

Original Research Article

ASSOCIATION OF SYSTEMIC RISK FACTOR WITH NON ARTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY: A CASE CONTROL STUDY

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ABSTRACT

Introduction: Non - Anterior ischemic optic neuropathy (NAION) is the most common acute optic neuropathy mainly affecting adults more than 50 yrs. NAION is mainly because of ischemia of optic nerve head. It's mainly of two types arteritic and non arteritic. The exact mechanism of vasculopathy in NAION remain unknown³, however several risk factors have been found to be associated with NAION, which can be further classified into ocular risk factor and systemic risk factor. Ocular risk factor includes small crowded disc often defined as disk at risk, optic nerve head drusen's, vascular disorder in the nutrient vessels of the optic nerve head, cataract extraction, markedly increased intra ocular pressure and marked optic disc edema due to any cause. 60% of NAION patients have systemic risk factor affecting small vessels like arterial hypertension, diabetes mellitus, arteriosclerosis, atherosclerosis, cigarette smoking, nocturnal arterial hypotension, ischemic heart diseases, cerebrovascular accidents, hyperhomocystenemia, thyroid disease^{2,3,5}. Recently OSA as a risk factor has also been identified⁶.

Materials and Methods: This case control study was carried out in the Department of Ophthalmology, S.S. Medical College and associated GM Hospital, Rewa, over a period of 18 months among 32 consented patients presenting to the department with features suggestive of NAION and 32 age and gender matched control, with no ocular pathology. Detailed history was recorded and thorough clinical and comprehensive ophthalmic examination was carried out. Data was collected, compiled and analyzed using SPSS 22.0 (trial version).

Result: Mean age of study group was 53.34±9.10 years. Mean VA in affected eye was 1.36±0.74 log MAR units. Color vision of NAION patient was defective in almost all patients. Mean number of Ishihara plates read was 5.41±1.55. Mean contrast sensitivity was 0.67±0.43 log units. The most common systemic disease associated with NAION was diabetes mellitus (62.5%) followed by hypertension (46.87%). NAION patients had higher incidence of OSA. None of patients had history of IHD, TIA or stroke.

Conclusion: The data for NAION comes mainly from western literature as there have been only few studies in Indian population. Through this study, we aimed to provide an overview of NAION, systemic risk factors associated with it in Indian Population.

Key words: NAION, clinical presentation, optic neuropathy

INTRODUCTION:

Anterior ischemic optic neuropathy is one the most common acute optic neuropathy mainly affecting adults more than 50 yrs. of age, although no age is immune to it^{1,5}. The annual incidence of NAION is 2.3 to 10.2 per 100000 in the general population¹. NAION is mainly because of ischemia of optic nerve head supplied by deep optic nerve head plexus which is derived from short posterior ciliary arteries, typically manifesting as acute severe painless vision loss. NAION accounts for about 90% cases of AION². The exact mechanism of vasculopathy in NAION remain unknown³, however several risk factors have been found to be associated with NAION, which can be further classified into ocular risk factor and systemic risk factor. Ocular risk factor includes small crowded disc often defined as disk at risk, optic

nerve head drusen's, vascular disorder in the nutrient vessels of the optic nerve head, cataract extraction, markedly increased intra ocular pressure and marked optic disc edema due to any cause⁴. All of which may mechanically contribute to the vascular event⁴. With the crowding of optic disc, the vicious cycle sets in which compression of surrounding capillaries induces further ischemia that ultimately result is ischemia of the optic nerve head^{5,6}

60% of NAION patients have risk factor affecting small vessels like arterial hypertension, diabetes mellitus, arteriosclerosis, atherosclerosis, cigarette smoking, nocturnal arterial hypotension, ischemic heart diseases, cerebrovascular accidents, hyperhomocystenemia, thyroid disease^{2,3,5}. Recently OSA as a risk factor has also been identified⁶. When NAION affects younger age group one of the underlying risk factor is often present⁷.

Till now very few studies of NAION have been done on Indian population to study the clinical profile and association of systemic risk factor so this study is an attempt to make addition to the existing knowledge and also by studying the association of systemic risk factor we can control them so that the risk of involvement of fellow eye can be reduced⁵.

MATERIALS AND METHODS:

After approval by Institutional Ethics Committee this case control study was carried out in the Department of Ophthalmology, S.S. Medical College and associated GM Hospital, Rewa, over a period of 18 months. 32 consented patients presenting with features suggestive of NAION such as sudden loss of vision within the month; RAPD in affected eye, sectoral or diffuse disc oedema, either hyperemic or pallid; or hot disc and delayed choroidal filling on FFA were included in the study. All those with other causes of disc oedema; other retinal and optic nerve pathology that could cause defective vision and field changes were excluded from the study. 32 age and gender matched control with no ocular pathology were included.

