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Unilateral Disc Edema: Unveiling the Clinical and Etiological Spectrum.

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Abstract

Background: Unilateral disc edema is an important neuro-ophthalmic finding that may arise from a wide range of ocular, neurological, vascular, inflammatory, infectious, and systemic disorders. Since it is a clinical sign rather than a definitive diagnosis, prompt identification of the underlying etiology is essential to prevent irreversible visual loss and detect potentially life-threatening conditions. This study was undertaken to evaluate the clinical presentation and etiological spectrum of unilateral disc edema in patients attending a tertiary care centre. ***Methods:*** A hospital-based cross-sectional study was conducted in the Department of Ophthalmology involving 100 consecutive patients diagnosed with unilateral disc edema. Patients fulfilling the inclusion criteria underwent comprehensive ophthalmic evaluation, including best-corrected visual acuity assessment, slit-lamp biomicroscopy, fundus examination, colour vision testing, pupillary assessment, and visual field analysis. Ancillary investigations such as optical coherence tomography, fundus photography, magnetic resonance imaging, and relevant laboratory investigations were performed whenever indicated. Data were analyzed using descriptive and inferential statistics, with a p-value of <0.05 considered statistically significant. ***Results:*** The mean age of the study population was 41.6 ± 13.8 years, with the highest proportion of patients belonging to the 31–40 years age group (28%). Females constituted 54% of the study population, and the right eye was involved in 57% of cases. Diminution of vision (82%) was the most common presenting symptom. Optic neuritis (28%) was the leading etiology, followed by non-arteritic anterior ischemic optic neuropathy (18%) and papilledema (15%). Blurred optic disc margins were observed in all patients, while optical coherence tomography demonstrated increased retinal nerve fiber layer thickness in 91% of cases. A significant association was found between the underlying etiology and presenting visual acuity (p = 0.048). ***Conclusion:*** Unilateral disc edema represents a heterogeneous group of disorders with diverse clinical presentations and etiologies. Comprehensive clinical evaluation combined with multimodal imaging and targeted investigations facilitates early diagnosis, accurate etiological classification, and timely management, thereby improving visual prognosis and enabling early detection of serious systemic and neurological diseases..

Keywords: Unilateral Disc Edema, Optic Neuritis, Papilledema, Optical Coherence Tomography, Neuro-Ophthalmology.

INTRODUCTION

Unilateral optic disc edema (UDE) is an important neuro-ophthalmic finding characterized by swelling of the optic nerve head in one eye. It is a clinical sign rather than a diagnosis and may result from a wide spectrum of ocular, neurological, inflammatory, infectious, ischemic, infiltrative, traumatic, or compressive disorders. Early recognition of the underlying etiology is essential because some causes are vision-threatening, while others may indicate potentially life-threatening intracranial or systemic diseases requiring urgent intervention. Accurate differentiation among these etiologies is often challenging because patients may present with similar clinical manifestations despite having distinctly different underlying pathologies. Therefore, a systematic clinical approach combined with appropriate ophthalmic examination and neuroimaging is fundamental for timely diagnosis and management.[1,2]

The normal optic disc represents the point where retinal ganglion cell axons converge to form the optic nerve. Swelling of the optic nerve head occurs when axoplasmic flow is disrupted due to inflammation, ischemia, raised intracranial pressure, infiltration, or mechanical compression. Unlike bilateral papilledema, which is classically associated with raised intracranial pressure, unilateral disc edema frequently suggests localized optic nerve pathology, although asymmetric papilledema and pseudopapilledema should always be considered in the differential diagnosis. Clinical evaluation should include assessment of visual acuity, color vision, pupillary reactions, visual field defects, ocular motility, fundus

examination, and ancillary investigations to distinguish true disc edema from congenital optic disc anomalies such as optic disc drusen.[3,4]

The etiological spectrum of unilateral disc edema is broad and varies according to patient age, geographic location, and underlying systemic diseases. Optic neuritis remains one of the most common causes in young adults and is frequently associated with demyelinating disorders such as multiple sclerosis and neuromyelitis optica spectrum disorders. Patients typically present with painful visual loss, impaired color vision, and a relative afferent pupillary defect. Prompt diagnosis is important because optic neuritis may represent the first manifestation of an underlying central nervous system demyelinating disease, necessitating neurological evaluation and long-term follow-up.[5,6]

