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Profile of optic atrophy presented in the neuro-ophthalmology department of the tertiary eye care center

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ABSTRACT

Background: Optic atrophy is a clinical presentation in which the optic disc appears pale due to irreversible damage of retinal ganglion cells and axons in the anterior visual pathway. **Aims and Objectives:** The aim of this study was to determine the profile of optic atrophy cases in the neuro-ophthalmology department of a tertiary eye hospital and to identify the common causes and associated visual impairments. **Materials and Methods:** This was a cross-sectional study conducted from January 2021 to December 2021, using convenience sampling method for data collection. Demographic data, medical history, and examinations were conducted on all included patients. Optic atrophy secondary to glaucomatous optic nerve damage was excluded. This study included both children and adults with both congenital and acquired patients with optic atrophy. Best-corrected visual acuity (BCVA) was recorded and anterior segment examinations were conducted using a torchlight to assess pupillary reaction and slit lamp to assess other anterior segment details. The posterior segment was evaluated on a dilated pupil with a handheld magnifying 90D lens and a slit lamp. Color vision and contrast sensitivity and visual field assessments were performed whenever possible. **Results:** Out of 127 patients enrolled, 55.1% were male and 44.9% were female. The median age was 40, with a minimum age of 4 years to a maximum of 85 years old. Twenty-one percent were below 20 years old and they were associated with congenital causes, hydrocephalus and sequelae to bilateral papillitis. The most common age group was 40–50 years, comprising 21.3%. The total of eyes presented with optic atrophy was 214. Unilateral involvement of the eye was 31.5%, the patients with the right eye in 18.9% and the left eye in 12.6%. Both eye optic atrophies were found in 68.5%. The most common cause of optic atrophy was non-arteritic anterior ischemic optic neuropathy (NAION) in 22.8% of cases, the second common cause was papilledema in 16.5%, and then, traumatic optic neuropathy comprised 15.7% of patients. BCVA in the right eye was <6/60 in 58.3% of cases and in the left eye 56.7%. **Conclusion:** Optic atrophy did not show sex predisposition. The most common age group affected was 40–50 years, and patients above 40 years comprised nearly half of the patients. Bilateral optic atrophy was common. The most common cause of optic atrophy was NAION, followed by papilledema, traumatic optic neuropathy, and optic neuritis. Optic atrophy is one of the leading causes to irreversible blindness.

Key words: Profile; Optic atrophy; Causes; Congenital; Acquired

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INTRODUCTION

Optic atrophy is a clinical presentation in which the optic disc appears pale due to irreversible damage of retinal ganglion cells and axons in the anterior visual pathway.[1] It has been characterized by slow loss of retinal ganglion cells and their axons from the optic nerve. Each optic nerve carries visual information from retinal photoreceptors to

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the brain.[2] Various studies have shown glaucoma as the leading cause of optic atrophy; however, optic atrophy due to other ophthalmic causes is a different entity.[3,4] The optic atrophy can be congenital (autosomal dominant optic atrophy or Leber hereditary optic neuropathy) or acquired (iatrogenic, autoimmune/inflammatory, metabolic disorders, ischemia, trauma, toxins, stress, intracranial tumors).[2,3,5] Optic atrophy classically presents with severe visual impairment, Relative afferent pupillary defect in unilateral cases and in all cases optic nerve pallor, significant reduction in colour vision and contrast sensitivity and mostly central or cecocentral visual field impairment.[2,5]

The researcher conducted the first study on optic atrophy in the general ophthalmology department, where 60% of the cases were found to be glaucomatous.[3] In this second study, the focus was on neuro-ophthalmological causes of optic atrophy.

Optic atrophy is a prevalent cause of irreversible blindness, and currently, there is no known cure for it. The only available approach is timely management of the causes before optic disc becomes completely pale and dysfunctional. However, patients often visit several eye care centers in search of a cure for this condition. In the researcher's observation, there is often no correlation between the anatomical status and the visual acuity of the patients. This observation highlights the need for further studies in the future to understand this issue.

Aims and objectives

The aim of this study was to determine the profile of optic atrophy cases in the neuro-ophthalmology department of a tertiary eye hospital and to identify the common causes and associated visual impairments.

