

## Quality of sleep and psychological distress in glaucoma

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### Abstract

**Background:** People living with glaucoma are psychologically burdened because of the threat of visual loss. Therefore, understanding the psychosocial issues and quality of sleep holds important implications for the recognition, prevention, and treatment of emotional problems among people with glaucoma. This study investigated the quality of sleep and psychological distress among people with glaucoma.

**Methods:** This was a cross-sectional study of adults recruited over a period of 12 weeks from a glaucoma clinic of a Teaching Hospital in south-west Nigeria. The quality of sleep and psychological distress were evaluated using the Pittsburgh Sleep Quality Index and General Health Questionnaire respectively.

**Results:** Ninety-three adults with glaucoma participated in the study. The mean age was  $62.33 \pm 15.25$  years. Fifty-seven (61.3%) of the subjects were poor sleepers while 27 (29.0%) were psychologically distressed. Psychological distress correlated with global sleep score ( $r = 0.399$ ,  $p = 0.000$ ), subjective sleep quality ( $r = 0.341$ ,  $p = 0.001$ ), sleep latency ( $r = 0.245$ ,  $p = 0.018$ ) and sleep disturbance ( $r = 0.279$ ,  $p = 0.007$ ).

**Conclusion:** Psychological distress and sleep disturbances were common among patients with glaucoma. Concerns about these issues should be incorporated into routine clinical evaluations of patients with glaucoma.

**Keywords:** Eye disorders, Glaucoma, Psychological distress, Quality of sleep.

### Introduction

Visual perception accounts for the majority of sensory inputs to the brain, thus making vision critical and essential for connection to the world. <sup>[1-3]</sup> Sight is: precious and the loss of this sense is most dreaded. Any substantial loss of visual function may compromise the ability to remain socially included, contribute to the workforce or perform caregiving roles. <sup>[4]</sup> This implies that without sight, people are at risk of losing their jobs, ability to travel independently with the need to rely on caregivers in order to undertake

day to day tasks. <sup>[5]</sup> The visual impairment also puts them at risk of falls and accidents. <sup>[6]</sup> These challenges can provoke psychosocial distress which may lead to maladjustment and reduced quality of life. <sup>[7]</sup> Several ophthalmic diseases have been shown to contribute to the burden of visual impairment in the population. <sup>[8]</sup> These diseases include cataract, glaucoma, macular degeneration, diabetic retinopathy, and optic nerve atrophy. <sup>[9,10]</sup>

Glaucoma is the second leading cause of blindness, after cataract, and the first cause of irreversible blindness worldwide, thus presenting an even greater public health challenge than cataract. <sup>[11, 12]</sup> It is a progressive optic neuropathy, in which tissue damage occurs at the level of the optic nerve head. It

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ultimately leads to optic nerve atrophy, visual impairment and blindness by way of axonal loss.<sup>[13,14]</sup> Glaucoma can impose a psychological burden on affected people as a result of its asymptomatic, chronic nature and potential outcome of blindness.<sup>[15]</sup> Following the diagnosis of glaucoma, the perception of the quality of life of the patient may be altered, not only by the disease process that results in progressive axonal injury, attendant visual field deficit and acuity loss but also by the anxiety and other psychological reactions elicited by the diagnosis itself. Glaucoma may induce fears of blindness and altered perceptions of well-being and future health problems.<sup>[16]</sup>

Sleep disturbances have also been reported in people with vision loss.<sup>[17]</sup> A high prevalence of sleep disorders, such as insomnia, daytime sleep and sleep apnea, has been reported among patients with glaucoma.<sup>[18-22]</sup> Li *et al* demonstrated a higher prevalence of sleep disturbances among patients with glaucoma compared to healthy controls.<sup>[21]</sup>

The ophthalmologist must be conversant with ways by which glaucoma can affect a patient's life and recognise that these effects begin from the point of diagnosis. Therefore, the ophthalmologist needs to carry forth from treatment effects to other physical and social effects of the disease. However, the health care focus for people with glaucoma is in the medical and surgical ophthalmic care. The psychological aspect is often ignored. This implies that the medical services have focused on the control of symptoms and neglected the patient as a person.

The lack of sufficient literature on the psychological distress and sleep disturbances associated with visual loss has contributed to the negligence of the psychological care of patients with these conditions. Therefore, it is essential to direct research focus on this area. Providing evidence on the magnitude of psychological distress and sleep quality will help to attract more attention and improve the clinical decision-making as well as the psychosocial care of affected individuals. The purpose of this study was to

investigate the quality of sleep and psychological distress among adults with glaucoma.

