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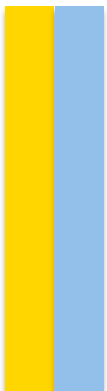
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Primary headaches among medical, veterinary, and pharmaceutical science students

Raquel Rebelo Castela

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Artigo Original

Dissertação de candidatura ao grau de Mestre em Medicina, submetida ao Instituto de Ciências Biomédicas Abel Salazar – Universidade do Porto

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Porto, junho de 2025

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Declaração de Integridade Científica

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Porto, junho de 2025



(Raquel Rebelo Castela)

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Resumo

Introdução: Estudantes universitários da área da saúde apresentam maior risco de cefaleias primárias devido à exigência académica e elevados níveis de stress. Apesar do impacto significativo, estas patologias continuam subdiagnosticadas e subtratadas, existindo dados limitados nestas populações a nível mundial. Este estudo pretende analisar a incidência de cefaleias primárias e os fatores associados numa população de estudantes universitários da área da saúde em Portugal.

Métodos: Este estudo observacional transversal avaliou a prevalência, as características e o impacto funcional das cefaleias primárias em estudantes de Medicina e Medicina Veterinária do ICBAS-UP, e de Ciências Farmacêuticas da FFUP, através de um questionário anónimo digital, durante o ano letivo 2024/2025. As cefaleias foram classificadas segundo os critérios da ICHD-3 e o impacto funcional avaliado através do HIT-6. Dados sociodemográficos, prevalência de fatores desencadeantes e medidas terapêuticas foram outras variáveis analisadas. A análise estatística incluiu métodos descritivos e inferenciais, considerando-se significativos valores de $p < 0,05$.

Resultados: Foram obtidas 530 (22,5%) respostas válidas. A prevalência de cefaleias primárias foi de 44,7%, das quais 32,1% corresponderam a enxaqueca provável e 40,5% a cefaleia tipo tensão provável. Verificaram-se associações estatisticamente significativas entre a prevalência de cefaleias e o sexo feminino (OR=2,58; $p<0,001$), a perceção de sobrecarga académica (OR=1,73; $p=0,019$), o ano académico ($p=0,0025$) e uma associação inversa com o tabagismo (OR=0,31; $p=0,005$). Os principais fatores desencadeantes referidos foram o stress (73%), a exposição excessiva a ecrãs (59,5%) e a privação de sono (57,4%). Em 44,3% dos casos, foi observado impacto funcional severo no HIT-6. Apenas 20,7% (n=49) dos estudantes afetados procuraram consulta médica, sendo que, destes, 78,9% (n=187) recorreu a analgésicos de venda livre e 70,5% (n=167) a métodos não farmacológicos. Observaram-se ainda associações significativas entre o subtipo de cefaleia e o impacto funcional ($p<0,001$), bem como entre a frequência e gravidade das cefaleias e a procura de acompanhamento médico.

Conclusão: As cefaleias primárias afetam aproximadamente metade dos estudantes avaliados, com impacto funcional considerável. A baixa procura por cuidados de saúde, associada ao recurso frequente a automedicação, poderá refletir uma tendência para a subvalorização destes sintomas ou barreiras no acesso aos cuidados. Estes resultados sublinham a importância de estratégias institucionais focadas na prevenção, promoção da saúde mental e acesso facilitado a cuidados, servindo simultaneamente de base para futuras investigações.

Palavras-chave: Cefaleias primárias; Estudantes de medicina; Estudantes de ciências farmacêuticas; Estudantes de medicina veterinária; Prevalência; Fatores de Risco; Impacto.

Abstract

Background: University students in health-related fields are at increased risk of primary headaches, associated with academic pressure and heightened levels of stress. Despite their significant impact, these disorders remain underdiagnosed and undertreated, with limited data available for these populations worldwide. This study aims to explore the incidence of primary headaches and associated factors among health science university students in Portugal.

Methods: This cross-sectional observational study assessed the prevalence, characteristics, and functional impact of primary headaches among students of Medicine and Veterinary Medicine at ICBAS-UP, and Pharmaceutical Sciences at FFUP using an anonymous online questionnaire, during the 2024/2025 academic year. Headaches were classified according to ICHD-3 criteria, and functional impact was assessed using the HIT-6 scale. Sociodemographic data, prevalence of triggering factors, and therapeutic approaches were also analysed. Statistical analysis included descriptive and inferential methods, with p-values <0.05 considered significant.

Results: A total of 530 valid responses were obtained (22.5%). Primary headaches were identified in 44.7% of respondents, with probable migraine present in 32.1% and probable tension-type headache in 40.5%. Statistically significant associations were identified between headache prevalence and female sex (OR=2.58; $p<0.001$), perceived academic overload (OR=1.73; $p=0.019$), and academic year ($p=0.0025$), while smoking showed a significant inverse association (OR=0.31; $p=0.005$). The most commonly reported triggers were stress (73%), excessive screen exposure (59.5%), and sleep deprivation (57.4%). Nearly half (n=105; 44.3%) experienced severe functional impairment. Only 20.7% (n=49) sought medical consultation, with 78.9% (n=187) self-managing through over-the-counter analgesics and 70.5% (n=167) with non-pharmacological methods. Statistically significant associations were observed between headache subtype and impact level ($p<0.001$), as well as between consultation rates and headache severity and frequency.

Conclusion: Primary headaches affect approximately half of students surveyed, with a considerable functional impact. The low rate of healthcare-seeking, along with frequent self-medication, may reflect a tendency to overlook these symptoms or barriers to healthcare access. These findings call for institutional strategies focused on prevention, mental health promotion, and improved access to healthcare, while providing a foundation for future research.

Keywords: Primary headaches; Medical students; Pharmaceutical science students; Veterinary medicine students; Prevalence; Risk factors; Impact.

List of Abbreviations

CI	Confidence Interval
FFUP	Faculdade de Farmácia da Universidade do Porto
HIT-6	Headache Impact Test – 6 items
ICBAS-UP	Instituto de Ciências Biomédicas Abel Salazar da Universidade do Porto
ICHD	International Classification of Headache Disorders
IQR	Interquartile Range
OR	Odds Ratio
TTH	Tension-Type Headache
UP	Universidade do Porto
YLDs	Years Lived with Disability

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Background

Primary headaches can be defined as recurrent episodes of headache in the absence of an identifiable underlying cause[1] and rank among the most common neurological disorders worldwide[2]. It is estimated that nearly 46% of the global population experience an active headache disorder, with prevalence rates of 11%, 42%, and 3% for migraine, tension-type headache and chronic headache, respectively, with females being the most affected[2]. Due to their high prevalence and associated disability, primary headaches represent a considerable public health concern[3]. According to the Global Burden of Disease Study (2019), these disorders accounted for approximately 46.6 million years lived with disability (YLDs), ranking third among all causes of disability across all age groups[4].

