

# Clinical Features and Visual Outcome in Acute and Recurrent Cases of Optic Neuritis

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## ABSTRACT

**Introduction:** Optic neuritis is an inflammation of the optic nerve that usually affects young females. In Western countries, natural history and treatment of optic neuritis (ON) has been studied extensively. However aetiology, natural history, clinical features of ON and their relation to multiple sclerosis in Asian population needs to be defined yet.

**Methods:** 30 patients who were diagnosed as optic neuritis were included between June 2013 to December 2014 at BP Koirala Lions Centre for Ophthalmic Studies (BPKLCOS). A detailed history was obtained followed by examination of anterior and posterior segment. Assessment of visual acuity, color vision, contrast sensitivity, visual evoked potential (VEP), visual field and MRI of orbit and brain was done in all cases. All patients were treated with intravenous Methylprednisolone 500mg twice daily for 3 days followed by oral steroid for 11 days which was tapered in the next 4 days. The patients were reassessed at 2 weeks, 1 month and 3 months.

**Results:** A total of 40 eyes of 30 patients were included in the study. Maximum cases (33.3%) belonged to the age group 21-30 years, with mean age being 31.9±13 years. 63% were female and the female: male ratio was 1.7:1. Majority of cases were unilateral (67%). Commonest presenting symptom was diminution of vision (65%). Recurrent optic neuritis was seen in 27% (n=8) only, and one of them was diagnosed as multiple sclerosis thereafter. MRI showed multiple paraventricular oval plaques definite of multiple sclerosis in one patient and one was diagnosed as probable MS who had a single periventricular plaque. Visual evoked potential (VEP) showed increase in the mean P100 latency at 60' and reduction in amplitude in eyes affected with optic neuritis compared to normal eyes. All the patients included in the study were treated with intravenous methylprednisolone followed by oral steroid. At 3 months follow up, 70% had good visual recovery (>6/18). The cause of non-improvement in vision was disc pallor. Optic disc pallor was detected in 37.5% of the eyes during follow up.

**Conclusions:** Good visual recovery was observed in most eyes with acute optic neuritis. Multiple sclerosis was seen in 1 patient who had recurrent optic neuritis.

**Keywords:** optic neuritis; multiple sclerosis

## INTRODUCTION

Optic neuritis refers to inflammation of the optic nerve. Such inflammation may spare the optic disc (retrobulbar optic neuritis) or may cause optic disc swelling (papillitis). Inflammation of the optic disc with adjacent

retinal inflammation is referred to as neuroretinitis. Most patients with acute optic neuritis are between the ages of 20 and 50 years, with a mean age of 30-35 years. Females are affected more commonly than males.<sup>1</sup> In the ONTT, 77% of the patients were female, 85% were Caucasian, and the mean age was 32 ± 7 years. Nevertheless, optic neuritis can occur at any age. 15–20%<sup>2</sup> of patients with definite multiple sclerosis (MS) present with optic neuritis, and an additional 35–40%<sup>3</sup> develop optic neuritis at some point during the course of the disease. Patients with MS may develop subclinical (asymptomatic) optic neuritis.<sup>4,5</sup>

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In Western countries, natural history and treatment of optic neuritis and its relation to MS have been studied extensively but limited study has been carried out in Asian patients. It is important to understand the clinical features of optic neuritis and their relation to MS in Asian patients. This study can act as a guideline for evaluation of such cases as well as a foundation for further studies in this regard.

The objective of the study is to find the clinical features, visual function, electrophysiological tests and visual outcome in acute and recurrent cases of optic neuritis.

## METHODS

**Study Design:** Hospital based descriptive study

**Place of study:** BPKLCOS

**Study period:** 18 months (1st June 2013 to 30th December 2014)

### Inclusion criteria

1. Acute and recurrent cases of optic neuritis presenting to the OPD of BPKLCOS and Emergency department (TUTH).

### Exclusion criteria

1. Patient with congenital optic nerve disorders eg. Optic nerve head dysplasia, Morning glory disc.
2. Patients with glaucomatous optic atrophy.
3. Patient with history of congenital color blindness.
4. Patient with traumatic optic neuropathy.
5. Patients who could not be evaluated as per the study protocol.

