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Original Research Article

Risk of Nonarteritic Anterior Ischemic Optic Neuropathy in Patients Prescribed Semaglutide

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Abstract

Background: Non-arteritic anterior ischemic optic neuropathy is the most common acute optic neuropathy in patients older than 50 years. Risk factors for NAION are structural crowding of disc, diabetes, systemic hypertension, hyperlipidaemia, smoking. Patients present with sudden monocular vision loss, dyschromatopsia, visual field defect, disc edema diffuse or segmental. ***Objectives:*** To evaluate risk of non arteritic anterior ischemic optic neuropathy after routine treatment. ***Method:*** This Longitudinal observational study was carried out from January 2016 to June 2016 at Department of Neuro-Ophthalmology, National Institute of Ophthalmology & Hospital, Sher -E-Bangla Nagar, Dhaka among Sixty cases. Detailed information were obtained in each cases according to protocol. A complete history was taken from the patient. Relevant investigation reports were collected. Selected patients were undergone detailed ophthalmological and systemic evaluation. They were treated at NIO&H with following measure like proper counseling, controlling of risk factors like diabetes, hypertension, hyperlipidaemia and were advised to take tablet vitamin B1, B6 & B12. They were followed up at 1st week, 4th week & 8th week. In each visit visual acuity, color vision, field of vision, RAPD & optic disc changes were recorded in a pre- designed data collection sheet. All the information's were recorded according to fixed protocol. ***Results:*** Among the 60 cases, mean age was 55.67 (±4.89) years, minimum age was 51 and maximum age 69 years. Majority 32(53.3%) were male and 28(46.67%) were female. Associated risk factor like diabetes, hypertension, hyperlipidaemia and sleep apnea which were 53.3%, 36.67%, 30% and 13.3% respectively. Different disc changes of the study population were segmental disc swelling 36(60%) and diffuse disc swelling 24(40%) respectively. Regarding distant visual acuity patients were grouped into 6/6 to 6/12 group, 6/18-6/36 group, 6/60- 1/60 group and counting finger to hand movement group. At presentation most of the patient belongs to 6/6- 6/12 group which was 26(43.33%) followed by 6/18-6/36 group, it was 18(30%), 10(16.67%) were included in (6/60-1/60) group and the rest 06(10%) were included in counting finger to hand movement group. At final visit on 8th week 20(35.7%) patients remain in 6/6-6/12 group and also 6/18-6/36 group includes 20(35.7%) patients, 10(16.67%) were included in (6/60-1/60) group and the rest 06(10%) were included in counting finger to hand movement group. RAPD present in pretreatment 52(86.7%) and in post treatment were 46(82.14%). ($p>0.05$) that was not statistically significant. Color vision dyschromatopsia in pretreatment 46(76.7%) and in post treatment were 37(60%). In post treatment 06(10.71%) were normal color vision. ($p<0.5$) that was statistically significant. ocular involvement 52(86.67%) were 1st eye and 08(13.3%) were 2nd eye. Comparison of pre-treatment and post treatment visual field were Arcuate scotoma 12(20%) vs 09(16.07%), Inferior Altitudinal field defect 32(53.33%) vs 31(57.14%), Superior Altitudinal field defect 02(3.3%) vs 02(3.57%) respectively. ***Conclusion:*** In study no significant change found on visual acuity, colour vision and field of vision after treatment of non-arteritic anterior ischemic optic neuropathy.

Keywords: risk factors for NAION, treatment of NAION, visual acuity, color vision.

INTRODUCTION

Non-arteritic anterior ischemic optic neuropathy (NAION) is a leading cause of sudden loss of vision, which particularly affects individuals older than 50 years [1]. NAION is the most common ischemic optic neuropathy. By definition anterior ischemic optic neuropathy (AION) involves the 1mm segment of the optic nerve head, also known as optic disc, and result in visible disc swelling. Predispositions includes structural crowding of the optic nerve head so that the physiological cup is either very small or absent, hypertension, diabetes mellitus, hyperlipidaemia, collagen vascular disease, sudden hypotensive events and sleep apnea syndrome. Diabetic patients with NAION show several demographic and clinical differences from non diabetic patients [2].

