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Role of MRI in Evaluation of Patients with Non - Traumatic Headaches

K Venkata Sai Kumar[1], Sandesh Gowda C A[2], Praveen Ramegowda[3], Banuprakash S[4], Anand S H.[5]

[1]Junior Resident, Department of Radiology, Sri Siddhartha Medical College and Hospital, Tumkur – 572107, Karnataka, India
Email: *korlimarla.kumar[at]gmail.com*

[2]Junior Resident, Department of Radiology, Sri Siddhartha Medical College and Hospital, Tumkur – 572107, Karnataka, India.
Email: *sandeshgowda1993.sg[at]gmail.com*

[3]Senior Resident, Department of Radiology, Sri Siddhartha Medical College and Hospital, Tumkur – 572107, Karnataka, India.
Email: *praveen.hims92[at]gmail.com*

[4]Professor, Department of Radiology, Sri Siddhartha Medical College and Hospital, Tumkur – 572107, Karnataka, India.
Corresponding Author Email: *drbanuprakash[at]gmail.com*

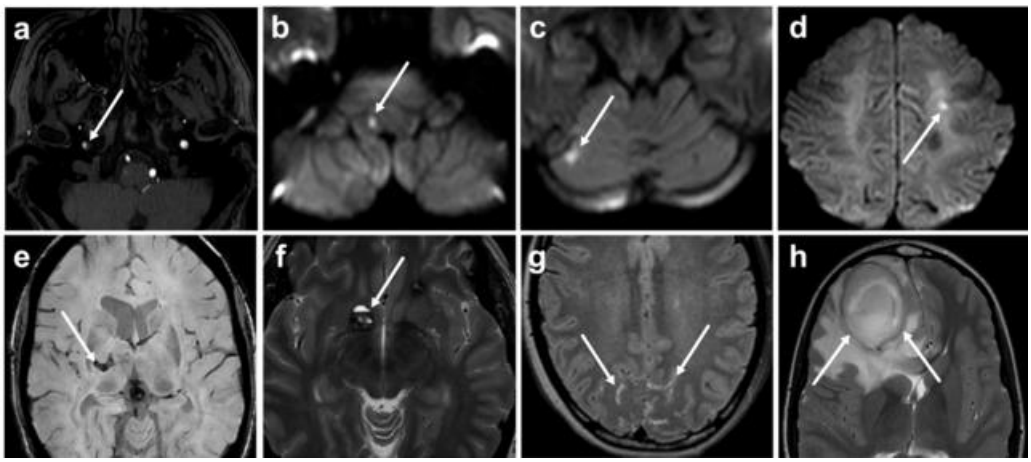
[5]Professor and HOD, Department of Radiology, Sri Siddhartha Medical College and Hospital, Tumkur – 572107, Karnataka, India.
Email: *anandsh78[at]gmail.com*

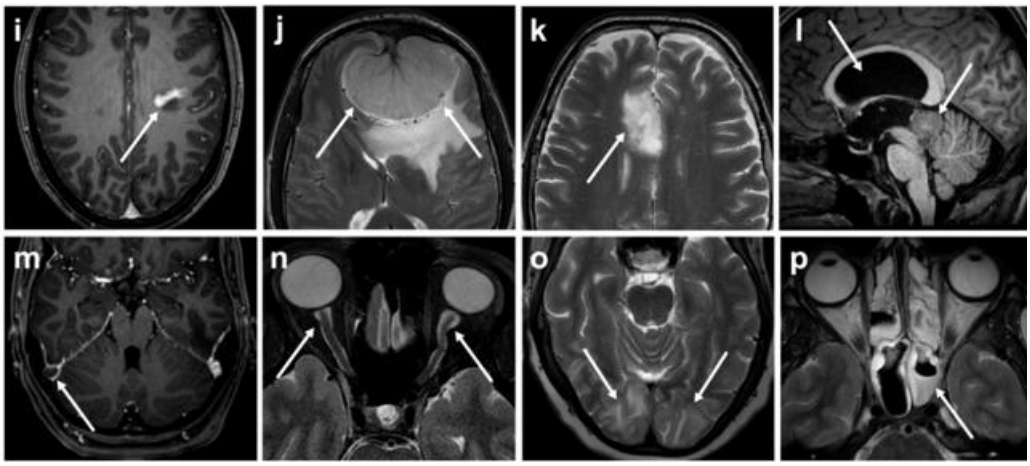
Abstract: ***Magnetic Resonance Imaging (MRI) is a non - invasive imaging modality that offers high - resolution visualization of soft tissues, making it essential in evaluating non - traumatic headaches. These headaches may be primary (e. g., migraine, tension - type, cluster) or secondary (due to structural/pathological causes like tumours or vascular anomalies). MRI aids in differentiating between these by detecting subtle abnormalities undetectable by CT. MRI is particularly useful when headaches present with atypical features, neurological deficits, or changes in frequency/severity. This study aimed to assess the role of MRI in evaluating non - traumatic headaches. A cross - sectional observational study was conducted on patients presenting with such headaches. While 72.2% of patients had normal MRI findings, 27.8% exhibited abnormalities such as white matter changes, arachnoid cysts, and Chiari I malformations. MRI findings correlated significantly with age group (31–45) and chronicity. MRI proves to be a valuable diagnostic tool guiding patient management.***