### Ethical consideration

The study protocol was approved from Institutional Review Board (IRB) at Institute of Medicine and consent was given for the study.

With the informed consent from the patients, all patients meeting the inclusion criteria presenting to BPKLCOS and receiving

treatment were included in the study.

### Data processing and analysis

Data were entered in the computer database for statistical analysis and analysed with SPSS version 20.

## RESULTS

40 eyes of 30 patients that followed up at least 3 months were enrolled in the study.

Majority of the patients (33.3%) were in the age group of 21 to 30 years.

Mean age of presentation was  $31.9 \pm 13$  years.

63% (n=19) were female and 37% (n=11) were male.

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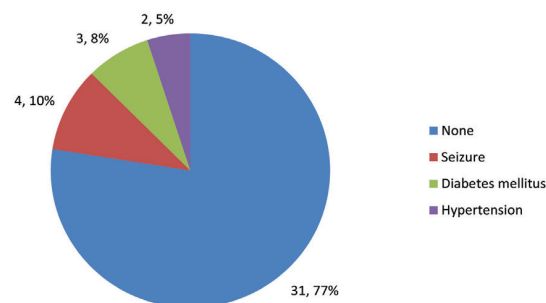
Unilateral cases (67%) of optic neuritis outnumbered the bilateral (33%) cases of optic neuritis.

Right eye was involved in 55% (n=22) and left eye was involved in 45% (n=18).

65% (n=26) had diminution of vision. 17.5% (n=7) had pain on extraocular movements and diminution of vision. 17.5% (n=7) had headache and diminution of vision. (Table 1)

**Table 1. Chief complaints.**

Chief complains	n (%)
Diminution of vision	26 (65.0)
Pain on EOM and diminution of vision	7 (17.5)
Headache and diminution of vision	7 (17.5)
Total	40 (100.0)



**Figure 1. Other systemic illness.**

On presentation, majority of the eyes 43%( n=17) had visual acuity <3/60, 5%( n= 2) were NPL. 2%( n=1) had vision between 5/60-3/60, 40%( n=16) had vision between 6/24 -6/60 and 10%( n=4) had vision between 6/6-6/18. (Table 2)

**Table 2. Visual acuity at presentation and follow up visits.**

Range of VA	At presentation	2 weeks	1 Month	3 Months
	n (%)	n (%)	n (%)	n (%)
6/6-6/18	4 (10)	26 (65)	28 (70)	28 (70)
6/24-6/60	16 (40)	8 (20)	6 (15)	6 (15)
5/60-3/60	1 (2)	0 (0)	0 (0)	1 (2)
<3/60	17 (43)	6 (15)	6 (15)	5 (13)
NPL	2 (5)	0 (0)	0 (0)	0 (0)
Total	40 (100)	40 (100)	40 (100)	40 (100)

After receiving the treatment, at 3 months follow up, 70% ( n= 28) had vision between 6/6-6/18, 15%(n=6) had vision between 6/24 -6/60, 2% (n= 1) had vision between 5/60-3/60 and 13% (n= 5) had vision <3/60. No eyes were NPL.

Among the study population, at initial presentation, 25% (n=10) had normal disc findings, 75% (n=30) had hyperaemic disc.

After receiving treatment, at 3 months follow up 62.5% (n=25) had normal disc findings and 37.5% (n=15) had temporal disc pallor (Table 3).

**Table 3. Optic disc appearance at presentation and follow up visits.**

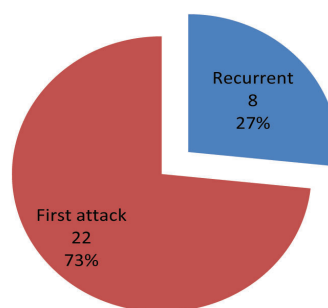
Optic disc appearance	At presentation	2 weeks	1 Month	3 Months
	n (%)	n (%)	n (%)	n (%)
Normal	10 (25)	15 (37.5)	24 (60)	25 (62.5)
Hyperemic	30 (75)	23 (57.5)	2 (5)	0 (0)

Pallor (temporal)	0 (0)	2 (5)	14 (35)	15 (37.5)
Total	40 (100)	40	40	40

The diagnosis of optic neuritis was based upon history, examination of anterior and posterior segment, assessment of visual acuity, color vision, contrast sensitivity, visual evoked potential (VEP), visual field, MRI orbit and brain. Among 40 optic neuritis cases, 67%(n=27) were diagnosed as papillitis and 33%(n=13) were retrobulbar optic neuritis .

