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Undergraduate Headache Education Is Underrepresented in Brazil Compared with Chest and Abdominal Pain: National Cross-Sectional Survey Data from 54 Medical Schools

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Abstract

Introduction: Pain is one of the most common complaints in healthcare settings. Therefore, it is essential to assess whether medical students are adequately prepared to manage patients who present different pain syndromes, especially headache, in both emergency and outpatient settings. Although headache is one of the most frequent causes of medical consultation, literature evaluating medical students' knowledge and interest in primary pain syndromes, particularly headache, remain scarce. This investigation aims to assess medical students' knowledge regarding the main pain syndromes, as well as to quantify the frequency of pain-related teaching during medical school, and to identify potential gaps in the medical curriculum related to headache and other pain syndromes.

Methodology: This cross-sectional-descriptive study included undergraduate medical students from several Brazilian universities. Data were collected using an online questionnaire that included items on demographic characteristics (age, gender, university, year of study, city, and state), objective questions assessing knowledge of major pain syndromes, and questions about the frequency of pain-related classes throughout medical training. The questionnaire link was offered to institutional communication channels, social media platforms, and student organizations. Responses were collected over seven months and analyzed descriptively.

Results: A total of 520 responses were obtained from students enrolled in 54 medical schools across multiple Brazilian states. Although most respondents (90%) recognized headache as a frequent complaint in emergency departments, 56.9% reported not having received formal training on the initial evaluation of headache in emergency settings, and 70.6% had never attended scientific events addressing this topic. In contrast, only 33.7% reported not having received classes on the evaluation of chest pain in emergency departments, and only 26.7% reported a lack of training in the approach to abdominal pain. These findings demonstrate a clear disparity in educational emphasis, with headache receiving significantly less attention than other common pain syndromes encountered in hospital practice.

Conclusion: The identified knowledge gaps in headache and pain management highlight the critical need for curriculum enhancements, motivating healthcare policymakers and educators to prioritize structured training and scientific activities in medical education.

Introduction

Headache is a common neurological condition in emergency departments. In a multinational European study aimed at updating epidemiological data on the prevalence and impact of headache, showed that more than half of European adults reported suffering from headache in general within a period of up to one year, with tension headache being the most common complaint among them, representing up to 60% of cases.[1]

Another manuscript involving 67 hospitals across 10 countries (including European centers), enrolled 4,536 patients with nontraumatic headache as their main presenting complaint over one calendar month, and demonstrated that headache represents a significant burden on emergency services internationally.[2]

Furthermore, this symptom may be present in a wide range of clinical conditions, from acute to chronic, and might even lead to death. Moreover, in many patients, this symptom may incapacitate them from performing their daily activities, negatively impacting their quality of life.

Therefore, it is extremely important that doctors, especially those who provide emergency care, know how to examine patients and understand possible differential diagnoses, so they may distinguish primary from secondary conditions, thereby contributing to patient survival and quality of life.

What is currently known is that neurologists' diagnoses of the condition differ from those given by general practitioners, and that many referrals to specialists are unnecessary, indicating a lack of practical and theoretical knowledge among attending physicians. Additionally, students arrive at their internships with considerably different prior clinical experiences. This scenario highlights the urgent need to adapt and standardize the medical curriculum, ensuring that students have comprehensive information on the subject and sufficient time to consolidate their knowledge.

Notwithstanding, studies assessing medical students' knowledge of headaches and the discrepancy between the time spent studying them and the time spent studying other pain conditions (such as chest or low back pain) are significantly rare. Thus, this article presents a study using a questionnaire administered to hundreds of medical students from various universities in Brazil, aimed at assessing their knowledge of headaches, quantifying the frequency of pain-related classes in medical school, and identifying potential gaps in the medical curriculum related to this topic.

Methods

I. Study Design, Setting, and Sample Size

This cross-sectional, descriptive study involved medical students from multiple universities in Brazil and utilized an online questionnaire as data-collection instrument. The questionnaire was distributed to students from various medical schools through university communication channels, social media, and student organizations.

Inclusion criteria were: being an undergraduate medical student,≥ 18 years old, willing to provide informed consent, voluntarily participating in the study, and enrolled in years 1 through 6 of medical program. Exclusion criteria included refusal to complete the questionnaire, prior graduation, or lack of official registration in the program.

The study was exempt from ethics committee approval. Data collection, data analysis, and manuscript preparation were carried out over two years.

Assuming a 95% confidence level, an estimated proportion of 50%, and a margin of error of 0.05, the minimum required sample size was calculated to be between 480 and 500 participants (after adjusting for potential dropouts), and the achieved sample size was 583 responses.

II. Data Collection and Tools

Data were collected through an online questionnaire administered via Google Forms. Participants completed them via self-assessment to ensure accurate responses. Collected data were stored on Google Drive, password-protected, with access restricted to the research team. Data collection lasted for two years, and data analysis was finished within four months. Each completed questionnaire recorded the date, time, and participant's initials to ensure study integrity.

III. Variables

The questionnaire included demographic items such as age, gender, university, year of study, course, city, and state of residence to ensure responses were attributable to the intended target population. Additionally, there were objective questions assessing knowledge of the main pain syndromes and the frequency of related teaching in the medical curriculum, totaling 34 items.

IV. Statistical Analysis

Responses obtained via the questionnaire were imported into Microsoft Excel 2010, using automated data entry by converting the form into a compatible file format. Whenever applicable, response data were grouped into categorical variables. For each item, the number of responses and their percentage relative to the total sample or to relevant subgroups were calculated. These calculations were used to generate graphs that visually illustrated the proportions of responses across the various questionnaire items.

