Clinical Profile of Non-Arteritic Anterior Ischemic Optic Neuropathy at A Tertiary Institute in North-East India

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Research Article

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Abstract

Purpose: To study the clinical profile on non-arteritic ischemic optic neuropathy (NAION) and review of literature at a tertiary institute of northeast India

Methods: Retrospective analysis the records of all 61 patients diagnosed with NAION between September 2016 and December 2018. All the patients were dealt on an outpatient basis. Standard clinical details and findings were consistent with NAION. Visual field with 30-2 was done and in selected cases. All patient with optic neuritis, arteritic optic neuropathy, trauma, underlying malignancies were excluded from the study

Results: Of the 61 patients in the study, 41 (67.2%) were males and 20 (32.8%) were females. The mean age was 56 years. Duration of reporting to the institute less than 14 days was seen in 7cases (11.47%). Of the 61 patients, the right eye was affected in 30 (49.1%), left eye in 25 (41%) and both eyes in six (9.8%) patients. In this study we found that 18 (29.5%) patients had diabetes, 24 (39.3%) had hypertension, hypercholesterolemia in 13 (21.3%) cases and 18 (29.5%) cases gave a history of smoking. Two (3.27%) cases gave a history of using sildenafil. Associated macular oedema was seen in seven patients (11.47%)

Conclusion: Early reporting (< 2weeks) of NAAION cases in a tertiary institute of northeast India was found to be low in the study. Macular edema in isolated cases was important where additional treatment was required. Lifestyle modifications of avoiding smoking and tobacco can be suggested in substance abuse cases.

Introduction

Ischemic optic neuropathy is of two types: anterior and posterior, which is based on the location of ischemic insult [1–8]. Anterior ischemic optic neuropathy can be either non-arteritic or arteritic [9–14]. Non-arteritic ischemic optic neuropathy (NAION) is mostly because of non-inflammatory small vessel disease whereas arteritic optic neuropathy has inflammatory reaction in small vessels secondary to vasculitis [15–18].

NAION is optic nerve disorder caused by infarction of posterior ciliary arteries that supply anterior portion of optic nerve head [19–21]. It is the second most common form of optic neuropathy after glaucoma. Around 6000 new cases are diagnosed with NAION every year in the United States of America [22–25]. NAION usually affects people over 50 years of age [26–33]. Caucasians have a higher incidence of NAION of about 2.3–10.2 per 100,000 populations annually and with equal involvement of male and female [2].

Many systemic and ocular disorders have been suggested in past studies which increases the risk of NAION in patients [1, 2, 14, 17, 19]. In IONDT study, amongst NAION patients they found 24% of patients had diabetes mellitus, 47% had hypertension, and 60% of patients had some vasculopathic risk factor [3]. Hyperlipidemia, smoking, sildenafil and amiodarone use are various other suggested risk factors for NAION [1, 30–33].

A pre-existing crowded optic disc with ischemic insult leads to circulatory insufficiency of small posterior ciliary arteries causing axonal edema. The probable mechanism suggested is a mechanical obstruction to axoplasmic flow at the level of cribriform plate [14]. Electron microscopy has shown that the upper and the lower half of the optic nerve head has distinct blood supply from short posterior ciliary arteries and this is responsible for the typical corresponding altitudinal visual field defects seen in NAION [21, 22, 32, 33].

Materials And Methods

In this study, we retrospectively analyzed the records of all 61 patients diagnosed with NAION between September 2016 and December 2018. Institutional Ethics Committee permission was obtained before starting the study. All the patients were dealt on an outpatient basis. Standard clinical details and findings were consistent with NAION.

NAION was diagnosed with the following criteria: acute onset optic neuropathy with painless diminution of vision, the presence of a relative afferent pupillary defect, corresponding visual field defects, and optic disc edema. These patients had no history of trauma, intracranial neoplasm, aneurysm, inflammation on neuroimaging studies. Arteritic anterior ischemic optic neuropathy was excluded on the basis of the absence of clinical features like a headache, scalp tenderness, jaw claudication, neck pain, malaise, fever and absence of inflammatory blood markers.

