ETIOLOGICAL ANALYSIS OF PAPILLEDEMA IN A RURAL TERTIARY HEALTHCARE SETTING

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ABSTRACT

Purpose

To determine the etiological factors leading to papilledema in patients presenting to a rural tertiary healthcare center.

Materials and Methods

This observational, descriptive, cross-sectional study included 20 clinically diagnosed cases of papilledema presenting to the Ophthalmology Department of a rural tertiary care hospital between January 2024 and February 2025. Patients underwent detailed clinical evaluation, fundus examination, and grading using the Modified Frisén Scale. Neuroimaging and relevant investigations were performed to identify the underlying etiology. Data were analyzed descriptively.

Results

Papilledema was more common in females (60%) than males (40%). The majority of patients belonged to the 25–45 years age group (45%). Bilateral papilledema was observed in 90% of cases, while 10% showed unilateral involvement, including Foster Kennedy and pseudo–Foster Kennedy syndromes. Headache was the most common presenting symptom (50%). Space-occupying lesions were the most frequent etiology (35%), followed by meningitis (25%) and cerebrovascular accidents (15%). Idiopathic intracranial hypertension accounted for 5% of cases. Most patients presented with early-stage papilledema, with Stage 2 being the most common (45%).

Conclusion

Papilledema in a rural tertiary healthcare setting shows a varied etiological profile, with intracranial space-occupying lesions and infections being the predominant causes. Early-stage presentation is common, emphasizing the importance of routine fundus examination. Prompt recognition of papilledema and timely neuroimaging are crucial, as it often represents the first clinical sign of potentially life-threatening intracranial pathology.

INTRODUCTION

Papilledema is defined as optic disc swelling secondary to raised intracranial pressure (ICP), regardless of the underlying cause.[1] Its pathophysiology is best understood through the Monro–Kellie doctrine, which states that the sum of brain parenchyma, CSF, and intracranial blood volume remains constant within the fixed cranial vault; increases in any of these components elevate ICP.[2]

The causes of increased ICP are varied and include mass lesions, hydrocephalus, venous sinus obstruction, meningitis, and idiopathic intracranial hypertension (IIH).[4] Papilledema may present with headache, nausea, vomiting, transient visual obscurations, and cranial nerve VI palsy—signs that reflect the underlying rise in ICP.[1] Accurate recognition is essential, as papilledema can be the initial manifestation of life-threatening intracranial disease.[4]

The Frisén grading scale, introduced in 1982, remains the most widely used clinical system to stage the severity of papilledema based on optic nerve head swelling.[6]

The etiological spectrum of papilledema varies between populations. Rural regions—owing to differences in healthcare access, infectious disease burden, and delayed neuroimaging—may exhibit distinct patterns. Limited Indian studies have examined the epidemiology of raised ICP, with contributions from Pal et al. and Sharma et al., who described the Indian demographics of IIH.[8] [9]

Given the potentially serious implications of papilledema, evaluating its causes, clinical features, and severity in a rural tertiary setting is crucial.

AIM

To determine the etiological factors leading to papilledema in patients presenting to a rural tertiary healthcare center.

