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# Evaluation of the Etiological Factors in Optic Neuropathies with Visual Loss

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## To cite this article:

Musa Yigit, Levent Tok, Ozlem Yalcın Tok, Yavuz Bardak. Evaluation of the Etiological Factors in Optic Neuropathies with Visual Loss. *American Journal of Internal Medicine*. Vol. 10, No. 4, 2022, pp. 79-82. doi: 10.11648/j.ajim.20221004.11

**Received:** May 7, 2022; **Accepted:** June 25, 2022; **Published:** July 13, 2022

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**Abstract:** Our purpose was to evaluate the etiological of patients who are followed up with optic neuropathy in our clinic. Optic neuritis is the inflammation of the optic nerve. Neuropathy is named like anterior optic neuritis or papillitis, retrobulber neuritis and neuroretinitis, according to the location of the inflammation on the optic nerve. The most common cause of optic neuropathy under the age of 50 is optic neuritis, and above the age of 50 years is nonarteritic optic neuropathy. Optic neuropathy is defined as the decrease of visual function due to inflammatory lesion of the optic nerve. The patient with optic neuropathy has to be evaluated clinically but also with multidisciplinary techniques (radiological imaging methods optic coherence tomography, visual evoked potentials, cerebrospinal fluid examination) because optic neuropathy could be the presenting symptom in multiple sclerosis patients and these patients should be followed by the neurologist in order to signal the appearance of new neurological signs. In our clinic, 50 patients who were diagnosed with optic neuropathy between April 2015 and May 2017 were examined, retrospectively. As a result of this, optic neuropathy etiology differs between age groups, ischemic factors come into prominence especially in older ages and gender predisposition is not seen.

**Keywords:** Agriculture, Etiology, Optic Neuropathy, Vision Loss

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## 1. Introduction

The optic nerve is an important cranial nerve. There are four segments according to the location from the eyeball to the brain; intraocular, intraorbital, intracanalicular, and intracranial. Notable disorders that occur along the four segments are presented. For example, papilledema and anterior ischemic optic neuropathy involve the intraocular segment, dysthyroid optic neuropathy or optic nerve sheath meningiomas affect the intraorbital segment, traumatic optic neuropathy is mainly within the intracanalicular segment, and pituitary tumors and suprasellar masses compromise the intracranial segment [1, 2].

The differential diagnosis of optic nerve swelling differs according to whether the swelling is unilateral or bilateral, or whether visual function is normal or impaired. Patients with abnormal visual function most likely have demyelinating optic

neuritis or non-arteritic anterior ischaemic optic neuropathy. Patients with bilaterally swollen optic nerve heads and normal visual function most likely have papilloedema, and require neuroimaging followed by lumbar puncture. However, if their visual function is affected, the most likely causes are bilateral demyelinating optic neuritis, neuromyelitis optica spectrum disorder and anti-myelin oligodendrocyte glycoprotein optic neuritis: these patients require investigating with contrast-enhanced MRI of the orbits. Patients with a unilaterally swollen optic nerve and normal visual function most likely have optic nerve head drusen [3, 4].

Acute optic neuritis is a common clinical problem, assessment and management are very important to prevent severe visual loss. The optic nerve is the most accessible part of the central nervous system, so optic neuritis also represents an important paradigm to help decipher mechanisms of damage and recovery in the central nervous system [4, 5].

Optic neuritis remains a clinical diagnosis; increasingly optical coherence tomography is a key ancillary investigation. Patients with 'typical' optic neuritis, commonly a first presentation of multiple sclerosis, must be distinguished from 'atypical' optic neuritis [3].

The most common cause of optic neuropathy under the age of 50 is optic neuritis, and above the age of 50 years is nonarteritic optic neuropathy.

Optic neuritis is the inflammation of the optic nerve. If there is an edema on the disc, it is called papillitis or anterior optic neuritis; if the disc is in normal appearance, it is called retrobulbar neuritis. The optic nerve and its surrounding retinal inflammation is called neuroretinitis [2-5].

The most known common cause of the optic neuritis is multiple sclerosis.

In children, optic neuritis caused by infection-parainfection and developing in 1-3 weeks after vaccinations are more frequent.

Ischemic optic neuropathies are named like anterior and posterior according to the location of ischemic damage in the nerve. Optic neuritis is the inflammation of the optic nerve.

Anterior ischemic optic neuropathy contains the syndromes that cause the optic disc edema seen at the beginning of the optic nerve. Posterior ischemic optic neuropathy contains the conditions that hold the intraorbital, intracanalicular or intracranial parts of the optic nerve without an edema in the optic disc.

Ischemic optic neuropathies are divided like arteritic and nonarteritic. Nonarteritic anterior ischemic optic neuropathy is the most common and often idiopathic. Systemic hypertension was reported in 34-50% of patients and diabetes mellitus was reported in 5-25% of patients [6-9].

Cases of ischemic optic neuropathy due to hemodynamic disorder and irradiation to the brain-orbita region have also been reported in the literature.

Optic neuropathy can also be observed due to the trauma as a result of damage caused by a severe impact. The most common cause of trauma is motorcycle accidents. Direct traumatic optic neuropathy is caused by traumas that impair the anatomical and functional integrity of the optic nerve. Indirect traumatic optic neuropathy is as a result of the transmission of forces from far away of the optic nerve to the

optic nerve. Optic nerve damage is seen most common in the intracanalicular region. Optic neuropathy may also develop due to exposure to toxic agents and prolonged nutritional deficiencies. Hereditary and compressive-infiltrative causes rarely cause optic neuropathy [10-13].

The aim of the study is evaluation of the etiological factors in the optic neuropathies in our clinic.