The patient underwent a comprehensive ophthalmic and systemic examination. The patient particulars like age and gender were noted. A detailed history was elicited regarding the onset, duration, and progress of the diminution of vision and associated pain. Past medical history of hypertension, diabetes, hypercholesterolemia, history of tobacco/ smoking/any medicines use was noted. Patient's visual acuity, uncorrected, pinhole, best corrected was assessed using the Snellen chart. In bilateral cases, the vision of the worse eye was taken for statistical analysis. The extraocular movements were assessed. Pupillary reaction was noted and presence and grading of the relative afferent pupillary defect was done as per the classification by Bell et al (Grade I, a weak initial constriction and greater redilatation; Grade II, initial stall and greater redilatation; Grade III, immediate pupillary dilatation; Grade IV, immediate pupillary dilatation following prolonged illumination of the good eye for 6 seconds; Grade V, immediate pupillary dilatation with no secondary constriction) [22]. Ocular findings were analyzed by external examination, slit lamp bio-microscopy which included applanation tonometry and indirect ophthalmoscopy using the 20-diopter lens. Disc edema was specified (sectoral, diffuse, segmental, hyperemic, pallor), splinter hemorrhages and other disc findings were noted. Color vision was assessed using the Ishihara pseudo-isochromatic plates. All the patients underwent a visual field examination using the automated static threshold perimetry (30-2 Humphrey visual field). The ancillary investigation included optic disc photography and optical coherence tomography (OCT) in optic disc parameters. In isolated cases, fundus fluorescence angiography (FFA) was done. Blood investigation included complete blood count with erythrocyte sedimentation rate, C-reactive protein, blood sugar, lipid profile and any related investigations as suggested by the physician. Magnetic resonance imaging (MRI) brain scan with or without contrast was done in selected cases for periventricular ischemic demyelination. Consultations were done with a neurologist in selected cases.

All patients with optic neuritis, neuro-retinitis, history of trauma and systemic malignancy were excluded from the study.

Result

Of the 61 patients in the study, 41 (67.2%) were males and 20 (32.8%) were females. The mean age was 56 years. Of the 61 patients, the right eye was affected in 30 (49.1%), left eye in 25 (41%) and both eyes in six (9.8%) patients. The clinical and demographic characteristics of the patients are summarised in [Table 1]. Presenting visual acuity was counting fingers (CF) to 6/36 in 29 (47.5%) patients, between 6/9 to < 6/36 in 21 (34.4%) patients and between 6/7.5 to < 6/9 in 11 (18%) patients [Figure. 1]. A maximum number of cases, that is, 54 (88.5%) gave a history of sudden onset of symptoms whereas seven (11.5%) patients gave a history of gradual onset of symptoms. Ocular findings were, RAPD positive in 31 (50.81%) cases, color vision abnormality in 47 (77%) cases, and associated macular edema in seven (11.47%) cases. The pattern of disc edema was studied in 49 cases, it was sectoral in 22 (45%) cases, diffuse in 16 (33%), segmental in eight (16%) and hyperemic in three (6%) cases [Figure. 2]. Analysis of the visual field defects showed that, of the 61 cases, 23 (40.35%) had inferior altitudinal defect, 12 (21.05%) had superior altitudinal defect, nine (15.78%) had central defect, six (10.52%) had arcuate defect, four (7.01%) had inferior quadratic, three (5.26%) had unclassified defect and four cases had normal visual field [Figure.3]. In this study we found that 18 (29.5%) patients had diabetes, 24 (39.3%) had hypertension, hypercholesterolemia in 13 (21.3%) cases and 18 (29.5%) cases gave a history of smoking. Two (3.27%) cases gave a history of using sildenafil and eight (13.1%) cases gave a positive history of taking intravenous methylprednisolone or oral steroid prior to the first visit. Another eye with small crowded disc was seen in 18 cases excluding those with bilateral cases. MRI brain scan was done in 21 cases where periventricular ischemic demyelination was seen in 17 cases and all of them had hypertension and diabetes.

Discussion

Our study which span over two years with a total of 61 cases found that 41 (67.2%) were males and 20 (32.8%) were females. Almost all of the previous studies showed male preponderance. The study by Repka et al,found that the number of males was more than females (92 males and 77 females)[24]. Similar results were seen by Hayreh et al (244 males and 162 females), Jacobson et al (30 males and 21 females), Palombi et al (18 males and 9 females),Salomon et al (45 males and 16 females)and Cestari et al (529 males and 448 females) [28–31]. However, the Giambene et al and Yee et al found NAION to be more prevalent in the females, 54% and 60% respectively. [24, 32] Results are summarized in [Table 2]

The mean age in our study was found to be 56 years. Rest of the other studies found the mean and median age to be in the late sixties, Repka et al, 64 years, Hayreh et al,60 years, Jacobson et al, 68 years, Palombi et al,65 years, Salomon et al, 62 years,Cestari et al,64 years,Giambene et al, 65 years [24, 28–33]. However, the study by Yee et al, found the mean age to be much higher, that is, 76 years [8].