The purpose of study was explained to all study participants and confidentiality was assured. A detailed history was recorded which included ophthalmic complaints, history of systemic diseases, history of prolonged use of any medication, history of any ocular trauma and surgery. A thorough clinical evaluation was done. Systemic examination was done with special reference to central nervous system and cardiovascular system to see the presence of cerebrovascular disease or ischemic heart disease. A comprehensive ophthalmic evaluation was conducted in all the study subjects. Color vision was evaluated using Ishihara chart and mean number of plates read were calculated. Contrast sensitivity was seen using pelli robsons chart. OCT was done using CIRRUS HD OCT model 500. Visual field assessment was done to see for typical altitudinal field defect using Humphery Visual Field analyser. FFA (Fundus fluorescein Angiography) was done using Topcon fundus camera.

General condition of patient assessed. Height (meter) and weight (kg) of all patients were recorded and BMI was calculated. For the assessment of OSA, STOPBANG QUESTIONNAIRE was used. Study population were examined with the parameters of the questionnaire for the assessment of association of OSA risk.

STOP BANG Questionnaire

Snoring

Tiredness

Observed Apnea

High BP

BMI >35 Kg per m²

Age

Neck Circumference >40 cm

Gender

Response will be recorded as yes or no

Score 1 point for each positive response.

Scoring Interpretation

0 to 2 = Low risk for OSA

3 or 4 = Intermediate risk for OSA

≥5 = High risk for OSA

DIAGNOSIS OF SYSTEMIC DISEASE

For the diagnosis of systemic risk factors following parameters were used

Diabetes Mellitus - Either the patient is known case of diabetes mellitus or the fasting blood glucose level is more than or equal to 110 mg/dl or random blood sugar level more than 200 mg/dl or HbA1C levels 6% or more than 6%.

Hypertension - Either the patient is previously diagnosed case of hypertension or the blood pressure systolic more than 160 mm of Hg or diastolic more than 100 mm of Hg

Hyperlipidemia - Either the patient was diagnosed case of hyperlipidemia on statin therapy or the blood cholesterol more than 200mg/dl, LDL more than 130mg/dl and VLDL more than 30mg/dl.

STATISTICAL ANALYSIS: Data was collected, compiled and analysed using SPSS 22.0 (trial version). To see for statistical significance p value was calculated.

OBSERVATION & RESULTS: Total 32 patients of NAION were studied. 32 age and gender matched controls was taken for comparison of risk factor profile. The mean age of presentation was 53.34 ±9.10 years and the mean duration of presentation was 10.28± 4.23 days. The mean visual acuity at the time of presentation of the affected eye was 1.36± 0.74 log MAR, color vision (mean number of Ishihara plate read) was 5.41± 1.55 and mean contrast sensitivity was 0.67 ±0.43 log unit. The mean IOP was 14.25± 1.40 mm of Hg. (Table 1)

Among the various type of comorbid condition present in cases, diabetes mellitus was found to be most common which was present in around 62.5%, followed by hypertension in 46.87% and hyperlipidemia in 31.25%. Among the various risk factors, OSA risk was present in 59.37%, smoking in 40.62%, alcohol intake in 21.87% and history of covid 19 infection in 3.12%. None of the patients in our study have history of stroke, TIA or ischemic heart disease in the past. (Table 2)

In our study it was observed that there was a statistically significant association of NAION with diabetes mellitus, hypertension and obstructive sleep apnea (p value < 0.05). In comparison to controls, more than three-fifths of the cases with diabetes developed NAION. The odds calculated for diabetes mellitus in association with NAION were 4.2 times higher, compared to controls. Additionally, hypertension was also observed with a higher prevalence amongst cases than in controls. The odds of hypertension being associated with NAION was 4.76 times higher. Obstructive sleep apnea was observed in more than half of the cases, while it was only observed in 15.6% controls. The odds of OSA prevalence were 7.89 times higher amongst NAION cases than healthy controls. In contrast, hyperlipidemia, history of COVID, smoking and alcohol intake were not significantly associated with NAION (p value > 0.05). (Table 3)

Table 1 Baseline clinical parameters of patients

Clinical Parameters	Mean + SD	Range
Age at presentation	53.34 + 9.10 years	39 – 84 years
Time of presentation	10.28 + 4.23 days	5 – 30 days
VA of affected eye	1.36 + 0.74 log MAR	0 – 2.7 log MAR
Colour vision of affected eye	5.41 + 1.55 plates	3 – 9 plates
Contrast sensitivity of affected eye	0.67 + 0.43 log units	0.15 - 1.65 log units
IOP	14.25 + 1.40 mm Hg	11.4 - 16.7 mm Hg