## 2. Materials and Methods

Optic disc edema is a localized swelling of the optic nerve head and it is nonspecific and does not differ from the etiology. Various etiologies may cause optic disc edema, therefore patient history and knowledge of the clinical characteristics of the underlying conditions should be evaluated carefully. On the other hand, papilloedema defines that the optic disc oedema as a consequence of elevated intracranial pressure and it is usually a bilateral involvement of both eyes and visual function can be served until late. Unlike papilloedema, optic disc edema caused by an anterior optic neuropathy is usually unilateral and concomitant with early visual function decrease.

In our clinic, 50 patients who were diagnosed with optic neuropathies between April 2015 and May 2017 were examined, retrospectively.

Our region is famous with apple and cherry agriculture, therefore people may be exposed to agricultural pesticides. That's why we examined the reasons of the optic neuropathies in our clinic.

## 3. Results

Optic neuropathy is defined as the decrease of visual function due to inflammatory lesion of the optic nerve. The patient with optic neuropathy has to be evaluated clinically but also with multidisciplinary techniques (radiological imaging methods optical coherence tomography, visual evoked potentials, cerebrospinal fluid examination) because optic neuropathy could be the presenting symptom in multiple sclerosis patients and these patients should be followed by the neurologist in order to signal the appearance of new neurological signs.

*Table 1. Etiological Factors in Optic Neuropathies.*

Age Groups and Etiologic Factors	Under 20 years age	20-50 years age	Above 50 years age
Glucose-6 phosphate dehydrogenase Deficiency	1	0	0
Trauma	1	0	1
Obesity + Intracranial Pressure Increase	0	1	0
Vitamin B12 deficiency	0	2	2
Vitamin B12 deficiency + Alcohol use	0	1	0
After Myocardial Infarctus	0	1	1
Diabetes mellitus +/- Hipertention	0	4	20
Idiopathic	0	4	11

Twenty-six (52%) of the patients were male and 24 (48%) were female.

Etiological factors were examined by divided into 3 groups: patients aged 20 and under, 20-50 years, 50 years and

50 years of age.

Glucose-6 phosphate dehydrogenase deficiency was seen in one of the patients under 20 years of age, and trauma was seen in the other patient.

In the 20-50 years age group; diabetes mellitus and/or hypertension in four patients, obesity and idiopathic intracranial hypertension in one patient, vitamin B12 deficiency in two patients one of them was with alcohol use and the other one was with myocardial infarction, and trauma in one patient were seen.

No etiological factors were detected in 4 patients in the 20-50 age group and 11 patients over the age of 50 group.

## 4. Discussion

Clinical diagnosis of optic neuropathies is related with visual loss, decreased or altered color vision function, relative afferent pupillary defect (RAPD) (if the optic neuropathy is unilateral), and changes in optic nerve appearance. Clinical characteristics often allow an etiologic diagnosis. Diagnosis of papilledema may have some difficulties in its different stages. It should be differentiated from optic neuropathies and structural abnormalities of the optic disc known as pseudopapilloedema [5, 6].

Optical coherence tomography is a non-invasive interferometric optical tomographic imaging technique that provides cross-sectional in vivo images of the optic nerve and the retina. Optical coherence tomography, ultrasonography and fundus fluorescein angiography are low-invasive diagnostic techniques are also useful to rule out pseudopapilloedema and optic disc swelling secondary to other neuropathies.

For detecting important changes of loss or thickening of the optic nerve, evaluation and measurements of the retinal nerve fiber layer thickness and its subsequent analysis are very useful. Mainly, fundus fluorescein angiography (FFA) remarks the abnormalities and irregularities in the retinal vessel permeability in different types of optic disc swelling, by the way is we can the disorder can be distinguished whether it is a true papilloedema or a pseudopapilloedema. Furthermore, optic disc drusen is a major cause of pseudopapilloedema and for diagnosis ocular ultrasonography is the most reliable technique to show the drusen of the optic disc head [2-5].

The annual incidence of acute optic neuritis is 1-5 per 100,000 in the United States. It usually occurs between the ages of 20 and 50. It occurs 3 times more in women than in men.

A study conducted in Malaysia found that the average age range of optic neuritis was 3-55 in the Asian community, peaked between the ages of 21 and 30, and there was a female predominance [7, 8].

All isolated optic neuritis are thought to be a vague form of multiple sclerosis.

The estimated annual incidence of nonarteritic anterior ischemic optic neuropathy in the United States is 2.3-10.2% and has no gender predisposition.

Arteritic anterior ischemic optic neuropathy is approximately 6% of anterior ischemic optic neuropathy and in the U.S., the estimated annual incidence over the age of 60 is 5.7%, and also more frequent in women.

Although the exact cause is not yet known, the incidence of multiple sclerosis leading to optic neuritis is higher in those living at high altitudes (north America, northwest Europe, new Zealand and south Australia...). As getting closer to the equator, the incidence decreases.

It has been shown in the studies that there is a relationship directly between vitamin D (25-hydroxyvitamin) level and multiple sclerosis occurrence and/or relapse. This situation explains the relationship of sunlight exposure to optic neuropathy partially. The incidence of optic neuritis is eight times higher in white northern Europeans than in blacks and Asians.

In those who migrated to another place before puberty, the incidence varies according to the ethnic and environmental conditions in the place of migration [7-12].

## 5. Conclusion

In our clinic, there were two patients that the causes of trauma which was considered in etiology of the optic neuritis in the under 20 years of age was falling from the bicycle, while in the case over 50 years of age, was the cow's tail hitting to the eye. In both of the two cases which were considered MI (myocardial infarctus) in etiology, vision impairment occurred within ten days after MI. The majority of patients with diabetic-related optic neuropathy had uncontrolled diabetes.

In our study, optic neuropathy etiology differs between age groups, ischemic factors come into prominence especially in older ages and gender predisposition is not seen.

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