In our study, we found that the presenting visual acuity was worse than 6/36 in 29 (47.5%) patients and better than 6/9 in 11 (18%) patients. Similarly,Repka et al, found in their study that the visual acuities were 6/60 or worse in 77 of 184 affected eyes and 6/12 or better in 83 of 184 eyes and Palombi et al found the VA to be 20/200 or worse in 40% and VA better than 20/40 in 30% of the cases [24, 31]In our study we found that the most common visual field defect was inferior altitudinal field defect seen in 23 (40.35%) cases. It was followed by superior altitudinal defect in 12 (21.05%) cases, nine (15.78%) had central defect and six (10.52%) had arcuate defect. We also found that four cases had normal visual field. In the study by Repka et al, they found that the most frequently defect was inferior altitudinal seen in 46% cases, whereas partial inferior defects occurred in 16% of cases [24]. With respect to the systemic risk factors, the aetiology of NAION is considered to be multi-factorial. The various risk factors as described by various studies can be seen in Table 2. Known risk factors were also associated in the patient study like previous studies [1–19]. Early reporting (< 2weeks) of NAAION cases in a tertiary institute of northeast India was found to be low in the study. Macular edema in isolated cases was important where additional treatment was required. Lifestyle modifications of avoiding smoking and tobacco can be suggested in substance abuse cases.

Declarations

Funding – This study was supported by Sri Kanchi Sankara Health and Educational Foundation (SKSH&EF), Guwahati, Assam, India.

Conflicts of interest/Competing interests – There are no conflicts of interest.

Availability of data and material – Available

Code availability – Not applicable

Authors' contributions (optional: please review the submission guidelines from the journal whether statements are mandatory)

Ethics approval – Study approved by Institutional Ethics Committee

Consent to participate – Informed written consent obtained.

Consent for publication – All authors consent for publication.

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Tables

Table 1. Demographic and clinical details of the cases.

Characteristics		Cases n = 61, n (%)
Sex	Male	41 (67.2%)
	Female	20 (32.8%)
Age (years), mean ± SD (Range)		53 years (37-82)
Affected eye	OD	30 (49.1%)
	OS	25 (41%)
	OU	6 (9.8%)
Onset of vision loss	Sudden	54 (88.5%)
	Gradual	7 (11.5%)
Other ocular findings	RAPD positive	31 (50.81%)
	Color vision abnormality	47 (77%)
	Crowded optic disc (In unilateral cases)	18 (29.5%)
	Associated macular oedema	7 (11.47%)
Visual field defects	Inferior altitudinal defect	23 (40.35%)
	Superior altitudinal defect	12 (21.05%)
	Central defect	9 (15.78%)
	Arcuate defect	6 (10.52%)
	Inferior quadratic	4 (7.01%)
	Unclassified	3 (5.26%)
Systemic disease and risk factors	Hypertension	24 (39.3%)
	Diabetes	18 (29.5%)
	Smoking	18 (29.5%)
	Hypercholesterolemia	13 (21.3%)
	Tobacco use	13 (21.3%)
	IVMP or oral steroid use prior to first visit	8 (13.1%)
	Sildenafil use	2 (3.27%)

Table 2. Review of literature for association of systemic diseases with NAION.