MATERIALS AND METHODS

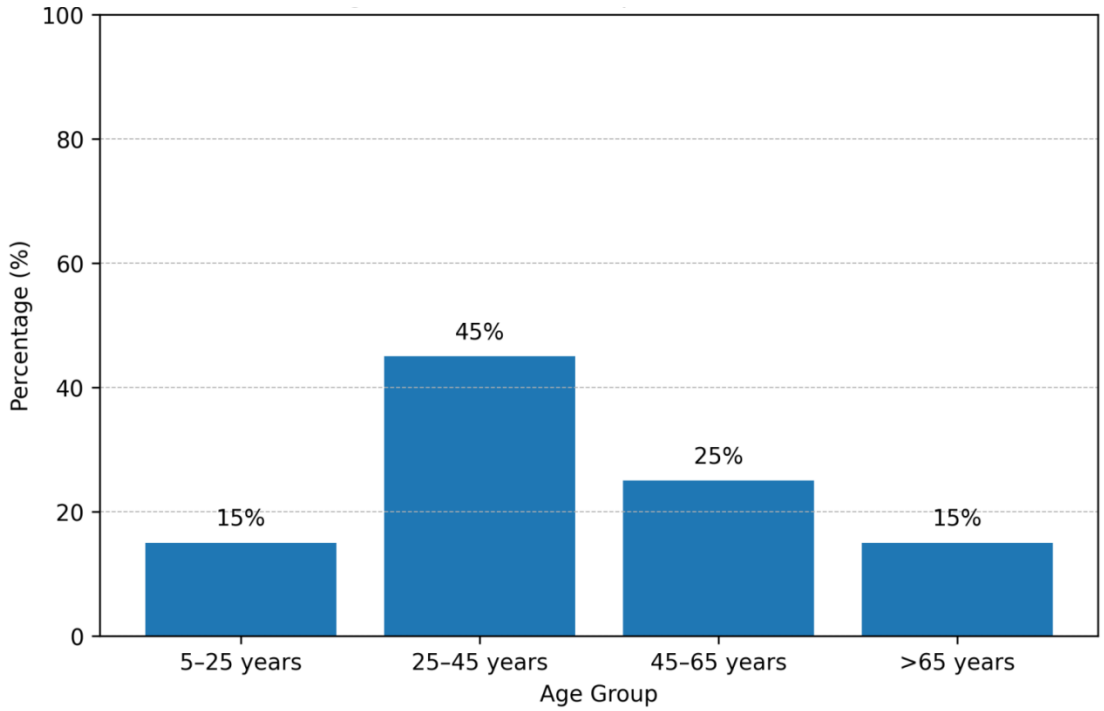
This observational, descriptive, cross-sectional study included 20 clinically diagnosed cases of papilledema presenting to the Ophthalmology Department of Dr. Vikhe Patil Pravara Rural Hospital, Loni, between January 2024 and February 2025. The study was initiated after obtaining approval from the Institutional Ethics Committee. Purposive sampling was employed. All patients with clinically confirmed papilledema seen either in the outpatient department or during inpatient admissions were included, while patients below 5 years of age and those with pseudopapilledema were excluded.

Each patient underwent a detailed history and systemic evaluation, followed by comprehensive ophthalmic assessment including visual acuity testing and fundus examination using slit-lamp biomicroscopy. The severity of papilledema was graded according to the Modified Frisén Scale. Neuroimaging, either computed tomography or magnetic resonance imaging, was performed in all possible cases to determine the underlying etiology, and relevant laboratory investigations were obtained as clinically indicated.

All collected data were organized and analyzed descriptively.

