



Epidemiology of headache in a neurological Emergency Department in Medellin, Colombia

Alejandro Cardozo¹ , Valentina Jaramillo¹ , Paola Parra¹ , Anne-Maree Kelly^{2,3} 

¹Instituto Neurológico de Colombia, Medellin, Antioquia, Colombia.

²Joseph Epstein Centre for Emergency Medicine Research @ Western Health, Sunshine Hospital, St Albans, Victoria, Australia

³Department of Medicine – Western Health, Melbourne Medical School, The University of Melbourne, Parkville, Victoria, Australia



Anne-Maree Kelly
anne-maree.kelly@wh.org.au

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Marcelo Moraes Valença

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Abstract

Introduction

Headache is a common reason for presentation to emergency departments (ED) around the world. In many countries, ED are not speciality-focussed, however, in Colombia and some other countries, specialist neurological hospitals have ED with a strong neurological focus. For patients presenting with headache, these ED may have different epidemiology, investigation strategies and treatment patterns from general ED. The objective of this study was to describe the epidemiology of headache presenting to the ED of Instituto Neurológico de Colombia in Medellin, Colombia – an ED which is a referral centre for neurological and neurosurgical diseases.

Methods

This was an observational study by chart review of adults (aged ≥ 18) with a main presenting complaint of headache. Demographic, clinical, imaging, diagnoses and outcome data were collected. The primary outcome of interest was the rate of serious secondary intracranial headache cause. Analysis was descriptive.

Results

757 patients were studied – female 76%, median age 39. Most headache were of gradual onset (85%) and new neurological signs were uncommon (4%). CT was performed in 50% of cases and MRI in 20%. A wide variety of headache causes were identified. Serious secondary intracranial headache was identified in 8.9% (95% CI 7.1-11.1%) of cases. Most patients (89%) were discharged home from ED.

Conclusion

Diagnosis of headache in ED is challenging with a very wide range of possible causes. A small proportion of patients (approx. 9%) have a serious cause for their symptoms – a proportion similar to that reported in other international emergency department cohorts.

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Introduction

Headache is a common reason for presentation to emergency departments (ED) internationally, accounting for about 1% of total presentations.^{1,5} It is traditionally classified as primary and secondary. In primary headache, the headache has no underlying serious cause. In secondary headache, headache is a symptom of another disease.⁶ The objectives of ED management are pain control, the identification of the nature of the headache (primary or secondary), effective use of diagnostic modalities according to the clinical context and, potentially, identifying patients with primary headache which are candidates for prophylactic treatment.⁷ To date, most epidemiological data for headache in ED is from Europe, North America and Australasia.^{1,8,9} In most of the countries in these regions, ED are general and not speciality-focussed. In Colombia and in some other countries, there are specialist neurological hospitals which have ED with a strong neurological focus. Because of this important difference between health systems, the epidemiology of headache in ED in these countries could be different.

The aim of this study was to describe the epidemiology of headache presenting to the ED of Instituto Neurológico de Colombia in Medellín, Colombia – an ED in a referral centre for neurological and neurosurgical diseases.

Methods

Design

This was an observational study by medical record review. The methodology was adapted from the HEAD study and has been reported previously.¹

Setting

Instituto Neurológico de Colombia (Medellín – Colombia) is a level 3 complexity referral centre for neurological and neurosurgical diseases in the city of Medellín, Colombia. The ED sees approximately 60,000 presentations per year. The staff is composed of general practitioners, emergency medicine specialists, neurologists and neurosurgeons between 07:00 and 19:00, with staff on call overnight.

Participants

Participants were adults (aged ≥ 18 years) who presented during 2019 with a main complaint of headache. We excluded patients with already diagnosed secondary headache.

Data collected

Data collected included demographic data, mode of arrival (self-referred, referred by doctor, ambulance), triage category allocation, clinical features (history and examination), use of diagnostic aids (including imaging), treatment provided, final ED diagnosis and disposition. See Supplementary file A.

Outcome of interest

The primary outcome of interest was the proportion of patients with serious secondary intracranial cause for their headache. We defined serious headache as any of headache due to subarachnoid haemorrhage (SAH), intracranial haemorrhage, meningitis, encephalitis, cerebral abscess, neoplasm, vascular dissection, stroke, temporal arteritis, idiopathic intracranial hypertension (IIH), hydrocephalus or cerebral vein thrombosis.

Statistical analysis and sample size

Statistical analysis was descriptive. As this was an exploratory study, no sample size was calculated.

Ethics approval

This study has the approval of the institutional ethics committee of Instituto Neurológico de Colombia - Medellín (No PR0107). Individual patient consent for data collection was not required.