MATERIALS AND METHODS

This was a cross-sectional study performed on patients coming to the neuro-ophthalmology department of Lumbini Eye Institute and Research Center with unilateral or bilateral optic atrophy from January 2021 to December 2021. Convenience sampling method was used for data collection. Ethical approval was obtained from the Institutional Review Committee. Demographic data, history, and examination of all the included patients were taken. Optic atrophy secondary to glaucomatous optic nerve damage was excluded from the study. All the patients, children, and adults, including both congenital and acquired patients with optic atrophy, were included. After recording name, age, gender, geographical distribution, and ethnicity, a history of constitutional symptoms such as headache, fever, nausea, vomiting, dizziness, or loss of consciousness was taken. The duration of diminution of vision was recorded. A history of associated risk factors was taken such as trauma, dietary habits, cardiovascular disease, disease of chronic illness, drug history, alcohol consumption, and smoking. BCVA was taken. Anterior segment examination with torchlight was done to assess pupillary reaction and RAPD and with slit lamp to assess other anterior segment details. The posterior segment was evaluated on a dilated pupil with a handheld magnifying lens (90D) and a slit lamp. Optic disc pallor with diminution of vision was used as a clinical feature to diagnose optic atrophy. Color vision and contrast sensitivity and visual field were done whenever possible. Neurological imaging with magnetic resonance imaging (MRI) was done whenever indicated.

Data collection was done with standard pro forma and was entered and analyzed in SPSS version 20.

RESULTS

Out of 127 patients enrolled, 70 (55.1%) were male and 57 (44.9%) were female. The median age was 40, with a minimum age of 4 years to a maximum of 85 years old. Twenty-seven (21.3%) patients were below 20 years old. Below 20 years, optic atrophy were associated with congenital causes, hydrocephalus and sequelae to bilateral papillitis. The most common age group was 40–50 years, comprising 21.3%. More than half (52.3%) of the patients were between 30 and 60 years old. The patients above 40 years were 45.7% (Table 1).

The total of eyes presented with optic atrophy was 214. Unilateral involvement of the eye in 40 (31.5%), the patients with the right eye in 24 (18.9%) and the left eye in 16 (12.6%). Both eye optic atrophies were found in 87 (68.5%) (Table 2).

The causes of optic atrophy were primary in 52 (40.9%) and secondary in 74 (58.3%), and one case was consecutive. The most common cause of optic atrophy was non-arteritic anterior ischemic optic neuropathy (NAION) in 29 (22.8%) cases, the second common cause was papilledema in 21 (16.5%), and then, traumatic optic neuropathy comprised 20 (15.7%) patients. Others causes were drug induced optic neuropathy, optic neuritis, idiopathic intracranial hypertension, nutritional, toxic, congenital (Table 3 and Figure 1).

The best-corrected visual acuity (BCVA) in the right eye was <6/60 in 74 (58.3%) cases and in the left eye 72 (56.7%). The BCVA was 3/60 in 50.3% and 51.9% of patients in the right and left eyes, respectively (Tables 4 and 5).

Table 1: Age distribution of patients with optic atrophy

Age range	Frequency (%)
0–10	9 (7.1)
10–20	18 (14.2)
20–30	22 (17.3)
30–40	20 (15.7)
40–50	27 (21.3)
50–60	20 (15.7)
60–70	8 (6.3)
70–80	2 (1.6)
80–90	1 (0.8)
Total	127 (100)

Table 2: Laterality of optic atrophy

Eye involved	Frequency (%)
Right	24 (18.9)
Left	16 (12.6)
Both eye	87 (68.5)
Total	127 (100)

Table 3: Causes of optic atrophy

Causes	Frequency (%)
Optic neuritis	7 (5.5)
Papilledema	21 (16.5)
Idiopathic intracranial hypertension	6 (4.7)
NAION	29 (22.8)
Traumatic ON	20 (15.7)
Drug-induced ON	13 (10.2)
Toxic ON	1 (0.8)
Nutritional ON	1 (0.8)
Congenital ON	4 (3.1)
Others	25 (19.7)
Total	127 (100)