Results

The sample consisted of 583 medical students who fully completed the survey. As shown in Fig. 1, the distribution across academic periods showed broad representation throughout the medical curriculum, with the eighth term (14.1%) having the highest concentration, followed by the fifth (11.8%) and fourth (11.0%) terms. The third, sixth, and seventh terms presented similar proportions, ranging from 9.9% to 10.8%. The first term accounted for 6.2% of respondents, the second for 5.3%, the ninth for 6.5%, the tenth for 5.7%, and the eleventh for 4.6%, indicating balanced participation across the pre-clinical and clinical phases of the program. Regarding geographical distribution, most participants were from the state of São Paulo (39.6%), followed by Minas Gerais (8.8%), Bahia (5.5%), Paraná (5.3%), Rio Grande do Sul (4.1%), Ceará (2.6%), Santa Catarina (2.2%), and Distrito Federal (1.5%). Students from 16 additional states accounted for 30.4% of the sample, confirming nationwide reach.

With respect to headache, Fig. 2 illustrates that nearly all students recognized it as a common complaint in both primary care and emergency or urgent care settings (90.4%). Regarding the inclusion of the topic

in semiology courses, 49.9% reported having encountered it, while 50.1% not having. Only 42.2% indicated that they had received specific training to assess headaches in emergency settings. Participation in extracurricular scientific events was similarly limited. Only 30.5% had attended symposiums or congresses on headache, while 69.5% had never participated.

When it comes to chest pain, 80.1% of respondents reported it as a frequent complaint in primary care as shown in Fig. 3. It increased to 98.1% in emergency settings. Most students (80.8%) reported having received curricular instruction on chest pain, whereas 19.2% indicated the absence of such content. The reported number of lectures varied substantially, though most students cited between one and three sessions. The inclusion of chest pain in semiology courses was confirmed by 74.6% of respondents, mirroring the proportion reporting curricular exposure, 68,4% reported having received practical training in the evaluation of chest pain in emergency departments. Participation in academic events on the topic was modest, with 22.0% of students attending such activities, compared to 78.0% who did not.

Regarding low back pain, almost all respondents recognized it as a common complaint in both primary care (97.8%) and emergency settings (77.5%). See Fig. 4. A total of 69.5% reported having attended curricular lectures on low back pain; among those who did, most reported having between one and three classes. In semiology courses, 60.4% of students reported instruction on low back pain, whereas 39.6% did not. Only 34.5% reported participating in practical sessions on assessing low back pain in emergency settings. Likewise, among other pain types, engagement in scientific events was low: only 6% had participated in symposia or congresses on the subject, while 94.0% had not.

In the domain of abdominal pain, 95.0% of respondents identified it as a frequent complaint in primary care, and 97.3% did so for emergency services (Fig. 5). Instruction on abdominal pain was the most comprehensive among the pain types investigated: 78.2% of students reported receiving curricular lectures on the subject, whereas 21.8% did not. As for the number of classes, 46.7% of students reported one to five, 22.5% reported six to ten, 21.3% reported none, and 4.5% reported twelve or more. An additional 5.2% responded, “I don’t know.” Regarding semiology courses, 75.3% reported instruction on abdominal pain, while 24.7% did not. Practical instruction on assessing abdominal pain in emergency settings was reported by 64.5% of respondents, whereas 35.5% had no such experience. Participation in extracurricular events on the topic was the lowest among all pain categories, with only 16.6% attending symposia or congresses.

Finally, when evaluating students’ perception of the importance of headache education, 97.1% considered it important to receive more information and participate in events on the subject during medical training. In contrast, only 2.9% expressed a contrary opinion as illustrated in Fig. 6.

Discussion

The results of this study reveal a significant discrepancy between the widespread recognition of pain as a common clinical complaint and the limited curricular and practical exposure medical students receive in Brazil. Although nearly all participants acknowledged headache (99.5%) and abdominal pain (95.0%)

as common complaints in primary care—and even higher proportions identified chest pain (98.1%) and abdominal pain (97.3%) as frequent in emergency settings—there is insufficient training provided, both in theoretical and practical aspects. This disconnection between the recognition of pain's clinical importance and effective preparation for its management highlights a persistent gap in medical education, reflecting structural deficiencies already described in other national and international studies. This scenario is not unique to Brazil. European studies have documented similar deficiencies across the continent. In the landmark APPEAL (Advancing the Provision of Pain Education and Learning) study, examined 242 medical schools across 15 European countries and found that 55% of schools taught pain only within non-pain-specific modules, while 7% showed no evidence of any pain teaching whatsoever.[3] More recently, in a comprehensive European Pain Federation (EFIC) multiple-methods study, revealed significant heterogeneity in hours dedicated to pain training and inconsistencies in content, teaching, and assessment methods across European curricula, with curriculum constraints, lack of resources, and limited specialized staff identified as key barriers.[4]

Regarding headache, a topic of significant epidemiological and social relevance, the results indicate that less than half of the students had contact with the subject in semiology courses (49.9%) or emergency training (42.2%). This lack of specific training reflects the scenario described previously in a manuscript which revealed insufficient knowledge and low confidence among Brazilian general practitioners in managing headaches in emergency units.[5] The convergence of findings from both studies suggests that gaps in initial medical training persist into professional practice, leading to underdiagnosis and undertreatment of headaches, especially in high-demand care settings. This educational deficit in headache medicine is a global phenomenon with particularly concerning implications. In a study conducted among medical students and residents in neurology and family medicine in the USA, showed that although medical schools consider students' knowledge of headaches sufficient, directors of medical residency programs believe that students graduating from these institutions are not adequately prepared for headache management when they enter the medical residency program, showing that 72% of the students interviewed had only 1 to 3 hours of classes on headaches during their entire undergraduate studies, which may last up to 6 years.[6]