Based on histopathology, electron microscopic corrosion cast studies, optic nerve blood flow studies, and clinical data, the pathogenesis of idiopathic nonarteritic ischemic optic neuropathy includes the following features: (1) structurally crowded optic discs are predisposed; (2) laminar and retrolaminar regions are the most common locations for infarction; (3) there is flow impairment in the prelaminar optic disc during the acute phase; (4) lack of consistent choroidal flow impairment and the retrolaminar location of infarcts suggest vasculopathy within or distal to the paraoptic branches of the posterior choroidal arteries; (5) diabetes is the most consistently identified vasculopathic risk factor; (6) impaired autoregulation of the disc circulation by atherosclerosis, with a possible contribution from serotonin and endothelin-mediated vasospasm, may play a role; and (7) progression may be caused by secondary cell death after the initial ischemic insult or compression from cavernous degeneration and mechanical axonal distortion [3].

Patients present with sudden monocular vision loss, dyschromatopsia, visual field defect disc edema diffuse or segmental. The optic disc usually becomes atrophic within 4-8 weeks. A repeat episode of NAION in an already affected eye distinctly unusual, but occurrence in the fellow eye is common [4]. Occurrence in the second eye produces the clinical appearance of "pseudo-Foster Kennedy syndrome" in which the previously affected disc is atrophic and the currently involved nerve head is edematous. VA in about 30% of the patient has normal vision or slightly reduced at presentation. The remainder has moderate to severe impairment. High percent agreement and final outcome between affected eyes of patients with bilateral NAION for visual acuity, color vision, and visual field loss [5]. It may be possible to predict the visual outcome of the second affected eye based on the parameter of first eye [5]. Dyschromatopsia is usually proportional to the level of visual impairment. Visual field defect is typically inferior altitudinal. Disc edema is diffuse or sectoral. Investigations done are BP recording. Blood sugar, serum lipid profile, visual field analysis, color fundus photograph.

The 5-year risk of non-arteritc anterior ischemic optic neuropathy occurring in the second eye is far lower [6]. Various studies were done on use of corticosteroids, aspirin, brimonidine, levodopa for NAION. Ischemic damage of the optic nerve has no proven effective treatment [7]. Patients are treated at NIO&H with following measures proper counseling, controlling of risk factors like diabetes, hypertension, hyperlipidemia and vitamin B1, B6 & B12.

Proper ophthalmic and medical history of patients of NAION attending neuro-ophthalmology department of NIO&H was taken. Visual evaluation, visual acuity with snellen visual acuity chart, color vision with ishahara chart, visual field with humphrey field analyzer was done. Same ophthalmic evaluation was done at first visit and follow up visits.

Objective

This study was conducted to evaluate risk of nonarteritic ischemic optic neuropathy by comparing post treatment visual function with pre treatment visual function.

METHODOLOGY

Study Design: Longitudinal observational study.

Study Period: January 2016 to June 2016

Place of Study: Department of Neuro-Ophthalmology, National Institute of Ophthalmology & Hospital, Sher - E-Bangla Nagar, Dhaka

Study Population: Patients with NAION attending the Neuro-Ophthalmology department of National Institute Of Ophthalmology and Hospital.

Sample Size: Sixty patients with NAION attending in the Neuro-Ophthalmology department of National institute of Ophthalmology & Hospital.

Sampling Method(s): Purposive sampling

Selection Criteria:

Inclusion Criteria:

1. Patients diagnosed as non-arteritic anterior ischemic optic neuropathy of both sexes at any age.

Exclusion Criteria:

1. Patients suffering from arteritic anterior ischemic optic neuropathy.
2. Patients with posterior ischemic optic neuropathy.
3. Patients diagnosed as optic neuritis.
4. Patient with toxic optic neuropathy

5. Patient with other ocular disease such as glaucoma, cataract which may affect vision.

Evaluation prior to treatment:

All patients with NAION undergoing treatment had a complete evaluation from history, general, systemic and ocular examinations.

Emphasis was given on visual acuity, RAPD, color vision, visual field, fundus examination.

Visual Acuity: Was recorded by snellen chart at 6 meter distance those unable to read any letters were further examined by reducing distance at 3 meter, 2 meter & 1 meter then counting fingers, hand movements or perceiving light.

RAPD: Was demonstrated using swinging flash light test.

Color vision: Was tested using Ishihara pseudoisochromatic chart. The test plates were hold at a distance of 75 cm from the patients eye and was asked to read out the numbers written on the plate or to trace the line. Those who can read or trace 13 or more plates out of 17 are graded as normal, those who can read or trace less than 13 plates are graded as partial color blind and those who unable to read any numbers or trace lines are graded as total color blind.