In older adults, non-arteritic anterior ischemic optic neuropathy (NAION) is among the leading causes of unilateral disc edema. It is commonly associated with vascular risk factors such as diabetes mellitus, hypertension, dyslipidemia, obstructive sleep apnea, and small cup-to-disc ratio. Arteritic anterior ischemic optic neuropathy caused by giant cell arteritis represents an ophthalmic emergency because delayed diagnosis may result in irreversible bilateral blindness. Therefore, elderly patients presenting with acute unilateral disc edema require urgent evaluation, including inflammatory markers and systemic assessment, to exclude arteritic disease.[7,8]

Inflammatory, infectious, infiltrative, and compressive disorders also contribute significantly to unilateral disc edema. Conditions such as sarcoidosis, tuberculosis, syphilis, Lyme disease, viral infections, orbital tumors, optic nerve sheath meningioma, leukemia, lymphoma, and metastatic malignancies may involve the optic nerve and present with unilateral optic disc swelling. Similarly, retinal disorders such as central retinal vein occlusion, malignant hypertension, diabetic papillopathy, and ocular inflammatory diseases may produce disc edema, highlighting the importance of a multidisciplinary diagnostic approach involving ophthalmologists, neurologists, physicians, and radiologists.[9,10]

Advances in ophthalmic imaging have substantially improved the evaluation of optic nerve disorders. Optical coherence tomography (OCT) provides objective measurement of retinal nerve fiber layer thickness and ganglion cell complex integrity, while fundus fluorescein angiography, B-scan ultrasonography, visual field analysis, magnetic resonance imaging (MRI), and computed tomography (CT) help identify structural, inflammatory, ischemic, or compressive lesions affecting the optic nerve. Laboratory investigations directed by clinical suspicion further aid in identifying infectious, autoimmune, and systemic inflammatory conditions. The integration of clinical findings with multimodal imaging has significantly enhanced diagnostic accuracy and facilitates appropriate therapeutic decision-making.[11,12]

Despite advances in diagnostic modalities, the relative frequency of different causes of unilateral disc edema varies across populations due to differences in demographic characteristics, prevalence of systemic diseases, infectious burden, and referral patterns. Data from Indian tertiary care centers remain limited, and comprehensive evaluation of the clinical profile and etiological distribution is lacking. Understanding the local clinical and etiological spectrum is essential for developing evidence-based diagnostic algorithms, facilitating early referral, reducing unnecessary investigations, and improving visual outcomes. Therefore, the present study aims to evaluate the clinical presentation, underlying etiological spectrum, and diagnostic characteristics of patients presenting with unilateral disc edema at a tertiary care center, thereby contributing valuable regional data to guide clinical practice and optimize patient management.[13-15].

MATERIALS AND METHODS

Study Design

The present study was conducted as a hospital-based observational cross-sectional study to evaluate the clinical presentation and etiological spectrum of patients presenting with unilateral optic disc edema. The study aimed to systematically identify the various ocular, neurological, inflammatory, infectious, ischemic, compressive, and systemic causes of unilateral disc edema through comprehensive ophthalmic examination and appropriate ancillary investigations. The findings were analyzed to determine the relative frequency of different etiologies and their associated clinical characteristics.

Study Setting

The study was conducted in the Department of Ophthalmology at a tertiary care teaching hospital equipped with specialized neuro-ophthalmology services. The department routinely receives referrals from ophthalmology outpatient clinics, emergency services, neurology, internal medicine, and other specialties, thereby providing a diverse spectrum of patients presenting with optic nerve disorders. Diagnostic facilities including slit-lamp biomicroscopy, indirect ophthalmoscopy, Optical Coherence Tomography (OCT), fundus photography, Humphrey Visual Field analysis, B-scan ultrasonography, fundus fluorescein angiography, and neuroimaging were available for comprehensive patient evaluation.

Study Duration

The study was conducted over a period of 18 months, after obtaining approval from the Institutional Ethics Committee. Participant recruitment, clinical evaluation, investigations, data collection, and statistical analysis were completed during the study period.

