

Etiological Analysis of Pale Optic Disc and its Correlation with Visual Outcome

Anupama Raju Taklikar¹, Geetamma²

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ABSTRACT

Purpose: To analyze the etiological spectrum of pale optic discs and assess their correlation with visual outcomes in patients presenting to a tertiary care hospital.

Methods: A prospective observational study was carried out on 40 patients above 20 years of age with optic disc pallor. Detailed history, clinical examination, and investigations including fundus photography, perimetry, biochemical tests, and neuroimaging were performed. Best Corrected Visual Acuity (BCVA) was recorded at baseline and at six months follow-up. Data were analyzed for etiological patterns and correlation with visual prognosis.

Results: The mean age of participants was 38.68 ± 12.09 years, with male predominance (56%). The most common etiology was traumatic optic neuropathy (28%), followed by optic neuritis (22%) and intracranial tumors (22%). Primary optic atrophy accounted for 16% of cases, while toxic, ischemic, and inflammatory causes contributed less frequently. At six months, only 34% of patients showed improvement in BCVA, predominantly in optic neuritis and traumatic cases. Tumor-related cases showed partial recovery, while ischemic and primary atrophy cases had poor outcomes.

Conclusion: Optic disc pallor is a clinical sign of diverse etiologies with variable prognosis. While overall visual recovery was limited, early recognition of inflammatory and compressive causes provided better outcomes. Timely evaluation and targeted management are crucial in preserving residual vision.

KEYWORDS

- Optic Disc Pallor • Optic Atrophy • Visual Prognosis • Optic Neuritis
- Traumatic Optic Neuropathy

AUTHOR'S AFFILIATION:

¹ Professor and HOD, Department of Ophthalmology, Navodaya Medical College and Research Centre, Mantralayam Road, Raichur, Karnataka, India.

² Postgraduate, Department of Ophthalmology, Navodaya Medical College and Research Centre, Mantralayam Road, Raichur, Karnataka, India.

CORRESPONDING AUTHOR:

Geetamma, Postgraduate, Department of Ophthalmology, Navodaya Medical College and Research Centre, Mantralayam Road, Raichur, Karnataka, India.

E-mail: reddygeetha151@gmail.com

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INTRODUCTION

The optic nerve is vital for vision, and its integrity is reflected in the appearance of the optic disc. Optic disc pallor is the hallmark of optic atrophy and represents axonal degeneration of retinal ganglion cells.⁵ It is not a disease in itself but the end result of multiple pathological processes affecting the anterior visual pathway.¹

Etiologies of optic disc pallor range from ischemic optic neuropathies, optic neuritis, compressive lesions, traumatic and toxic neuropathies, to hereditary and metabolic causes. Each carries a distinct natural course and prognosis. For example, optic neuritis often responds favorably to corticosteroids, whereas ischemic optic neuropathies and hereditary atrophies rarely show visual improvement.²

The clinical challenge lies in determining the cause, as optic atrophy is usually irreversible. Early detection of treatable conditions such as inflammation, compression, or toxins can halt further deterioration. In India, where trauma and infections are common, etiological profiles may differ from those reported in Western populations.

This study was designed to analyze the etiological distribution of pale optic discs in patients presenting to a tertiary care hospital and to correlate these causes with visual outcomes after six months of follow-up.

MATERIALS AND METHODS

Study design and setting: A prospective observational study was conducted at the Department of Ophthalmology.

Participants: 40 patients aged >20 years with optic disc pallor confirmed on fundus examination were included.

Inclusion criteria: Adults >20 years of age with optic disc pallor.

Exclusion criteria: Known glaucoma, optic disc pallor secondary to retinal disorders, no light perception, terminally ill or unconscious patients.

Evaluation protocol:

- **History:** trauma, systemic illnesses (hypertension, diabetes, tuberculosis), drug use (ethambutol, alcohol), family history.