In 27% (n=8), there was recurrence of optic neuritis. 3% (n=1) had previous history of optic neuritis in the same eye, 17% (n=5) had prior episode of optic neuritis in the other eye and 7% (n=2) had prior episode of optic neuritis in both eyes.

There was no previous history of optic neuritis in 73% (n=22) of patients. (Figure 2)

**Figure 2. Recurrent optic neuritis.**

At initial presentation, colour vision could not be done in 35% (n=14) due to poor vision. Colour vision was normal in 15%(n=6). There was deutan defect in 7.5% (n=3), tritan defect in 12.5% (n=5), total colour vision defect in 2.5% (n=1) and non-specific colour vision defect in 27.5% (n=11).

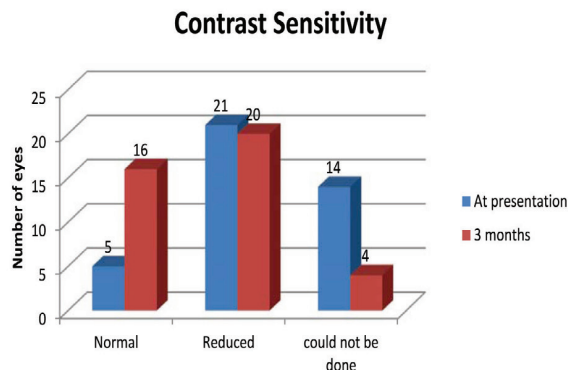
After receiving treatment at 3 months follow up, 37.5% (n=15) eyes had normal colour vision, 10% (n=4) had deutan defect, 15% (n=6) had tritan defect, 27.5% (n=11) had non-specific colour vision defect and colour vision could not be done in 10% (n=4) due to poor vision. (Table 4)

**Table 4.** Colour vision at presentation and follow up visits

Colour vision	At presentation	3 months
	n (%)	n (%)
could not be done	14 (35.0)	4 (10.0)
Normal	6 (15.0)	15 (37.0)
Deutan defect	3 (7.5)	4 (10.0)
Tritan defect	5 (12.5)	6 (15.0)
Total colour blind	1 (2.5)	0 (0)
Non-specific defect	11 (27.5)	11 (27.0)
Total	40 (100)	40 (100)

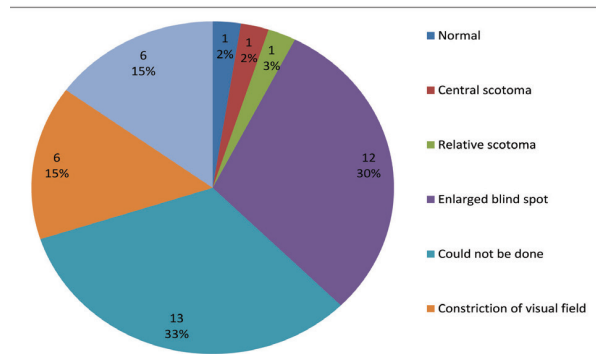
Among 40 eyes included in the study, contrast sensitivity was normal in 12.5% (n=5), reduced in 52.5% (n=21) and couldn't be done in 35% (n=14) on presentation.

