ORIGINAL RESEARCH

Assessment of sleep apnoea as a risk factor in the development of open angle glaucoma

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ABSTRACT
Background: Sleep apnea, particularly obstructive sleep apnea (OSA), has been increasingly recognized as a significant risk factor for glaucoma. The present study was conducted to assess sleep apnoea as a risk factor in the development of open angle glaucoma. **Materials & Methods:** 48 cases of POAG and NTG of both genders were selected. Group I comprised of POAG, group II had NTG and group III had control. The Epworth Sleepiness Scale was used to measure excessive daytime sleepiness, and a score of more than 10 was deemed severe. The severity of the sleep apnoea was graded according to the Apnea Hypopnea Index (AHI) scale. **Results:** Group I had 14 males and 10 females, group II had 9 males and 15 females and group III had 12 males and 12 females. Severity of sleep apnoea was mild in 13 I group I, 10 in group II and 24 in group III, moderate in 11 in group I, and 14 in group II. The difference was significant (P< 0.05). **Conclusion:** Obstructive sleep apnea is a significant risk factor for glaucoma due to its effects on oxygenation, vascular regulation, and systemic inflammation.

Keywords: obstructive sleep apnea, open angle glaucoma, Sleep apnea

INTRODUCTION

Sleep apnea, particularly obstructive sleep apnea (OSA), has been increasingly recognized as a significant risk factor for glaucoma.OSA is a condition characterized by repeated episodes of partial or complete obstruction of the upper airway during sleep, leading to reduced or paused breathing.[1]Loud snoring, choking or gasping during sleep, excessive daytime sleepiness, morning headaches, and difficulty concentrating.Glaucoma represents an optic neuropathy, wherein the tissue damage occurs at the level of the optic nerve head, resulting in a characteristic alteration of the optic nerve head appearance, as well as a distinct pattern of visual field disturbances.[2] Whether these occur through a solely vascular or a mechanical mechanism, or a combination of both, has not yet been established. Repeated episodes of apnea cause intermittent hypoxia (reduced oxygen levels), which can damage the optic nerve.Apnea episodes can lead to significant changes in intracranial and intraocular pressure, potentially affecting the optic nerve.[3]OSA can lead to impaired blood flow and autoregulation in the optic nerve head, contributing to glaucoma.OSA is associated with increased systemic inflammation, which can exacerbate optic nerve damage.[4]

Primary open- angle glaucoma (POAG) is the most common form of glaucoma associated with OSA. The chronic, progressive nature of POAG can be influenced by the intermittent hypoxia and vascular dysregulation caused by OSA.[5]Patients with normal tension glaucoma (NTG)often have lower intraocular pressures, and the role of systemic factors like OSA becomes more prominent. Hypoxia and vascular issues in OSA can contribute to optic nerve damage even at normal IOP levels.[6]The present study was conducted to assess sleep apnoea as a risk factor in the development of open angle glaucoma.

MATERIALS & METHODS

The present study was conducted on 48 cases of POAG and NTGof both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Group I comprised of POAG, group II had NTG and

group III had control. All were given a validated sleep disturbance questionnaire, positive results on the sleep disturbance questionnaire were defined as snoring, headaches in the morning, bouts of choking or suffocation during sleep, a non-refreshing sleep, and weight increase of eight to ten kg or more during the preceding three years. The Epworth Sleepiness Scale was used to measure excessive daytime sleepiness, and a score of more than 10 was deemed severe.The severity of the sleep apnoea was graded according to the Apnea Hypopnea Index (AHI) scale. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Group	Group I	Group II	Group III
M:F	14:10	9:15	12:12

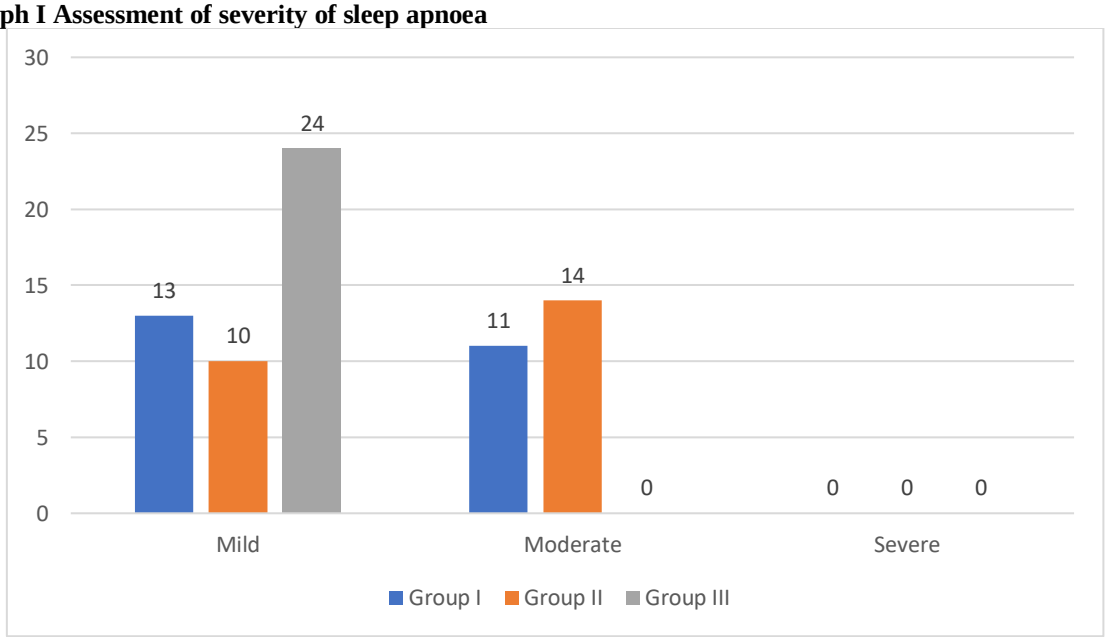
Table I shows that group I had 14 malesand 10 females, group II had 9 males and 15 females and group III had 12 males and 12 females.