Keywords: Non - traumatic headache, Magnetic Resonance Imaging (MRI), Primary vs secondary headache, Acute headache, Chronic headache, arachnoid cysts, chiari malformations

1. Introduction

Magnetic Resonance Imaging (MRI) is an advanced imaging modality invaluable in assessing patients presenting with non - traumatic headaches. These can be either primary, like migraines and tension - type headaches, or secondary, which stem from structural or pathological causes. MRI offers detailed visualization of the brain parenchyma, vascular structures, and surrounding tissues, aiding differentiation. Clinical scenarios that suggest secondary causes (e. g., red flag symptoms) benefit the most from MRI. Advancements such as functional MRI (fMRI) and high - field imaging have expanded MRI's utility. Despite limitations like cost and accessibility, MRI remains the gold standard when evaluating unexplained or atypical headaches.



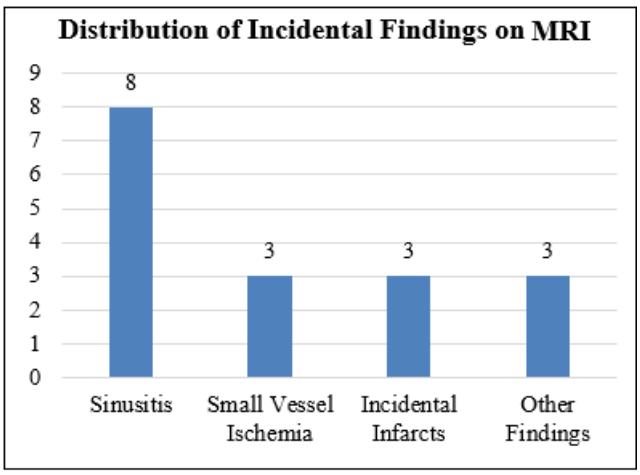


2. Materials and Methods

This cross - sectional observational study was conducted in the Department of Radiodiagnosis at Sri Siddhartha Medical College and Hospital, Tumkur. Patients presenting with non - traumatic headaches underwent detailed clinical evaluation followed by MRI brain studies using a 1.5 Tesla MRI scanner. MRI protocols included T1, T2, FLAIR, DWI, and MR angiography as needed. Clinical parameters, headache duration, associated symptoms, and imaging findings were documented. Data analysis was performed retrospectively to assess associations and diagnostic yield.