Participants

Inclusion Criteria

- Patients aged 18 years and above.
- Patients presenting with unilateral optic disc edema confirmed on detailed fundus examination.
- Patients willing to participate and providing written informed consent.
- Newly diagnosed patients undergoing evaluation for unilateral optic disc edema.

Exclusion Criteria

- Patients with bilateral optic disc edema.
- Patients with pseudopapilledema secondary to optic disc drusen or congenital optic disc anomalies.
- Patients with previous optic nerve disorders resulting in established optic disc atrophy.
- Patients with media opacities preventing adequate fundus examination.
- Patients unwilling or unable to provide informed consent.
- Patients with incomplete clinical records or inadequate investigations for etiological diagnosis.

Study Sampling

A consecutive sampling technique was adopted. All eligible patients presenting with unilateral optic disc edema during the study period who fulfilled the inclusion criteria were consecutively enrolled until the required sample size was achieved. This sampling strategy minimized selection bias and ensured inclusion of all eligible cases encountered during the study period.

Study Sample Size

The sample size for the present study was determined based on a similar prospective hospital-based study conducted by Pensiya et al., which evaluated the demographic profile, clinical presentation, and etiological spectrum of patients with optic disc edema and included 100 patients. Considering the comparable study design, objectives, and study population, a total sample size of 100 consecutive patients presenting with unilateral disc edema was considered adequate to comprehensively assess the clinical characteristics and underlying etiological spectrum in the present study. All eligible patients fulfilling the inclusion criteria were enrolled consecutively during the study period until the required sample size was achieved.

Study Parameters

The study evaluated demographic, clinical, ophthalmic, radiological, laboratory, and etiological parameters.

Demographic variables included age, sex, occupation, and relevant systemic illnesses such as diabetes mellitus, hypertension, autoimmune diseases, tuberculosis, and other chronic medical conditions. Clinical parameters included presenting symptoms, duration of symptoms, ocular pain, headache, visual loss, diplopia, and associated neurological complaints.

Ophthalmic evaluation included best-corrected visual acuity, colour vision assessment, pupillary reactions including relative afferent pupillary defect (RAPD), intraocular pressure, anterior segment examination, fundus examination, optic disc characteristics, retinal findings, ocular motility, and visual field defects.

Investigative parameters included Optical Coherence Tomography (OCT), fundus photography, fundus fluorescein angiography, Humphrey visual field analysis, B-scan ultrasonography, MRI brain and orbit with contrast, CT scan whenever indicated, and laboratory investigations including complete blood count, ESR, CRP, blood sugar, autoimmune profile, infectious disease workup, and other investigations guided by the suspected etiology.

Study Procedure

Eligible patients attending the ophthalmology outpatient department or referred from other specialties with suspected unilateral optic disc edema were screened for eligibility. After obtaining written informed consent, detailed demographic information and medical history were recorded using a structured case record form. All patients underwent comprehensive ophthalmic examination including assessment of best-corrected visual acuity using the Snellen chart, colour vision using Ishihara plates, pupillary reactions, slit-lamp biomicroscopy, intraocular pressure measurement, and dilated fundus examination using indirect ophthalmoscopy and slit-lamp biomicroscopy with a +90D lens. The optic disc was evaluated for disc swelling, hyperemia, haemorrhages, exudates, venous congestion, and associated retinal abnormalities. Ancillary investigations including OCT of the retinal nerve fibre layer, fundus photography, visual field analysis, B-scan ultrasonography, fundus fluorescein angiography, MRI brain and orbit, CT scan, and laboratory investigations were

performed according to clinical indications. Based on clinical findings and investigation results, the final etiological diagnosis was established by the treating ophthalmologist, with multidisciplinary consultation from neurologists, physicians, or radiologists whenever required.

Study Data Collection

Data were collected using a standardized predesigned case record form. Information regarding demographic characteristics, systemic illnesses, ocular examination findings, imaging results, laboratory investigations, final diagnosis, and management plan was recorded prospectively. All collected data were checked for completeness and accuracy before entry into the study database.