Visual field: Analysis was done by Humphrey visual field analyzer, 30-2 programme.

Fundus examination: Was done with direct ophthalmoscope and slit lamp biomicroscope with +90D Volk lens.

Equipment's used:

a. Computer with internet access and printer.
b. Pen torch.
c. Snellen visual acuity chart.
d. Ishihara pseudoisochromatic chart.
e. Slit- lamp biomicroscope with condensing lens.
f. Tonometer (Goldmann, Schiotz).
g. Ophthalmoscope (Direct, Indirect)
h. Humphrey visual field analyzer.

Investigations:

a. Complete blood count with ESR
b. Blood sugar- fasting & 2 hours after breakfast
c. Lipid profile
d. MRI of brain & optic nerve
e. Color fundus photograph
f. Humphrey visual field analysis

Treatment:

1. Proper counseling regarding disease process, treatment option, prognosis and complication
2. Controlling risk factors like diabetes, hypertension, hyperlipidaemia
3. Diabetes- diet control, exercise and anti diabetic medication.
4. Hypertension- diet control, exercise and antihypertensive.
5. Hyperlipidaemia - diet control, exercise, avoid smoking and lipid lowering agent.
6. Vitamin B, B6 & B12.

Follow up:

The patients were monitored through regular follow up visits. Follow up visits were scheduled on the 1st week, 4th week and 8th week from the initial commencement of treatment.

Procedures of collecting data:

Data collected from NAION patients attending Neuro-Ophthalmology department of NIO&H in a data collection sheet with a questionnaire.

Data Analysis:

Data were processed and analyzed using SPSS (Statistical Package for Social Sciences) software version 20. The chi- square test was done to analyze the significance level of $p < 0.05$. Continuous scale data were presented as mean standard deviation and categorical data were presented as number percentage. The summarize data were present in the table and chart.

RESULTS

Above table demonstrates age distribution of 60 patients included in this study. Among 60 patients maximum 24(40%) were 50-55 years age group, mean age was 55.67 (±4.89) years, minimum age was 51 and maximum age 69 years.

Table 1: Age group distribution of the study population (n=60)

Age group	Number	Percentage
50-55	24	40.00
56-60	22	36.67
> 60	14	23.33
Total	60	100
Mean ±SD	55.67	Range 51-69 years

Majority 32(53.3%) were male and 28(46.67%) were female.

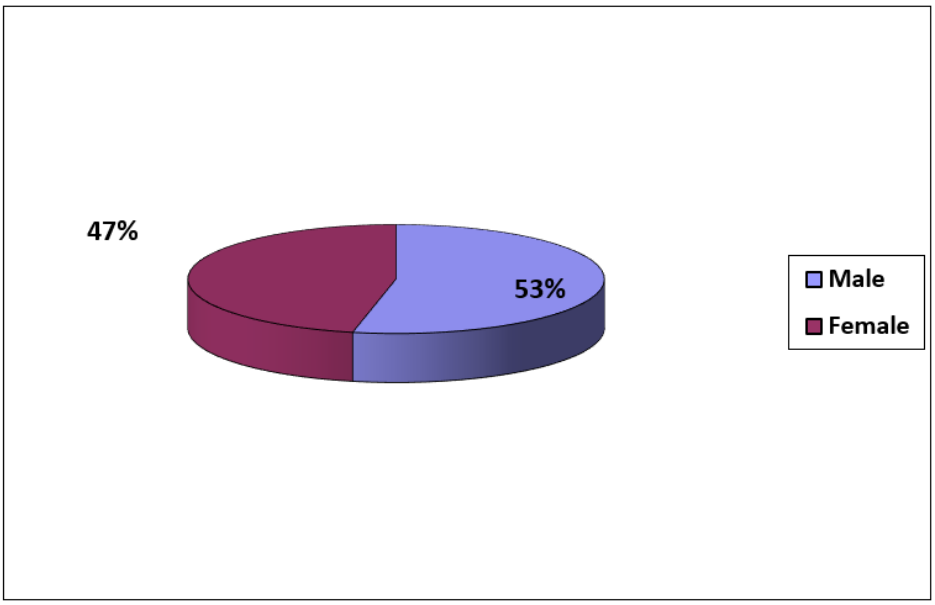

Figure-1: Sex distribution of the study population

Table shows ocular involvement 52(86.67%) were 1st eye and 08(13.3%) were 2nd eye.