To ensure diagnostic consistency and support research, the International Headache Society developed the International Classification of Headache Disorders (ICHD), which distinguishes three major categories: primary headaches, secondary headaches (caused by an underlying pathology), and painful cranial neuropathies[5]. Primary headaches are further subdivided into migraine, tension-type headaches (TTH) and trigeminal autonomic cephalalgias, according to their characteristics, intensity, duration, frequency and associated symptoms[1].

The ICHD has served as a fundamental framework for clinical practice and research since the first edition, and it has significantly contributed to the development of targeted treatments[6]. Its ongoing revision, currently on the fourth edition (ICHD-4), reflects the dynamic nature of the field, with present efforts addressing several contemporary challenges, including the classification of menstrual migraine, the role of biomarkers and genetics and the influence of age, sex and regional variation[6].

Within the university setting, the prevalence of headaches tends to be even higher than in the general population, particularly among students enrolled in medicine, pharmaceutical sciences, and other health-related disciplines due to the high academic workload, frequent stress, irregular sleep schedules, depressed mood, academic dissatisfaction and often unhealthy lifestyle habits[7–9]. Although prevalence rates vary across regions, studies estimate that up to 70% of medical students experience unspecified headaches, approximately 18.9% suffer from migraine, and around 40% report TTH[10]. These conditions may significantly impact their quality of life and academic performance[10]. In addition, psychological comorbidities such as anxiety and depression are frequent, and may further compromise students' quality of life and academic prospects[11].

Despite their high prevalence and considerable impact on daily functioning, primary headaches remain widely underdiagnosed and inadequately managed [12,13]. Studies report that around 88.2% of students resort to self-medication, typically with over-the-counter analgesics, raising concerns about medication overuse, which can ultimately contribute to suboptimal management[12].

Given the scarcity of data on this topic, particularly among Portuguese university students, this study aims to fill a critical gap in the literature by assessing the prevalence, characteristics, and impact of primary headaches among health-related students of *Universidade do Porto* (UP). Furthermore, the identification of associated risk factors, common triggers and self-care behaviours may help define potential preventive strategies for future implementation.

Methods

This cross-sectional observational study was conducted between April 4th and May 6th, 2025, after the Institutional and Ethics Committee approval (Ref.ª:2024.303(240-CAC/274-CE)). The targeted population included students in Medicine and Veterinary Medicine at *Instituto de Ciências Biomédicas Abel Salazar da Universidade do Porto* (ICBAS-UP) and Pharmaceutical Sciences at *Faculdade de Farmácia da Universidade do Porto* (FFUP), during the 2024/2025 academic year. Informed consent was obtained from all participants prior to data collection.

Eligibility criteria

Students were eligible to participate if they were enrolled in one of the above specified degrees and provided informed consent to answer an online questionnaire. The exclusion criteria applied was incomplete survey submission.

Sample size

In a total of 2354 students (1089 in Medicine, 390 in Veterinary Medicine and 875 in Pharmaceutical Sciences), the minimum required sample size to achieve a 95% confidence level with a 5% margin of error was 331.

Data collection

Data was collected through a structured, self-administered online questionnaire available on the UP's official platform (https://inqueritos.up.pt). Participation was voluntary and anonymous. Invitations were distributed via institutional email, and each student completed the questionnaire once, after reviewing an informational leaflet and providing electronic informed consent.

The survey

The questionnaire was developed in portuguese, grounded in a comprehensive literature review and adapted from validated tools used in published research[8,11,14]. It comprised 4 sections. The first one focused on demographics and psychosocial factors, gathering information on participants' age group, gender, academic program, academic year, prior academic background, employment status and lifestyle habits, such as physical activity, smoking and average sleep duration. Psychosocial variables such as academic dissatisfaction, perceived overload and depressive symptoms were also assessed. Further questions addressed the use of hormonal contraception or hormone therapy, as well as food intolerances. Headache occurrence was screened with the question: "In the past 3 months, have you experienced two or more headaches?".

A negative response led to the automatic end of the questionnaire. At this stage, students who met any of the exclusion criteria of the questionnaire were also filtered out, in order to prevent the inclusion of secondary headaches. These criteria were history of traumatic brain injury, a diagnosed neurological condition (e.g., stroke, epilepsy, multiple sclerosis, brain tumor), history of sinusitis, and current pregnancy.

The second section, focused on headache characterization, included questions aligned with the ICHD 3rd edition (ICHD-3), covering aspects such as pain type, location, duration, frequency, intensity, and exacerbation by physical activity. Participants also provided information about associated symptoms, including nausea, photophobia, phonophobia, and neck tension. Further details on reversible neurological symptoms, family history of headaches, age at onset, seasonal patterns, and potential triggers (stress, sleep disruption, menstruation, alcohol, and caffeine withdrawal) were also gathered.

The third section included the portuguese version of the Headache Impact Test (HIT-6)[14] to assess the impact of headaches on the students' daily life.

Finally, the fourth section explored the coping strategies used by the participants, including non-pharmacological methods, the use of over-the-counter analgesics, prescribed medications (both abortive and preventive), and pursuit of specialist medical consultation.

Statistical Analysis

Survey data was cross-checked and coded in Excel. Implausible outlier values for age at onset of headaches were also removed during the data analysis process. Based on responses to the screening question "In the past three months, have you experienced two or more headaches?" participants either progressed with the questionnaire or were excluded. After exclusion of relevant past medical history, individuals identified with primary headaches were subsequently classified according to the ICHD-3 criteria as having probable migraine (with or without aura), probable TTH, or unclassified headache, as presented in Figure 1. HIT-6 responses were systematically scored, and a derived variable was generated to categorise the level of functional impact according to the total score.

The dataset was analysed using IBM SPSS Statistics® software version 28. Descriptive statistics were presented as frequencies and percentages for categorical variables, and as median with interquartile range (IQR) for non-parametric continuous variables. Inferential analyses were performed using the Chi-square (χ^2) test. Odds ratios (OR) with 95% confidence intervals (CI) were

calculated to assess the strength of association between categorical variables. A p-value <0.05 was considered statistically significant.