The European Headache Federation has outlined key principles for postgraduate training and developed standardized educational programs, including the Headache School initiative, which provides guidelines for organizing headache education across Europe.[7] Beltramone et al. demonstrated in France that neurology residents with specific headache training through the "Diplôme Inter-Universitaire Migraine et Céphalées" showed significantly better knowledge and management skills than those without such training, with 62.1% having read clinical guidelines, compared to only 1.6% of untrained residents.[8]

Furthermore, international literature supports the view that the lack of structured headache education is a global phenomenon given that most medical schools worldwide lack formal headache education programs and that the topic is often addressed superficially and episodically, disconnected from clinical practice.[9] This reality is corroborated in our findings, in which most students reported limited exposure

to theoretical and episodic classes, with no integrated practical activities or competency assessments. This underscores the urgent need to implement longitudinal, competency-based programs that prioritize clinical reasoning, red-flag recognition, and appropriate therapeutic approaches.

From this perspective, the competency-based education model emerges as an essential alternative. Given that merely including content in the curriculum does not ensure the development of clinical competencies. It is necessary to adopt integrated frameworks that connect theoretical knowledge, technical skills, and ethical attitudes through supervised strategies and formative assessments.[10] European experts have developed robust frameworks for competency-based pain education. Van Lankveld et al. operationalized the International Association for the Study of Pain (IASP) interprofessional curriculum using Dublin Descriptors, with 22 European pain educators achieving > 70% agreement on 62% of IASP items, emphasizing that competency levels should focus on "Knowledge and Understanding" and "Applying Knowledge and Understanding" for undergraduate training.[11] Fishman et al. established core competencies for pain management, organized into four domains: the multidimensional nature of pain, pain assessment and measurement, pain management, and the context of pain management—competencies that should be common to all prelicensure health professionals.[12]

In line with this, our data show that although 80.8% of students attended theoretical classes on chest pain, only 68.4% received practical training in emergency care. Similar patterns were observed for low back pain (69.5% attending theoretical classes and 34.5% receiving practical training) and abdominal pain (78.2% attending theoretical classes and 64.5% receiving practical training). These discrepancies indicate that even when formal curricular content is present, experiential learning remains minimal and disconnected from real emergency scenarios. The European context mirrors these findings precisely. Briggs et al., in a survey of undergraduate pain curricula across UK healthcare programs, found that pain education averaged only 12.0 hours and accounted for less than 1% of program hours for some disciplines, with traditional teaching methods dominating (lectures 87.8%) and only two programs having fully implemented IASP curriculum.[13].

The incorporation of active methodologies and clinical simulations has proven effective in reducing these gaps. In this regard, the use of standardized patients and simulated scenarios significantly increases diagnostic accuracy and student confidence in complex clinical contexts,[14] which is consistent with the hypothesis that the use of simulations in teaching pain management—especially headache and chest pain—may foster the development of practical and cognitive competencies essential for rapid and safe decision-making in critical situations.

In Brazil, the structure of internships in emergency and urgent care remains a challenge to the consolidation of clinical competencies. Previous studies have highlighted recurring problems, including inadequate supervision, lack of standardized activities and variability in practical opportunities.[5] These findings are consistent with the present study, in which only 42.2% of students reported practical training in headache management, 34.5% in low back pain, and 35.5% in abdominal pain. This limitation in practical experience during internships may compromise the development of essential clinical skills,

negatively impacting future performance in both primary care and emergency settings. European data confirm that these structural problems transcend national boundaries. Miró et al., in a cross-sectional study across healthcare professions in Catalonia, Spain, found considerable differences in pain-related hours among disciplines, with the area least covered being "Management of pain," particularly content related to vulnerable populations.[15] The EFIC identified that the absence of standardized, evidence-based curricula necessitates implementing targeted educational standards, increasing interdisciplinary training, and supporting qualified educators to address this fragmented landscape.[4]

Additionally, the low participation of students in pain-related scientific events—ranging from 6.0% for low back pain to 30.5% for headache—illustrates the scarcity of extracurricular opportunities for in-depth study and continued learning. This lack of encouragement for continued education during medical school may contribute to the persistence of theoretical and practical deficiencies throughout a medical career. As persistent gaps have been identified, this suggests that the deficiencies observed in initial training are not adequately corrected in clinical practice, often leading to inappropriate pain management and negatively impacting the quality of care.[16]

In summary, the results of this study reinforce the urgent need for a profound and systematic reform of pain education in undergraduate medical training. It is essential to adopt longitudinal, integrated pedagogical approaches grounded in competencies and active methodologies, combining theory, practice, and critical reflection. Implementing clinical simulations and supervised internships focused on pain and emergency care may optimize learning and strengthen the transition from academic knowledge to professional practice.

The European experience provides clear direction for these reforms. Thompson et al., in a comprehensive 25-year scoping review of pain education research, identified key factors repeatedly reported as important in advancing pain education and called for environments that promote excellence in pain practice as the norm in healthcare.[17] The IASP interprofessional pain curriculum, validated by European educators, provides a standardized framework that has been available for over 20 years.[11] Nevertheless it remains rarely employed, as pain is not a core part of regulatory and quality assurance standards for health professions.