Table 2: Ocular involvement of the study respondent

Ocular involvement	Number	Percentage
1st eye	52	86.67
2nd eye	08	13.33
Total	60	100

Table shows associated risk factors diabetes, hypertension, hyperlipidaemia and sleep apnea which were 53.3%, 36.67%, 30% and 13.3% respectively.

Table 3: Associated factors of the study population

	Number	Percentage
Diabetes	32	53.33
Hypertension	22	36.67
Hyperlipidaemia	18	30.00
Sleep apnea	06	10.00

Table shows different disc changes of the study population, Sectoral disc oedema 36(60%) and diffuse disc oedema 24(40%).

Table-4: Disc changes found on first visit of study population

	Number	Percentage
Sectoral disc oedema	36	60%
Diffuse disc oedema	24	40%

Table shows disc status of the other eye of the study population, crowded disc, normal disc and optic atrophy 28(46.67%), 24(40%) and 08(13.33%) respectively.

Table 5: Disc status of the other eye

	Number	Percentage
Crowded disc	28	46.67%
normal disc	24	40%
Optic atrophy	08	13.33%

The table shows the status of visual acuity of the study subjects at presentation and on different follow up visits. 26(43.3%) subjects had visual acuity 6/6-6/12 at first visit and at 1st week 26(43.3%), after 4th weeks

24(41.38%) and 8th weeks 20(35.7%) were in this group. At first visit 18(30%), 1st week 18(30), after 4th weeks 19(32.76%) and 8th weeks 20(35.7%) had visual acuity 6/18-6/36. 10(16.67%) subjects had visual acuity 6/60-1/60 at first visit, 10(16.67) at 1st week, 09(15.52%) at 4th week and 10(16.67%) at 8th week had same vision. At first visit and follow up visits 06(10%) subjects had visual acuity counting finger to hand movement.

Table 6: Distribution of distant vision pre-treatment and post treatment (n=60)

Distant vision	First visit n=60	1st week n=60	4th weeks n=58	8th weeks n=56	P value
6/6-6/12	26(43.33)	26(43.33)	24(41.38)	20(35.7)	0.999
6/18-6/36	18(30.0)	18(30.0)	19(32.76)	20(35.7)	
6/60-1/60	10(16.67)	10(16.67)	09(15.52)	10(17.9)	
Counting finger to hand movement	06(10.0)	06(10.0)	06(10.34)	06(10.7)	

Table shows RAPD present in pretreatment 52(86.7%) and in post treatment were 46(82.14%). (p>0.05) that was not statistically significant.

Table 7: Distribution of RAPD status of pretreatment and post treatment

RAPD	Pre-treatment n(%)	Post treatment n(%)	P value
Present	52(86.7)	46(82.14)	0.58
Absent	08(13.3)	10(17.86)	
Total	60(100)	56(100)	

Table shows color vision status of study population, dyschromatopsia in pretreatment 46(76.7%) and in post treatment were 37(60%). In post treatment 06(10.71%) were normal in color vision. (p>0.05) that was not statistically significant.

Table 8: Color vision status of pretreatment and post treatment

Color vision	Pre-treatment n(%)	Post treatment n(%)	p value
Normal	00	06(10.71)	0.09
Dyschromatopsia	46(76.7)	37(60.07)	
Non detected	14(23.3)	13(23.21)	
Total	60(100)	56(100)	

Table shows comparison of pre-treatment and post treatment visual field were Arcuate scotoma 12(20%) vs 09(16.07%), Inferior Altitudinal field defect 32(53.33%) vs 31(57.14%), Superior Altitudinal field defect 02(3.3%) vs 02(3.57%) respectively.

Table 10: Field of vision status of the study population on pretreatment and post treatment

Field of vision	Pre-treatment n(%)	Post-treatment n(%)	p value
Arcuate scotoma	12(16.67)	09(16.07)	
Inferior Altitudinal field defect	32(53.33)	32(57.14)	
Superior Altitudinal field defect	02(3.3)	02(3.57)	0.96
Could not be assessed	14(23.3)	13(25.0)	
Total	60(100)	56(100)	

DISCUSSION

In this study ocular involvement 52(86.67%) were 1st eye and 08(13.3%) were 2nd eye. Boghen DR and Glaser JS found second eye is involved in about 40% of cases [8].