Publication	Foulds et al[20]	Ellenberger et al[21]	Eagling et al[22]	Boghen et al[23]	Repka et al[24]	Guyer et al[25]	Moro et al[26]	Giuffre[27]
Year published	1969	1973	1974	1975	1983	1985	1989	1990
Patients of NAION	24	45	33	37	169	200	81	44
% with Hypertension	21	16	18	44	38	34	40	39
% with Diabetes	8	29	9	37	15	10	12	20
% with Cerebrovascular accidents	8	9	9	8	3	-	-	-
% with Cardiac disease	8	9	-	8	15	-	-	-
% with Migraine	-	-	6	8	-	2	10	-
% with Hypercholesterolemia	-	-	-	-	-	-	-	-
% with Dyslipidaemia	-	-	-	-	-	-	-	-
% with Obstructive sleep apnoea	-	-	-	-	-	-	-	-

Publication	Hayreh et al[28]	Jacobson et al[29]	Salomon et al[30]	Palombi et al[31]	Giambene et al[32]	Cestari et al[33]	This study
Year published	1994	1997	1999	2006	2009	2016	-
Patients of NAION	406	51	61	27	85	977	61
% with Hypertension	55	57	44	59	60	88	39
% with Diabetes	17	34	32	37	4	50	29
% with Cerebrovascular accidents	6	-	6	-	-	-	-
% with Cardiac disease	15	18	32	-	-	17	-
% with Migraine	4	-	-	-	-	-	-
% with Hypercholesterolemia	-	49	36	-	-	-	21
% with Dyslipidaemia	35	-	-	44	48	90	-
% with Obstructive sleep apnoea	6	10	-	89	-	19	-

