Unravelling Migraine: A Systematic Review of Misdiagnosis and Diagnostic Delays

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Objective

- Migraine, a highly prevalent and debilitating primary headache disorder, imposes significant socio-economic and personal impacts, which are exacerbated by misdiagnosis and delayed diagnosis[1, 2]
- Given the considerable strain that migraine places on individuals and society, addressing these diagnostic challenges becomes critical for improving patient outcomes
- This systematic review of literature aims to synthesize evidence on migraine mis-diagnosis and diagnostic delays to inform better disease management

Methodology

- A systematic search was conducted in Embase® and MEDLINE® using the interfaces Embase.com and PubMed **(Figure 1)**
- Real world studies published in English language in the last 10 years (January 2014 – May 2024), with documented cases of migraine misdiagnosis as other disease or vice versa and/or delays in migraine diagnosis were included
- No geographical or any other restrictions were applied

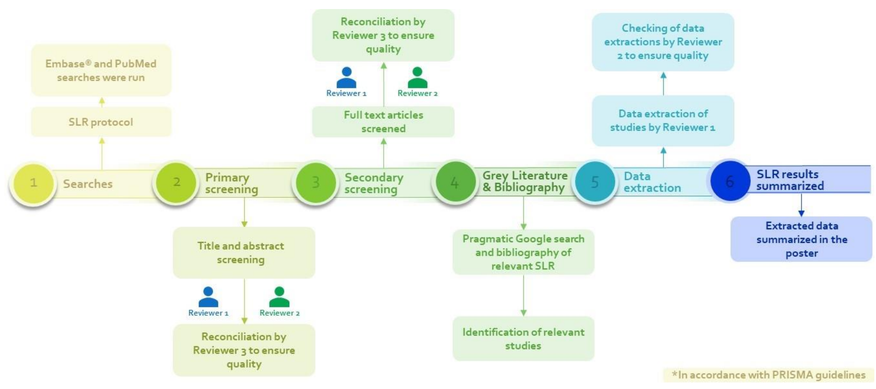


Figure 1: SLR methodology

Results

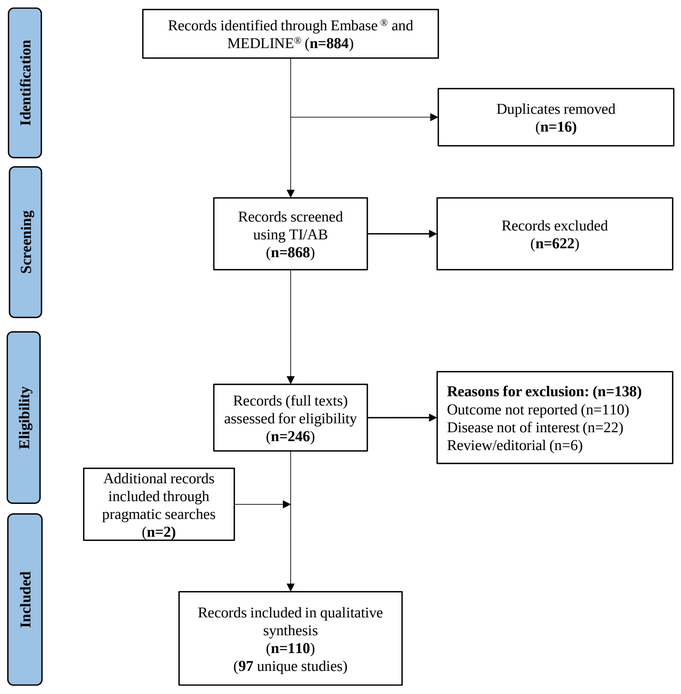


Figure 2: PRISMA diagram

- A total of 884 records were retrieved from the two biomedical databases. After deduplication, title/abstract and full-text screening, 108 publications met the inclusion criteria
- Further, linking of publications and bibliographic searching of relevant systematic reviews resulted in the inclusion of 110 publications, leading to 97 unique extractions **(Figure 2)**