Table II Assessment of severity of sleep apnoea

Severity	Group I	Group II	Group III	P value
Mild	13	10	24	0.05
Moderate	11	14	0	
Severe	0	0	0	

Table II, graph I shows that severity of sleep apnoea was mild in 13 I group I, 10 in group II and 24 in group III, moderate in 11 in group I, and 14 in group II. The difference was significant (P< 0.05).

Graph I Assessment of severity of sleep apnoea



DISCUSSION

Numerous studies have found an association between OSA and increased prevalence of glaucoma. For example, patients with OSA have been shown to have a higher risk of developing glaucoma compared to those without OSA.[7]The severity of OSA (measured by the apnea-hypopnea index, AHI) has been correlated with the likelihood and severity of glaucoma.[8,9]Reduction of IOP remains the only consistently modifiable risk factor for slowing or delaying the progression of glaucoma and the only treatment modality which has been consistently proven in clinical trials to be effective. However, VF deterioration still occurs in many patients despite IOP control in the normal and even low normal range.[10] This realization has stimulated the search to identify additional risk factors, including those associated with underlying systemic disorders and those common to neurodegenerative diseases as a whole.[11,12]The present study was conducted to assess sleep apnoea as a risk factor in the development of open angle glaucoma.

We found that group I had 14 males and 10 females, group II had 9 males and 15 females and group III had 12 males and 12 females. Khandgave TP et al[13]ascertained the significance of sleep apnoea as a risk factor in patients with glaucoma. A sleep disturbance questionnaire and the Epworth sleepiness scale were used to screen the potential cases of sleep apnoea amongst 40 glaucomatous subjects, with both primary open angle glaucoma (POAG) and

normotensive glaucoma (NTG), as well as 40 controls. Positive responses to the sleep apnoea questionnaire were obtained from a total of twenty participants, 16 (40%) from the glaucoma Group and four (10%) were obtained from the control Group. In the glaucoma Group, ten (37.03%) of the 27 POAG individuals, and six (46.15%) of the 13 NTG cases showed significant positive responses to the questionnaire. Four subjects (10%) (1POAG, 3 NTG) from the glaucoma Group and one (2.5%) from the control Group were diagnosed to have sleep apnoea by polysomnography. The percentage of the sleep apnoea positive cases was higher among the NTG subjects (23.07%) than among the POAG subjects (3.7 %). This study had an odds ratio of 4.333 (>1).

We observed that severity of sleep apnoea was mild in 13 I group I, 10 in group II and 24 in group III, moderate in 11 in group I, and 14 in group II. Sergi et al[14]explored the prevalence of normal tension glaucoma (NTG) among patients with obstructive sleep apnea syndrome (OSAS) and to examine OSAS as a risk factor of NTG.Fifty-one consecutive white patients with OSAS were compared with 40 healthy subjects. All the study subjects underwent blood gas analysis, polysomnography, oxyhemoglobin saturation, and an ophthalmologic examination including visual field, visually evoked potential (VEP), and pattern electroretinography (PERG) and disc analysis with the Heidelberg Retina Tomograph II.Three of 51 OSAS patients (5.9%) had NTG. No patient in the control group had OSAS or NTG. The severity of OSAS correlated with intraocular pressure, the mean deviation of the visual field, the cup/disk ratio and the mean of the retinal nerve fiber layer thickness (P<0.01 to 0.001). Apnea hypopnea index and intraocular pressure were significantly greater in OSAS patients with abnormal VEP and PERG, compared to those with normal PERG and VEP.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that obstructive sleep apnea is a significant risk factor for glaucoma due to its effects on oxygenation, vascular regulation, and systemic inflammation.

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