4 (16.0)	
Severe	8 (32.0)	5 (20.0)	
Extremely Severe	5 (20.0)	2 (8.0)	
Hunger			
Yes	24 (52.1)	26 (35.6)	0.088 (0.930-4.150)[a]
Menstruation			
Yes	16 (50.0)	22 (48.8)	1.000 (0.422-2.588)[a]
Physical activities			
Yes	23 (50.0)	35 (47.9)	0.853 (0.519-2.271)[a]
Noise			
Yes	20 (43.7)	34 (46.5)	0.850 (0.420-1.854)[a]
Specific food			
Yes	16 (34.7)	10 (13.7)	0.011 (1.364-8.279)[a]

a: Chi-square test; *: p-value <0.05
Denominators: TTH group n=46; No TTH group n=73 (total respondents included in the precipitating-factor analysis = 119). For Menstruation, denominators are restricted to female respondents only (TTH female n=32; No TTH female n=45).

Inadequate sleep, reported by 93.5%, is another major factor, similar to Liaquat et al.(32) (86%). Poor sleep affects serotonin regulation, leading to altered vascular permeability and abnormal vasodilation–vasoconstriction cycles. This disruption affects pain modulation pathways and increases trigeminal nerve sensitivity, which can trigger migraine (33).

Migraine triggers in medical students, similar to the general population, include poor sleep, environmental changes, stress, and head movement (4,5,23,24). This study found significant associations of weather, stress, and menstruation with migraine. Seasonal changes can stress the body and disrupt brain chemicals like serotonin, potentially triggering migraines. Weather changes had a 41.9% prevalence, likely lower due to student adaptation. Menstruation significantly affected migraines (65.2%) due to hormonal fluctuations. A review conducted by Athar et al.(34) reported a prevalence of 31.8%, indicating that menstruation affected migraine occurrence in female medical students (31). This phenomenon, known as estrogen-withdrawal headache according to the International Classification of Headache Disorders (ICHD) (19), is attributed to hormonal fluctuations during the menstrual cycle. Estrogen levels drop, disrupting neurotransmitter communication and triggering migraine by activating pain signals along the trigeminal nerve. Estrogen also

stimulates the synthesis and release of substances such as nitric oxide and calcitonin gene-related peptides, contributing further to migraine pathophysiology. Additionally, estrogen imbalance affects levels of Mg2+ and Ca2+, potentially heightening neural excitability and migraine susceptibility (35).

Precipitating factors of TTH

The most prevalent perceived precipitating factor of TTH in this study was long working hours (86.9%). As per Law Number 13 of 2003 regarding Manpower in Indonesia, standard working hours amount to 40 hours weekly, distributed across either 7-hour shifts for 6 days a week or 8-hour shifts for 5 days a week (36). This study utilized 8 hours per day as a threshold, classifying activities exceeding this duration as prolonged. Fatigue was reported by 80.4% of students with TTH, consistent with the findings of Hassan and Asaad (37) (90%). However, few studies have reported fatigue as a precipitating factor of TTH among medical students. This may reflect that each person possesses different thresholds and standards for experiencing fatigue, and that this perception is inherently subjective, influenced by personal factors such as stress levels, lifestyle, and overall health. What one person may find exhausting, another may perceive as manageable. This factor may also be connected to physical activities (50%), since individuals are likely to experience fatigue after physical exertion.

Sleep deprivation, the third most frequently reported perceived factor, was 78.2%, comparable to the studies of Anaya et al. (17) (88.5%) and Dabilgou et al.(27) (83.7%). Transition from episodic to chronic TTH is frequently triggered by sleep difficulties. The fourth most common perceived factor is anxiety (71.7%). This result is higher than that in a study by Alkarrash et al.(38), which reported anxiety as a TTH factor in 56.1%. Stress (54.3%), in fifth place, is also one of the perceived precipitating factors of TTH, aligning with Alkarrash et al.(38) (60.5%) and Dabilgou et al.(27) (52.3%). Both stress and anxiety are closely related to TTH since they may result in overly tight muscles, which lowers oxygen delivery and increases the synthesis of chemicals that cause pain. Frequent stressful and painful episodes cause brain and peripheral sensitization, lowering pain thresholds and ultimately resulting in TTH. Both anxiety and stress showed statistically significant associations with TTH ($p=0.005$, <0.05).