- **Examination:** Best Corrected Visual Acuity (Snellen's chart), intraocular pressure (non-contact tonometer), slit-lamp biomicroscopy, dilated fundus examination, and fundus photography.
- **Functional tests:** color vision (Ishihara plates), contrast sensitivity (Pelli-Robson chart), automated perimetry (Humphrey's).
- **Advanced tests:** visual evoked potentials (in selected cases), biochemical investigations, and neuroimaging (CT/MRI) when clinically indicated.

Follow-up: All patients were followed for six months with repeat BCVA assessment and documentation of optic disc changes.

Statistical analysis: Quantitative variables represented as frequency and percentages. Associations were tested using Chi-square or Fisher's exact test, with $p < 0.05$ considered statistically significant. software SPSS 16v used for analysing the data.

RESULTS

Demographic profile: The mean age was 38.68 ± 12.09 years (range: 21–66 years). There were 28 males (56%) and 22 females (44%).

Laterality: Optic disc pallor was unilateral in 70% and bilateral in 30%. Right eye involvement was 38%, left eye 32%, and both eyes 30%.

Etiological distribution:

- Traumatic optic neuropathy: 28%
- Optic neuritis: 22%
- Tumors (CP angle, intracranial): 22%
- Primary optic atrophy: 16%
- Other causes (toxic, ischemic, infectious, thyroid orbitopathy, post-papilledema): 12%

Visual outcomes:

- **At baseline:** majority presented with moderate to severe visual impairment.
- **At six months:** Improved BCVA in 34% of patients (≥ 1 line on Snellen's chart), while 66% showed no improvement. Optic neuritis showed the best prognosis, trauma and tumors showed partial

recovery, and ischemic/atrophic cases had poor outcomes.

DISCUSSION

This study emphasizes the importance of determining the etiology of optic disc pallor in clinical practice.

Trauma was the most common cause, reflecting the young adult predominance in this cohort. Road traffic accidents and blunt ocular injuries remain significant contributors to visual morbidity in developing countries.⁷ Kang *et al* quantifying optic disc pallor in traumatic optic neuropathy (TON) and objectively assessing TON severity.

Optic neuritis was the second most common cause, usually affecting younger patients. Ambika *et al* shows visual recovery was favorable, consistent with outcomes reported in the Optic Neuritis Treatment Trial (ONTT) in children.¹¹

Tumors accounted for nearly one-quarter of cases, highlighting the crucial role of neuroimaging in unexplained disc pallor. Surgical or medical intervention yielded partial recovery in some patients.⁷

Primary optic atrophy and ischemic neuropathies showed the worst prognosis, as though less common, underline the importance of eliciting drug and alcohol history, since discontinuation of the offending agent may prevent further visual decline.²

Only one-third of patients in this study showed visual improvement, emphasizing that optic disc pallor usually denotes advanced optic nerve damage.¹² Nevertheless, identifying the cause is vital, as early treatment of reversible conditions can prevent further progression.⁹

Chaddah M.R. *et al* study showed infective (meningitis (16%) (syphilis (10%)), tumors 10% are leading causes of optic atrophy.

Naidu *et al* study highlights early detection of causative disorders can prevent permanent vision loss.

Chinta *et al* highlights neonatal hypoxia is the leading cause of childhood optic atrophy.

Our findings align with Indian studies where trauma, optic neuritis,⁷ and infections are prominent causes, differing from Western

reports that often highlight demyelinating and ischemic etiologies.¹³

CONCLUSION

Optic disc pallor is a significant ophthalmic sign with multiple etiologies. In this study, trauma, optic neuritis, and tumors were the leading causes. Visual prognosis was generally poor, though optic neuritis showed the most favorable recovery.

Comprehensive evaluation including history, ocular examination, functional testing, and neuroimaging is essential in identifying the underlying cause. Although optic atrophy itself is irreversible, timely intervention for inflammatory, compressive, or toxic causes can preserve residual vision and prevent further optic nerve damage.

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