ON: Optic neuropathy, NAION: Non-arteritic anterior ischemic optic neuropathy

Table 4: Best-corrected visual acuity in the right eye

BCVA	Frequency (%)
6/6–6/18	30 (23.6)
6/18–6/60	23 (18.1)
6/60–3/60	6 (4.7)
3/60–1/60	29 (22.8)
HM	20 (15.7)
PL	14 (11)
NPL	1 (0.8)
Total	127 (100)

BCVA: Best-corrected visual acuity, HM: Hand movement, PL: Perception of light, NPL: No perception of light

A history of trauma was present in 20 (15.7%), hypertension in 31 (24.4%), diabetes mellitus in 13 (10.2%), and antituberculosis treatment in 10 (7.9%) (Table 6). MRI was available in 88 (69.3%). Intracranial space-occupying lesion (ICSOL) was seen in 14 patients. ICSOL included pituitary macroadenoma, craniopharyngioma, medulloblastoma, and meningioma.

Table 5: Best-corrected visual acuity in the left eye

BCVA	Frequency (%)
6/6–6/18	35 (27.6)
6/18–6/60	20 (15.7)
6/60–3/60	6 (4.7)
3/60–1/60	20 (15.7)
HM	21 (16.5)
PL	16 (12.6)
NPL	9 (7.1)
Total	127 (100)

BCVA: Best-corrected visual acuity, HM: Hand movement, PL: Perception of light, NPL: No perception of light

Table 6: Association of risk factor with optic atrophy patients

History	Frequency (%)
Trauma	20 (15.7)
Hypertension	31 (24.4)
Diabetes mellitus	13 (10.2)
Antituberculosis treatment	10 (7.9)

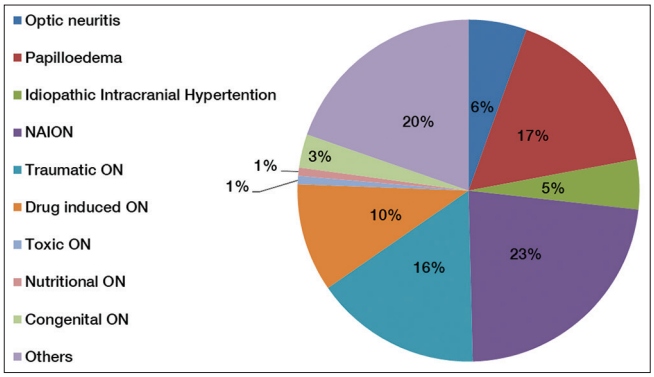

Figure 1: Causes of optic atrophy

DISCUSSION

In our study, 55.1% of optic atrophy patients were male and 44.9% female. This result was similar to the study conducted in Nigeria where 52.5% of males and 47.5% of females were found.[6] It was also similar to the previous study conducted in the general outpatient department in Nepal.[3] However, in a study conducted by Oluleye et al., the male-to-female ratio was 2:1.[7] Optic atrophy was common in females (54.5%) than males (45.5%) in a study by Mbekeani et al.[5] In most of the studies, male gender was affected more with optic atrophy,[1,3] and in some studies, females are affected more. There is no sex predisposition for optic atrophy.

In our study, the median age was 40 years, with a range of 4–85 years. The median age was 27 in a study done by Mbekeani et al.[5] Our study included both congenital and acquired causes. The patients below 20 years old were

21.3%. Below 20 years, optic atrophy were associated with congenital causes, hydrocephalus and sequelae to bilateral papillitis. Congenital optic atrophies such as Leber congenital amaurosis and retinitis pigmentosa were common. The most common age group was 40–50 years, comprising 21.3%. More than half (52.3%) of the patients were between 30 and 60 years old. The patients above 40 years were 45.7%. In one study done in Singapore, the highest incidence was in the 5th decade, 25%, followed by the 6th decade, 18.75%, and 56.8% were above 40 years.[8] As age increases, optic atrophy was more common in acquired cases of optic atrophy.

