Original Article

A Clinical Study of Optic Disc Edema in a Tertiary Eye Center of Nepal

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Abstract

Purpose: To evaluate the etiology and clinical presentation of cases with optic disc edema presenting to a tertiary eye center of Nepal.

Background: The etiology of optic disc edema ranges from relatively benign to potentially sight and life threatening conditions. Till date very few studies have been done on disc edema in Nepal.

Method: The authors conducted a prospective, descriptive study at B.P. Koirala Lions Center for Ophthalmic Studies (BPKLCOS), Nepal. All cases with disc edema presenting to the out patient department (OPD) from January 1, 2014 to June 30, 2015 were included in the study.

Results: Total 112 patients were included in the study, out of which diagnosis could be established in 99. The mean age of the patients was 32.54 ± 13.97 years with the majority being female. The most common cause of disc edema was idiopathic intracranial hypertension (IIH) (37.5%,). Majority of the patients complained of isolated diminution of vision (38.4%). Among the eyes affected, 78.3% had best corrected visual acuity (BCVA) 6/6-6/18, 36.6% had color vision defect and 31.4% had reduced contrast sensitivity. The most common visual field defect was isolated enlarged blind spot (39.7 %).

Conclusion: IIH followed by optic neuritis (ON) are the most common causes of disc edema. Conditions with disc edema mainly affect the age group 21-40 years with females affected 2.5 times more than males. Visual acuity, color vision and contrast sensitivity are deranged in majority of cases of ON and normal in majority of cases of IIH..

Key words: Idiopathic Intracranial Hypertension, Optic Disc Edema, Optic Neuritis, Papilledema.

Introduction

Optic disc edema refers to axonal distension and elevation of the optic disc. It is the end result of a wide range of pathological processes (Van Stavern, 2007). Swollen optic disc, disc edema, papilledema, papillitis, choked disc and elevated optic nerve are terms that are frequently used to describe swelling of the optic disc. Papilledema means disc swelling

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secondary to elevated intracranial pressure and papillitis has traditionally been used to denote inflammation of the optic disc, due to demyelination or syphilis (Van Stavern, 2007).

Optic neuritis and non-arteritic ischemic optic neuropathy (NAION) are the two most common causes of optic disc edema (Jung et al, 2011; Ozdamar et al, 2009). The most common cause of optic disc swelling in Caucasians has been reported to be anterior ischemic optic neuropathy (Miller et al, 2008). However there is a paucity of studies on disc edema in the Asian population. Therefore, the purpose of this study was to determine the clinical manifestations and etiology of optic disc edema in Nepalese patients. We also aimed to compare the various clinical characteristics among the most common causes of disc edema.

Materials and Methods

The Institutional Review Board (IRB) at the Institute of Medicine, Tribhuvan University, approved the study. Informed written consent was obtained from all the patients. All patients who had optic disc edema while presenting to the ophthalmology OPD from January 1, 2014 to June 30, 2015 were included in the study. Those with concomitant uveitis or pseudopapilledema were excluded from the study.

A detail clinical history was obtained followed by a thorough ocular examination. Ophthalmic examination included best-corrected visual acuity (BCVA), color vision (Fransworth-Munsell Dichotomous D-15 test), contrast sensitivity (Pelli-Robson Contrast sensitivity chart at one metre distance) and visual field test using Goldmann projection perimeter (Takagi Seiko Co., Ltd). Clinical photography of the optic disc was done for documentation. Blood investigations, B-scan, radio imaging including magnetic resonance imaging (MRI), magnetic resonance venography (MRV) and computed tomography (CT) were done whenever necessary. IIH was diagnosed using the modified Dandy Criteria (Smith, 1985; Friedman and Jacobson, 2002). Grade IV hypertensive retinopathy was diagnosed according to the Keith, Wagener, and Barker classification (Keith et al, 1974; Henderson et al, 2011). Consultant neurologist in the neuro-ophthalmology clinic performed complete neurological examination. IBM SPSS Statistics for Macintosh, Version 20.0. Armonk, NY: IBM Corp. was used for statistical analysis.