Results

Sociodemographic and lifestyle characteristics

A total of 620 responses were collected, of which 90 were excluded from the final dataset due to incomplete data. With 530 valid responses, the margin of error was reduced to 3.74%, surpassing the minimum threshold and allowing for higher statistical power.

Most participants identified as female (n=440; 83%), while 90 (17%) identified as male. Regarding academic programs, 339 participants (64%) were enrolled in Medicine, 117 (22.1%) in Veterinary Medicine, and 74 (14%) in Pharmaceutical Sciences. The majority of students were between 20 and 23 years old (n=339; 64%), and all academic years were represented.

Regarding lifestyle habits and well-being, 60.8% reported sleeping 6 to 7 hours per night, and 57.5% engaged in regular physical activity. A total of 81.7% reported feeling overwhelmed or frequently anxious due to university demands, and 20% expressed dissatisfaction with their degree programme. Additionally, 27.7% reported persistent low mood, and 62.3% reported visual difficulties.

Prevalence and characterization of primary headaches

Of the 344 students (64.9%) who screened positive for headaches, 107 (20.2%) were excluded due to a medical history suggestive of secondary headache. The remaining 237 (44.7%) were classified as having primary headaches, as shown in figure 2.

According to ICHD-3 criteria, 74 (31.2%) students were classified with probable migraine, with 51 (68.9%) reporting aura symptoms and 23 (31.1%) without aura. Probable TTH was identified in 96 cases (40.5%), while 67 (28.3%) did not meet criteria for classification within a specific primary headache subtype.

The median age of headache onset was 16 years (IQR=3), with ages ranging from 5 to 25 years. Regarding monthly frequency, most participants (n=155; 65.4%) experienced between 1 and 14 episodes of headache per month, while 76 students (32.1%) had fewer than 1 episode per month, and a small proportion (n=6; 1.5%) reported more than 15 episodes per month. Associated symptoms included phonophobia (n=137; 57.8%), photophobia (n=134; 56.5%), cervical tension (n=89; 37.5%) and nausea and/or vomiting (n=41; 17.3%). Among those diagnosed with probable migraine with aura (n=51; 21,5%), visual aura was the most frequently reported (n=33; 13.9%), followed by motor symptoms (n=18; 7.6%), sensory disturbances (n=13; 5.5%) and language impairment (n=4; 1.7%).

No seasonal pattern was described by the majority of students (n=117; 41.5%). Among those who identified a seasonal variation, January was the most frequently reported month for headache occurrence (n=44; 17.6%), followed by June (n=34; 13.6%).

A family history of headache was reported by 52.7% (n=125) of the students. Among those classified with probable migraine, 60.8% reported a positive family history, with no statistically significant association (χ^2=2.81, p=0.094; OR=1.61, 95% CI: 0.921–2.815).

Based on the HIT-6 questionnaire, 105 students (44.3%) experienced severe headache-related impact, 46 (19.4%) reported substantial impact, 59 (24.9%) some impact and 27 (11.4%) little to no impact on daily functioning. The distribution of impact levels differed significantly by headache subtype, with a statistically significant association found between headache type and HIT-6 scores ($\chi^2(9)$=47.548, p<0.001). Migraine with aura was linked to the highest proportion of severe functional impact.

Further details regarding headache characteristics, including pain quality and location are presented in Table 2.

Triggering factors of primary headache

As presented in Figure 3, the most reported potential headache triggers in this study were stress (n=173;73%), excessive screen use (n=141; 59.5%), insufficient sleep (n=136; 57,4%), menstruation (n=87; 36,7%) and noise exposure (n=84; 35,4%).

Risk factors for primary headaches

Primary headaches were significantly more prevalent among female students ($\chi^2(1)$=14.29, p<0.001; OR=2.58; 95% CI [1.56, 4.27]). A statistically significant association was also found between female sex and both the frequency of headache episodes ($\chi^2(2)$=6.65, p=0.036) and the level of functional impact ($\chi^2(4)$=21.20, p<0.001). A statistically significant inverse association was observed between smoking and the presence of primary headaches ($\chi^2(1)$=7.87, p=0.005; OR=0.31, 95% CI [0.13, 0.73]). Headache prevalence differed significantly across academic years ($\chi^2(5)$=12.83, p=0.025). In addition, the presence of anxiety related to academic demands was also significantly associated with primary headaches ($\chi^2(1)$=5.50, p=0.019; OR=1.73, 95% CI [1.09, 2.74]). No other statistically significant associations were observed.

Full distribution of primary headaches by sociodemographic, lifestyle, and psychosocial characteristics are presented in Table II.

Management of primary headaches

Out of the 237 students identified with primary headaches, only 49 (20.7%) reported seeking medical consultation. There was a significant association between headache type and medical consultation ($\chi^2(3)=40.362$; $p<0.001$), with students experiencing migraine, especially with aura association, being more strongly linked to healthcare-seeking. Consultation was also more frequent among students reporting higher headache-related impact on quality of life, according to HIT-6 ($\chi^2(3)=22.540$; $p<0.001$) and among those with more frequent headaches' episodes ($\chi^2(3)=13.985$; $p=0.003$).

Meanwhile, for pain relief, the majority of students (n=187; 78.9%) relied on over-the counter analgesics and non-pharmacological strategies (n=167;70.5%), such as resting in a quiet room, taking showers, or applying ice or cold compresses. The use of prescribed medications was less frequently reported in agreement with the low rates of medical consultation. Additionally, a small proportion of students (n=12; 5.1%) reported not adopting any strategy to manage headaches, findings demonstrated in Figure 4.

Discussion

In the present study, the prevalence of primary headaches was 44.7%, a value consistent with estimates in the general population[2] and within the range reported among university students in health-related fields: 46.0% in Nigeria[15], 58.7% in Iran[16], and 40.0% in Brazil[17]. In contrast, significantly higher rates have been documented in other settings, with reported prevalences reaching 76.7%[7] and 81.1%[12]. Such variability may reflect differences in headache surveys, diagnostic criteria, institutional environments, and sociodemographic characteristics of the populations studied. In comparison to a 1998 study conducted among medical students at ICBAS-UP[18], the prevalence of primary headaches observed in the present study was substantially lower. The earlier investigation reported that 92.3% of participants experienced headaches in the preceding year[18]. It is important to note, however, that this previous study did not exclude potential secondary headache cases, and differences in the screening methodology may have contributed to the observed disparity. Despite these discrepancies, our findings reinforce that primary headaches are a significant health concern among university students.