The time spent by students studying and using gadgets continuously was 6 and 9 hours/day, respectively. Both may be interconnected since medical students generally use gadgets (tablet, laptop, or computer) as their study devices. In a study by Anaya et al.(17), 79.8% of students' TTH triggering factor was long study hours, but they did not specify the exact time of studying. Given that the average preclinical student spends approximately 9 hours/day using electronic gadgets and 6 hours/day studying, it is plausible to consider this extensive screen time as a significant contributing factor to their increased incidence of TTH. Prolonged device use leads to eye strain, poor posture, and mental fatigue, all of which are potential triggers for TTH.

Factors such as fatigue, overexertion, and maintaining a fixed head position for long intervals are significant because they are associated with severe clenching of the muscles in the head and neck. These physical stresses can potentially lead to discomfort and health issues, warranting further investigation in the context of this study (19). Additionally, the continuous use of tablets can lead to central sensitization due to emitted radiation and sustained posture, affecting blood vessels and releasing noxious stimuli (26).

This study has several limitations that should be acknowledged. First, the cross-sectional design relied on participants' recollection of headache episodes during the previous three months, which may have introduced recall bias. Second, all variables were obtained through self-administered questionnaires, which may lead to self-report bias and potential misclassification of headache types, especially in the absence of clinical confirmation by a neurologist. In particular, the precipitating factors reported here reflect participants' perceptions of their triggers rather than objectively verified causes. Third, the study involved a relatively small sample size and was conducted at a single center, which may limit the statistical power and the generalizability of the findings to other medical student populations. Despite these limitations, validated instruments (HSQ, MIDAS, and DASS-21) and standardized scoring criteria were used to reduce measurement error and improve internal consistency.

Conclusion

The study reveals a high prevalence of headache disorders among preclinical medical students at Universitas Indonesia, with 40.2% experiencing migraine and 59.7% suffering from TTH. Notably, female students exhibited a higher prevalence of both migraine and TTH compared to their male counterparts. Perceived triggers for migraine included long working hours, inadequate sleep, stress, menstruation, and weather changes, while perceived precipitating factors for TTH were similar and included long working hours, fatigue, sleep deprivation, anxiety, and stress. A significant association was found between stress and TTH, underscoring its impact on the prevalence and severity of TTH among these students.

In summary, both migraine and TTH are prevalent among preclinical medical students, with stress emerging as a common and significant factor associated with both types of headaches. These findings highlight the need for targeted interventions to address stress and other precipitating factors, potentially incorporating stress management programs and lifestyle adjustments to mitigate the impact of headaches on students' academic performance and overall well-being.