After treatment, at 3 months follow up,



**Figure 3.** Evaluation of contrast sensitivity at presentation and 3 months follow up.

In 33% (n=13) visual field testing could not be performed due to poor visual acuity. 30% had enlarged blind spot, 15% had marked constriction of all isopters with enlarged blind spot, 15% had constriction of visual field, 3% had relative scotoma, 2% had central scotoma and 2% had normal visual field. (Figure 4)



**Figure 4.** Evaluation of visual field changes at presentation.

There was significant increase in P100 latency at 60' and reduction in amplitudes in both the frequencies in eyes affected with optic neuritis in comparison to the normal eyes.( Table 5)

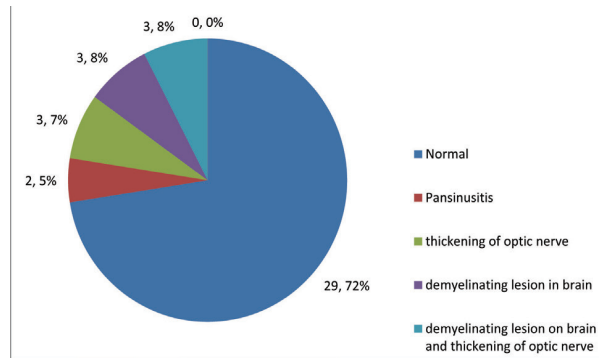
**Table 5.** Evaluation of VEP of eyes with optic neuritis and normal eyes.

VEP	Diseased eyes		Normal eyes		p-value (One-Way ANOVA)
	Mean	S.D	Mean	S.D	
P100 at 60' (ms)	111.20	15.71	99.68	14.15	0.002
P100 at 15' (ms)	112.27	12.07	107.68	10.56	0.102
N75-P100 at 60seconds (μV)	4.93	3.69	9.76	4.75	0.000
N75-P100 at 15seconds (μV)	4.03	3.31	10.50	5.51	0.000

In 75% of patients, MRI did not show any significant abnormality. 8% had demyelinating lesion on brain not compatible with MS, 8% had demyelinating lesion on brain along with thickening of the affected optic nerve. In 7% there was only thickening of affected optic nerve. 5% had pansinusitis. (Figure 5)

Out of the 3 patients who had demyelinating lesion on brain along with thickening of the affected optic nerve, 1 was diagnosed as multiple sclerosis in whom multiple paraventricular oval plaques were present and 1 was diagnosed as probable MS

(clinically isolated syndrome)



**Figure 5. Imaging study (MRI findings).**

## DISCUSSION

The study done by Suehiro et al<sup>6</sup> in Japan also showed female preponderance with the ratio of female to male 1.7:1. In study done by I-H. Wang et al<sup>7</sup> in Taiwan, 76.7% of the patients were female. In ONTT too there was female preponderance i.e 77.2%<sup>8</sup>. The study by Zhang et al in China<sup>9</sup> also showed female preponderance with 45.9% cases being men and 54.1% women. However Das H et al<sup>10</sup> study in Eastern Nepal found male to female ratio of 1.25:1 and study by Malla et al<sup>11</sup> reported 65% cases of males and 35% cases of females.

In our study 67%(n=20) had unilateral optic neuritis while 33%(n=10) had bilateral optic neuritis comparable to the study by Saxena et al (2010)<sup>13</sup> (67.5% of unilateral and 32.5% of bilateral cases of optic neuritis) and Zhang et al in China<sup>9</sup> ( 67.3% unilateral and 32% bilateral cases of optic neuritis). However, Suehiro et al<sup>6</sup> in Japan reported 85.5% unilateral cases. The incidence of bilateral optic neuritis was also lower in study done by I-H. Wang et al<sup>7</sup> in Taiwan with unilateral to bilateral ratio of 27:3. In contrast, Das H et al<sup>10</sup> study showed more cases of bilateral optic neuritis and Malla et al<sup>11</sup> showed equal number of unilateral and bilateral cases.

Right eye was affected in 55%(n=22) and left eye in 45% (n=18). Among 40 eyes included in the study, 65%(n=26) had diminution of vision as the main presenting symptom similar to Saxena et al<sup>13</sup> (66%) and I-H. Wang et al<sup>7</sup> (69.7%), but more than in the studies

by Zhang et al in China<sup>10</sup> (42.9%), Jain et al<sup>14</sup> (33.4%), Das H et al<sup>10</sup> study (33.33%) and Suehiro et al<sup>6</sup> in Japan (17.6%). In ONTT 92% of their patients had ocular pain. In our study 17.5% cases had ocular pain.

In our study, 10% had seizure disorder, 8% had diabetes mellitus, 5% had hypertension and 77% had no other systemic illness.