In present study common medical histories were diabetes, hypertension and sleep apnea which were 53.3%, 36.67% and 13.3% respectively. Lee *et al.*, shows DM was associated with a 43% increased risk. A total of 25 515 patients with DM and an equal number of age- and gender-matched nondiabetic patients were included in their study and they found in the diabetes group, 188 individuals developed NAION (0.7%) compared with 131 individuals (0.5%; P < 0.01) in the control group [9].

In this study 36(60%) was presented with segmental disc swelling and 24((40%) with diffuse disc swelling. Dean Cestari *et al.*, also found two varieties of disc swelling, diffuse or segmental and segmental was more common [10].

In this study 28(46.67%) had crowded disc JB Jonus shows the disc area was significantly less in patient with NAION compared with that of the normal subjects [11].

In this study, visual acuity was recorded by snellen chart at 6 meter distance those unable to read any letters were further examined by reducing distance at 3 meter, 2 meter & 1 meter then counting fingers, hand movements or perceiving light. Regarding distant visual acuity patients were grouped into 6/6 to 6/12 group, 6/18-6/36 group, 6/60- 1/60 group and counting finger to hand movement group. At presentation most of the patient belongs to 6/6- 6/12 group which was 26(43.33%) followed by 6/18-6/36 group, it was 18(30%), 10(16.67%) were included in (6/60-1/60) group and the rest 06(10%) were included in counting finger to hand movement group. At final visit on 8th week 20(35.7%) patients remain in 6/6-6/12 group and also 6/18-6/36 group includes 20(35.7%) patients, 10(16.67%) were included in (6/60-1/60) group and the rest 06(10%) were included in counting finger to hand movement group.No significant change found between pretreatment with post treatment distant vision.

In present study at 1st visit maximum 26(43.3%) out of 60 had visual acuity 6/6-6/12 while Hayreh SS and Zimmerman MB demonstrate about half of the eyes with NAION presented with almost normal visual acuity (20/15 to 20/30) at the initial visit [10].

Wilhem *et al.*, tested whether 0.2% brimonidine tartrate could improve the outcome of patients with non-arteritic anterior ischemic optic neuropathy (NAION) but a statistically significant advantage for the patients receiving brimonidine tartrate could not be shown [11].

Arnold *et al.*, evaluate the effectiveness of hyperbaric oxygen therapy in reducing optic nerve damage in acute nonarteritic anterior ischemic optic neuropathy and found hyperbaric oxygen therapy using 100% oxygen and 2.0 absolute atmospheres of pressure did not produce a significant improvement in visual acuity or visual field for patients with acute nonarteritic anterior ischemic optic neuropathy [12].

Rebolleda *et al.*, evaluate the visual and anatomic outcomes after systemic steroid treatment in non-arteritic anterior ischemic optic neuropathy (NAION). High-dose systemic steroid treatment did not show any beneficial effect in visual and anatomic outcomes when given during the acute phase of NAION. Furthermore, it caused serious complications in a third of the patients treated [13].

Hayreh ss, Zimmerman MB evaluate the role of systemic corticosteroid therapy in non-arteritic anterior ischemic optic neuropathy (NA-AION) and suggested that NA-AION eyes treated during the acute phase with systemic corticosteroids resulted in a significantly higher probability of improvement in visual acuity ($p = 0.001$) and visual fild ($p = 0.005$) than in the untreated group. Both visual acuity and visual fields improved up to 6 months after onset of NA-AION [14].

In this study showed RAPD present in pretreatment 52(86.7%) and in post treatment were 46(82.14%). ($p>0.05$) that was not statistically significant.

In current study showed color vision Dyschromatopsia in pretreatment 46(76.7%) and in post treatment were 37(60%). In post treatment 06(10.71%) were normal color vision. ($p>0.05$) that was not statistically significant.

In present study comparison of pre-treatment and post treatment visual field were Arcuate scotoma 12(20%) vs 09(16.07%), Inferior Altitudinal field defect 32(53.33%) vs 31(57.14%), Superior Altitudinal field defect 02(3.3%) vs 02(3.57%) respectively. Majority 32(53.33%) had Inferior Altitudinal field defect Hayreh *et al.*, evaluate the pattern of various types of visual field defects and their prevalence at initial examination of nonarteritic anterior ischemic optic neuropathy (NA-AION and found that a combination of relative inferior altitudinal defect with absolute inferior nasal defect is usually the most common pattern in NA-AION [14].

CONCLUSION

In our study no significant change found on visual acuity, colour vision and field of vision after treatment of non-arteritic anterior ischemic optic neuropathy.

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