Probable migraine was identified in 32.1% of participants, while probable TTH was observed in 40.5%. These results are comparable to those reported in a 1998 study conducted at ICBAS-UP, which found prevalence rates of 25.4% for migraine and 30.5% for TTH, including cases that met all but one diagnostic criterion. The prevalence of migraine in previous studies in similar populations ranged between 14.2 and 26.9%[7,16,19,20] and the prevalence of TTH between 36.9% and 66.8% [7,12,21]. However, it is important to note that the classification in the present study was limited to probable cases, as it relied solely on self-reported data without clinical interviews or neurological examinations. This limitation prevented the confirmation of all diagnostic criteria. Given the non-diagnostic nature of this approach, the results should be interpreted as a screening for headache and cannot not be extrapolated to estimate prevalence at the population level.

Probable migraine with aura (21.5%) was more frequent than without aura (9.7%), a pattern that differs from most epidemiological data. This may be due to the questionnaire format, wherein self-report of at least one fully reversible symptom such as visual, sensory, language or motor disturbances allowed for a broader identification of cases. Furthermore, the potential response bias from individuals with more disabling symptoms may also have contributed to the frequency observed.

Although the association between family history of headache and probable migraine did not reach statistical significance, the high proportion of affected students reporting a positive family

history is consistent with previous research. For example, a study conducted in Egypt reported that 67.4% of individuals with migraine had a family history of headaches[22]. Such findings reinforce the widely accepted role of genetics in migraine, with heritability estimates ranging from 30 to 60%[23].

A notable sex-related difference was observed, with female students showing a significantly higher prevalence of primary headaches. This pattern aligns with prior research from Ethiopia[12], Saudi Arabia[8], and Syria[11], and is often attributed to variations in hormonal levels and increased psychological stress sensitivity among women[24]. In this sample, the disparity extended beyond prevalence, as female students also reported a greater number of headache episodes and experienced moderate to severe functional impact more frequently. These findings are in line with former studies from both clinical and academic settings, which consistently report a higher headache burden among women in terms of frequency, intensity, and associated disability[21,25]. The gender distribution in this study was uneven, with 80% of the students identifying as female. Even though the health science degrees at ICBAS-UP have a higher proportion of female students compared to male, the imbalance of this data set should be still considered when interpreting the sex-related correlations. Generalization of our findings to more gender-balanced settings may not be possible.

Academic burden also appears to play a crucial role in headache onset, with students experiencing high levels of academic stress being 1.73 times more likely to report headaches. This is consistent with prior findings, where stress affected 56% of students with headaches, and overwork emerged as a significant psychosocial correlate[9]. In addition, population-based studies have shown that individuals with migraine tend to present higher levels of anxiety compared to healthy controls[26], reinforcing the association between psychological stress and headache disorders. These findings highlight the need for preventive strategies that address mental health, particularly stress and anxiety management, while promoting a healthier work-life balance.

Stress (73%), screen exposure (59.5%) and sleep deprivation (57.4%) emerged as the most frequently reported headache triggers among participants. The prominence of stress and irregular sleep patterns is consistent with previous literature and is expected given the academic demands typical of health-related programmes. While the impact of excessive screen exposure on headache development is not yet fully elucidated, the growing dependence on digital devices for both academic and recreational purposes has raised concerns about its potential health implications[27]. The present findings reinforce existing evidence linking prolonged screen time with an increased likelihood of headache occurrence[28,29]. These results highlight the need for increased awareness

and further investigation into digital behaviours as potentially modifiable risk factors in headache prevention strategies among student populations.

A considerable proportion of students (44.3%) reported severe functional impairment due to headaches, highlighting the clinical and academic relevance of this condition within the university setting. This finding aligns with previous studies conducted in similar populations, in which 34.7% and 37% of participants reported that headaches disrupted their daily activities[8,30]. The high burden observed may reflect inadequate treatment strategies. Future research should explore whether this level of disability translates into impaired concentration, absenteeism, or reduced academic productivity, as suggested by prior studies[22].

Significant variation in functional impact was observed across headache subtypes, consistent with previous epidemiological findings[24]. Severe functional impairment was reported by 76.5% of participants with probable migraine with aura and in 73.9% of those with probable migraine without aura, compared to 27.1% among those with TTH. This greater impact may be attributed to higher pain intensity and disabling associated symptoms such as neurological disturbances, nausea and sensory hypersensitivity[31]. In contrast, the burden of TTH appears more heterogeneous, likely reflecting the wider range of frequencies and intensities observed within this diagnostic category[2].

A statistically significant variation in headache prevalence was observed across academic years, with higher rates reported among sixth-year (51.6%) and fourth-year (50.8%) students. It is important to interpret these findings considering that 64% of participants were studying medicine. These results suggest that headache burden may intensify during academically demanding phases. In the sixth year, this could reflect the combined stress of completing a dissertation, undertaking internships, and preparing for the exam that allow entry into residency training. Similarly, the fourth year often involves a substantial shift in workload due to increased clinical demands and exposure to multiple hospital specialities. First-year students also report a high prevalence (48.6%), likely related to the psychological and academic adjustments required during the transition to university. While this pattern partially aligns with findings from Taif University, where the first and final years registered higher headache rates[13], some studies report no significant variation across academic years[22]. Such discrepancies may reflect institutional differences in curriculum structure, academic demand and support systems.

Contrary to previous research suggesting that medical students are disproportionately affected by headaches due to greater academic demands and stress levels[7,13], this study did not find significant differences in headache frequency across academic programmes. This suggests that

academic stress and lifestyle-related factors may be common to the broader university population. These findings differ from those reported at Aleppo University, where headache prevalence was higher among medical students (61%) compared to their peers in pharmacy (45.5%)[11]

No clear seasonal pattern in headache frequency was identified, with 41.5% of participants reporting no temporal association. Among those who did, January and June were the most frequently identified months, possibly reflecting the increased academic demands commonly associated with exam periods. This aligns with findings from paediatric populations, where increased headache incidence has been observed during school periods and reduced during holidays[32]. While some studies suggest increased migraine activity during winter and spring, the evidence remains inconclusive, potentially reflecting methodological and geographical heterogeneity[33]. Further investigation is needed to clarify how academic pressure, environmental conditions, and seasonal factors may interact to influence headache patterns in student populations.