Results

There were 194 eyes of 112 patients with disc edema in the study. Diagnosis could be established only in 99 patients. Table 1 shows the etiological diagnosis of optic disc edema in our study where IIH followed by ON were the commonest causes of disc edema. Table 2 shows the gender distribution, age group, laterality and complaints of the patients in accordance with their etiology. Likewise table 3 shows the BCVA, pupillary reaction, color vision defect (CVD), contrast sensitivity and visual field finding in eyes with optic disc edema in accordance with their etiology.

Radiological Investigations

Radiological investigations were performed in 76.78 % (N=86) of the patients. In cases of IIH, all (N=42) patients underwent MRI and MRV. The findings were normal in 78.57% (N=33) patients, empty sella in 11.9% (N=5) patients, and hypoplastic dural sinus in 7.1% (N=3) patients. A 48 year old female with IIH had features of cerebral atrophy in MRI with normal MRV findings. Among the cases (N=43) of optic neuritis, 79.31% (N=23) patients underwent MRI. Among these 23 patients, MRI revealed thickened optic nerve in 17.4 % (N=4) patients, features of demyelination in 13.04% (N=3) patients, and normal findings in 69.56% (N=16) patients. In cases with ICSOL and IOSOL, the radiological investigations were supportive for their respective clinical diagnosis. Among the

five cases with dural venous sinus thrombosis, MRI/MRV showed sigmoid sinus thrombosis in 80% (N=4) patients, while 20% (N=1) had sagittal vein thrombosis.

Table 1: Etiological Diagnosis of Optic Disc Edema

Etiology of disc edema		
Diagnosis	**Frequency**	**Percent(%)**
Idiopathic intracranial hypertension (IIH)	42	37.5
Optic Neuritis (ON)	29	25.9
ICSOL*	7	6.3
Grade IV hypertensive retinopathy	6	5.4
Sinus thrombosis	5	4.5
Others **(including undiagnosed cases)	23	20.5
Total	**112**	**100**

*ICSOL= Intracranial space occupying lesion
**Others include- (besides 13 undiagnosed cases): 3 cases of central retinal vein occlusion (CRVO), 2 cases each of diabetic papillopathy and intraorbital space occupying lesion (IOSOL); and one case each of acute myeloid leukemia (AML), dysthyroid optic neuropathy (DON) and orbital cellulitis.

Table 2: Gender distribution, age group, laterality and complaints of the patients in accordance with their etiology