Results

757 patients were included, of whom 581 (77%) were women. Median age was 39 years (IQR 28 - 51), with 26% (95% CI 23-30%) aged over 50. Most patients self-referred (77%, 95% CI 74-80%). The majority of patients were assigned the second level on a local three-tiered triage scale (98%, 95% CI 96-99%). A significant proportion of patients had taken analgesia before attending ED (26%, 95% CI 23%-29%), predominantly paracetamol (91%), non-aspirin non-steroidal anti-inflammatory agents (NSAID, 61%), dipyrrone (12%) and triptans (11%).

Clinical features are shown in Table 1. Most headaches were of gradual onset and moderate severity. Duration was variable. Nausea or vomiting and photophobia were common. Findings such as nuchal rigidity, speech alteration, limb weakness, visual changes and alteration of vital signs were present in less than 10% of the population.



New neurological signs were very uncommon (4%, 95% CI 3-6%).

Table 1. Clinical features

Clinical features		N= 757	
History	n, %	95% CI	
Duration of symptoms			
<24 hours	177, 23.4%	20.5%-26.5%	
1-3 days	216, 28.5%	25.4%-31.9%	
>3 days	327, 43.2%	39.7%-46.8%	
Onset of symptoms			
Gradual	645, 85.2%	82.5%-87.6%	
Sudden or thunderclap (instant peak)	57, 7.5%	5.9%-9.6%	
Peak intensity <1 hour	27, 3.6%	2.5%-5.1%	
Unknown	28, 3.7%	2.6%-5.3%	
Head trauma within the last week	27, 3.6%	2.5%-5.1%	
Location of headache			
Generalised	450, 59.5%	55.9-62.9%	
Unilateral	271, 35.8%	32.5%-39.3%	
Unclear	36, 4.8%	3.5-6.5%	
Worst headache ever	61, 8.0%	6.3-10.2%	
Severity			
Mild (pain score ≤3)	82, 10.8%	8.8%-13.2%	
Moderate (pain score 4-7)	582, 76.9%	73.8%-79.7%	
Severe (pain score >7)	78, 10.3%	8.3%-12.7%	
Unclear	15, 2.0%	1.2%-3.2%	
Reported neck pain or stiffness	33, 4.4%	3.1%-6.1%	
Nausea or vomiting	521, 68.9%	65.4%-72.0%	
Syncope or loss of consciousness	38, 5.0%	3.7%-6.8%	
Reported photophobia	338, 44.7%	41.1%-48.2%	
Reported new limb weakness (current/transient; unilateral or bilateral)	37, 4.9%	3.6%-6.7%	
Reported new limb paraesthesia (current/transient; unilateral/bilateral)	76, 11.0%	8.1%-12.4%	
Reported new speech difficulty (current/transient)	22, 2.9%	1.9%-4.4%	
New visual disturbance (current/transient)	61, 8.1%	6.3%-10.2%	
Subjective fever or rigors	46, 6.1%	4.6%-8.0%	
Reported rash	6, 0.8%	0.4%-1.7%	
Clinical examination			
Glasgow Coma Score			
15	747, 98.7%	97.6%-99.3%	
13-14	5, 0.7%	0.3%-1.5%	
<13	3, 0.4%	0.1%-1.1%	
Rash on examination	3, 0.4%	0.1%-1.1%	
Confusion on examination	10, 1.3%	0.7%-2.4%	
Meningism on examination	10, 1.3%	0.7%-2.4%	
Limited neck flexion on examination	23, 3.0%	2.0%-4.5%	
New neurological signs on examination	29, 3.8%	2.7%-5.5%	

contrast head computed tomography (CT) was performed in 50% of patients, with the scan being normal in 83% and showing an acute clinically important abnormality in 9% of patients. The proportion of patients undergoing CT scan did not vary significantly with duration of symptoms. Magnetic resonance imaging (MRI) was performed in 20% of patients and was normal in more than 70%. Overall, 63% of patients underwent advanced imaging (95% CI 59.3-66.1%). Lumbar puncture was performed in 9% of patients, with more than 80% being normal or inconclusive.