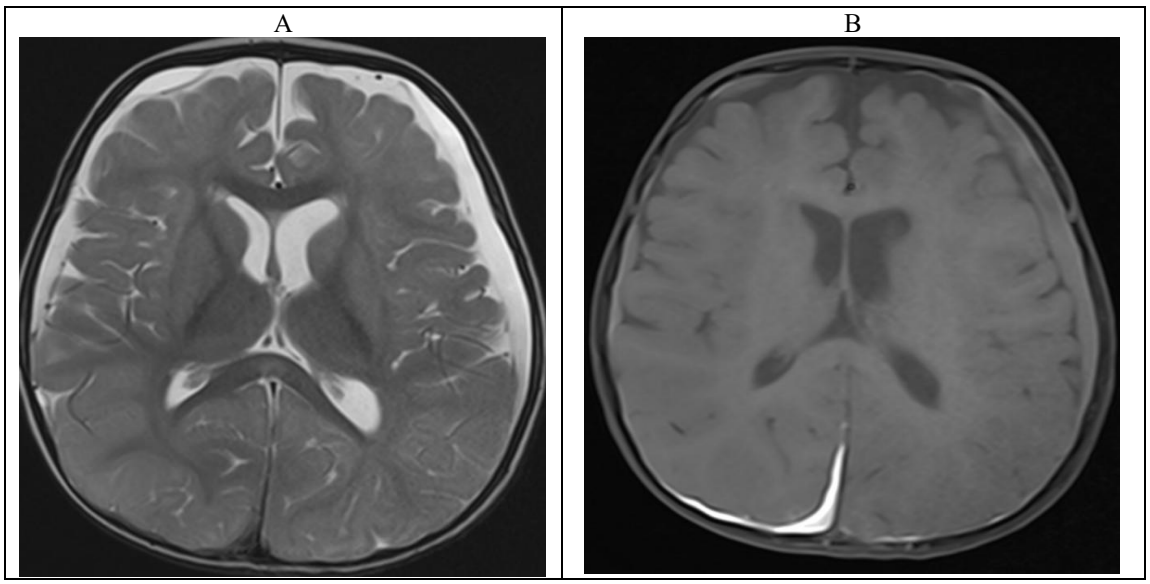
3. Results and Discussion

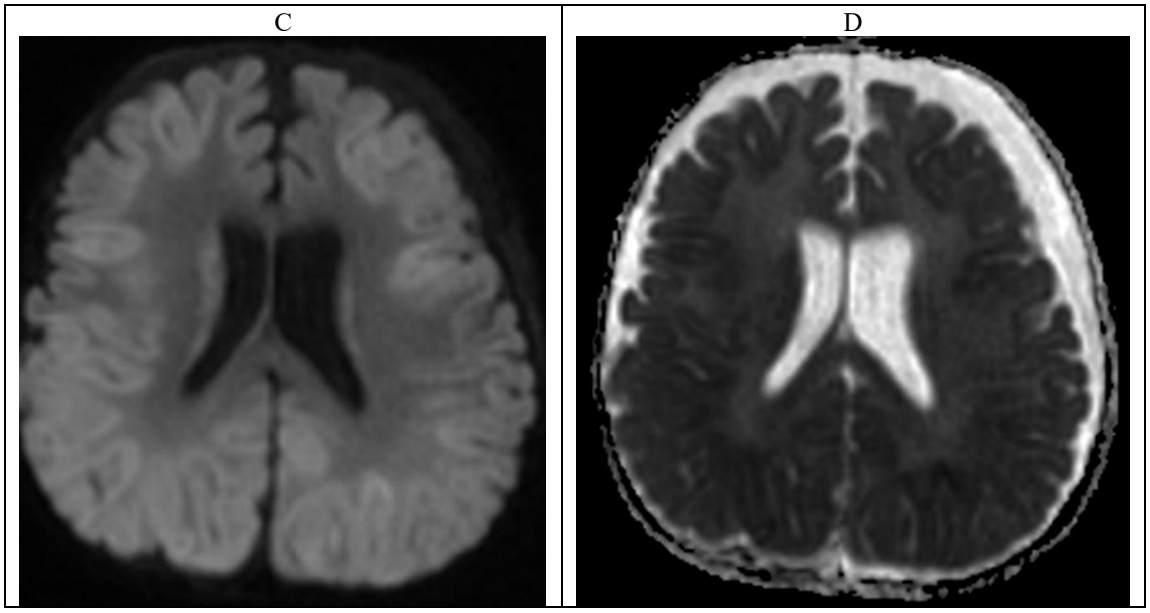
Out of 97 patients, 70 (72.2%) showed normal MRI studies while 27 (27.8%) had abnormalities. The most frequent abnormal findings were white matter changes (common in migraine), arachnoid cysts, and Chiari I malformations. Abnormal findings were more prevalent in patients aged 31–45 and those with chronic headache symptoms. Inter - observer agreement on MRI findings was high, affirming the reliability of standard protocols. MRI identified incidental findings in several cases, including sinusitis and small vessel ischemic changes. These results align with global studies emphasizing MRI's role in identifying secondary causes of headache, especially when guided by clinical suspicion.