	Total	**IIH**	**ON**	**ICSOL**	**G4HR**	**ST**	**Others**
	N=112 (%)	**N=42 (%)**	**N=29 (%)**	**n=7 (%)**	**N=6 (%)**	**N=5 (%)**	**N=23 (%)**
Gender							
Male	32 (28.6)	6 (14.3)	13 (44.8)	2 (28.6)	3 (50)	0 (0)	8 (34.8)
Female	80 (71.4)	36 (85.7)	16 (55.2)	5 (71.4)	3 (50)	5 (100)	15 (65.2)
Age Group							
≤10	1 (0.9)	0 (0)	1 (3.4)	0 (0)	0 (0)	0 (0)	0 (0)
11 - 20	25 (22.3)	8 (19)	7 (24.1)	2 (28.6)	0 (0)	0 (0)	8 (34.8)
21 - 30	28 (25)	10 (23.8)	9 (31)	2 (28.6)	2 (33.3)	1 (20)	4 (17.4)
31 - 40	27 (24.1)	14 (33.3)	2 (6.9)	3 (42.9)	1 (16.7)	2 (40)	5 (21.7)
41 - 50	21 (18.8)	8 (19)	4 (13.8)	0 (0)	2 (33.3)	2 (40)	5 (21.7)
51 - 60	7 (6.3)	2 (4.8)	4 (13.8)	0 (0)	0 (0)	0 (0)	1 (4.3)
61 - 70	2 (1.8)	0 (0)	1 (3.4)	0 (0)	1 (16.7)	0 (0)	0 (0)
71+	1 (0.9)	0 (0)	1 (3.4)	0 (0)	0 (0)	0 (0)	0 (0)
Laterality of disc edema							
RE	20 (17.9)	2 (4.8)	10 (34.5)	0 (0)	1 (16.7)	0 (0)	7 (30.4)
LE	10 (8.9)	0 (0)	5 (17.2)	0 (0)	0 (0)	0 (0)	5 (21.7)
BE	82 (73.2)	40 (95.2)	14 (48.3)	7 (100)	5 (83.3)	5 (100)	11 (47.8)
Complain							
DOV only	43 (38.4)	6 (14.3)	20 (69)	1 (14.3)	4 (66.7)	2 (40)	10 (43.5)
DOV + Headache	11 (9.8)	5 (11.9)	2 (6.9)	2 (28.6)	1 (16.7)	1 (20)	0 (0)
DOV + Pain	5 (4.5)	1 (2.4)	2 (6.9)	0 (0)	0 (0)	0 (0)	2 (8.7)
Pain + Headache	3 (2.7)	0 (0)	1 (3.4)	1 (14.3)	0 (0)	0 (0)	1 (4.3)
DOV +Pain + Headache	3 (2.7)	0 (0)	2 (6.9)	0 (0)	0 (0)	1 (20)	0 (0)
Headache only	32 (28.6)	23 (54.8)	2 (6.9)	2 (28.6)	1 (16.7)	1 (20)	3 (13)
Asymptomatic	7 (6.3)	7 (16.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Others	8 (7.1)	0 (0)	0 (0)	1 (14.3)	0 (0)	0 (0)	7 (30.4)

*G4HR= Grade IV hypertensive retinopathy, ST= sinus thrombosis, DOV= diminution of vision
*N= Number of patients

Table 3: BCVA, pupillary reaction, color vision defect (CVD), contrast sensitivity and visual field finding in eyes with optic disc edema in accordance with their etiology.