References

1. Steiner TJ, Stovner LJ. Global epidemiology of migraine and its implications for public health and health policy. Nat Rev Neurol 2023;19:109–17. Doi:10.1038/s41582-022-00763-1.
2. Oraby MI, Soliman RH, Mahmoud MA, Elfar E, Abd ElMonem NA. Migraine prevalence, clinical characteristics, and health care-seeking practice in a sample of medical students in Egypt. Egypt J Neurol Psychiatr Neurosurg 2021;57:26. Doi:10.1186/s41983-021-00282-8.
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. Doi:10.1186/s10194-022-01402-2.
4. Ragab S, Zaitoun N, Elrafie A, el-Ansarey H, Srour A, Nabil N, et al. Migraine among Egyptian medical students: prevalence, disability and psychological distress-cross sectional study. Egypt J Neurol Psychiatr Neurosurg 2023;59:62. Doi:10.1186/s41983-023-00665-z.
5. Thiagarajan A, Aziz NA, Tan C-E, Muhammad NA. The profile of headaches and migraine amongst medical students and its association to stress level, disability and self-management practices. Malays Fam Physician 2022;17:81–8. Doi:10.51866/oa1370.
6. Wiyarta E, Ali SW. Potensi Vitamin D Sebagai Obat Preventif Untuk Menghambat Progresivitas Tension Type Headache. Neurona Perdosni 2021;38.
7. Sudibyo DA, Suharjanti I, Palupi IR. MIGRAIN RETINAL. Neurona Perdosni 2021;38.
8. Siagian D, Adnyana MO, Widyadharma PE. Kadar Substansi P Serum Tinggi Sebagai Faktor Risiko Chronic Tension Type Headache Pada Mahasiswa Fakultas Kedokteran Universitas Udayana. Majalah Kedokteran Neurosains Perhimpunan Dokter Spesialis Saraf Indonesia 2020;37:136–42. Doi:10.52386/neurona.v37i2.119.
9. Onofri A, Pensato U, Rosignoli C, Wells-Gatnik W, Stanyer E, Ornello R, et al. Primary headache epidemiology in children and adolescents: a systematic review and meta-analysis. J Headache Pain 2023;24:8. Doi:10.1186/s10194-023-01541-0.
10. Onan D, Younis S, Wellsgatnik WD, Farham F, Andruškevičius S, Abashidze A, et al. Debate: differences and similarities between tension-type headache and migraine. J Headache Pain 2023;24:1–16. Doi:10.1186/s10194-023-01614-0.
11. Rizzoli P, Mullally WJ. Headache. Am J Med 2018;131:17–24. Doi:10.1016/j.amjmed.2017.09.005.
12. Sabah ZU, Aziz S, Narapureddy BR, Alasiri HAA, Asiri HYM, Asiri AHH, et al. Clinical-Epidemiology of Tension-Type Headache among the Medical and Dental Undergraduates of King Khalid University, Abha, Saudi Arabia. J Pers Med 2022;12. Doi:10.3390/jpm12122064.
13. Muthmainnina AN, Kurniawan SN. Tension Type Headache (TTH). JPHV (Journal of Pain, Vertigo and Headache) 2022;3:41–4. Doi:10.21776/ub.jphv.2022.003.02.3.
14. Baglioni V, Orecchio S, Esposito D, Faedda N, Natalucci G, Guidetti V. Tension-Type Headache in Children and Adolescents 2023;13. Doi:10.3390/life13030825.
15. Ruschel MAP, Jesus O d. Migraine Headache. 2024.
16. Bhattarai AM, Gurung S, Pathak BD, Karki S, Adhikari A, Tandon OP, et al. Prevalence and clinical characteristics of headache among medical students of Nepal: A cross-sectional study. PLoS One 2022;17:1–10. Doi:10.1371/journal.pone.0277821.
17. Anaya F, Abu Alia W, Hamoudeh F, Nazzal Z, Maraqa B. Epidemiological and clinical characteristics of headache among medical students in Palestine: a cross sectional study. BMC Neurol 2022;22:1–8. Doi:10.1186/s12883-021-02526-9.
18. Wilkensia WA. Prevalensi migrain pada mahasiswa FKIK UIN angkatan 2011 dan faktor-faktor yang mempengaruhinya tahun 2012 . UIN Syarif Hidayatullah, 2012.
19. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. Cephalalgia 2018;38:1–211. Doi:10.1177/0333102417738202.
20. Ketaren RJ, Wibisono Y, Sadeli HA. Validitas Migraine Screen Questionnaire (MS-Q) Versi Indonesia Sebagai Alat Penapis Migren. Neurona 2014;31:1–8.
21. Lipton RB, Stewart WF, Sawyer J, Edmeads JG. Clinical utility of an instrument assessing migraine disability: the Migraine Disability Assessment (MIDAS) questionnaire. Headache 2001;41:854–61.
22. Ifdil I, Syahputra Y, Fadli RP, Zola N, Putri YE, Amalianita B, et al. The depression anxiety stress scales (DASS-21): an Indonesian validation measure of the depression anxiety stress. COUNS-EDU: The International Journal of Counseling and Education 2022;5:205–15. Doi:10.23916/0020200536840.
23. Raju S, S G. Prevalence of migraine among medical students of a tertiary care teaching medical college and hospital in South India - A cross-sectional study. Natl J Physiol Pharm Pharmacol 2018;8:1377–83. Doi:10.5455/njppp.2018.8.0620111062018.
24. Menon B, Kinnera N. Prevalence and characteristics of migraine in medical students and its impact on their daily activities. Ann

