



Letter to the Editor

Delays and misdiagnosis of aneurysmal subarachnoid hemorrhage: The impact of socioeconomic barriers

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Dear Editor,

The diagnosis of aneurysmal subarachnoid hemorrhage (aSAH) is a delicate process requiring precision in patient care, patient safety, adequate investigations, and high-quality health care. Diagnosing patients in low- and middle-income countries (LMICs) with limited resources and immature healthcare systems is a challenging and crucial duty. Such nuances can lead to increased morbidity and mortality. Several factors can lead to delay or misdiagnosis or both of aSAH in LMICs, factors such as socioeconomic and medical aspects. About 20% of aSAH patients are comatose during the initial presentation in high-income countries (HICs).^[3] Therefore, early access to neurointensive care treatment is crucial to reduce complications. Misdiagnosing of aSAH could be mistaken for migraine due to similar pain intensity, and aSAH shows signs of meningeal irritation, like photophobia, which may be mistaken as meningitis.^[9] In addition, managing aSAH requires the utmost surgical accuracy and technology as it involves critical cases with potential complications that necessitate continuous monitoring and allocation of resources. A positive neurological outcome is contingent upon timely diagnosis and early treatment at a specialized neurovascular center.^[10] The objectives of this paper are to tackle the challenges encountered in LMICs with restrained resources as a result of socioeconomic factors that lead to delays and misdiagnosis in aSAH cases. Furthermore, we provide potential solutions to surmount these obstacles.

HEALTHCARE SETTINGS IN LMICS VERSUS HICS: CONSEQUENCES

Diagnosing aSAH based on the clinical symptoms and signs alone can be misleading since the symptoms of meningism often overlap with those of other conditions. However, aSAH is marked by the sudden onset of a severe headache. Additional symptoms may include meningeal irritation, intracranial hypertension, seizures, and focal neurologic deficits.^[9] Typically, cases requiring precise diagnosis are referred to tertiary centers for further investigations unavailable in other medical centers. However, tertiary centers are often overburdened with patients in areas with less developed primary and secondary health care. This can lead to delays and misdiagnosis, which

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can have serious consequences for patients. In HICs the tertiary centers are more feasible in addition to the presence of a well-established primary and secondary healthcare system. This is in stark contrast to other regions where such facilities are overburdened, leading to a strain on the entire healthcare system. Therefore, the rate of misdiagnoses of aSAH in HICs appears to be decreasing.^[5]

In Iraq, neurosurgeon numbers compared to the population ratio are 1/195,240,^[4] while in the USA, it is 1:61,000 which has a great impact on patient care due to the shortages of neurosurgeons.^[7] Consequently, internal medicine specialists may manage some patients conservatively due to the scarcity of neurosurgeons.^[8] The timely diagnosis of aSAH in LMICs can be significantly challenging because of logistical problems, the processes of referral, and road traffic, travel time. Moreover, some medical centers in developing countries transfer aSAH patients to other departments, centers, and often to other countries or continents for endovascular treatment. However, the literature does not mention the transportation process.^[2] Based on our experience, it is important to point up that the transfer process to other countries is the responsibility of the patient's family, and they must provide the necessary financial support for it. The length of the delays is currently uncertain for all the situations mentioned earlier. Therefore, it is crucial to recognize and highlight their existence and the negative impact they can have. On the other hand, logistical and referral problems were not a cause of delay in the diagnosis of aSAH in developed countries.^[5]

Being a vascular neurosurgeon in a limited resources system may encounter various situations. To that end, some patients can present late to the hospital with a poor prognosis or even brain death, which increases the burden of morbidity and mortality of the patients.^[6] Furthermore, it is worth considering extended conflicts, political and social instability, and insufficient financial resources impede the medical training of qualified physicians, attainability of diagnostic investigations, and provision of preventative and therapeutic interventions have substantial consequences on health care in LMICs.^[1] On the other hand, such situations are seen less frequently in developed countries.^[3]

In conclusion, the diagnosis of aSAH can be challenging in LMICs due to the scarcity of neurosurgeons, logistical and referral problems, and delays in the referral process. This leads to misdiagnosis and a burden on the healthcare system. In contrast, a well-established primary and secondary healthcare system in HICs reduces the rate of misdiagnosis. Political and social instability, insufficient financial resources, and inadequate medical training of qualified physicians increase the burden of morbidity and mortality in LMICs. Therefore, there is a need for investment in healthcare infrastructure, medical training, and logistical solutions to improve the diagnosis and management of aSAH and other neurosurgical conditions in LMICs.