	Total	IIH	ON	ICSOL	G4HR	ST	Others
	n=194 (%)	n=82 (%)	n=43 (%)	n=14 (%)	n=11 (%)	n=10 (%)	n=34 (%)
Best Corrected Visual Acuity							
6/6-6/18	152 (78.3)	79 (96.3)	17 (39.5)	10 (71.4)	7 (63.6)	10 (100)	29 (85.3)
6/24-6/60	20 (10.3)	1 (1.2)	12 (27.9)	0 (0)	3 (27.3)	0 (0)	4 (11.8)
5/60-3/60	8 (4.1)	0 (0)	8 (18.6)	0 (0)	0 (0)	0 (0)	0 (0)
<3/60-PL	10 (5.2)	2 (2.4)	6 (14)	0 (0)	1 (9.1)	0 (0)	1 (2.9)
NPL	4 (2.1)	0 (0)	0 (0)	4 (28.6)	0 (0)	0 (0)	0 (0)
Pupil reaction							
Brisk	164 (84.5)	82 (100)	20 (46.5)	10 (71.4)	10 (90.9)	10 (100)	32 (94.1)
Absent	3 (1.5)	0 (0)	1 (2.3)	2 (14.3)	0 (0)	0 (0)	0 (0)
Sluggish	13 (6.7)	0 (0)	10 (23.3)	2 (14.3)	1 (9.1)	0 (0)	0 (0)
RAPD	14 (7.2)	0 (0)	12 (27.9)	0 (0)	0 (0)	0 (0)	2 (5.9)
CVD in affected eye							
Normal	100 (51.5)	60 (73.2)	2 (4.7)	4 (28.6)	5 (45.5)	10 (100)	19 (55.9)
Non-specific Defect	52 (26.8)	18 (22)	17 (39.5)	5 (35.7)	4 (36.4)	0 (0)	8 (23.5)
Protan Defect	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.9)
Deutran Defect	8 (4.1)	0 (0)	5 (11.6)	0 (0)	0 (0)	0 (0)	3 (8.8)
Total CV Defect	2 (1)	0 (0)	2 (4.7)	0 (0)	0 (0)	0 (0)	0 (0)
Red Green Defect	3 (1.5)	0 (0)	2 (4.7)	0 (0)	0 (0)	0 (0)	1 (2.9)
Titran Defect	5 (2.6)	2 (2.4)	1 (2.3)	1 (7.1)	0 (0)	0 (0)	1 (2.9)
Not Done	23 (11.9)	2 (2.4)	14 (32.5)	4 (28.6)	2 (18.2)	0 (0)	1 (2.9)
Contrast sensitivity							
Normal	112 (57.7)	63 (76.8)	2 (4.7)	5 (35.7)	7 (63.6)	10 (100)	25 (73.5)
Reduced	61 (31.4)	15 (18.3)	30 (69.7)	5 (35.7)	3 (27.3)	0 (0)	8 (23.5)
Could not be done	21 (10.8)	4 (4.9)	11 (25.6)	4 (28.6)	1 (9.1)	0 (0)	1 (2.9)
Visual field in affected eye							
Enlarged Blind Spot	77 (39.7)	44 (53.7)	3 (7)	6 (42.9)	3 (27.3)	4 (40)	17 (50)
Normal	39 (20.1)	17 (20.7)	1 (2.3)	3 (21.4)	5 (45.5)	2 (20)	11 (32.4)
Generalised Constriction with enlarged blind spot	26 (13.4)	9 (11)	14 (32.5)	0 (0)	2 (18.2)	0 (0)	1 (2.9)
Superior field constriction with enlarged blind spot	19 (9.8)	8 (9.8)	5 (11.6)	1 (7.1)	0 (0)	2 (20)	3 (8.8)
Not Done	16 (8.2)	3 (3.7)	8 (18.6)	4 (28.6)	1 (9.1)	0 (0)	0 (0)
Cecocentral scotoma	7 (3.6)	0 (0)	6 (14)	0 (0)	0 (0)	0 (0)	1 (2.9)
Superior and nasal field constriction with enlarged blind spot	6 (3.1)	0 (0)	3 (7)	0 (0)	0 (0)	2 (20)	1 (2.9)
Paracentral scotoma	2 (1)	0 (0)	2 (4.7)	0 (0)	0 (0)	0 (0)	0 (0)
Inferior field constriction and enlarged blind spot	1 (0.5)	1 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mid-peripheral unequal constriction of isopters	1 (0.5)	0 (0)	1 (2.3)	0 (0)	0 (0)	0 (0)	0 (0)

*n= Number of eyes

Out of the total 43 eyes with optic disc edema secondary to ON, VEP findings were available for 41 eyes, which is given in Table 4.

Table 4: VEP Findings in the Eyes with Optic Disc Edema Secondary to ON

VEP	P100 at 60'(ms)	P100 at 15'(ms)	N75-P100 at 60 seconds (μV)	N75-P100 at15 seconds (μV)
Mean	109.66	112.15	5.05	4.63
Number	41	41	41	41
Std. Deviation	13.20	13.87	4.41	3.86

Discussion

In our study the most common causes of disc edema were IIH (37.5%), ON (25.9%), and ICSOL (6.3%). Diagnosis could not be established in 11.6% patients. Jung et al (2011) reported the commonest cause of disc edema to be NAION (34.7%) and optic neuritis (30.6%), similar to the findings of Ozdamar et al (2009): NAION (49.3%) and papillitis (16.9%) and Marques et al (2011): NAION (51.9%) and papillitis (32.7%). However the latter two studies involved cases with unilateral disc edema only. In the study by Saoji et al (2016) and Iijima et al (2014) on patients with papilledema and bilateral disc edema respectively, the most common causes of disc edema were ICSOL (53.3%) and brain tumor (44.4%) respectively.