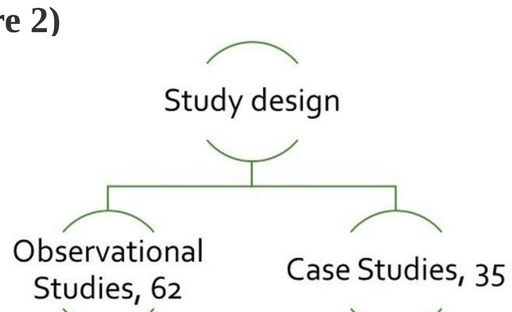


Figure 3: Types of study design

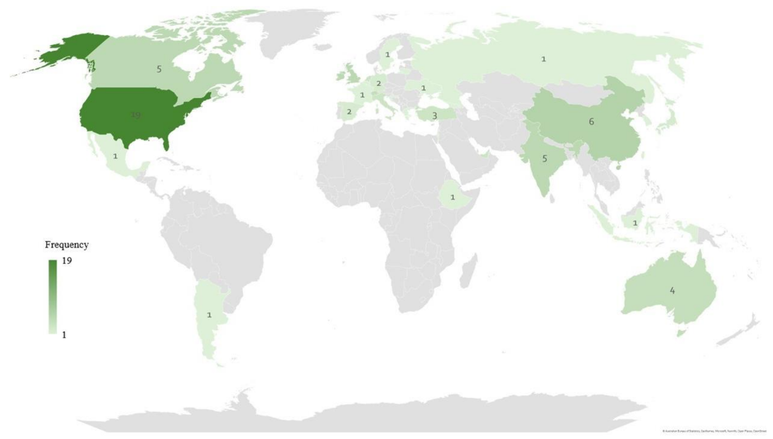


Figure 4: Geographical distribution of records

- The included publications comprised of 63 observational studies and 35 case reports **(Figure 3)**
- Geographically, the included articles represented populations from Europe (38), Asia-Pacific (27), and the Americas (25); however, it was not possible to interpret location for seven studies **(Figure 4)**
- Misdiagnosis of migraine was reported in 89 studies, four studies reported diagnostic delays, and five reported both the scenarios **(Figure 5)**

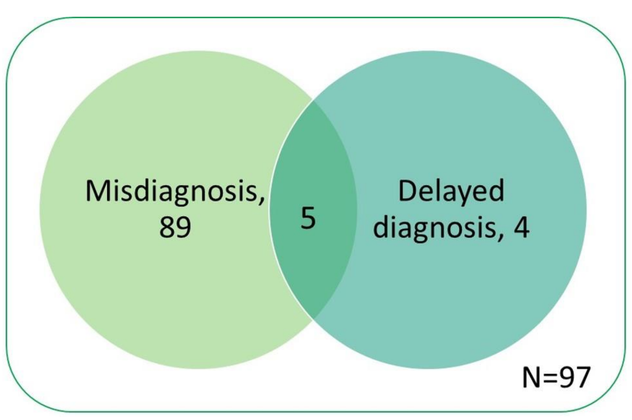
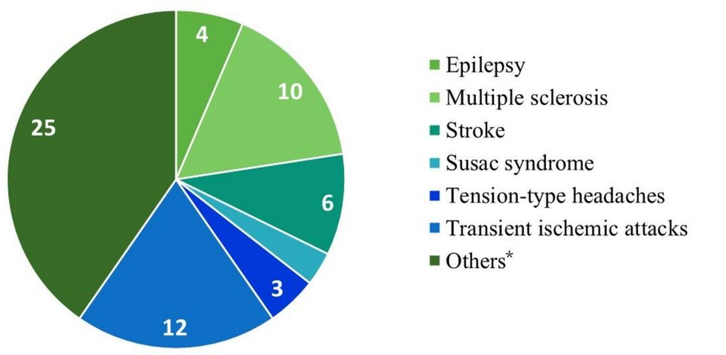