Despite the inherent limitations of cross-sectional, self-reported studies, the data presented provide robust evidence that pain management education remains significantly lacking in medical training and fragmented within the curriculum, highlighting the need to improve students' knowledge. This improvement should include the use of innovative and evidence-based methods for content delivery, such as flipped classrooms and realistic simulations focused on headache management in common clinical scenarios, as well as the assessment of knowledge in clinical practice during undergraduate training to ensure the effective transmission of this content.[9]

The convergence of this study’s findings with existing literature underscores the urgency of rethinking medical education in the context of pain management. Investing in medical education focused on

clinical competence is, therefore, essential not only for improving professional practice but also for ensuring safe and effective care for patients experiencing pain across all levels of healthcare.

Conclusion

This study highlights that although most students regard knowledge of headaches as important, there is a gap between their understanding of headaches and that of other pain syndromes in the undergraduate medical curriculum. This gap may be due to either a lack of qualified faculty to teach these topics in Brazilian medical schools or to difficulties conveying knowledge about pain syndromes in clinical practice to students. Such deficiencies contribute to patient dissatisfaction with the health care system, frequent medical errors, and neglect in identifying and treating pain conditions.

Future physicians are key to addressing this issue, provided they recognize these cases when they arise and manage them safely and correctly. To achieve this, medical students must receive comprehensive education in headache and pain management, especially in situations that qualify as medical emergencies. This requires that both theoretical and practical courses incorporate these topics into their curricula. Additionally, dedicated academic events must focus on the subject to improve pain management in clinical practice.

Abbreviations

APPEAL
Advancing the Provision of Pain Education and Learning
EFIC
European Pain Federation
IASP
International Association for the Study of Pain

Declarations

I. Ethics approval and consent to participate

Not applicable.

II. Consent for publication

Not applicable.

III. Availability of data and materials

Only the research team had access to a password-protected Excel document with the data, which can be shared upon requesting the corresponding author at carol.iccir@gmail.com

IV. Competing interests

The authors declare that they have no competing interests.

V. Funding

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VI. Authors' contributions

CMR, FFC, IMF, and LSO wrote the main manuscript text and participated in data collection and analysis. HMJ contributed to data interpretation and critical revision of the manuscript, supervised the research, and provided critical feedback throughout the study. All authors reviewed and approved the final manuscript.

VII. Footnotes

The authors thank all the students who participated in this study. Furthermore, they thank all the medical schools that distributed the questionnaire.