The mean age of the patients in our study was 32.54 ± 13.97 years which differs from the findings of the studies by Marques et al (2011) and Ozdamar et al (2009): 53.5 ± 22.9 years , and 43.0 ± 12.3 years respectively. However, in a study done on patients with papilledema, the most common age group was 31-40 years (Saoji et al, 2016), which is similar to our study.

Our cases with IIH had the mean age 32.26 ± 11.19 years which runs parallel to other studies: 31 years (Wall and George, 1991) and 29 years (Wall et al, 2014). Likewise, our ON patients had the mean age of 33.69 ± 17.70 years, similar to the findings of Nikoskelainen (1975) and Jain et al (1981) i.e. 32 ± 12 years and 20-40 years respectively. Our patients with ICSOL had the mean age of 26.29 ± 12.38 years, however, in another study the commonest age group was 40-50 years (Raju, 2009).

In our study, females were more affected than males with the male to female ratio of 1:2.5. In the studies by Marques et al (2011) and Ozdamar et al (2009) this ratio was 1 : 1.6 and 1 :1.1 respectively. We found this ratio to be 1:6 in cases of IIH, 1:1.23 in ON and 1:2.5 in ICSOL. This ratio was 1:10 in cases of IIH in the study by Bruce et al (2009), and 1:11.5 in the study by Wall and George (1991). Similarly in the study on ON by the Optic Neuritis Study Group (Group, 1991), this ratio was 1:3.35 and in the study by Nikoskelainen (1975), this ratio was 1:1.3. Likewise, this ratio was 1:1.5 in cases with ICSOL in the study by Raju (2009).

Our 38.4% patients complained of DOV only and 28.6% patients complained of headache only. However in the study by Ozdamar et al (2009), 85.7% of patients had major complaint of DOV. Our 54.8% IIH patients complained of headache only, followed by DOV only in 14.3%. Another 16.7% had come for regular eye evaluation. In studies by Wall et al (2014) and Ambika et al (2010) on IIH, the most common symptom was headache, 84% and 76% respectively. Likewise, our 69% of ON patients complained of DOV only, which is similar to studies by Nikoskelainen (1975) and Jain et al (1981), 58% and 66.7% respectively. Likewise among our ICSOL cases, 28.6% complained of headache only and another 28.6% complained of DOV + headache. In the study by Raju (2009) on ICSOL, headache along with other symptoms was the most common symptom (63.3%), and headache only occurred in 30% patients.

The BCVA in majority of the affected eyes in our study was 6/6-6/18 (78.3%), followed by 6/24-6/60 (10.3%). In cases of IIH, 96.3% of eyes affected had BCVA 6/6-6/18. Likewise in the study by Wall et al (2014) on IIH, 71% of the affected eyes had BCVA 6/6-6/12. Similarly 78.1% of the affected eyes had BCVA 6/6-6/18 in the study by Ambika et al (2010).

Among the eyes affected by ON in this study, only 39.5% eyes had BCVA 6/6-6/18, the rest had worse. In the study by Ismail et al (2012), 73.3% of the eyes affected by ON had BCVA of 6/60 or worse. The baseline BCVA was 6/60 or worse in 36% eyes in ONTT (Smith, 2005; Group,1991). In our cases with ICSOL, 71.4% of eyes affected had BCVA 6/6-6/18. Likewise in the study by Madan et al (2015), among the patients with brain tumors, 56% had BCVA 6/6-6/12 and 29% had 6/18-6/36.