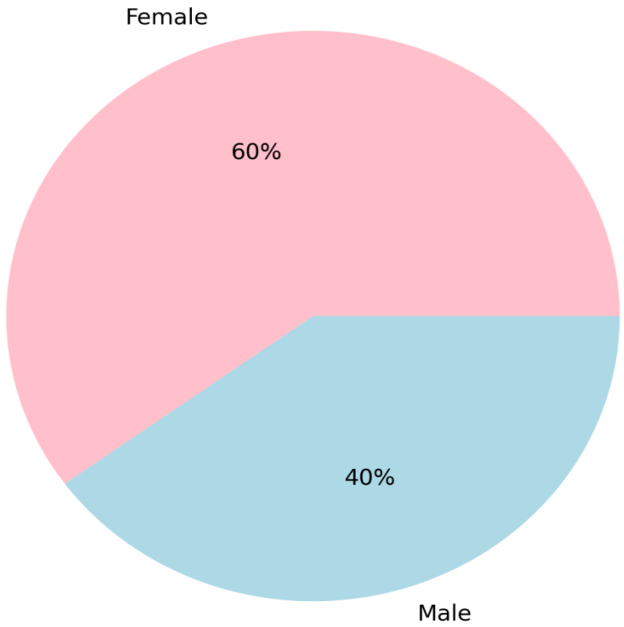
RESULTS

Fig 1 – Age Distribution of Papilledema Patients



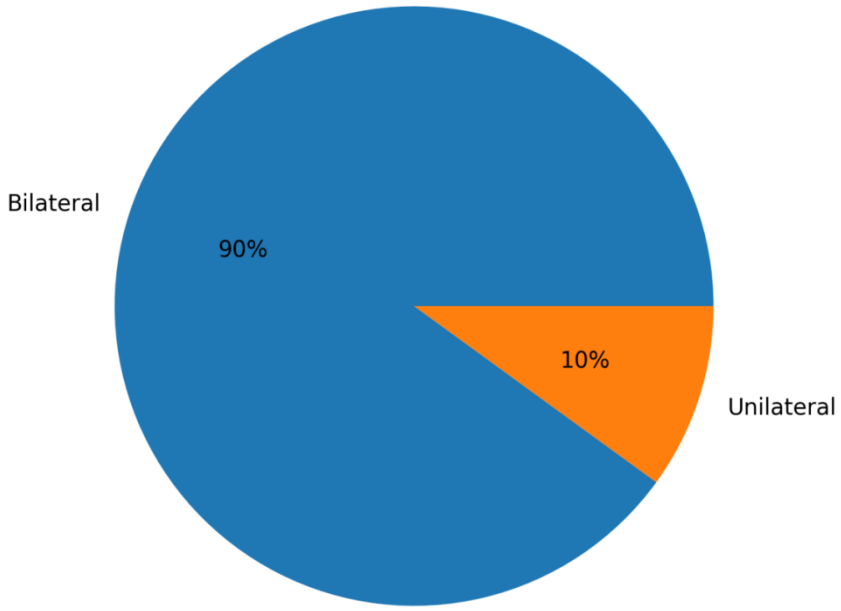
In the present study, the majority of patients fall within the 25–45 years age group (45%), followed by the 45–65 years group (25%). The 5–25 years and >65 years groups each account for 15% of the cases.

Fig 2 – Sex Distribution of Papilledema Patients



In the present study, papilledema is more common in females, who constitute 60% of the cases, while males account for 40%. This indicates a higher preponderance of papilledema among females in our study population.

Fig 3 – Laterality of Papilledema



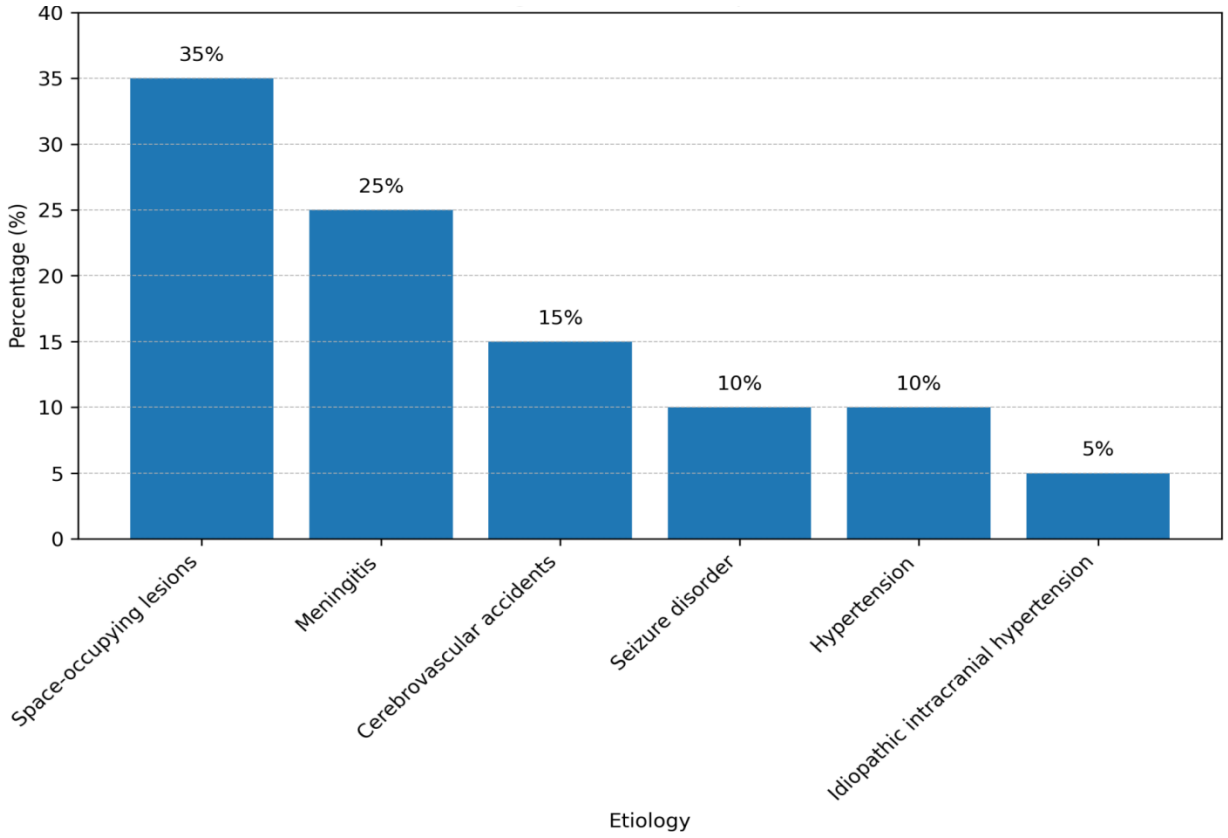
In the present study, the majority of patients have bilateral papilledema (90%), while unilateral involvement is seen in 10% of cases.