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Figures

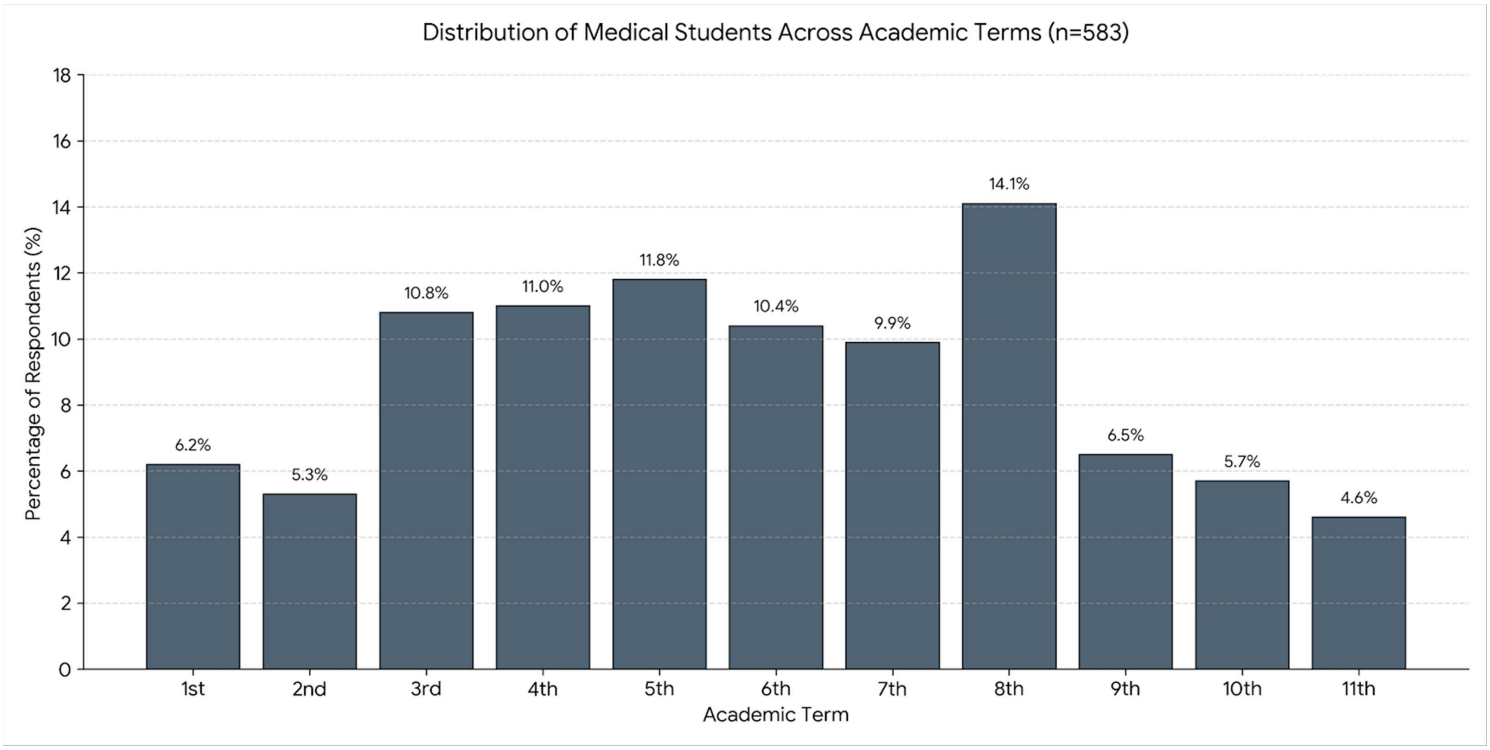


Figure 1

Distribution of medical student respondents across academic terms (n=583). The bars represent the percentage of the total sample belonging to each term of the medical curriculum. The highest representation was observed in the 8th term, with consistent participation across both pre-clinical and clinical cycles. Data are expressed in percentages.

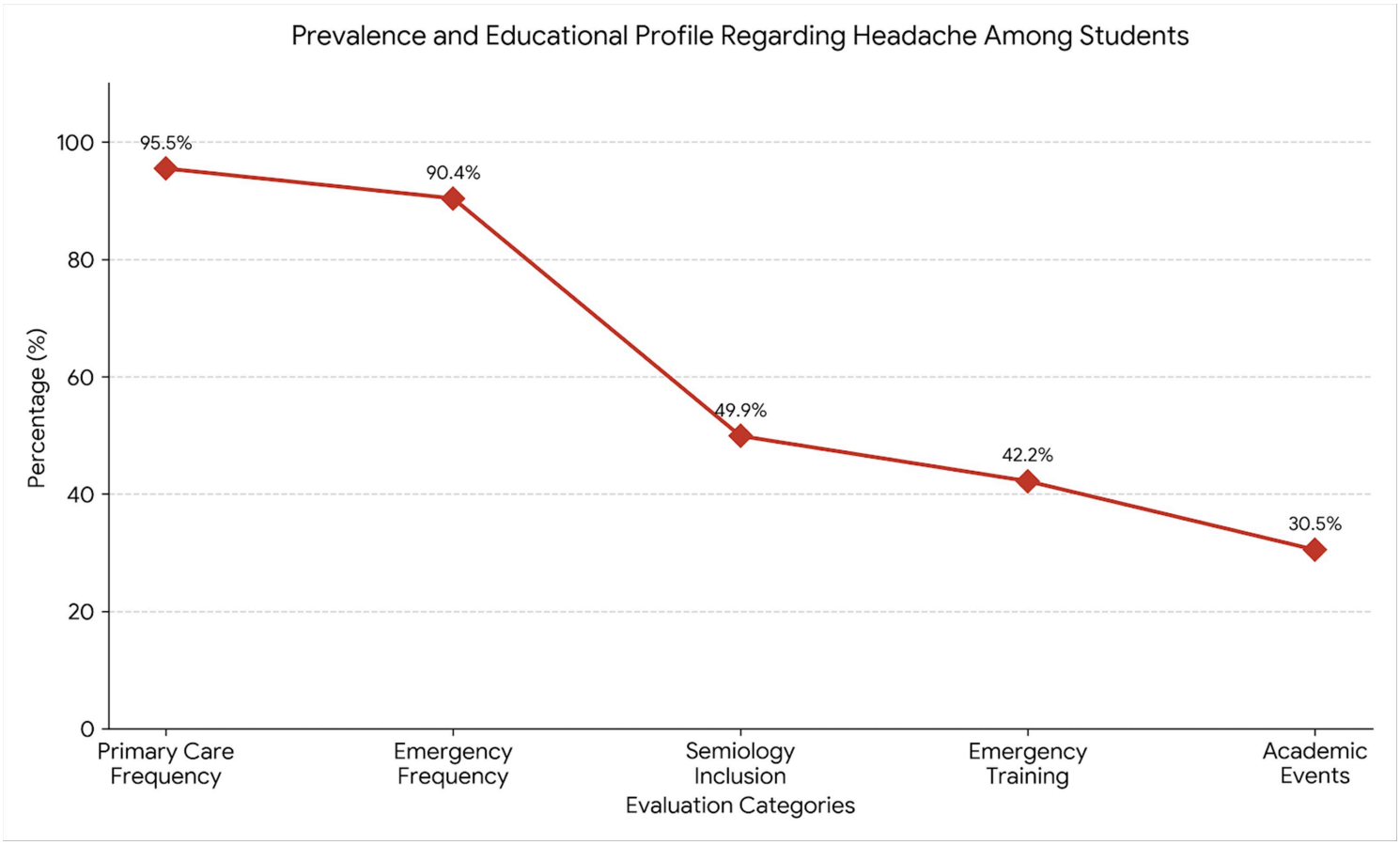


Figure 2

Prevalence and Educational Profile Regarding Headache. The figure illustrates the high clinical recognition of headache as a common complaint compared to the lower rates of curricular inclusion in semiology, specific emergency training, and participation in extracurricular scientific events. Data expressed in percentages (n=total respondents).