In this study optic disc edema was present in both eyes in 73.2% cases. However in the study by Jung et al (2011), only 18.4% cases had bilateral optic disc edema. Regarding color vision, 51.5% of affected eyes had normal color vision and 26.8% of affected eyes had non-specific color vision defect. In cases of IIH, 73.2% of affected eyes had normal color vision and 21.9% of affected eyes had non-specific color vision defect. Whereas in the study on IIH by Ambika et al (2010), color vision was normal in 28% patients, but the test was not done in a significant number of patients, 26 (52%). In our ON cases only 2 affected eyes (4.7%) had normal color vision, all the rest had defective color vision. Likewise other studies show that color vision is almost always affected in cases with ON (Nikoskelainen, 1975; Group, 1991).

In our study contrast sensitivity was normal in 57.7% affected eyes and reduced in 31.4%. It could not be done in 10.8 % eyes due to poor vision. In cases of IIH, 76.8% of the affected eyes had normal contrast sensitivity, while among eyes affected with ON, 69.8% had reduced contrast sensitivity, the test could not be performed on 25.6% eyes because of poor vision and 2 affected eyes (4.7%) had normal contrast sensitivity. These findings of reduced contrast sensitivity are similar to other studies on ON by Beck et al (1984) and Sethi et al (2006), 93% and 100% respectively.

In our study the most common visual field finding in eyes with disc edema was enlarged blind spot (39.7%). Likewise, 13.4% of affected eyes had generalized constriction with enlarged blind spot and 20.1% had normal visual field. In our IIH cases, 53.7% of the affected eyes showed enlarged blind spot. Likewise in a study by Ambika et al (2010), 62.5% eyes had enlarged blind spot .

In this study in cases with ON, 32.5% of the affected eyes had generalized constriction with enlarged blind spot and 13.9% affected eyes had cecocentral scotoma. In ONTT (Keltner et al, 1994) diffuse depression occurred in 48% of the affected eyes, while strictly central or cecocentral scotomas constituted less than 10%. In the study by Nikoskelainen (1975), the most common visual field defect was central or cecocentral scotoma (37% of eyes). Likewise in their study on optic neuritis, Jain et al (1981) found the most common visual field defect to be concentric contraction (25%) followed by central scotoma (19.1%). In this study the most common visual field finding in eyes of cases with ICSOL was enlarged blind spot (42.8%), which is similar to 53.5% in the study by Raju (2009).

In this study, the mean low frequency and high frequency P100 latencies in the affected eyes in cases of optic neuritis were 109.66 ± 13.20 ms and 112.15 ± 13.87 ms respectively. These values show that the latencies are delayed in cases of optic neuritis compared to the normative values of P100 latency received from the study by Shibasaki and Kuroiwa (1982) and Tandon and Sharma (1989), (92.5 ± 4.44 ms)

and (95.37 ± 6.85 ms for males and 91.07 ± 49 ms for females) respectively.

The findings of MRI/MRV in cases of IIH in this study were normal in 78.57% patients and 11.9% patients had empty sella. In the study by Ambika et al (2010) on IIH, neuroimaging revealed prominent perioptic CSF spaces in 28% patients and empty sella in 6% patients.

Similary, among the cases of ON who underwent MRI in this study, neuroimaging revealed normal findings in 69.56% cases, thickened optic nerve in 17.39% cases and some features of demyelination in 13% patients. Likewise in the study by Zhang et al (2007), MRI in 121 affected eyes with fat-depressed T2 sequences of optic nerve, optic nerve enhancement was found in 85 (70.2%) cases, and periventricular plaques or other abnormalities on MRI consistent with MS changes were found in 15 (15.3%) cases. Likewise in another study, MRI of the orbits with gadolinium contrast showed enhancement of the affected optic nerve in approximately 95% of cases of optic neuritis (Rizzo et al, 2002).

Conclusion

We found that the common etiologies of optic disc edema were idiopathic intracranial hypertension, optic neuritis and intracranial space occupying lesion. The majority of the patients were young female with bilateral presentation and the common complaints were decreased vision and headache. The majority of the affected eyes had good visual acuity and enlarged blind spot except in cases of optic neuritis where majority of affected eyes had diminished BCVA, abnormal color vision and decreased contrast sensitivity.

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