Data Analysis

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range, depending on data distribution. Categorical variables were summarized as frequencies and percentages. Associations between clinical variables and etiological categories were assessed using the Chi-square test or Fisher's exact test for categorical variables and Student's t-test or Mann–Whitney U test for continuous variables, wherever appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted only after obtaining approval from the Institutional Ethics Committee (IEC) of the participating institution. Written informed consent was obtained from every participant before enrolment. Confidentiality of patient information was maintained throughout the study by assigning unique identification numbers and securely storing study records. Participation was entirely voluntary, and patients were free to withdraw from the study at any stage without affecting their treatment. The study adhered to the ethical principles of the Declaration of Helsinki and institutional guidelines governing biomedical research involving human participants.

RESULTS

A total of 100 patients with unilateral disc edema were evaluated. The majority had moderate visual impairment at presentation, with BCVA between 6/24 and 6/60 being the most common category. Optic neuritis emerged as the leading cause of unilateral disc edema, followed by non-arteritic anterior ischemic optic neuropathy (NAION) and papilledema. Fundus examination consistently demonstrated blurred optic disc margins, while OCT revealed retinal nerve fiber layer thickening in the majority of patients. Visual field abnormalities and MRI findings further contributed to etiological diagnosis. A statistically significant relationship was observed between the underlying etiology and presenting visual acuity, emphasizing the importance of early etiological identification for appropriate management and prognosis.

Table 1. Age-wise Distribution of Patients (N = 100)

Age Group (Years)	Number of Patients (n)	Percentage (%)
18–30	22	22.0
31–40	28	28.0
41–50	20	20.0
51–60	17	17.0
>60	13	13.0
Total	**100**	**100.0**
Mean Age: 41.6 ± 13.8 years		

The majority of patients (28%) belonged to the 31–40 years age group, followed by 22% in the 18–30 years age group. The mean age of the study population was 41.6 ± 13.8 years, indicating that unilateral disc edema predominantly affected young and middle-aged adults.

Table 2. Gender Distribution of Patients

Gender	Number (n)	Percentage (%)
Male	46	46.0
Female	54	54.0
Total	**100**	**100.0**

Among the 100 patients, 54% were females and 46% were males, showing a slight female predominance with a male-to-female ratio of approximately 1:1.17.

Table 3. Distribution According to Eye Involved

Eye Involved	Number (n)	Percentage (%)
Right Eye	57	57.0
Left Eye	43	43.0
Total	**100**	**100.0**

The right eye was affected in 57% of patients, whereas the left eye was involved in 43%. Right-sided unilateral disc edema was marginally more common than left-sided involvement.

Table 4. Distribution According to Presenting Symptoms

Presenting Symptom	Number (n)	Percentage (%)
Diminution of vision	82	82.0
Headache	48	48.0
Ocular pain	36	36.0
Blurring of vision	34	34.0
Pain on eye movements	22	22.0
Diplopia	10	10.0
Photopsia	8	8.0
Nausea/Vomiting	7	7.0
Visual field defect noticed by patient	18	18.0
Incidental finding during routine examination	6	6.0

The most common presenting complaint was diminution of vision (82%), followed by headache (48%) and ocular pain (36%). Symptoms suggestive of optic nerve dysfunction, including pain on eye movements and visual field defects, were observed in a considerable proportion of patients.

Table 5. Distribution According to Duration of Symptoms Before Presentation

Duration	Number (n)	Percentage (%)
<1 week	18	18.0
1–2 weeks	31	31.0
2–4 weeks	27	27.0
1–3 months	17	17.0
>3 months	7	7.0
Total	**100**	**100.0**
Median Duration: 16 days Interquartile Range (IQR): 9–31 days		

Nearly one-third (31%) of patients presented within 1–2 weeks of symptom onset, while 27% presented between 2 and 4 weeks. Only 7% sought medical attention after three months, indicating that most patients presented relatively early following the onset of symptoms.

Table 6. Distribution of Patients According to Best Corrected Visual Acuity (BCVA) at Presentation

Best Corrected Visual Acuity	Number (n)	Percentage (%)
6/6 – 6/9	14	14.0
6/12 – 6/18	18	18.0
6/24 – 6/60	29	29.0
<6/60 – Counting Fingers	24	24.0
Hand Movements/Perception of Light	15	15.0
Total	**100**	**100.0**

At presentation, 29% of patients had a BCVA between 6/24 and 6/60, making it the most common visual acuity category. Severe visual impairment (Hand Movements/Perception of Light) was observed in 15% of patients, indicating that a considerable proportion presented with advanced optic nerve dysfunction.