INSIGHTS FROM HISTORY: DIRECTIONS FOR FUTURE GENERATIONS

Access to quality healthcare services is crucial for everyone, but it can be challenging to provide adequate care in certain areas. Healthcare providers face significant challenges in delivering proper health care, especially in areas where there is a lack of endovascular treatment options. To address these inequalities, there needs to be a greater focus on public education about aSAH and the importance of seeking immediate medical attention. In addition, local governments and stakeholders should review their specialty training curricula and invest in expanding the infrastructure of the neurosurgical units in their countries to ensure that all patients with aSAH can access quality and timely intervention, regardless of their location or time of bleed.

To alleviate the burden on tertiary centers and ensure prompt and precise diagnosis and treatment, it is crucial to enhance the quality and availability of primary and secondary healthcare services. LMICs should allocate resources to train more specialists, such as neurosurgeons and internal medicine experts, to meet the growing demand for healthcare services. In addition, a better transportation infrastructure can expedite the transfer of patients and improve access to specialized healthcare services.^[11] Telemedicine and other digital health solutions can also overcome geographical barriers to healthcare access in remote regions. Improved financing systems can guarantee patients receive the care they need without incurring financial hardship. Furthermore, reducing political and social instability can foster a more stable environment for healthcare systems to function productively and provide comprehensive care to patients.

As a final observation, implementing solutions such as enhancing healthcare systems, boosting the number of healthcare professionals, improving transportation infrastructure, harnessing technology, strengthening healthcare financing systems, and mitigating political and social instability can help improve the quality of care and reduce the burden of disease in LMICs. Though these solutions require significant investments in healthcare infrastructure, training, and technology, they can lead to significant improvements in healthcare access and outcomes for people in need.

Ethical approval

The Institutional Review Board approval is not required.

Declaration of patient consent

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There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Alfawares Y, Ismail M, Ramanathan VP, Andaluz N, Hoz SS. A case that encapsulates the challenges of being a neurosurgeon in war-torn countries: Perspectives from Iraq. *Surg Neurol Int* 2024;15:46.
2. Dokponou YC, Kotecha J, Bandyopadhyay S, Erhabor J, Ooi SZ, Egiz A, *et al.* Continental survey of access to diagnostic tools and endovascular management of aneurysmal subarachnoid hemorrhage in Africa. *Front Surg* 2021;8:690714.
3. Goertz L, Pflaeging M, Hamisch C, Kabbasch C, Pennig L, von Spreckelsen N, *et al.* Delayed hospital admission of patients with aneurysmal subarachnoid hemorrhage: Clinical presentation, treatment strategies, and outcome. *J Neurosurg* 2020;134:1182-9.
4. Habibi Z, Hadi NA, Kim EE, Alkhataybeh RA, Sbeih A, Abou-Hamden A, *et al.* Progress in neurosurgery: Contributions of women neurosurgeons in the Middle East. *J Clin Neurosci* 2021;86:337-46.
5. Inagawa T. Delayed diagnosis of aneurysmal subarachnoid hemorrhage in patients: A community-based study. *J Neurosurg* 2011;115:707-14.
6. Ismail M, Ayad F, Al-Ageely TA, Elamin O, Salih HR, Aljuboori Z, *et al.* Societal challenges facing neurosurgeons in low- and middle-income countries: Iraq as an example. *Surg Neurol Int* 2023;14:253.
7. Miller T. Neurosurgical workforce shortage: The effect of subspecialization and a case for shortening residency training. Available from: <https://aansneurosurgeon.org/departments/neurosurgical-workforce-shortage-effect-subspecialization-cast-shortening-residency-training> [Last accessed on 2024 Jan 20].
8. Ogungbo B, Mendelow AD, Walker R. The epidemiology, diagnosis and treatment of subarachnoid haemorrhage in Nigeria: What do we know and what do we need to know? *Br J Neurosurg* 2004;18:362-6.
9. Petridis AK, Kamp MA, Cornelius JF, Beez T, Beseoglu K, Turowski B, *et al.* Aneurysmal subarachnoid hemorrhage. *Dtsch Arztebl Int* 2017;114:226-36.
10. Van Gijn J, Rinkel GJ. Subarachnoid haemorrhage: Diagnosis, causes and management. *Brain* 2001;124:249-78.
11. Van Lieshout JH, Bruland I, Fischer I, Cornelius JF, Kamp MA, Turowski B, *et al.* Increased mortality of patients with aneurysmal subarachnoid hemorrhage caused by prolonged transport time to a high-volume neurosurgical unit. *Am J Emerg Med* 2017;35:45-50.

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