Table 2. Investigation

Investigations	N=757	
	n, %	95% CI
Lumbar puncture performed		
Normal	68, 9.0%	7.2%-11.2%
Suggestive of infection	5, 7.4%	3.2%-16.1%
Suggestive of subarachnoid haemorrhage	2, 2.9%	0.8-10.1%
Suggestive of raised intracranial pressure	5, 7.4%	3.2%-16.1%
Inconclusive	2, 2.9%	0.8-10.1%
Head CT performed	378, 49.9%	
Normal	315, 83.3%	79.2%-86.8%
Subarachnoid haemorrhage	9, 2.4%	1.3%-4.5%
Other intracranial bleed	9, 2.4%	1.3%-4.5%
Abscess or intracranial infection	1, 0.3%	0.05%-1.5%
Neoplasm	9, 2.4%	1.3%-4.5%
Stroke	3, 0.8%	0.3%-2.3%
Vascular abnormality without acute complication (incl. aneurysm)	4, 1.1%	0.4%-2.7%
Hydrocephalus	0	0.0%-1.0%
Other (including chronic changes and extracranial findings)	18, 4.8%	3.0%-7.4%
Combined acute clinically important abnormality (excl. sinusitis and other)	35, 9.3%	6.7%-12.6%
MRI performed	149, 19.7%	17.0%-22.7%
Normal	106, 71.1%	63.4%-77.8%
Stroke	8, 5.3%	2.8%-10.2%
Intracranial bleed	2, 1.3%	0.4%-4.8%
Abscess	2, 1.3%	0.4%-4.8%
Neoplasm	7, 4.7%	2.3%-9.4%
Venous thrombosis	4, 2.7%	1.1%-6.7%
CT angiography performed	10, 1.3%	0.7%-2.4%
Normal	2, 20%	5.7%-51.0%
Aneurysm with bleed	3, 30%	10.8%-60.3%
Aneurysm without bleed	2, 20%	5.7%-51.0%
Arterial dissection	0	0%-27.8%
CT plus MRI	54, 7.1%	5.5%-9.2%
CT plus CTA	5, 0.7%	0.3%-1.5%

Investigations and their results are shown in Table 2. Non-



Final diagnosis and disposition are shown in Table 3. Most patients (68%) had a presumed benign cause of their headache – 42% non-migraine benign headache and 26% migraine. A serious secondary intracranial cause of headache was identified in 8.9% of patients (95% CI 7.1-11.1%). The most common were neoplasm (1.9%), IHH (1.7%), stroke (1.5%), SAH (1.3%) and non-subarachnoid intracranial haemorrhage (0.9%).

Table 3. Final diagnosis and disposition

ED Diagnosis (Total sample 4536)	N= 756, 1 missing data	
	N, %	95% CI
Presumed primary non-migraine headache (incl. tension-type, musculoskeletal and cluster)	319, 42.2%	38.7%-45.8%
Migraine	198, 26.2%	23.2%-29.4%
Hypertension	19, 2.5%	1.6%-3.9%
Sinusitis	18, 2.4%	1.5%-3.7%
Post traumatic headache	18, 2.4%	1.5%-3.7%
Viral illness (non-meningitis)	17, 2.3%	1.4%-3.6%
Neoplasm	14, 1.9%	1.1%-3.1%
Intracranial hypertension	13, 1.7%	1.0%-2.9%
Stroke/TIA	11, 1.5%	0.8%-2.6%
Subarachnoid haemorrhage	10, 1.3%	0.7%-2.4%
Non-SAH intracranial haemorrhage/haematoma	7, 0.9%	0.5%-1.9%
Meningitis (all)	6, 0.8%	0.4%-1.7%
Aneurysm/vascular malformation	6, 0.8%	0.4%-1.7%
Analgesia overuse syndrome	6, 0.8%	0.4%-1.7%
Post lumbar puncture headache	5, 0.7%	0.3%-1.5%
Trigeminal neuralgia/cranial neuralgia	3, 0.4%	0.1%-1.2%
Cerebral venous thrombosis	3, 0.4%	0.1%-1.2%
Anxiety or psychogenic	3, 0.4%	0.1%-1.2%
Non-cranial sepsis (e.g. pneumonia, UTI, etc.)	2, 0.3%	0.1-1.0%
Cerebral abscess	2, 0.3%	0.1-1.0%
Vertigo/BPPV	2, 0.3%	0.1-1.0%
Hyponatraemia	1, 0.1%	0.02%-0.7%
Vascular dissection	1, 0.1%	0.02%-0.7%
Glaucoma	1, 0.1%	0.02%-0.7%
Temporal arteritis	0	0%-0.5%
Alcohol-related hangover	0	0%-0.5%
Post coital headache	0	0%-0.5%
Toxicity	0	0%-0.5%
Encephalitis	0	0%-0.5%
Hydrocephalus	0	0%-0.5%
Other	16, 2.1%	1.3%-3.4%
Unclear	53, 7.0%	5.4%-9.0%
Aggregate serious secondary intracranial cause	67, 8.9%	7.1%-11.1%
Disposition		Missing =4
Home	668, 88.7%	
Ward	62, 8.2%	
Critical Care	10, 1.3%	
Operating room or interventional radiology	4, 0.5%	
Transfer	9, 1.2%	

The vast majority of patients were discharged home from the ED (89%), with 8% admitted to a general hospital ward and 1.3% admitted to critical care.