27%(n=8) had recurrent optic neuritis. 3% of patients had previous history of optic neuritis in the same eye, 17% had prior episode of optic neuritis in the other eye and 7% had prior episode of optic neuritis in both eyes. There was no previous history of optic neuritis in 73% of patients. This was similar to the study done by I-H. Wang et al<sup>7</sup> in Taiwan where 20% of patients had recurrent optic neuritis.

On presentation, majority of the eyes 43% (n=17) had visual acuity <3/60, 5%(n=2) were NPL, 2%(n=1) had vision between 5/60-3/60, 40%(n=16) had vision between 6/24 -6/60 and 10%(n=4) had vision between 6/6-6/18.

After receiving the treatment, at 3 months follow up, 70% cases (n= 28) had vision between 6/6-6/18, 15% cases (n=6) had vision between 6/24 -6/60, 2% cases (n= 1) had vision between 5/60-3/60 and 13% cases (n= 5) had vision <3/60. No eyes were NPL.

Study done by Wang et al<sup>16</sup> showed that the steroid treated patients had significant improvement in vision in 6 months follow up. All patients except one had improvement in vision to 6/12 or better, 1 patient with NPL vision had no improvement even after treatment till 6 months follow up. In ONTT, improvement in vision began within the first month. Majority of the patients improved by at least 1 line of Snellen's visual acuity. All except 6 patients improved at least 3 lines during the six months follow up.<sup>17</sup>

Among the study population, at initial presentation, 25% (n=10) had normal disc findings, 75% (n=30) had hyperaemic disc. After receiving treatment, at 3 months follow up 62.5%(n=25) had normal disc findings and 37.5%(n=15) had temporal disc pallor. Study done by Jain et al<sup>14</sup> showed that 29.4% of the eyes had normal disc appearance, 56% had blurring of the disc margin with or without oedema and 15% of the eyes were

pale on first visit. ONTT showed that normal optic disc was present in 66% of the cases at initial presentation.<sup>17</sup> However, the study done by Wang et al in Singapore documented hyperaemic disc in 65% of the patients.<sup>16</sup>

At initial presentation, we were able to evaluate color vision in 65%(n=26). Colour vision could not be done in 35%(n=14) due to poor vision. Colour vision was normal in 15%(n=6). There was deutan defect in 7.5%(n=3), tritan defect in 12.5%(n=5), total colour vision defect in 2.5%(n=1) and non-specific colour vision defect in 27.5%(n=11). 89.7% were totally colour blind in Malla et al<sup>11</sup> study and Tandan R et al(2006)<sup>18</sup> reported 75% normal colour vision in cases of optic neuritis. The ONTT<sup>10</sup> showed that most cases of optic neuritis show mixed red-green and blue-yellow colour vision defects. Colour vision defect type may shift over time.<sup>17</sup> Thus colour vision defect type cannot be used for the differential diagnosis of optic neuritis.<sup>17</sup>

After receiving treatment, 37.5%(n=15) eyes had normal colour vision at 3 months follow up. 10%(n=4) had deutan defect, 15%(n=6) had tritan defect, 27.5%(n=11) had non-specific colour vision defect and colour vision could not be done in 10%(n=4) eyes due to poor vision. In study done by I-H. Wang et al in Taiwan, 63.6% of affected eye had good recovery.

Among 40 eyes included in the study, contrast sensitivity was normal in 12.5%(n=5), reduced in 52.5%(n=21) and couldn't be done in 35%(n=14) on presentation. Roy W(1984) et al<sup>19</sup> reported abnormal contrast sensitivity in 93% of eyes of optic neuritis. However Tandan R et al<sup>18</sup> reported 100% abnormal contrast sensitivity in optic neuritis cases. After treatment, at 3 months follow up, contrast sensitivity was normal in 40%(n=16), reduced in 50%(n=20) and couldn't be done in 10%(n=4). In visual field testing at presentation, 30% had enlarged blind spot, 15% had marked constriction of all isopters with enlarged blind spot, 15% had constriction of visual field, 3% had relative scotoma, 2% had central scotoma and 2% had normal visual field. In 33% (n=13) visual field testing could not be performed due to poor visual acuity. In study done by I-H. Wang et al<sup>7</sup> in Taiwan presenting visual field defect was variable and the most common type

was diffuse depression. In ONTT too diffuse depression was present in 44.8%.<sup>8</sup> Jain et al<sup>14</sup> reported concentric contraction (25%) and Shatirah et al<sup>20</sup> reported paracentral scotoma (29.3%) as the most common visual field defect in cases of optic neuritis. Central scotoma (13.8%) was the most common defect in study done by Malla et al.<sup>11</sup>