Despite the considerable burden posed by primary headaches, only 20.7% of affected students sought medical consultation. This low rate of healthcare utilisation is in keeping with previous findings among university populations, where rates range from 15.9% to 35.4%[7,8,11,22]. Most participants reported self-managing their symptoms with over-the counter analgesics (78.9%) and non-pharmacological strategies (70.5%). While these approaches may offer temporary relief, they carry the risk of inadequate symptom control and the potential for medication overuse headaches[12]. These findings highlight a persistent underuse of healthcare services among students, likely influenced by academic demands, perceived barriers to care, and the tendency to underestimate the impact of headaches. There may also be a lack of knowledge regarding the resources and treatment options available, which also reduce help seeking.

The substantial prevalence and functional burden of primary headaches among students emphasizes the need for targeted institutional responses. Universities should consider implementing structured interventions such as stress management workshops, educational campaigns to raise awareness of headache disorders, and screening initiatives integrated within student health services. Given the high rates of self-medication and low uptake of medical consultation, it is crucial to promote appropriate healthcare-seeking behaviour and ensure access to effective treatment. Evidence supports combined non-pharmacological interventions, such as posture correction and cervical muscle strengthening, alongside relaxation techniques to effectively improve frequency and intensity of TTH[34].

In the context of limited national data on this issue, this paper serves as an important foundation for future investigations, with focus on longitudinal and multi-institutional approaches, incorporating clinical evaluations and intervention assessments. Such research is crucial to inform evidence-based policies that aim to reduce the prevalence of headaches and improve the overall well-being of students across higher education.

Limitations and strengths

Several limitations should be considered when interpreting these findings. Although headache classification was based on ICHD-3 criteria, data was collected through a self-administered, non-interactive questionnaire, which may have led to recall bias or misclassification due to unclear interpretation of certain items. The absence of clinical assessment further limits diagnostic accuracy. As a cross-sectional study, causal relationships cannot be established. Moreover, the sample was predominantly composed of medical students, potentially limiting generalisability to other health-related student groups. Despite these constraints, this is the first portuguese study to assess headache prevalence in veterinary and pharmaceutical science students, providing valuable insights and groundwork for future research.

Conclusions

This study provides a comprehensive assessment of the prevalence, characteristics, and functional impact of primary headaches among students in Medicine, Veterinary Medicine, and Pharmaceutical Sciences at ICBAS-UP and FFUP. With a prevalence of 44.7%, primary headaches emerge as a significant and multifactorial health concern, notably associated with stress, lack of sleep, and prolonged screen exposure. The observed sex-related disparities and academic year variations underscore the interplay between biological, psychological, and curricular determinants in headache susceptibility. Despite the significant functional impairment reported, healthcare-seeking behaviours remained exceptionally low, with most students resorting to self-medication, reflecting the under-recognition and normalization of headache disorders within academic cultures and the difficult access to health care. Collectively, the results highlight the importance of institutional policies aimed at health promotion, mental well-being, and early-intervention.

Tables and Figures

Table I . Headache characteristics.

		Frequency (n)	Percentage (%)
How would you describe your headache?	**Pressing or tightening**	132	55.7%
	Pulsating or throbbing	90	38.0%
	Stabbing / Sharp pain	15	6.3%
Where is your headache located?	**Frontal**	96	40.5%
	Occipital	9	3.8%
	Temporal	73	30.8%
	Orbital	19	8.0%
	Generalized (all over the head)	40	16.9%
Is the headache unilateral?	**Yes**	81	34.2%
	No	156	65.8%
On average, how long do the headache episodes last?	**<4h**	154	65.0%
	4-72h	81	34.2%
	>72h	2	0.8%
What is the severity of the headache?	**Mild**	71	30.0%
	Moderate	150	63.3%
	Severe	16	6.8%
Does the headache worsen with daily activities?	**Yes**	94	39.7%
	No	143	60.3%

Table II. Distribution of Primary Headaches by Sociodemographic, Lifestyle, and Psychosocial Characteristics

			n	%	% Without primary headaches*	% With primary headaches	p
Sociodemographic characteristics	**Sex**	**Female**	440	83.0%	51.6%	48.4%	<0.001
		Male	90	17.0%	73.3%	26.7%	
	Age (years)	**17-19**	94	17.7%	61.7%	38.3%	0.236
		20-23	339	64.0%	55.2%	44.8%	
		>23	97	18.3%	49.5%	50.5%	
	Academic year	**1º**	70	13.2%	51.4%	48.6%	0.025
		2º	71	13.4%	69.0%	31.0%	
		3º	76	14.3%	53.9%	46.1%	
		4º	132	24.9%	49.2%	50.8%	
		5º	88	16.6%	64.8%	35.2%	
		6º	93	17.5%	48.4%	51.6%	
	Previous degree	**Yes**	65	12.3%	58.5%	41.5%	0.582
		No	465	87.7%	54.8%	45.2%	
	Employment	**Yes**	39	7.4%	51.3%	48.7%	0.602
		No	491	92.6%	55.6%	44.4%	
	Master degree	**Medicine**	339	64.0%	54.6%	45.4%	0.47
		Veterinary	117	22.1%	59.8%	40.2%	
		Pharmaceutical sciences	74	14.0%	51.4%	48.6%	
Lifestyle and health-related habits	**Sleep Duration**	**<6h**	91	17.2%	59.3%	40.7%	0.648
		6-7h	322	60.8%	55.0%	45.0%	
		≥8 h	117	22.1%	53.0%	47.0%	
	Smoking	**Yes**	33	6.2%	78.8%	21.2%	0.005
		No	497	93.8%	53.7%	46.3%	
	Physical activity	**Yes**	305	57.5%	56.1%	43.9%	0.673
		No	225	42.5%	54.2%	45.8%	
	Meditation/ mindfulness/ coaching	**Yes**	44	8.3%	61.4%	38.6%	0.397
		No	486	91.7%	54.7%	45.3%	
	Food intolerances	**Yes**	61	11.5%	62.3%	37.7%	0.242
		No	469	88.5%	54.4%	45.6%	
	Regular medication	**Oral Contraceptive**	230	43.4%	53.0%	47.0%	0.741
		Hormone therapy	22	4.2%	63.6%	36.4%	
		Both	7	1.3%	57.1%	42.9%	
		None	271	51.1%	56.5%	43.5%	
Psychosocial wellbeing	**Course dissatisfaction**	**Yes**	106	20.0%	57.5%	42.5%	0.6
		No	424	80.0%	54.7%	45.3%	
	Overwhelmed/ anxious due to university	**Yes**	433	81.7%	52.9%	47.1%	0.019
		No	97	18.3%	66.0%	34.0%	
	Low mood	**Yes**	147	27.7%	61.2%	38.8%	0.088
		No	383	72.3%	53.0%	47.0%	
	Total		530	100.0	55.3%	44.7%	

*% Without primary headaches includes those with no headaches and with secondary headaches.