Figures

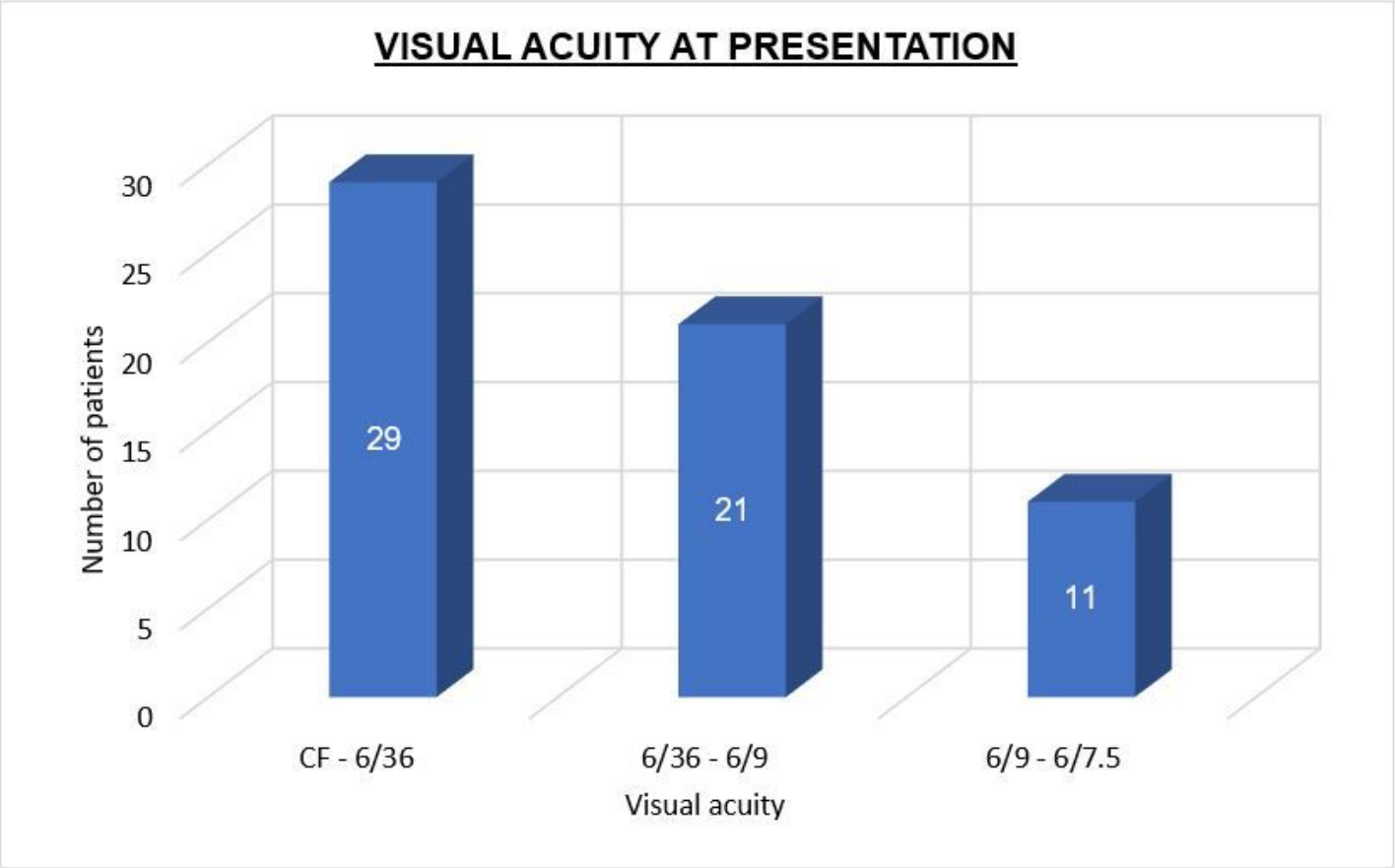

Figure 1

Bar diagram showing the visual acuity range of the patients at presentation.

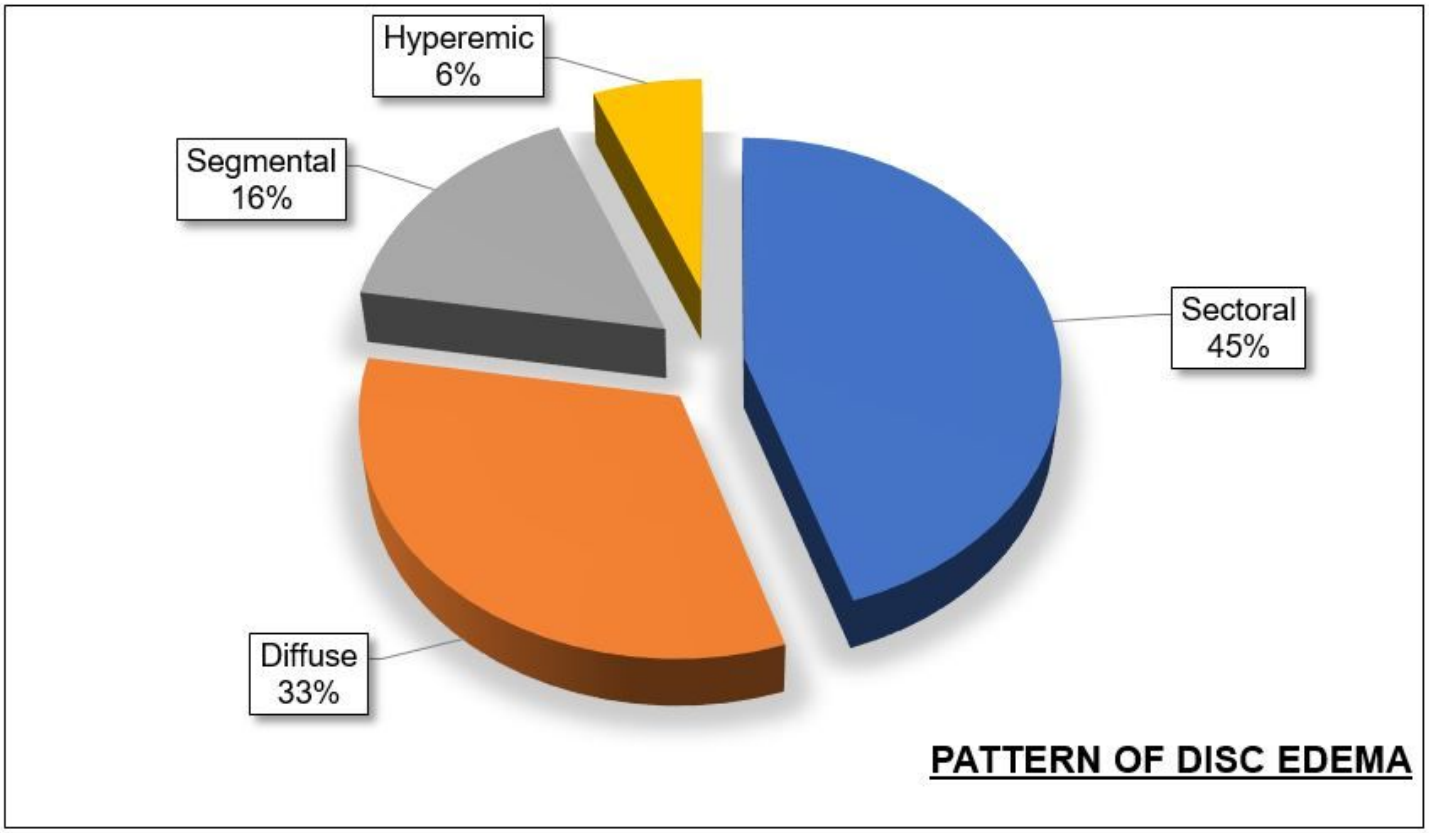

Figure 2

Pie- diagram showing the pattern of optic disc involvement in the patients.