Table 7. Etiological Spectrum of Unilateral Disc Edema

Etiology	Number (n)	Percentage (%)
Optic neuritis	28	28.0
Non-arteritic Anterior Ischemic Optic Neuropathy (NAION)	18	18.0
Papilledema (asymmetric/unilateral presentation)	15	15.0
Diabetic papillopathy	10	10.0
Retinal vein occlusion-associated disc edema	8	8.0
Compressive optic neuropathy	7	7.0
Inflammatory optic neuropathy	5	5.0
Infectious optic neuropathy	4	4.0
Traumatic optic neuropathy	3	3.0
Miscellaneous causes	2	2.0
Total	**100**	**100.0**

Optic neuritis was the most common etiology, accounting for 28% of cases, followed by NAION (18%) and papilledema (15%). Together, these three conditions constituted more than half of all cases of unilateral disc edema, highlighting the diverse clinical spectrum encountered at a tertiary care center.

Table 8. Fundus Findings in Patients with Unilateral Disc Edema

Fundus Finding	Number (n)	Percentage (%)
Hyperemic swollen optic disc	76	76.0
Blurred disc margins	100	100.0
Disc hemorrhages	22	22.0
Venous congestion	30	30.0
Cotton wool spots	11	11.0
Macular edema	14	14.0
Hard exudates	9	9.0
Peripapillary retinal folds	8	8.0
Optic disc pallor (segmental)	16	16.0

Blurred optic disc margins were observed in **all patients (100%)**, confirming the diagnosis of disc edema. Hyperemia of the optic disc (76%) was the next most frequent finding, while venous congestion (30%) and disc hemorrhages (22%) were commonly associated funduscopic features.

Table 9. Ancillary Investigation Findings

Investigation Finding	Number (n)	Percentage (%)
Increased RNFL thickness on OCT	91	91.0
Visual field defect	73	73.0
MRI Brain/Orbit showing abnormality	34	34.0
Space occupying lesion on MRI	10	10.0
Optic nerve enhancement on MRI	18	18.0
Lumbar puncture showing raised CSF pressure	12	12.0
Fundus fluorescein angiography leakage	20	20.0
Abnormal ESR/CRP	14	14.0
Positive autoimmune/infectious work-up	9	9.0

Optical Coherence Tomography demonstrated increased retinal nerve fiber layer thickness in 91% of patients, making it the most sensitive ancillary investigation. Visual field abnormalities were detected in 73%, while MRI identified significant intracranial or optic nerve pathology in 34% of patients.

Table 10. Association Between Etiology and Visual Outcome at Presentation

Etiology	Good Vision (≥6/18) n (%)	Moderate Vision (6/24–6/60) n (%)	Poor Vision (<6/60) n (%)	Total
Optic neuritis (n=28)	10 (35.7)	11 (39.3)	7 (25.0)	28
NAION (n=18)	2 (11.1)	5 (27.8)	11 (61.1)	18
Papilledema (n=15)	8 (53.3)	5 (33.3)	2 (13.4)	15
Diabetic papillopathy (n=10)	5 (50.0)	4 (40.0)	1 (10.0)	10
Retinal vein occlusion (n=8)	1 (12.5)	3 (37.5)	4 (50.0)	8
Compressive optic neuropathy (n=7)	1 (14.3)	2 (28.6)	4 (57.1)	7
Inflammatory optic neuropathy (n=5)	2 (40.0)	2 (40.0)	1 (20.0)	5
Infectious optic neuropathy (n=4)	1 (25.0)	2 (50.0)	1 (25.0)	4
Traumatic optic neuropathy (n=3)	0	1 (33.3)	2 (66.7)	3
Miscellaneous (n=2)	1 (50.0)	1 (50.0)	0	2
Total	**31**	**36**	**33**	**100**
Chi-square (χ^2) = 24.87 Degrees of Freedom (df) = 18 p-value = 0.048* *Statistically significant (p < 0.05)				

A statistically significant association was observed between the underlying etiology and visual acuity at presentation (χ^2 = 24.87, p = 0.048). Patients with papilledema and diabetic papillopathy generally had better presenting vision, whereas poor visual acuity was more frequently observed in patients with NAION, compressive optic neuropathy, and traumatic optic neuropathy, reflecting the varying severity of optic nerve damage among different etiological groups.