Table 1 – Presenting Symptoms of Papilledema Patients

Symptom	Number of Cases	Percentage (%)
Headache	10	50%
Weakness of limbs	5	25%
Nausea/Vomiting	2	10%
Diminution of vision	2	10%
Convulsions	1	5%

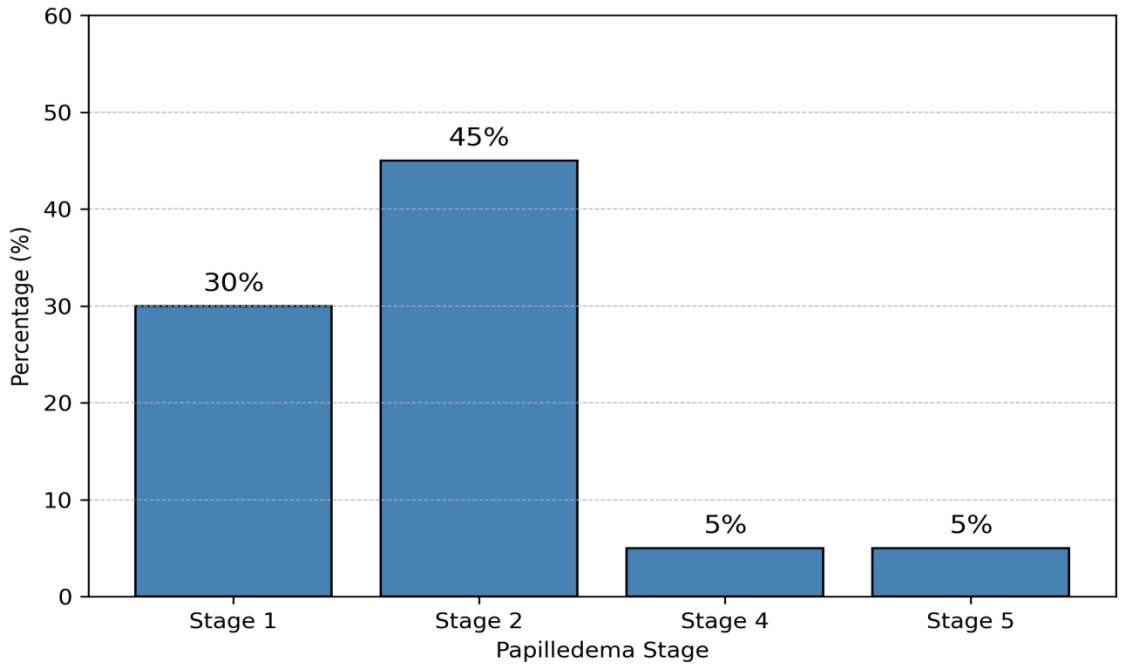
In the present study, the most common presenting symptom is headache (50%), followed by weakness of limbs (25%), while nausea/vomiting, blurring of vision (10% each), and convulsions (5%) are less frequently observed.