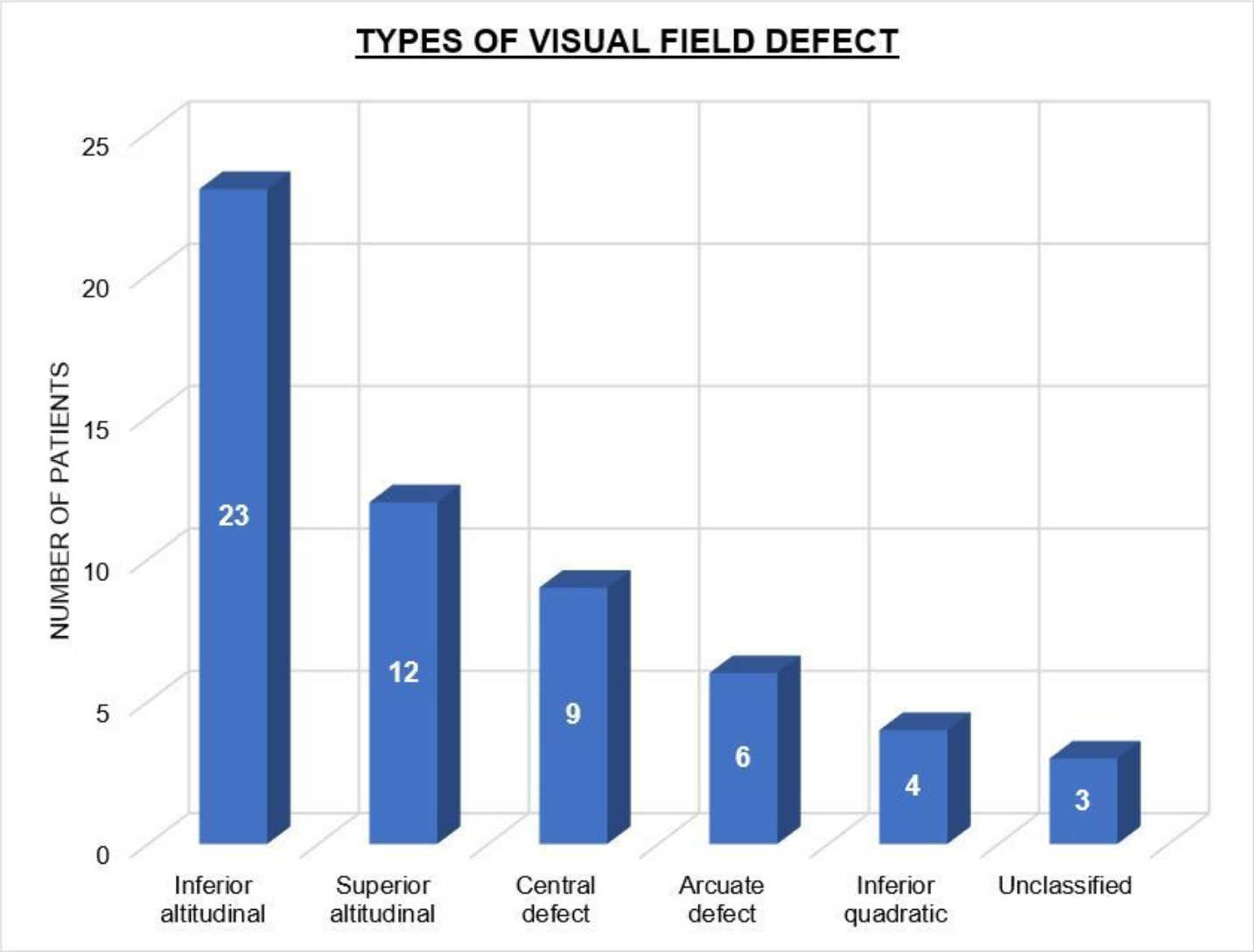

Figure 3

Bar diagram showing visual field defect in the studied patients