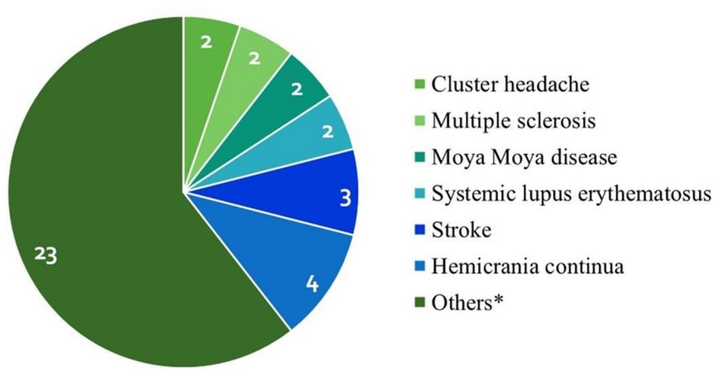
Figure 5: Diagnostic errors

- Further, 56 studies reported false negative diagnosis, where migraine was predominantly misdiagnosed as transient ischemic attack (n=13), multiple sclerosis (n=10), and stroke (n=8) **(Figure 6)**
- Thirty-seven studies reported false positive findings, where hemicrania continua (n=4), stroke (n=3), and epilepsy (n=3) were primarily misdiagnosed as migraine **(Figure 7)**



*Acute stroke, Aeroceles, Arachnoid granulations, ADHD, BPPV, CVST, Cervical arthrosis, Craniofacial pain, Demyelinating disease, Encephalitis, GCA, IgG4 disease, Lyme disease, MdDS, Mild ACVS, Nervous Headache, Panic attacks, Pulpitis or periapical lesions, Sinus headache, SAH, Transient PINS, Vertigo, Viral meningitis, Episodic ataxia

Figure 6: Migraine misdiagnosed as other disease



*Abscess, AIBSE, SV-cPACNS, CRVO, CVT, Epidermoid tumor, Epilepsy, Fibrous Dysplasia of the Ethmoid Bone, Occipital seizures/Epilepsy, PS, RCVS, SIH, SWS, TED, Temporal arteritis, TIA, VAD, VKH disease, Focal epilepsy, HSE, Ictal vomiting

Figure 7: Other diseases misdiagnosed as migraine

Conclusions

- Misdiagnosis and delayed diagnosis not only divert resources inefficiently but also delays the administration of appropriate treatment. This adversely affects patients' quality of life, leads to poorer treatment outcomes, and increases the overall cost burden
- The review found that misdiagnoses of migraine was widely prevalent, emphasizing the necessity for advanced and precise diagnostic methods, and vigilant utilization of ICHD-3 guidelines
- Data-driven algorithms utilizing artificial intelligence to perform predictive analytics can be adopted to enhance diagnostic accuracy, minimize diagnostic delays, and ultimately improve patient outcomes

References

1. GBD 2021 Nervous System Disorders Collaborators (2024). Global, regional, and national burden of disorders affecting the nervous system, 1990-2021: a systematic analysis for the Global Burden of Disease Study 2021. The Lancet. Neurology, 23(4), 344–381.
2. World Health Organization. (n.d.). Headache disorders. Retrieved from https://www.who.int/news-room/fact-sheets/detail/headache-disorders

Abbreviations

ACVS: Acute cerebrovascular syndrome; ADHD: Attention-deficit hyperactivity disorder; AIBSE: Acute idiopathic blind spot enlargement; BPPV: Benign paroxysmal positional vertigo; CRVO: Central retinal vein occlusion; CVST: Cerebral venous sinus thrombosis; CVT: Cerebral venous thrombosis; GCA: Giant cell arteritis; HSE: Herpes simplex encephalitis; ICHD-3: International Classification of Headache Disorders; PINS: Potential ischaemic neurological symptom; PRISMA: Preferred reporting items for systematic reviews and meta-analyses; PS: Panayiotopoulos syndrome; RCVS: Reversible cerebral vasoconstriction syndrome; SAH: Subarachnoid hemorrhage; SIH: Spontaneous intracranial hypotension; SLR: Systematic literature review; SV-cPACNS: Angiogram negative small vessel CNS vasculitis; SWS: Sturge-Weber Syndrome; TED: Thyroid eye disease; TI/AB: Title/Abstract; TIA: Transient ischemic attacks; VAD: Vertebral artery dissection; VKH: Vogt–Koyanagi–Harada

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