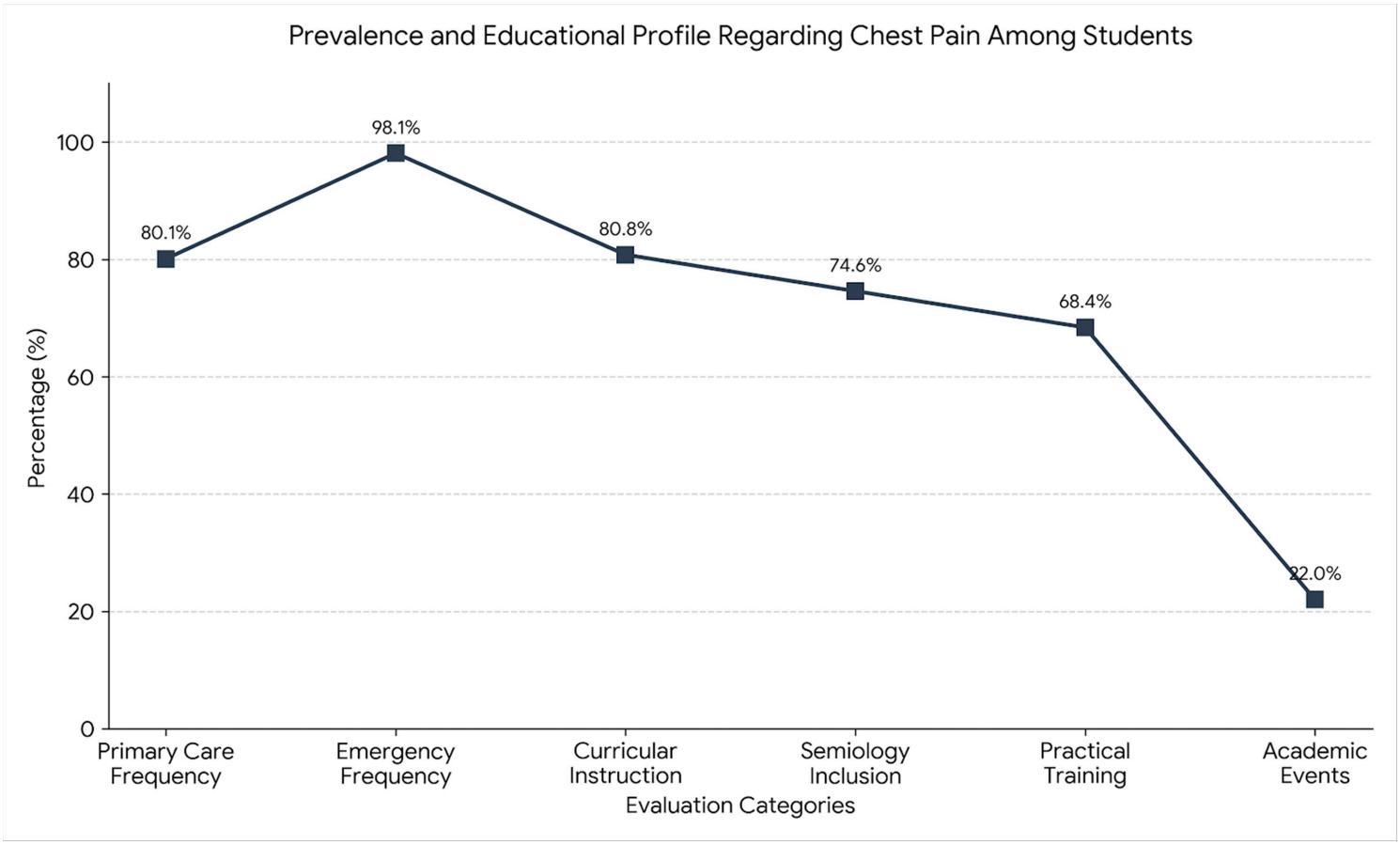


Figure 3

Prevalence and Educational Profile Regarding Chest Pain. The data compares the reported frequency of chest pain as a complaint in different healthcare settings against the levels of theoretical, practical, and extracurricular training received by medical students. Data expressed in percentages (n=total respondents).