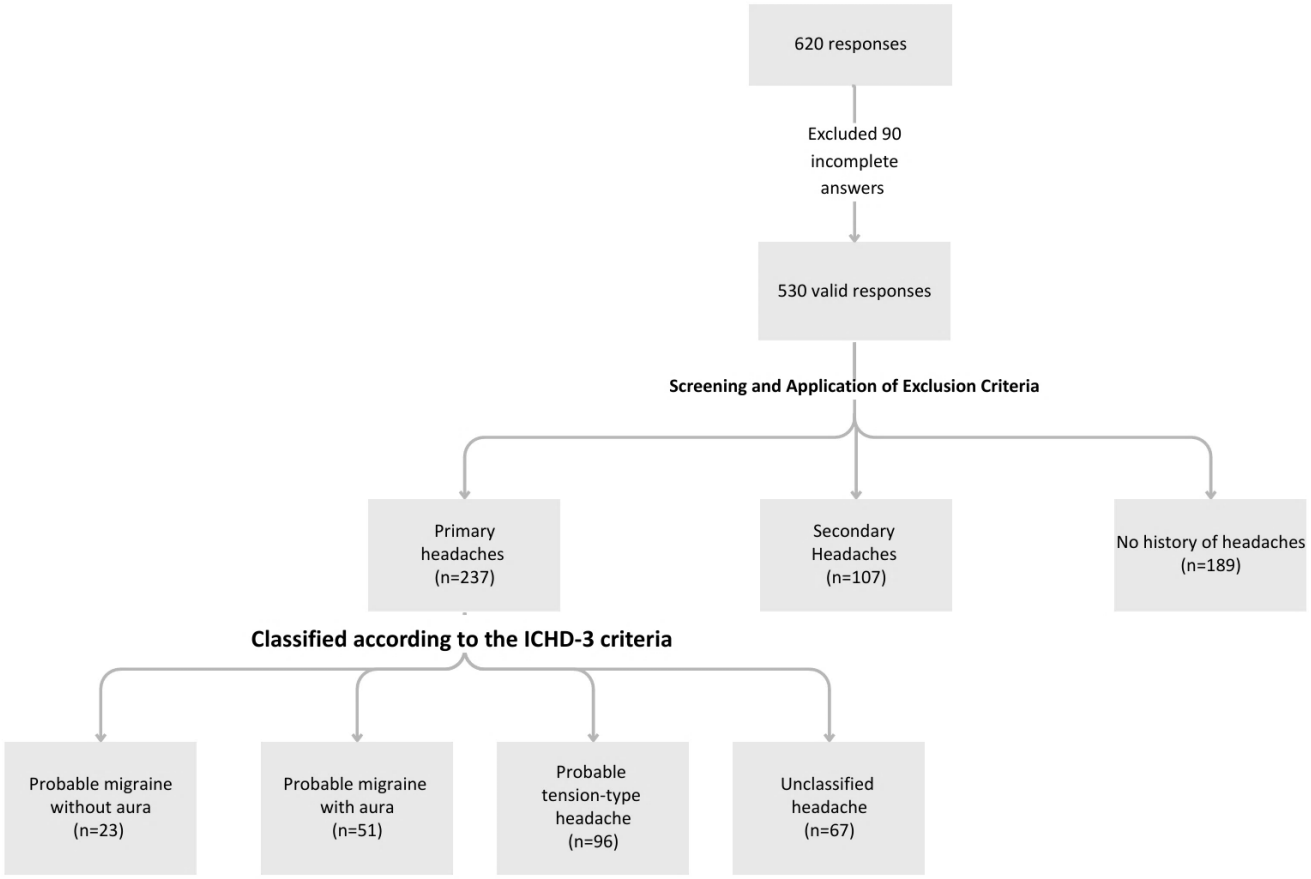


Figure 1. *Flowchart of participants.*

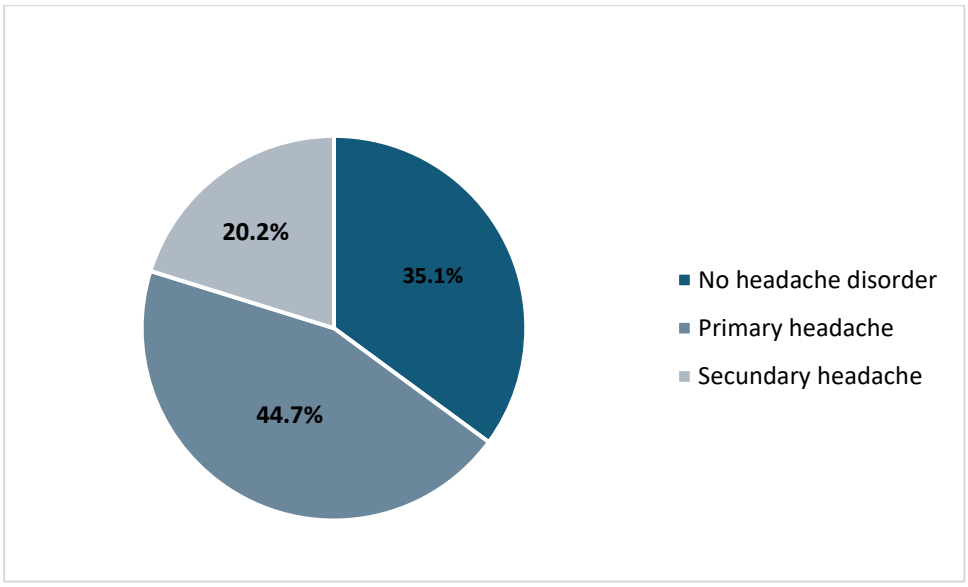


Figure 2. *Prevalence of headache disorders.*

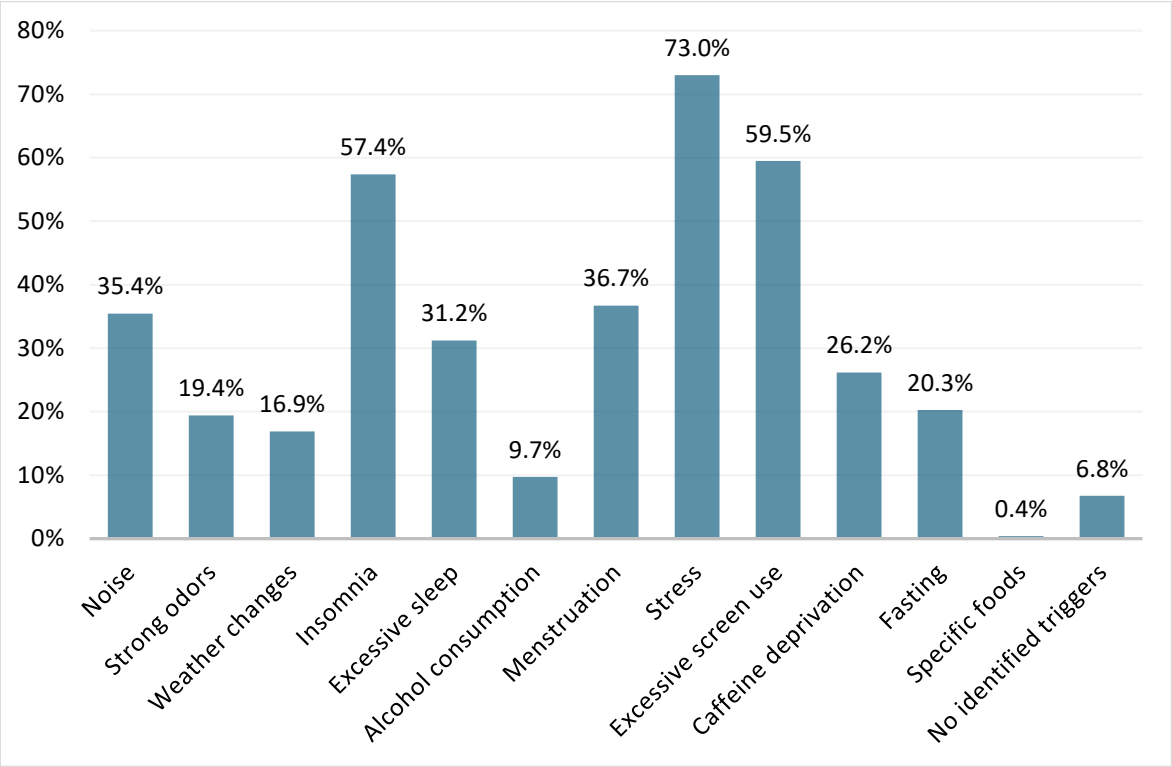


Figure 3. *Reported headache triggers.*

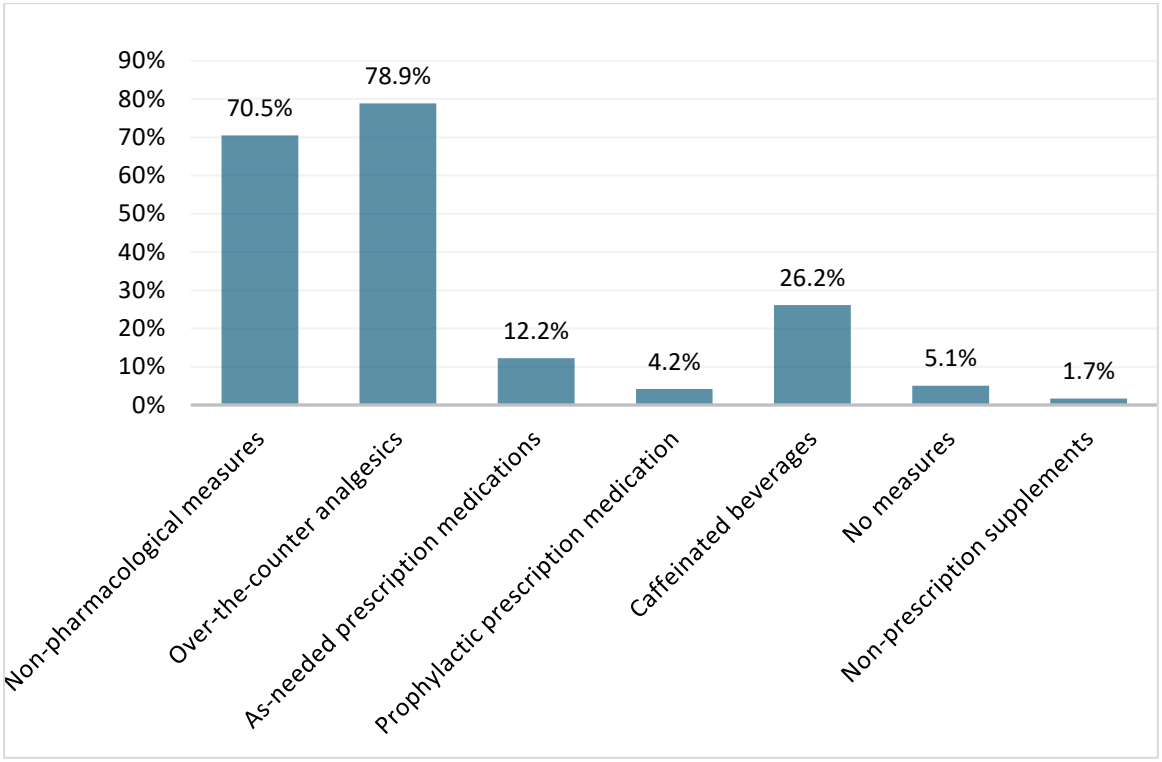


Figure 4. *Management options of headache.*

References

1. Mier RW, Dhadwal S. Primary Headaches. Dent Clin North Am 2018;62(4):611–28.
2. Stovner LJ, Hagen K, Jensen R, et al. The global burden of headache: A documentation of headache prevalence and disability worldwide. Cephalalgia 2007;27(3):193–210.
3. Martelletti P, Steiner TJ, Bertolote JM, Dua T, Saraceno B. The definitive position of headache among the major public health challenges. An end to the slippery slope of disregard. The Journal of Headache and Pain 2007 8:3 2007;8(3):149–51.
4. Steiner TJ, Stovner LJ, Jensen R, Uluduz D, Katsarava Z. Migraine remains second among the world's causes of disability, and first among young women: findings from GBD2019. Journal of Headache and Pain 2020;21(1):1–4.
5. Olesen J. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. Cephalalgia 2018;38(1):1–211.
6. Goadsby PJ, Evers S, Gelfand AA, et al. International Classification of Headache Disorders-4 – Work in Progress 1. Cephalalgia 2024;44(2).
7. Romozzi M, Trigila V, Cuffaro G, Calabresi P, Vollono C. Primary headaches prevalence, characteristics, and healthcare utilization in Italian medical students. Neurological Sciences 2024;45(6):2893–7.
8. Bashatah AS, Syed W, Al-Rawi MBA, Al Arifi MN. Assessment of Headache Characteristics, Impact, and Managing Techniques among Pharmacy and Nursing Undergraduates—An Observational Study. Medicina (Lithuania) 2023;59(1).
9. Lebedeva ER, Kobzeva NR, Gilev D V., Kislyak N V., Olesen J. Psychosocial factors associated with migraine and tension-type headache in medical students. Cephalalgia 2017;37(13):1264–71.
10. Abtahi SH, Esfahanian F, Akbari M, Roomizadeh P, Neshat S. Headache—a challenge across medical students' life: a systematic review and meta-analysis. Acta Neurol Belg. 2023;123(3):785–801.