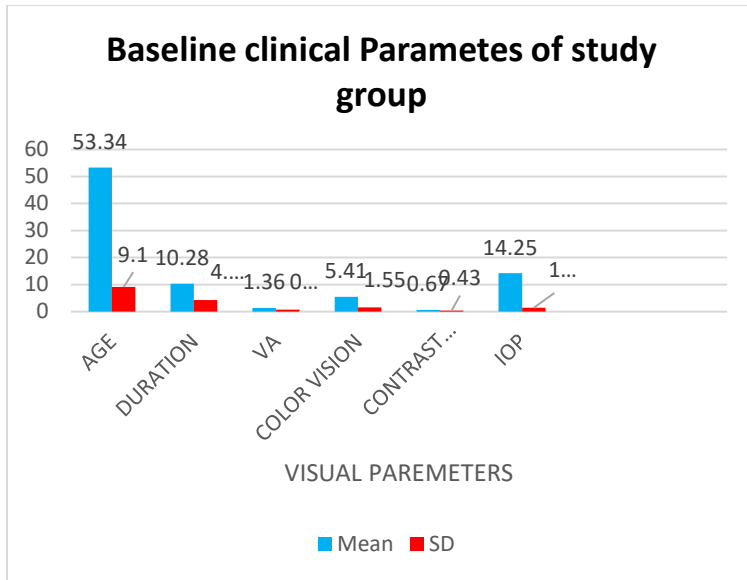


Table – 2 Associated comorbidities and possible risk factors in cases

Associated conditions	Number	Percentage
Diabetes Mellitus	20	62.5
Hypertension	15	46.87
Stroke	0	0
Diabetes +Hypertension	12	37.5
Hyperlipidemia	10	31.25
TIA	0	0
IHD	0	0
Covid history	1	3.12
Obstructive sleep apnea	19	59.37
Smoking history	13	40.62
Alcohol Intake history	7	21.87

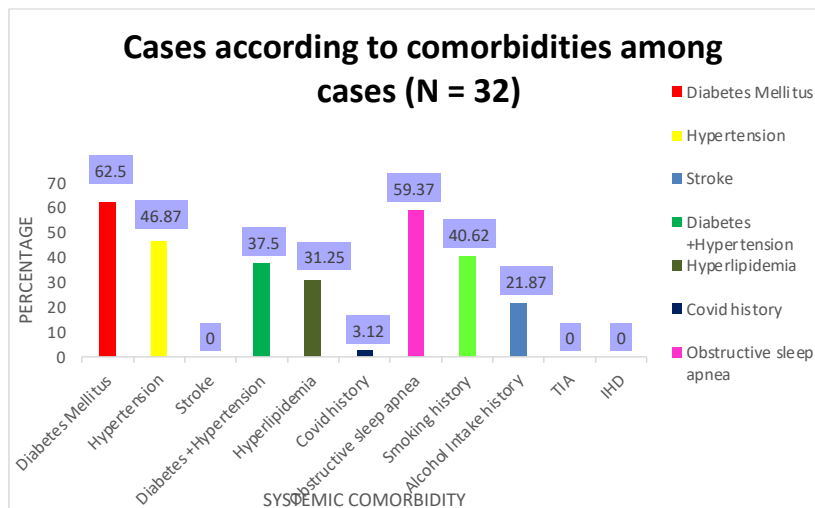
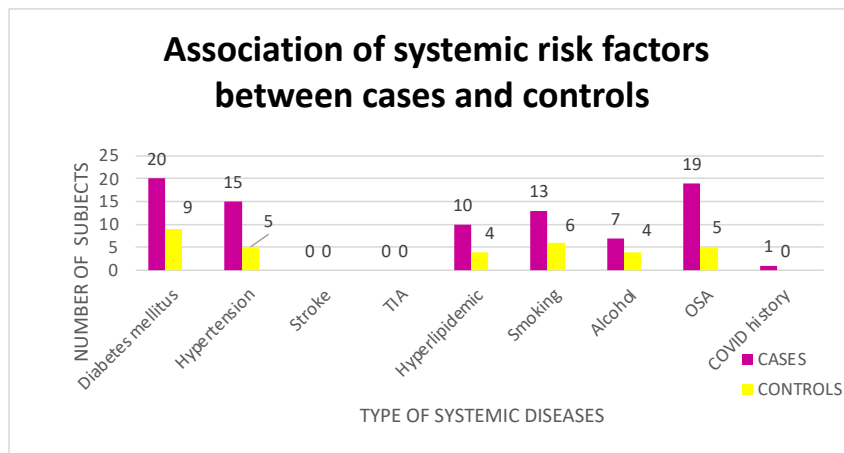