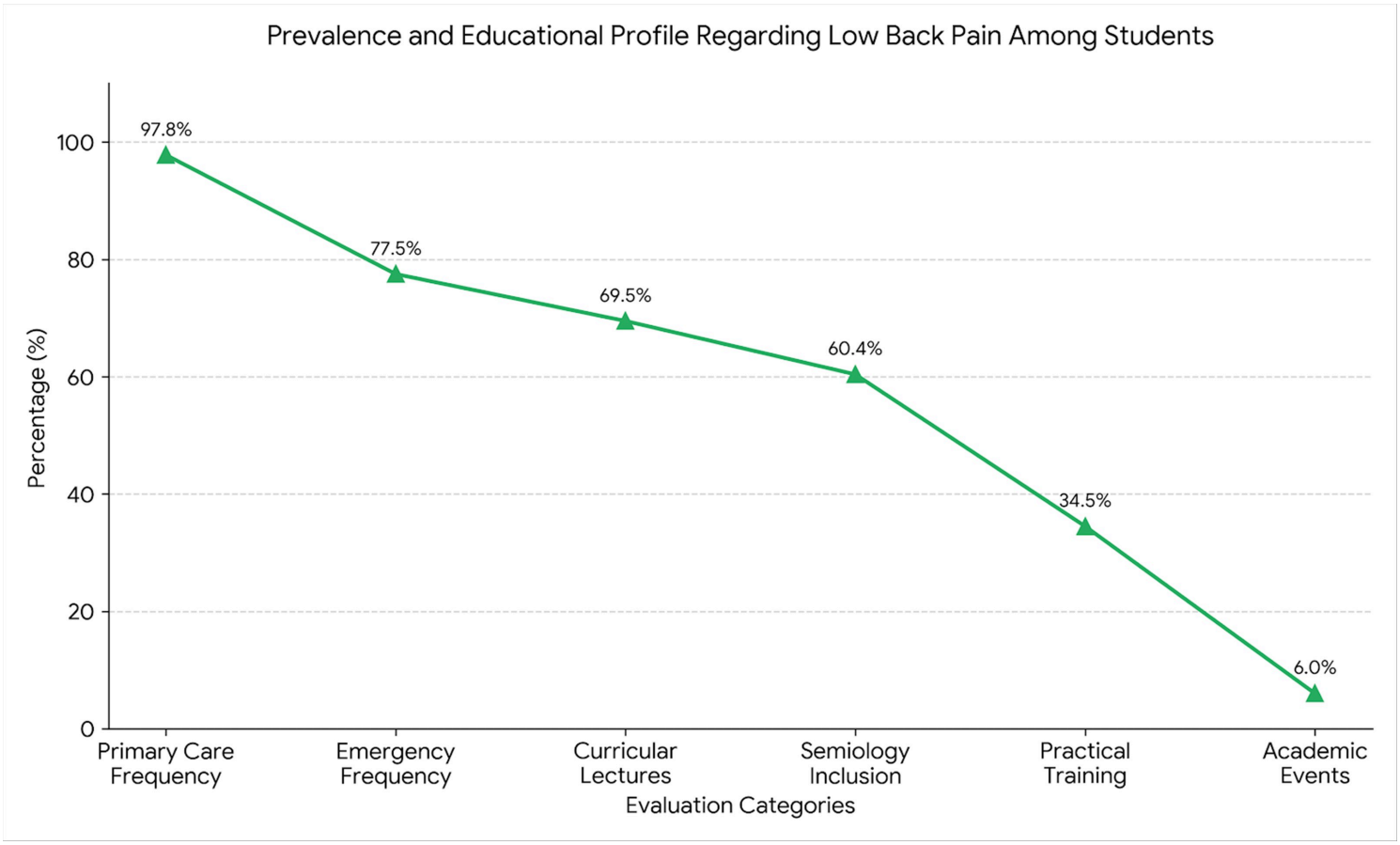


Figure 4

Prevalence and Educational Profile Regarding Low Back Pain. The graph shows the contrast between the high recognized prevalence of low back pain in healthcare settings and the declining levels of academic exposure, culminating in minimal participation in extracurricular scientific events. Data are expressed in percentages (n = total respondents).