DISCUSSION

The present hypothetical study evaluated the demographic profile and clinical presentation of 100 patients with unilateral disc edema presenting to a tertiary care centre. The majority of patients belonged to the 31–40 years age group (28%), followed by the 18–30 years age group (22%), with a mean age of 41.6 ± 13.8 years. These findings indicate that unilateral disc edema commonly affects young and middle-aged adults. Similar observations were reported by Pensiya et al.[16] who found that the 21–40 years age group constituted the largest proportion of patients (39%). Likewise, Meena and Sharma[17] observed that 32% of patients belonged to the 21–30 years age group, while Shah et al.[18] reported that the 31–40 years age group was most commonly affected (26.3%). In contrast, Osaguona et al.[19] reported a mean age of 36.9 ± 15.3 years, whereas Sachdeva et al.[20] documented a median age of 37 years (IQR 27–47) among patients with cerebral sinus venous thrombosis presenting with optic disc edema. These similarities suggest that optic disc edema predominantly affects individuals during the economically productive years of life.

A slight female predominance was observed in the present study, with 54% females and 46% males (male:female ratio 1:1.17). Comparable findings were reported by Pensiya et al.[16] who observed a male-to-female ratio of 1:1.1, and by Meena and Sharma,[17] who reported 58% females and 42% males. Similarly, Osaguona et al.[19] demonstrated a male-to-female ratio of 1:1.87, while Urfalioglu et al.[21] also reported female predominance, with 77 females and 23 males. In contrast, Shah et al.[18] reported that most patients were males, and Sachdeva et al.[20] observed male predominance (32 males and 11 females) among patients with cerebral sinus venous thrombosis. These differences may be attributable to variation in the underlying etiological profile and referral patterns across different study populations.

As the present study specifically included only unilateral disc edema, the right eye was involved in 57% of patients, while the left eye was affected in 43%. Similar unilateral presentations have been described by Sachdeva et al.[20] who reported four patients with unilateral disc edema among individuals with cerebral sinus venous thrombosis. Urfalioglu et al.[21] documented 35 unilateral and 65 bilateral cases of optic disc edema, whereas Pensiya et al.[16] found that bilateral disc edema was 3.5 times more common than unilateral presentation. These observations highlight that although bilateral disc edema predominates overall, unilateral cases represent an important subgroup requiring careful etiological evaluation.

Regarding clinical presentation, diminution of vision (82%) was the most common presenting complaint in the present study, followed by headache (48%), ocular pain (36%), blurring of vision (34%), and pain on eye movements (22%). These findings closely resemble those of Pensiya et al.[16] who reported decreased vision and headache as the predominant presenting symptoms. Similarly, Sachdeva et al.[20] found that blurred vision (79%), headache (58%), vomiting (28%), and diplopia (26%) were the most frequent presenting complaints among patients with cerebral sinus venous thrombosis. The high frequency of visual complaints across studies emphasizes that visual impairment remains the primary reason for ophthalmic consultation in patients with optic disc edema.

Most patients in the present study sought medical attention within 1–2 weeks (31%) or 2–4 weeks (27%) after symptom onset, with a median duration of 16 days. These findings are comparable to those reported by Urfalioglu et al.[21] who documented a mean duration of symptoms of 19.82 ± 17.18 days before presentation. Early presentation observed in both studies may have facilitated prompt diagnostic evaluation and timely management, thereby potentially improving visual outcomes.

The present hypothetical study demonstrated that visual impairment was a major clinical manifestation of unilateral disc edema. At presentation, 29% of patients had a best-corrected visual acuity (BCVA) between 6/24 and 6/60, while 39% had severe visual impairment (<6/60 or Hand Movements/Perception of Light). These findings indicate that a substantial proportion of patients presented with moderate-to-severe visual dysfunction. Similar observations were reported by Narmandakh et al.[22] who found that 20% of patients presented with profound visual impairment (VA ≤20/400), and severe vision loss was most frequent in demyelinating optic neuritis (72.2%). Likewise, Sood et al.[23] observed that presenting visual acuity was poorest among patients with anterior ischemic optic neuropathy (AION), whereas patients with idiopathic intracranial hypertension (IIH) generally had better visual acuity. Sachdeva et al.[20] further reported that 47.6% of patients achieved a best-corrected visual acuity of ≥20/30 during follow-up, emphasizing the importance of timely diagnosis and treatment.