11. Alkarrash MS, Shashaa MN, Kitaz MN, et al. Migraine and tension-type headache among undergraduate medical, dental and pharmaceutical students of University oof Aleppo a cross- sectional study. BMJ Neurol Open 2021;3(2).
12. Birru EM, Abay Z, Abdelwuhab M, Basazn A, Sirak B, Teni FS. Management of headache and associated factors among undergraduate medicine and health science students of University of Gondar, North West Ethiopia. Journal of Headache and Pain 2016;17(1).
13. Desouky DE, Zaid HA, Taha AA. Migraine, tension-type headache, and depression among saudi female students in taif university. Journal of the Egyptian Public Health Association 2019;94(1):1–9.

14. Martin M, Blaisdell B, Kwong JW, Bjorner JB. The Short-Form Headache Impact Test (HIT-6) was psychometrically equivalent in nine languages. J Clin Epidemiol 2004;57(12):1271–8.

15. Ojini F, Okubadejo N, Danesi M. Prevalence and clinical characteristics of headache in medical students of the University of Lagos, Nigeria. Cephalalgia 2009;29(4):472–7.

16. Ghorbani A, Abtahi SM, Fereidan-Esfahani M, et al. Prevalence and clinical characteristics of headache among medical students, Isfahan, Iran. J Res Med Sci 2013;18(Suppl 1):S24.

17. de Almeida CMO, Lima PAM da S, Stabenow R, Mota RS de S, Boechat AL, Takatani M. Headache-related disability among medical students in Amazon: a cross-sectional study. Arq Neuropsiquiatr 2015;73(12):1009–13.

18. Pereira Monteiro JM, Matos E, Calheiros JM. Headaches in medical school students. Neuroepidemiology 1994;13(3):103–7.

19. Flynn O, Fullen BM, Blake C. Migraine in university students: A systematic review and meta-analysis. European Journal of Pain (United Kingdom). 2023;27(1):14–43.

20. Demirkirkan MK, Ellidokuz H, Boluk A. Prevalence and clinical characteristics of migraine in university students in Turkey. Tohoku Journal of Experimental Medicine 2005;208(1):87–92.

21. 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):1–8.

22. 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. Egyptian Journal of Neurology, Psychiatry and Neurosurgery 2021;57(1).