Discussion

Headache is a common reason for presentation to ED.¹⁻⁵ As it can be a symptom of a serious condition, it is important for clinicians who evaluate these patients to be able to differentiate serious from non-serious causes and use investigations appropriately.¹⁰

This ED headache cohort had similar characteristics to other studies.^{1,8,9} Imaging studies were performed in 63% of the patients, which is higher than the median rate reported in other studies.^{1,9} However, those studies reported significant internal variation in investigation rates.¹ Neuroimaging rates have also been shown to vary by hospital type and location and between individual doctors.^{2,11,12} In line with other studies, most were normal.^{1,9} In particular, young patients with headache characteristics consistent with primary headache and without so-called red flags or associated risk factors, usually have normal imaging studies or findings do not explain the patient's pain.¹³

Instituto Neurológico de Colombia is a referral center. Many patients who attend are referred from rural areas where there is a lack of imaging capability and specialists. In those areas there is also a relatively high prevalence of neurocysticercosis causing concern for local doctors when patient symptoms are ongoing.¹⁴ It is possible that because of distance travelled and ongoing symptoms the threshold to perform advanced imaging in these patients was lower, even when their clinical assessment suggested a primary headache disorder.

In this cohort, patients were usually treated with NSAID alone or in combination with other drugs such as antiemetics, consistent with practice reported elsewhere.^{1, 5,15,16} Use of triptans in our setting is low, in keeping with similar studies.^{1,5,15} We demonstrated high use of corticosteroids compared with other studies.¹ There is good evidence that corticosteroids reduce short-term migraine recurrence, and some evidence that it reduces pain in acute attacks.^{17,18} Evidence is scarce for effectiveness in other primary headache disorders. As in other studies, the vast majority of patients were classified at ED discharge as primary headaches and were discharged from the ED without evidence of associated complications such as readmissions, need for hospitalization or death.^{1,8}



Our study confirms, similar to the recent international study¹, that the causes of headache in ED are diverse. Similar diversity has been shown in other studies.^{1,19,20} This demonstrates that significant diagnostic challenge faced by emergency clinicians in assessment and diagnosis of patients presenting with headache. Approximately 9% of patients had a defined serious secondary intracranial cause for their headache. Although defined slightly differently, this is slightly higher, but not significantly different from the proportion reported in a similar study.¹

There are some limitations that should be considered in interpreting the results of this study. The classification of headache as the main symptom and ED diagnosis were based on clinician judgment. Diagnosis was as determined by the ED physician at the end of the ED phase of care, so 100% accuracy is not likely. It is possible that some patients may have had further investigations after the ED phase of care which may have identified an alternative diagnosis. Data were collected retrospectively with the inherent risks that imposes, including of missing data for some items.²¹ The design of the study and resource limitations precluded assessment of inter-rater reliability of data collection. The study hospital is a neurological referral hospital which may have added bias, however this is a feature shared by health systems in several countries around the world and as such it is important that any differences in epidemiology and management are acknowledged.

Conclusion

Diagnosis of headache in ED is challenging with a very wide range of possible causes. A small proportion of patients (approx. 9%) have a serious cause for their symptoms – a proportion similar to that reported in other international emergency department cohorts. We plan to collaborate with international emergency medicine headache researchers to explore variations in practice and what a larger combined dataset can reveal.

Ethics approval and consent to participate

This study has the approval of the institutional ethics committee of Instituto Neurológico de Colombia - Medellín (No PRO107). Individual patient consent for data collection was not required.

Availability of data and materials

Data collection form is available as Supplementary File A. The dataset may be available subject to ethics committee approval.

Conflict of Interest

The authors have no competing interests to declare.

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Authors' contributions

AC, AMK had the concept for the study; AC, VJ, PP collected the data; AMK, primary analysis, all authors contributed to data interpretation and drafting and refinement of the manuscript. All authors approved the final version of the manuscript.

Alejandro Cardozo

<https://orcid.org/0000-0003-4841-0431>

Anne-Meree Kelly

<https://orcid.org/0000-0002-4655-5023>

Valentina Jaramillo

<https://orcid.org/0000-0003-2888-5106>

Paola Parra

<https://orcid.org/0000-0002-0822-619X>

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