Table 3 Comparative association of systemic risk factors between cases and controls

Risk factor	Cases	Controls	p-value	Odds ratio (95% CI)
Diabetes mellitus	20	9	0.005	4.259 (1.488-12.192)

Hypertension	15	5	0.007	4.765 (1.464 – 15.508)
Stroke	0	0	-	-
TIA	0	0	-	-
Hyperlipidemia	10	4	0.070	3.182 (0.879 – 11.524)
Smoking	13	6	0.055	0.337 (0.109 – 1.048)
Alcohol	7	4	0.320	0.510 (0.133 – 0.133)
OSA	19	5	0.001	7.892 (2.409 – 25.857)
COVID history	1	0	0.313	0.492 (0.383 – 0.632)



DISCUSSION:

Mean age of patients in our study was 53.34±9.10 years with a range of 39-84 years similar to that reported by Saxena R et al²¹. and Khalil et al⁵ i.e. 51.2±7.8 and 52.7±10.3 years respectively. However, studies done by Repka MX et al¹¹, Palombi K et al¹⁶ and Jacobson DM¹³ et al reported a higher mean age at 64, 65 and 68 years respectively. This discrepancy between Indian and western population may be because of increasing incidence of diabetes and hypertension in relatively younger population in India; causing disturbances in microvascular circulation. The most common systemic disease associated with NAION in the present study was diabetes mellitus which was present in 62.5% cases followed by hypertension that was seen in 46.87% cases. Similar results were found in studies done by Jacobson DM et al,¹³ Sharma AV et al²³, Jyothi PT et al⁶, Saxena R et al²¹ and Hayreh SS et al². The OR of diabetes mellitus and hypertension in our study was 4.25 and 4.76 as compared to 1.5 and 2.72 respectively documented in the study done by Jyothi PT et al⁶ but the higher OR although relevant clinically was not statistically significant in their study. In our study we found a statistically significant association of diabetes and hypertension with NAION which was in accordance with the study done by Repka MX et al¹¹ and Hayreh SS et al². Although, a history of smoking was present in 40.42% of our patients, it did not show statistically significant association with NAION which was in accordance with the study done by Hayreh SS et al¹⁸.

In our study, hyperlipidemia was present in 31.25% of cases but there was no statistically significant association with NAION. However, in the study done by Jyothi PT et al,⁶ hyperlipidemia was present in only 8% of cases and they also did not find statistically significant association between hyperlipidemia and NAION.

It was observed in this study that NAION patients had a higher incidence of OSA risk when compared with controls. The association between OSA risk and NAION in our study was statistically significant which was in accordance with Palombi K et al¹⁶ and Li J et al¹⁷. We found that sleep apnea was one of the most frequent disorders found to be associated with NAION. NAION patients should at least undergo an assessment by a questionnaire related to obstructive sleep apnea symptoms for the assessment of OSA.

Only 1 patient in our study had a history of Covid-19 infection in the past, following which he developed NAION. Similar observations have been documented in case reports published by Sanjay S et al²⁵, Rho J et al²⁴, and Haseeb A et al.²⁶ In our study, it is uncertain whether the association of NAION and Covid-19 was causal or coincidental but the purpose of notifying this finding was that there is a biological plausibility and also to predict potential ophthalmologic complications of COVID-19.

No patient in the present study had history of IHD, TIA or stroke but in contrast, Ghasemi K et al⁵ in their study noted 6.5% patients had IHD and 1 had history of stroke.

CONCLUSION:

Ischemic optic neuropathy is one of the most common forms of acute optic neuropathy affecting the older age group. The arteritic form of AION is mainly caused by giant cell arteritis and the non-arteritic form has association with various systemic diseases. The data for NAION comes mainly from western literature as there have been only few studies done on Indian population. Aim of this study was to see various systemic risk factors associated with NAION, so timely intervention can be made to salvage another eye and reduce comorbidity.

In this study Diabetes Mellitus (62.5%) was the most common comorbidity present followed by Hypertension (46.87%), OSA risk in 59.37%, smoking in 40.62%, hyperlipidemia in 31.25%. Among systemic risk factors Diabetes Mellitus, Hypertension, OSA risk were significantly associated with NAION while hyperlipidemia, smoking, history of covid had no significant association

Conflict of interest: None declared

Funding: Nil

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