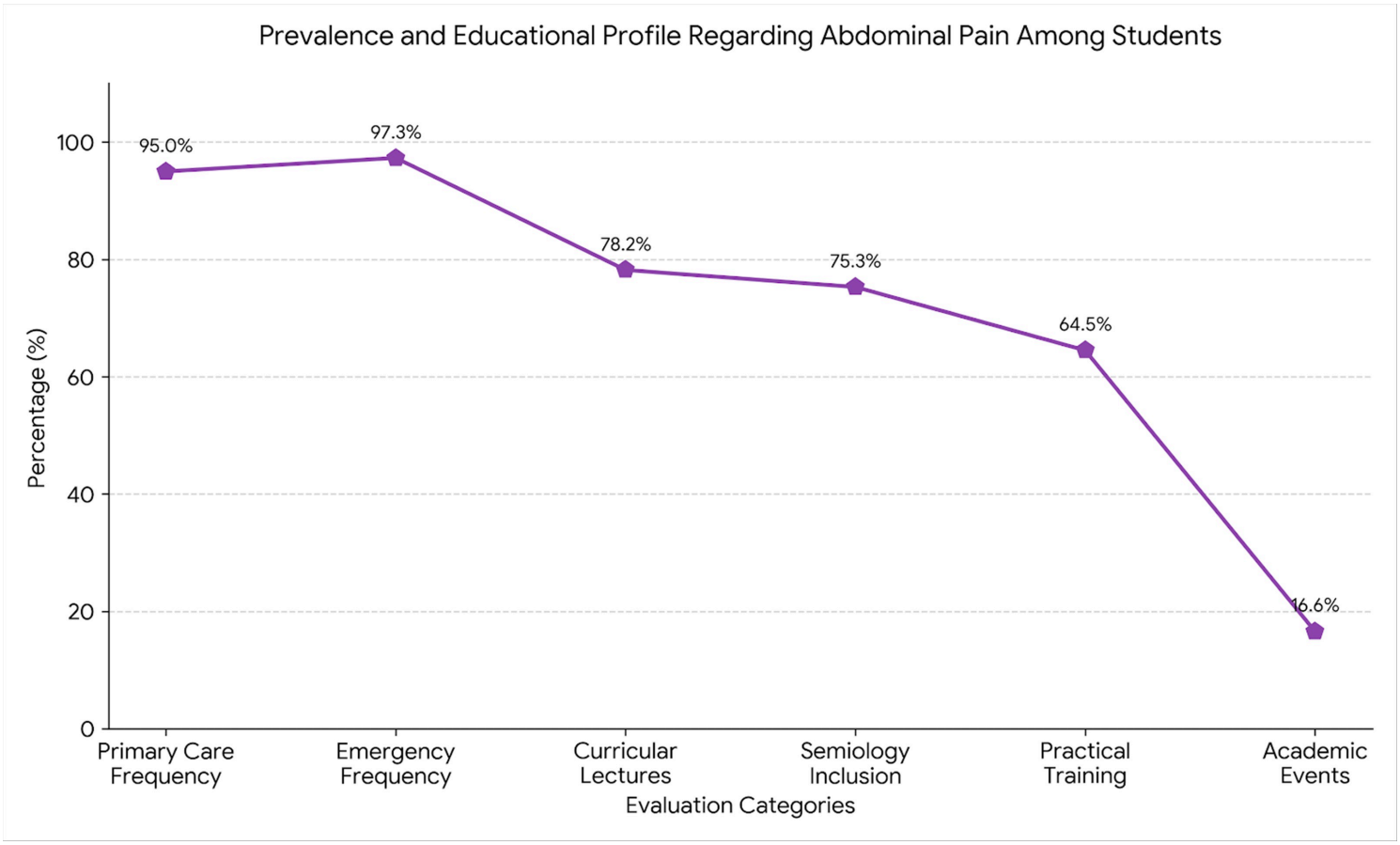


Figure 5

Prevalence and Educational Profile Regarding Abdominal Pain. This graph depicts the high perceived clinical frequency of abdominal pain alongside its comprehensive inclusion in medical curricula and practical training, contrasted with the relatively low participation in specialized extracurricular academic events. Data are expressed in percentages (n =total respondents).

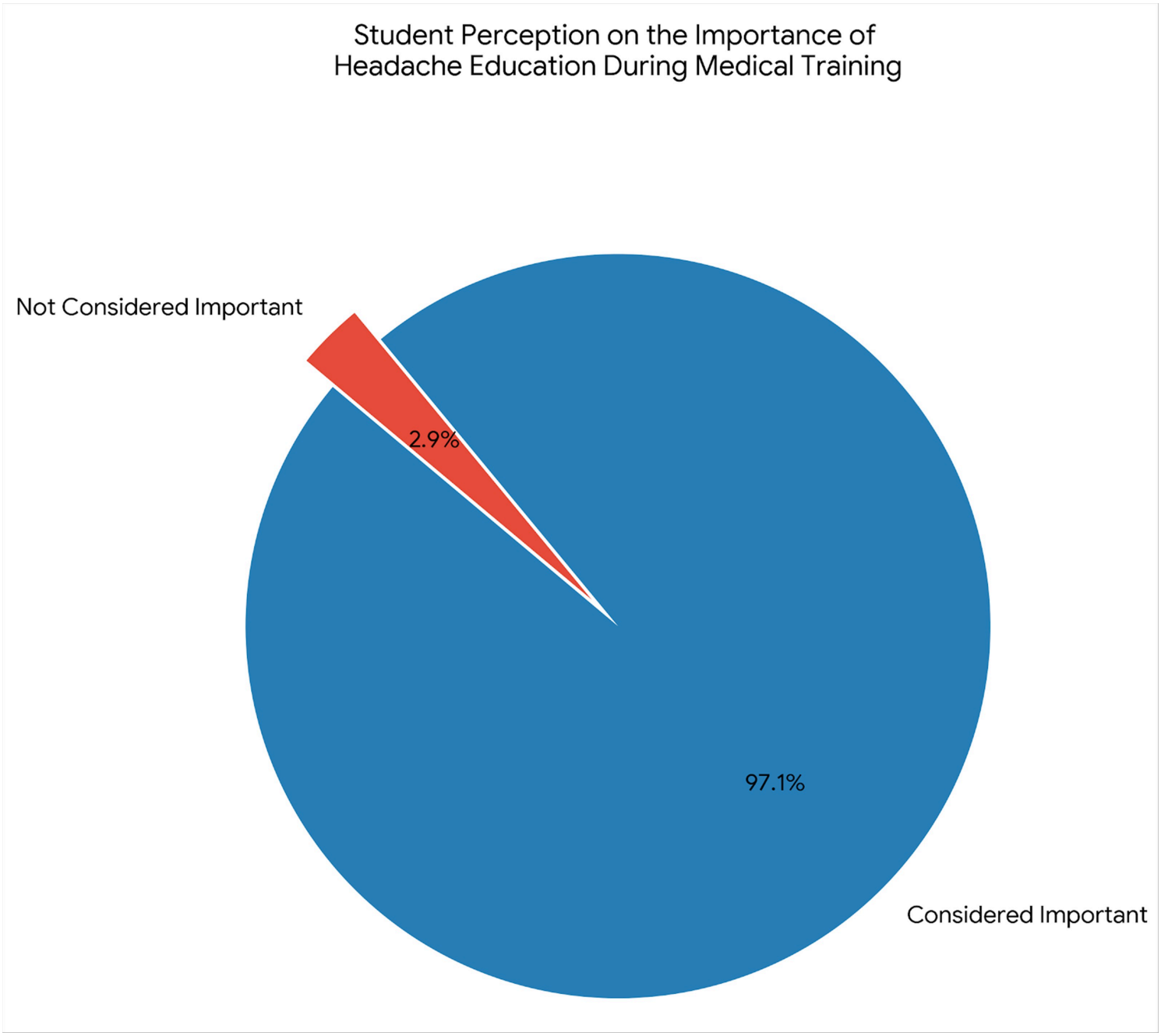


Figure 6

Student Perception of the Importance of Headache Education. The distribution shows that the vast majority of medical students consider it critical to enhance their knowledge and participate in specialized events concerning headache diagnosis and management during their undergraduate training. Data are expressed in percentages (n =total respondents).