Indian Acad Neurol 2013;16:221–5. Doi:10.4103/0972-2327.112472.
25. Gu X, Xie Y. Migraine attacks among medical students in Soochow University, Southeast China: a cross-sectional study. J Pain Res 2018;11:771–81. Doi:10.2147/JPR.S156227.
26. Shrestha O, Karki S, Thapa N, Lal Shrestha K, Shah A, Dhakal P, et al. Prevalence of migraine and tension-type headache among undergraduate medical students of Kathmandu Valley: A cross-sectional study. Health Sci Rep 2022;5. Doi:10.1002/hsr2.747.
27. Dabilgou AA, Dravé A, Kyelem JMAW, Coulibaly NZ, Napon C, Millogo A, et al. Prevalence of Tension-Type Headache Among Medical Students in Ouagadougou, Burkina Faso. SN Compr Clin Med 2023;5:151. Doi:10.1007/s42399-023-01498-w.
28. Allais G, Chiarle G, Sinigaglia S, Airola G, Schiapparelli P, Benedetto C. Gender-related differences in migraine. Neurol Sci 2020;41:429–36. Doi:10.1007/s10072-020-04643-8.
29. Mirghani HO, H. Altemani RF, J. Alharthi YH, R. Alotaibi MA, A. Alamrani AM, A. Altawili A, et al. Prevalence of Tension-Type Headache among Medical Students in Tabuk University, Saudi Arabia. J Pharm Res Int 2021:1–10. Doi:10.9734/jpri/2021/v33i51B33504.
30. van der Meer HA, Visscher CM, Engelbert RHH, Mulleners WM, Nijhuis-van der Sanden MWG, Speksnijder CM. Development and psychometric validation of the headache screening questionnaire - Dutch Version. Musculoskelet Sci Pract 2017;31:52–61. Doi:10.1016/j.msksp.2017.07.001.
31. Iba C, Ohtani S, Lee MJ, Huh S, Watanabe N, Nakahara J, et al. Migraine triggers in Asian countries: a narrative review. Front Neurol 2023;14:1–7. Doi:10.3389/fneur.2023.1169795.
32. Liaquat A, Sheikh WA, Yousaf I, Mumtaz H, Zafar M, Khan Sherwani AH. Frequency of migraine and its associated triggers and relievers among medical students of Lahore: a cross-sectional study. Ann Med Surg (Lond) 2024;86:103–8. Doi:10.1097/MS9.0000000000001377.
33. Aninditha T, Wiratman W. Buku Ajar Neurologi. vol. 2. Jakarta: Departemen Neurologi Fakultas Kedokteran Universitas Indonesia; 2017.
34. Athar F, Zahid A, Farooq M, Ayyan M, Ashraf M, Farooq M, et al. Frequency of migraine according to the ICHD-3 criteria and its association with sociodemographic and triggering factors in Pakistan: A cross-sectional study. Ann Med Surg (Lond) 2022;82:1–5. Doi:10.1016/j.amsu.2022.104589.
35. Amiri P, Kazeminasab S, Nejadghaderi SA, Mohammadinasab R, Pourfathi H, Araj-Khodaei M, et al. Migraine: A Review on Its History, Global Epidemiology, Risk Factors, and Comorbidities. Front Neurol 2022;12. Doi:10.3389/fneur.2021.800605.
36. Republic of Indonesia. Law Number 13/2003 Concerning Manpower 2003:1–99.
37. Hassan M, Asaad T. Tension-type headache, its relation to stress, and how to relieve it by cryotherapy among academic students. Middle East Current Psychiatry 2020;27:1–11. Doi:10.1186/s43045-020-00030-3.
38. Alkarrash MS, Shashaa MN, Kitaz MN, Rhayim R, Alhasan MM, Alassadi M, et al. Migraine and tension-type headache among undergraduate medical, dental and pharmaceutical students of University of Aleppo: a cross-sectional study. BMJ Neurol Open 2021;3. Doi:10.1136/bmjno-2021-000211.

Tiara Aninditha
https://orcid.org/0000-0002-8758-2167
Irma Savitri Madjid
https://orcid.org/0009-0008-3596-8579
Mexithania Golda Bindia Nadhila Hermawan
https://orcid.org/0009-0001-7188-4857
Adinda Aisya Kamila
https://orcid.org/0009-0003-1603-4897
Ahmad Rafi Faiq
https://orcid.org/0009-0000-7133-8592
Nadya Salsabila Elkarasjzi
https://orcid.org/0009-0006-7908-4041
Putri Azzahra Nur Azrina
https://orcid.org/0009-0006-1211-3776
Henry Riyanto Sofyan
https://orcid.org/0000-0001-5702-4968

Authors contributions: TA, IS, HRS: Conceptualization; TA, AAK: Methodology; TA, MGBNH: Investigation; TA: Formal Analysis; TA, MGBNH, AAK, HRS: Writing Original Draft; IA, HRS: Supervision; IA, MGBNH, AAK, ARF, NSE, PANA: Validation; IA: Writing Review & Editing; MGBNH: Data Curation; ARF, NSE, PANA: Visualization; NSE, PANA: Manuscript formatting; HRS: Project administration. All authors contributed substantially to the development of this study and approved the final manuscript.

Conflict of interest: The authors declare that there are no conflicts of interest relevant to the content of this study.

Funding: This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgments: The authors express their sincere gratitude to all preclinical medical students who participated in this research. The authors also thank the Department of Neurology, Faculty of Medicine, Universitas Indonesia, and Dr. Cipto Mangunkusumo National General Hospital for providing institutional and logistical support.