

Paradigm Shift in Optic Neuropathy: Early Insights into Precise Etiological Differentiation

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Editor in Chief

Due of its heterogeneity in etiology, including inflammatory, vascular, and traumatic causes rather than as a singular condition and individual disease, the global prevalence of non-glaucomatous optic neuropathy (NGON) continues to be a challenging scientific difficulty.^{1,2,3} A retrospective study was performed at a tertiary eye-care center in Yogyakarta, Indonesia, covering the period between January 2019 to December 2023 (4 years investigation period, including in the COVID-19 era). Four principal subtypes of optic neuropathy were analyzed:

- Optic neuritis (ON) – demyelinating or inflammatory inflammation of the optic nerve
- Ischemic optic neuropathy (ION) – anterior or posterior optic-nerve infarction secondary to compromised perfusion
- Compressive optic neuropathy (CON) – axonal injury from mass effect of orbital or intracranial lesions (e.g., tumors, aneurysms)
- Traumatic optic neuropathy (TON) – direct or indirect mechanical disruption of the optic nerve fibers

A total of 7,841 cases were identified (see Table 1), making neuro-ophthalmology the fifth-largest service line within the eye clinic.

Table 1. Characteristics of optic neuropathies in tertiary hospital in Yogyakarta, Indonesia

Variable	
Total cases	
Outpatient	
Old cases	3125 (42.7%)
New cases	4200 (57.3%)
Inpatient	
Old cases	16 (3.1%)
New cases	500 (96.9%)
Established caused of each optic neuropathy	
Optic Neuritis	

Multiple Sclerosis (MS)	11 (57.9)
Systemic Lupus Erythematosus (SLE)	3 (15.8)
Neuromyelitis Optica Spectrum Disorder (NMO-SD)	1 (5.26)
Autoimmune associated with Dry Eyes	2 (10.5)
Ischemic Optic Neuropathy	
Comorbidity	
Hypertension	16 (53.3)
Dyslipidemia	5 (16.7)
Diabetes Mellitus	4 (13.3)
Stroke	1 (3.3)
Mixed	4 (13.3)
Tumor Location: Compressive Optic Neuropathy Characteristics	
Skull based	30 (66.7)
Non Skull	15 (33.3)
Size	
Small (<5cm)	35 (77.8)
Large (>5cm)	10 (22.2)
Traumatic Optic Neuropathy Etiology	
Road traffic accident	6 (54.5)
Post-Surgery	2 (18.2)
Fall	1 (9.1)
Contact with sharp object	1 (9.1)
Object trauma	1 (9.1)

Table 1 summarizes the four evaluated NGON subtypes—inflammatory (optic neuritis, ON), ischemic (ischemic optic neuropathy, ION), compressive (compressive optic neuropathy, CON) and traumatic (traumatic optic neuropathy, TON). Optic neuritis accounted for the majority of cases ($\approx 74\%$), reflecting its predominance in the NGON spectrum. Although the clinical diagnosis of optic neuritis was abundant, the exact diagnosis seems difficult to clearly establish the exact cause of optic neuritis. The patients must follow several diagnostic procedures including neuroimaging and blood biomarkers, until each subtype of

optic neuritis can be established whether it is MS, SLE, NMO, or other autoimmune diseases. In our cohort, multiple sclerosis emerged as the principal underlying disorder for ON, consistent with international series that identify MS as the leading cause of inflammatory optic neuropathy.⁴ Compressive optic neuropathy comprised 12% of cases and showed a marked predilection for middle-aged women; this mirrors published data linking a higher incidence of optic-nerve-compressing meningiomas and sellar tumors to this demographic. The rising proportion of CON makes it the second most common NGON subtype in this population.⁵ Ischemic optic neuropathy represented about 8% of cases and is recognized as a major contributor to severe visual loss in older adults.^{6,7} Traumatic optic neuropathy was the least frequent ($\approx 5\%$). Most TON cases followed frontal or frontotemporal cranio-cerebral injuries, with road-traffic accidents being the chief mechanism of trauma.⁸

These findings highlight the diverse etiological landscape of non-glaucomatous optic neuropathy in Indonesia and underscore the importance of tailored diagnostics to the treatment. These small preliminary data may be overly ambitious in its attempt to draw epidemiological conclusions, therefore more detailed descriptive study is needed to investigate each characteristic of the optic neuropathy subtypes.

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