## Methods

This was a cross-sectional study of adults attending the Glaucoma Clinic of a state-government-owned University Teaching Hospital, located in south-west Nigeria. The subjects were consecutively recruited during the regular weekly clinic visits over a period of 12 weeks. The study was conducted in accordance with the declaration of Helsinki, Hong Kong revision (2000). The subjects were recruited into the study after obtaining informed consent from. People who could not give informed consent were excluded from the study.

**Data Collection:** A socio-demographic questionnaire was used to elicit demographic variables such as age, sex, educational status and marital status. The quality of sleep and degree of psychological distress were measured using the Pittsburgh Sleep Quality Index (PSQI) and General Health Questionnaire (GHQ) respectively.

The PSQI is a self-administrable questionnaire assessing the quality of sleep during the previous month and it contains 19 self-rated questions yielding seven components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medications and daytime dysfunction. Each component is scored between 0 and 3, yielding a global PSQI score between 0 and 21, with higher scores indicating lower quality of sleep. A global PSQI score > 5 indicates that the subject is a 'poor sleeper'.<sup>[23]</sup> GHQ-12 was used to assess psychological distress among the subjects. This tool has been validated for use in this environment.<sup>[24]</sup>

**Data analysis:** The data were analysed using Statistical Package for Social Sciences (SPSS, version 20) software. Frequencies and percentages were computed for categorical variables while means and standard deviations of

the continuous variables were also determined. Proportions of categorical variables were compared using the Chi-squared test. The Spearman correlation method was used to examine associations between continuous socio-demographic variables and PSQI. A p-value < 0.05 was considered statistically significant.

**Results**

Ninety-three subjects with glaucoma participated in the study. The mean age was 62.33 ± 15.25 years with a range of 26 – 84 years. There was no difference in the mean ages of males and females (62.21 ± 16.94 years Vs 62.49 ± 13.01 years; t = 0.086, p = 0.931). More than three-quarter of the subjects (79.6%) were aged above 45 years. Fifty-two (55.9%) of the subjects were males while about three-quarter of the subjects (76.3%) was married. The majority of the subjects (77.1%) were Christians.

The mean duration of illness was 6.84 ± 7.25 years with more than half of the subjects (54.8%) living with the illness for more than four years; 57.8% rated the severity of their illness as moderate or severe and 27.9% had other co-morbidities.

The mean score of the subjects on PSQI was 5.68 ± 2.68. (Table I) Fifty-seven (61.3%) of the subjects scored more than 5 on the sleep index scale, indicating they were poor sleepers. There was no statistically significant difference between gender and global sleep score (X<sup>2</sup> = 2.077, p = 0.15). On GHQ, 27 (29.0%) of the subjects scored above 2. There was no statistically significant difference between gender and GHQ (X<sup>2</sup> = 0.931, p = 0.335). When subjects with co-morbidities were excluded, 40 (59.7%) of the subjects had scores indicating poor sleepers on the PSQI while 20 (29.9%) scored above 2 indicating psychological distress.

The extent of impairment of visual acuity for both eyes is shown in Table II. There was a significant correlation between global sleep score and GHQ (r = 0.399, p = 0.000). Some components of sleep were positively correlated with GHQ: subjective sleep quality (r = 0.341, p = 0.001), sleep latency (r = 0.245, p = 0.018) and sleep disturbance (r = 0.279,

p = 0.007). The duration of illness correlated positively with sleep duration component score (r = 0.395, p = 0.000). The age of the subjects correlated positively with habitual sleep efficiency (r = 0.291, p = 0.005) but negatively with daytime dysfunction (r = -0.252, p = 0.015) components of sleep. There was no significant correlation between total sleep and cupped disc ratio for either the right eye (r = -0.063, p = 0.572) or the left eye (r = -0.135, p = 0.213). Similarly, there was no correlation between GHQ score and cupped disc ratio (right eye: r = -0.105, p = 0.347; left eye: r = -0.125, p = 0.250)

In terms of proportions, the subjects with impaired visual acuity (right eye 72.7%; left eye 77.1%) were more of poor sleepers compared with subjects with normal visual acuity (right eye 60.5%; left eye 57.8%). These differences did not reach the level of statistical significance (right eye X<sup>2</sup> = 1.023, p = 0.312; left eye X<sup>2</sup> = 3.127, p = 0.077). There was also no statistical significance between GHQ and the level of impairment of visual acuity (right eye X<sup>2</sup> = 0.507, p = 0.476; left eye X<sup>2</sup> = 2.655, p = 0.103).