Both eye optic atrophies were more common (68.5%) than unilateral involvement (31.5%) in our study. It was similar to bilateral involvement which was common (74%) in the study by Mbekeani et al.,[5] 67.5% in a study by Osaguona and Okeigbemen.[1] It was dissimilar to a study by Pedro-Egbe et al., who found that 22.5% were bilateral. In unilateral involvement, the occurrence has no predisposition of the eye.[6]

The secondary causes of optic atrophy were common 58.3% followed by primary in 40.9%, and one case was consecutive. This was dissimilar to the previous study done in Lumbini Eye Institute which showed that primary optic atrophy was common, 55%.[3]

The most common cause of optic atrophy in our study was NAION, accounting for 22.8% of cases. The risk factors for NAION were being male gender, hypertension, hyperlipidemia, diabetes mellitus, and coronary heart disease.[9] Hyperopia was a predisposing factor in another study.[10] NAION is the second most common optic neuropathy after glaucoma.[11] This was similar to our study as glaucoma was being excluded in this study. It is caused by infarction of short posterior ciliary arteries that supply the anterior portion of the optic nerve which leads to axonal edema and a compartment syndrome in an already crowded optic disc causing loss of vision.[11] The better understanding of the risk factor can help in therapeutic approaches and prevention of NAION. The researchers' observation was that NAION was common in hyperopic eye and small disc. After one eye involved with NAION, the second eye involvement is also common observation.

In our study, papilledema was the second most common cause of optic atrophy, accounting for 16.5% of cases, while traumatic optic neuropathy comprised 15.7% and optic neuritis accounted for 5.5% of cases. Other causes included drug induced, idiopathic intracranial hypertension, nutritional, toxic, and congenital. In a study by Osaguona and Okeigbemen, trauma was the etiology in 13.5% of cases and compressive lesions in 4.8%.[1] Most of the cases of traumatic optic neuropathy were associated with orbital fracture, maxillofacial fracture, and ocular and craniocerebral injury in a study by Li et al.,[12] Mbekeani et al., found that ICSOL was a common cause in adults accounting for 62.2%.[5] In a study by Pedro Egbe et al., optic neuritis was the etiology in 27.3% of cases.[6]

The study reported several risk factors associated with optic atrophy patients, including trauma, hypertension, diabetes, and antitubercular medication. A history of trauma was present in 15.7%, hypertension in 24.4%, diabetes mellitus in 10.2%, and antituberculosis treatment in 7.9%. MRI was performed in 69.3% of patients, and ICSOL was detected in 14 patients. ICSOL included pituitary macroadenoma, craniopharyngioma, medulloblastoma, and meningioma.

The study found that 58.3% of cases had a BCVA of <6/60 in the right eye and in the left eye 56.7%, which falls under the category of blindness. This was similar to a study by Pedro Egbe et al., who found 60%.[6] The BCVA was 3/60 in 50.3% and 51.9% in patients in the right and left eyes, respectively. BCVA in better eye <3/60 is categorized as social blindness in Nepal.[13] Cataract is the leading cause of curable blindness in Nepal, and optic atrophy is one of the common causes contributing to irreversible blindness.

Limitation and Recommendation

This study provides information on the profile of optic atrophy cases presented in the neuro-ophthalmology department. However, there is scope for further research in this field. An anatomical study of optic disc pallor and correlation with visual acuity could be conducted to understand the pathophysiology of optic atrophy better. Such a study could also help in identifying potential treatment approaches for optic atrophy patients. Additionally, this study was conducted in a cross-sectional manner, and conducting a prospective study over a longer period could provide additional information on the long-term effects of optic atrophy.

CONCLUSION

Optic atrophy affects both sexes equally and was most commonly observed in people aged between 40 and 50 years. As age increases, the incidence of acquired cases of optic atrophy also increased, with almost half of the patients being above 40 years old. Bilateral optic atrophy was more common than unilateral involvement, and there is no specific predisposition for the affected eye in unilateral involvement. NAION was the most common cause of optic atrophy, followed by papilledema, traumatic optic neuropathy, and optic neuritis. In this study, half of the patients were classified as having social blindness with BCVA <3/60. Optic atrophy is a prevalent cause of irreversible blindness.

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KB - Concept and design of the study, reviewed literature, collection of data, preparation, and revision of manuscript; **KJ -** Collection of data and preparation of manuscript; **AH -** Collection of data and revision of manuscript; **LM -** Collection of data and data entry; **HBT -** Revision of manuscript.

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