4. Illustrative Cases

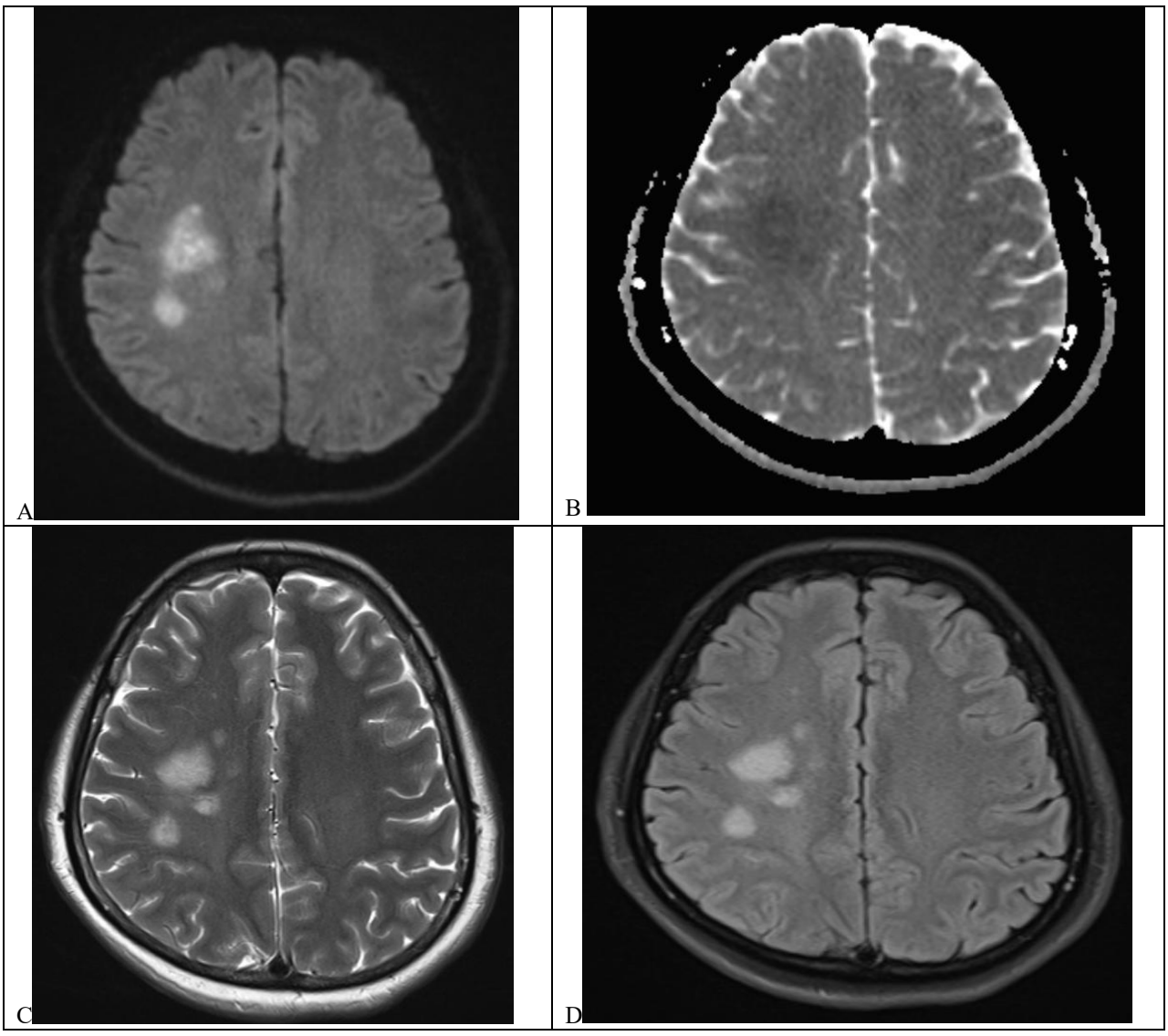
Case 1: Bilateral SDH





Bilateral subdural haemorrhage of different intensities noted on axial T2 and Axial T1 showing diffusion restriction on DWI with corresponding signal drop on ADC

Case 2: Infarcts



Axial DWI section showing acute infarcts in the right centrum semiovale and putamen, demonstrating diffusion restriction with corresponding signal drop on ADC and T2/FLAIR hyperintensity

5. Conclusion

MRI is a highly valuable tool in evaluating non - traumatic headaches, particularly when guided by clinical red flags or chronicity. Although a majority of cases are normal, MRI detects significant findings in a considerable minority, justifying its use in selected patients. Further multicentric studies with advanced imaging techniques can enhance diagnostic pathways and patient care.

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