**Table I: General Characteristics of the subjects**

Variables		Frequencies	Mean (SD)	Range
Age (Years)			62.33 (15.25)	26-84
Sex	Male	52 (55.9)		
	Female	41 (44.1)		
Marital status	Single	4 (4.3)		
	Married	71 (76.3)		
	Others	18 (19.4)		
Employment	Unemployed	42 (45.1)		
	Employed	51 (54.9)		
Duration of Illness			6.84 (7.25)	1-2
Quality of sleep	Global score		5.68 (2.68)	0-10
	Subjective sleep quality		0.74 (0.61)	0-3
	Sleep latency		1.09 (1.00)	0-3
	Sleep duration		1.12 (0.85)	0-3
	Habitual sleep efficiency		0.70 (0.99)	0-3
	Sleep disturbance		1.04 (0.42)	0-2
	Use of sleep medications		0.60 (1.09)	0-3
	Daytime dysfunction		0.43 (0.67)	0-2
Poor sleepers	(PSQI >5)	57 (61.3)		
Good sleepers	(PSQI ≤5)	36 (38.7)		
Psychological morbidity	Present	27 (29.0)		
	Absent	66 (71.0)		

Table II: Ocular characteristics of the subjects

Variables		Frequency (%)
Visual acuity (Right Eye)	Normal (6/5 - 6/12)	38 (40.9)
	Impairment (6/18 - 6/60)	31 (33.3)
	Blindness <6/60	24 (25.8)
Visual acuity (Left Eye)	Normal (6/5 - 6/12)	45 (48.4)
	Impairment (6/18 - 6/60)	26 (28.0)
	Blindness <6/60	22 (23.6)
Cupped disc ratio (Right Eye)	Normal	8 (9.8)
	Mild	10 (12.2)
	Moderate	26 (31.7)
	Severe	38 (46.3)
Cupped disc ratio (Left Eye)	Normal	8 (9.8)
	Mild	22 (26.8)
	Moderate	25 (30.15)
	Severe	27 (32.9)

\*Cupped disc ratio was only evaluated among 82 patients

## Discussion

Evaluating the psychosocial issues surrounding glaucoma could be meaningful from a public health point of view, given the fact that, glaucoma is emerging as a potential threat to the status of sight of the population. The present study assessed the quality of sleep and psychological distress among glaucoma patients and revealed that glaucoma was significantly associated with sleep disturbances and psychological distress.

The prevalence of psychological distress in the present study was 29%. This was consistent with some previous studies which reported a high prevalence of negative psychosocial states among glaucoma patients.<sup>[25-27]</sup> Another study which was conducted in this environment using a similar instrument (GHQ) to assess psychological distress in the general population, reported a prevalence of 5.8%.<sup>[28]</sup>

The occurrence of glaucoma is difficult to predict, thus forming a continuous threat to patients' independence. Studies have shown that patients with glaucoma are more likely to have

emotional instability,<sup>[29, 30]</sup> nervousness,<sup>[31]</sup> anxiety or depression when compared with normally sighted controls.<sup>[25-27]</sup> This may be due to the fact that, as vision loss gradually progresses in glaucoma, patients lose their ability to perform valued activities, as well as their sense of independence and self-confidence. This may make them have low self-esteem and view their future negatively and experience negative psychosocial states. Decreased vision often leads to an inability to read, keep accounts, drive and travel in unfamiliar places, thus substantially compromising the quality of life.<sup>[5]</sup>

The quality of life could be affected in patients with glaucoma in several ways. Firstly, the psychological effects of the diagnosis could result in anxiety, depression from the fear of blindness and fear of possible effects on other family members.<sup>[25-27]</sup> Secondly, the visual effects of glaucoma are also incapacitating.<sup>[5,6,32]</sup> Thirdly, the potential side effects of treatment (medical or surgical) have some impacts and lastly, the quality of life of glaucoma patients could also be adversely affected by financial effects accruing from<sup>[33,34]</sup> the cost of treatment and hospital visits as well as the loss of income as a result of absenteeism from work. The overall effect of all these is the burden of psychological distress on the patient.

The lack of correlation between GHQ and cupped disc ratio or statistical association between GHQ and visual acuity in the present study may suggest that the severity of glaucoma or impairment of vision does not necessarily provide additional psychological distress to the patients apart from the threat of loss of vision. Further studies are required to elucidate other factors associated with the psychological situation in glaucoma.