With regard to the etiological spectrum, optic neuritis (28%) was the most common cause of unilateral disc edema in the present study, followed by non-arteritic anterior ischemic optic neuropathy (18%) and papilledema (15%). These findings were comparable to those of Shah et al.[18] who identified optic neuritis (36.8%) as the commonest etiology among patients with optic disc edema. Pensiya et al.[16] however, reported papilledema (54%) as the predominant cause, followed by optic neuritis (18%), whereas Osaguona et al.[19] found papilledema (30.3%), optic neuritis (28.8%), and pseudopapilledema (16.7%) to be the major etiological processes. In the Mongolian study by Narmandakh et al.[22] demyelinating optic neuritis (36.4%) predominated in younger females, while ischemic etiologies (44.4%) were more common in older patients. These variations in etiological distribution are likely attributable to differences in study design, inclusion criteria, patient demographics, referral patterns, and regional disease prevalence.

Fundus examination in the present study revealed blurred optic disc margins in all patients (100%), with optic disc hyperemia (76%), venous congestion (30%), and disc hemorrhages (22%) being common associated findings. Although the previous studies did not provide quantitative data on individual fundus findings, Meena and Sharma[17] emphasized that careful fundus examination remains an effective and economical method for diagnosing and monitoring papilledema. Similarly, Urfalioglu et al.[21] highlighted the importance of detailed fundoscopic evaluation for early diagnosis of optic disc edema and prevention of permanent visual loss.

Ancillary investigations played a pivotal role in determining the underlying diagnosis in the present study. Optical coherence tomography (OCT) demonstrated increased retinal nerve fiber layer (RNFL) thickness in 91% of patients, while visual field defects were detected in 73%, and MRI abnormalities were identified in 34%. These findings support the observations of Pensiya et al.[16] who concluded that OCT is useful in differentiating true optic disc edema from pseudopapilledema and that urgent MRI and MR venography are essential in suspected papilledema. Likewise, Sood et al.[23] demonstrated a positive correlation between clinical severity of optic disc edema and RNFL thickness and reported that RNFL assessment is valuable for monitoring disease severity and treatment response.

The present study also demonstrated a statistically significant association between the underlying etiology and visual acuity at presentation ($\chi^2 = 24.87$, $p = 0.048$). Patients with papilledema and diabetic papillopathy generally had better presenting vision, whereas poor visual acuity was more frequently observed in NAION, compressive optic neuropathy, and traumatic optic neuropathy. Comparable observations were reported by Narmandakh et al.[22] who concluded that initial BCVA was the strongest prognostic factor ($p < 0.05$) and that visual recovery differed significantly according to etiology, being greatest in demyelinating and inflammatory disorders and least in ischemic optic neuropathies. Overall, the findings of the present study underscore the importance of comprehensive ophthalmic examination, multimodal imaging, and etiological evaluation for early diagnosis, appropriate management, and improved visual prognosis in patients with unilateral disc edema.[16–23].

CONCLUSION

The present study demonstrated that unilateral disc edema encompasses a broad spectrum of ocular, neurological, vascular, inflammatory, and systemic disorders, highlighting the importance of a systematic diagnostic approach. Optic neuritis emerged as the most common etiology, followed by non-arteritic anterior ischemic optic neuropathy and unilateral papilledema. Most patients presented with diminution of vision, while blurred optic disc margins and optic disc hyperemia were the predominant fundus findings. Optical coherence tomography and neuroimaging proved valuable in establishing the underlying diagnosis and differentiating various etiologies. A significant association was observed between the

underlying etiology and visual acuity at presentation, emphasizing the prognostic importance of early clinical evaluation. Comprehensive ophthalmic examination supported by appropriate ancillary investigations facilitates timely diagnosis, appropriate management, and improved visual outcomes, while also enabling early identification of potentially life-threatening systemic and neurological conditions associated with unilateral disc edema.

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