There was significant increase in P100 latency at 60' and reduction in amplitudes in both the frequencies in eyes affected with optic neuritis in comparison to the normal eyes. (Mean P100 latency at 1 degree  $111.20 \pm 15.71$  ms vs  $99.68 \pm 14.15$  ms, p-value=0.002) Similarly, the mean N75-P100 amplitude at 1 degree and 15 minute were also significantly reduced in the affected eyes in comparison to the control eyes. (Mean N75-P100 amplitude at 1 degree  $4.93 \pm 3.69$   $\mu$ V vs  $9.76 \pm 4.75$   $\mu$ V, p-value<0.001 and mean N75-P100 amplitude at 15 minute  $4.03 \pm 3.31$   $\mu$ V vs  $10.50 \pm 5.51$   $\mu$ V, p-value<0.001) The results were almost similar to the study done by Huban et al (2006)<sup>21</sup> which showed VEP amplitude was decreased ( $4.13 \pm 4.04$   $\mu$ V vs  $6.97 \pm 3.35$   $\mu$ V and  $6.97 \pm 4.43$   $\mu$ V) and latency was increased ( $122.59 \pm 20.09$  ms vs  $101.31 \pm 6.19$  ms and  $108.76 \pm 13.57$  ms) in affected eyes significantly in comparison to the unaffected eyes and control group, respectively.

In 75% of patients, MRI findings were normal. 8% had demyelinating lesion on brain, 8% had demyelinating lesion on brain along with thickening of the affected optic nerve. However demyelinating lesion compatible with multiple sclerosis was present in 1 patient who had multiple paraventricular plaques. One patient was diagnosed as probable MS who had single paraventricular plaque. In 7% there was only thickening of affected optic nerve and 5% had pansinusitis. Zhang et al<sup>9</sup> reported optic nerve enhancement in 85 of 121 (70%) eyes and 15 cases had periventricular plaques. Study done by Kupersmith et al<sup>15</sup> showed MRI with abnormal enhancement of the affected optic nerve with gadolinium and abnormal bright signal on the STIR sequences in 23 of 24 eyes (95%). Das H et al<sup>10</sup> study reported 1 case with features of multiple sclerosis in MRI. Saxena<sup>13</sup> et al study showed 7 cases with demyelinating lesions in brain in which multiple sclerosis were diagnosed in 2 patients and transverse myelitis was diagnosed in one patient.

In our study, multiple sclerosis was confirmed in 1 patient who had 2 episodes of retrobulbar neuritis and showed multiple periventricular plaques in imaging.

## CONCLUSIONS

In this study most of the cases of acute optic neuritis belonged to the age group 21-30 years with a female preponderance. Unilateral presentation was more common. The most common symptom was diminution of vision with pain on eye movement. Majority of the cases had non-specific colour vision defect, reduced contrast sensitivity and enlarged blind spot in visual field test. Papillitis was more common than retrobulbar neuritis. Multiple sclerosis was confirmed in a patient with recurrent optic neuritis who had multiple paraventricular plaques in magnetic resonance imaging of brain. VEP showed significant increase in P100 latency at 60' and reduction in amplitudes in both the frequencies in eyes affected with optic neuritis in comparison to the normal eyes.

After medical treatment, majority of the patients had good visual acuity and normal colour vision. However, contrast sensitivity remained reduced even at 3 months follow up period.

Although the incidence of multiple sclerosis is rare in developing countries like Nepal, neuroimaging will help to diagnose MS in case of acute and recurrent optic neuritis.

**CONFLICT OF INTEREST:** None.

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