This study also demonstrated a high level of sleep disturbance among patients with glaucoma. About 61.3% of the subjects in this study were poor sleepers. This finding is in keeping with the previous studies<sup>[21, 22]</sup> conducted outside this region of the world. Unfortunately, similar studies on quality of sleep among similar groups of subjects are not available in this environment for comparison. A study on the quality of sleep among hypertensive patients in the same setting

as the present study, using the same instrument, indicated a prevalence of 42.4%.<sup>[35]</sup> In a study that used a similar instrument in assessing sleep quality among chronic kidney disease patients, the prevalence of poor sleep was 53%.<sup>[36]</sup> The observed higher prevalence of poor sleep in the present study could be explained by the fact that glaucoma is one of the ophthalmic disorders associated with the gravest fears of irreversible blindness.<sup>[32]</sup>

Sleep disorders among patients with glaucoma have been attributed to psychological factors or discomforts caused by an elevated intra-ocular pressure during the night.<sup>[15,16,22]</sup> It is therefore not surprising that our study demonstrated a positive correlation between psychological distress and global quality of sleep. Psychological distress correlated positively with the sleep latency component of sleep, implying that, the longer it takes to fall asleep, the more the psychological distress for the patients. Similarly, psychological distress correlated well sleep disturbance and subjective rating of the subjects on the quality of sleep.

The poor quality of sleep in glaucoma could further be explained by circadian misalignments that have been reported in such patients.<sup>[37-39]</sup> There are ample evidence to suggest that glaucoma leads to retinal ganglion cells (RGC) death, including intrinsically photosensitive RGCs (ipRGCs) death.<sup>[37-39]</sup> These cells are connected to several non-image-forming functions, including circadian photoentrainment and pupillary reflexes. Photoc input from these cells synchronises the suprachiasmatic nucleus (the primary circadian pacemaker in the human brain) to the solar day, which keeps the human circadian rhythm close to a 24-hour cycle by driving the nocturnal synthesis of the pineal hormone melatonin and inducing the circadian phase and sleep.<sup>[40]</sup>

Polysomnographic studies have shown that, compared with healthy subjects, glaucoma patients had worse sleep quality, and the polysomnographic parameters of sleep disorders were associated with a poorer sustained response to the pupillary reflex in glaucoma patients.<sup>[37]</sup> Therefore, the damage to the ipRGCs caused by

glaucoma decreases their input synchronisation, thereby leading to sleep disorders. Recognition of this problem provides awareness of the fact that patients with glaucoma not only have impairment of visual functions but also suffer from sleep disturbances. Therefore, it may be helpful to improve their sleep quality with treatment using chronotherapeutic approaches (appropriately-timed exposure to bright light which may reset the timing of sleep and wake to the desired times and improve sleep quality) as well as melatonin treatment which can positively influence comorbid circadian misalignment and sleep disorders.<sup>[41,42]</sup>

It is worthy of note that the duration of illness correlated positively with the sleep duration component of sleep. The circadian misalignments earlier described could be responsible for this observation. Some evidence have shown that the damage done to ipRGCs by glaucoma is also correlated with increased daytime sleepiness.<sup>[38]</sup> Excessive daytime sleepiness affects the quality of life, daytime function, and mortality.<sup>[38]</sup>

## Conclusion

The present study showed that psychological distress and sleep disturbances are common among patients with glaucoma. However, caution should be exercised when interpreting the findings of this study because of the relatively small sample size and the cross-sectional design of the study which are clear limitations. Nevertheless, understanding the psychosocial issues and the quality of sleep in glaucoma may assist with the detection, prevention and treatment of emotional problems associated with the disorder. Concerns about these issues should be incorporated into the routine clinical evaluations of patients with glaucoma. Comprehensive management such as the use of consultation-liaison psychiatry services would contribute to better health care for individuals with glaucoma. Future studies, especially of longitudinal designs, are needed to prospectively explore the relationships between glaucoma, psychological distress and quality of sleep.

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data collection and assisted in drafting of the manuscript; ATO carried out statistical analysis, interpretation of data and final draft of the manuscript; OAA contributed in the acquisition of data and revised the manuscript; STO participated in the drafting and critical revision of the manuscript; OOO(2) participated in data acquisition and final draft of the manuscript; AF participated in statistical analysis and interpretation of results. All authors read and approved the final draft of the manuscript.

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