Fig 4 – Etiological Pattern of Papilledema



In the present study, space-occupying lesions are the most common cause of papilledema (35%), followed by meningitis (25%) and cerebrovascular accidents (15%). Seizure disorder and hypertension each account for 10% of cases, while idiopathic intracranial hypertension is the least common etiology (5%).

Fig 5 – Staging in patients of papilledema



In the present study, most patients presented with Stage 2 papilledema (45%), followed by Stage 1 (30%), while advanced stages such as Stage 4 (5%) and Stage 5 (5%) were less common

DISCUSSION

The present study evaluates the etiological profile, clinical presentation, laterality, and staging of papilledema in a rural tertiary healthcare setting. Papilledema is found to be more common in females and predominantly affects individuals in the 25–45 years age group. Bilateral papilledema is the most frequent presentation, with space-occupying lesions and infections being the leading etiologies. Most patients present with early-stage papilledema, highlighting the importance of timely ophthalmic evaluation.[1]

Age and Sex Distribution (Fig 1 & Fig 2) - In the present study, papilledema is more common in females (60%), with the majority of patients belonging to the 25–45 years age group. Similar demographic trends have been reported by Pal et al. and Sharma et al., where raised intracranial pressure and idiopathic intracranial hypertension show a higher prevalence among young and middle-aged females.[89] These findings suggest a comparable demographic pattern despite differences in etiology between rural and urban populations.

Laterality of Papilledema (Fig 3) - Bilateral papilledema is observed in 90% of cases, consistent with the classical understanding that raised intracranial pressure affects both optic nerves symmetrically.[12] Rigi et al. describe bilateral disc edema as the typical presentation of papilledema.[1] The two unilateral cases in the present study represent Foster Kennedy and pseudo–Foster Kennedy syndromes; such asymmetric presentations, though uncommon, have been well described by Lepore and are clinically significant.[3]

Presenting Symptoms (Table 1) - Headache is the most common presenting symptom, followed by neurological manifestations such as limb weakness. This symptom pattern aligns with established descriptions of papilledema, where headache is often the earliest and most consistent complaint due to raised intracranial pressure, as outlined by Rigi et al.[1] The presence of neurological symptoms reflects the underlying intracranial pathology.

Etiological Pattern (Fig 4) - Space-occupying lesions are the most common cause of papilledema in the present study, followed by meningitis and cerebrovascular accidents. This etiological pattern differs from urban-based studies, where idiopathic intracranial hypertension is more prevalent, as reported by Pal et al. and Sharma et al.[89] The predominance of mass lesions and infections in this study likely reflects delayed presentation and limited access to early neuroimaging in rural settings.[12]

Staging of Papilledema (Fig 5) - Most patients present with Stage 2 papilledema, followed by Stage 1, indicating early to moderate disease severity. The Frisén grading scale remains the standard method for staging optic disc edema and allows uniform assessment across studies.[6] Early-stage presentation suggests improving awareness and earlier ophthalmic referral, which is crucial in preventing visual morbidity.

CONCLUSION

The present study highlights that papilledema in a rural tertiary healthcare setting is most commonly associated with intracranial space-occupying lesions and infectious etiologies, reflecting the varied causes of raised intracranial pressure described in the literature.[12] Bilateral papilledema remains the predominant presentation, consistent with the classical mechanism of uniform transmission of raised intracranial pressure along the optic nerve sheaths.[1] Unilateral presentations, including Foster Kennedy and pseudo–Foster Kennedy syndromes, though uncommon, are clinically significant and align with previously described atypical patterns of papilledema.[3]

The majority of patients present with early-stage papilledema as classified by the Frisén grading scale, which remains the standard method for assessing optic disc edema severity.[6] Early recognition through fundus examination is essential, as papilledema often serves as the first clinical indicator of potentially life-threatening intracranial pathology.[14] Variations in etiological patterns compared to urban-based studies, particularly with a lower prevalence of idiopathic intracranial hypertension, may reflect demographic and healthcare access differences in rural populations.[89]

Overall, timely diagnosis and appropriate neuroimaging are crucial to prevent irreversible visual loss and improve systemic outcomes in patients with papilledema.[14]

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