23. Sutherland HG, Albury CL, Griffiths LR. Advances in genetics of migraine. The Journal of Headache and Pain 2019 20:1 2019;20(1):1–20.

24. Yuan R, Tong Z, Xiang G, et al. The burden and trends of headache disorders among the population aged 15–39: a study from 1990 to 2019. J Headache Pain 2023;24(1):168.

25. Chalmer MA, Kogelman LJA, Callesen I, et al. Sex differences in clinical characteristics of migraine and its burden: a population-based study. Eur J Neurol 2023;30(6):1774–84.

26. Muftuoglu MN, Herken H, Demirci H, Virit O, Neyal A. Alexithymic features in migraine patients. Eur Arch Psychiatry Clin Neurosci 2004;254(3):182–6.

27. Roy S, Iktidar MA, Chowdhury S, Pulock OS, Pinky SD, Sharif A Bin. Increased screen time and its association to migraine and tension-type headache: a cross-sectional investigation among Bangladeshi students. BMJ Neurol Open 2024;6(1):e000656.

28. Montagni I, Guichard E, Carpenet C, Tzourio C, Kurth T. Screen time exposure and reporting of headaches in young adults: A cross-sectional study. Cephalalgia 2016;36(11):1020–7.

29. Taehtinen RE, Sigfusdottir ID, Helgason AR, Kristjansson AL. Electronic screen use and selected somatic symptoms in 10-12year old children. Prev Med (Baltim) 2014;67:128–33.

30. Rafi A, Islam S, Hasan MT, Hossain G. Prevalence and impact of migraine among university students in Bangladesh: findings from a cross-sectional survey. BMC Neurol 2022;22(1).

31. Robbins MS. Diagnosis and Management of Headache: A Review. JAMA - Journal of the American Medical Association 2021;325(18):1874–85.

32. Soriani S, Fiumana E, Manfredini R, et al. Circadian and seasonal variation of migraine attacks in children. Headache 2006;46(10):1571–4.

33. Poulsen AH, Younis S, Thuraiaiyah J, Ashina M. The chronobiology of migraine: a systematic review. J Headache Pain 2021;22(1):76.

34. Álvarez-Melcón AC, Valero-Alcaide R, Atín-Arratibel MA, Melcón-Álvarez A, Beneit-Montesinos J V. Effects of physical therapy and relaxation techniques on the parameters of pain in university students with tension-type headache: A randomised controlled clinical trial. Neurologia 2018;33(4):233–43.

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