

# The Impact of Glaucoma on the Mental Health of Primary Open-Angle Glaucoma Patients Attending a Teaching Hospital in South East Nigeria

## Abstract

**Objective:** To evaluate the effect of glaucoma on the mental health of primary open-angle glaucoma patients using Hospital Anxiety and Depression Scale (HADS) **Materials and Methods:** This was a hospital-based comparative study in which 180 glaucoma patients and controls 18 years and above who met the inclusion criteria were selected consecutively in the Eye Clinic of Federal Medical Centre, Owerri, Imo State, in 2017. Data were collected using a questionnaire and the HADS protocol. All the participants underwent comprehensive ocular examination, and glaucoma was graded using visual field perimetric indices and mean deviation. **Results:** The mean age for cases was  $58.14 \pm 13.88$  years, whereas that of the control group was  $57.19 \pm 13.76$  years. The majority of glaucoma respondents had the moderate form of the disease followed by the severe form. The glaucoma patients showed evidence of poor mental health with 59 (32.8%) of them anxious and 39 (21.7%) depressed compared to controls ( $P < 0.001$ ). The mean scores for anxiety and depression were  $6.02 \pm 4.8$  and  $5.20 \pm 4.5$ , respectively, for glaucoma patients, whereas those for the control group were  $0.63 \pm 1.8$  and  $0.64 \pm 2.1$ , respectively ( $P < 0.001$ ). There was no uniform correlation between the mental health of patients and the variables under study. **Conclusion:** Primary open-angle glaucoma affects the mental health of patients. This effect is worsened by the severity of the disease and influenced by the occupation and educational level of the patients. Multidisciplinary management of primary open-angle glaucoma patients is recommended.

**Keywords:** Glaucoma, impact, mental health

## Introduction

Glaucoma is the leading cause of irreversible blindness globally.<sup>[1]</sup> Quigley and Broman in 2006, using prevalence models, reported a global glaucoma prevalence of 60.5 million in 2010 and 79.6 million in 2020.<sup>[2]</sup> By 2040, it is expected that approximately 111.8 million people will suffer from glaucoma.<sup>[3]</sup> In the United States of America, more than 3 million people are living with glaucoma, whereas 2.7 million people aged 40 years and above are affected by its most common form, open-angle glaucoma.<sup>[2]</sup> In Nigeria, the overall prevalence of blindness was 1.21% and the proportion of blindness due to glaucoma was 14.1% among those aged 40 years and above.<sup>[3]</sup> The glaucoma-specific blindness prevalence was 0.17%.<sup>[4]</sup> A recent study in Nigeria revealed that 5.02–6.9% (1.8 million) of people above 40 years suffer from glaucoma with almost 360,000 (20%) of them blind in both eyes.<sup>[5]</sup> Findings from various studies have shown that glaucoma is associated with low levels of psychosocial well-being characterized by

a diminution in the individual's perception of self and ability to function in the community and usually manifests as depression and/or anxiety.<sup>[6-10]</sup> Depressed people feel sad, empty, hopeless, worthless, and irritable with an aversion to activity.<sup>[11-13,14]</sup> Although anxiety is distinguished by feelings of precariousness and vulnerability, in severe cases, it comes with repeated apprehension and intense fear, which is incommensurate to the existing situation causing it.<sup>[11]</sup> It has been found that the presence of these symptoms in patients results in poor use of medication<sup>[15]</sup> and a vicious cycle of worsening vision.

About 90% of people who have glaucoma in the developing countries such as Nigeria are not aware that they have this disease.<sup>[16]</sup> This implies that many may develop severe visual impairment or blindness with its attendant psychological effects.

The Hospital Anxiety Depression Scale (HADS)<sup>[17-19]</sup> can aid in determining the psychosocial impact of glaucoma on patients, especially on their mental health. Evidence

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**How to cite this article:** Ubochi CC, Achigbu EO, Nkwogu FU, Onyia OE, Okeke CJ. The impact of glaucoma on the mental health of primary open-angle glaucoma patients attending a teaching hospital in South East Nigeria. *J West Afr Coll Surg* 2020;10:17-22.

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Received: 21-Dec-2021

Accepted: 29-Jan-2022

Published: 26-Mar-2022

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Access this article online

Website:

www.jwacs-jcoac.org

DOI: 10.4103/jwas.jwas\_59\_21

Quick Response Code:



elicited from the use of HADS may be utilized in the development of management strategies for glaucoma.

## Materials and Methods

### Study design

This was a hospital-based comparative study that comprised 180 old and new patients (18 years and above) diagnosed with varying degrees of severity of primary open-angle glaucoma and 180 age-matched, sex-matched controls with essentially normal eyes and no family history of glaucoma. Participants were selected consecutively until the sample size was attained.

### Sample size determination

The sample size was estimated at 162 using the Charan and Biswas<sup>[20]</sup> formula for case-control studies.

To accommodate for non-response, an extra 10% was added to the sample size using the following formula: Calculated sample size multiplied by  $100/100 - X$ , where  $X$  is 10 in this case.

The calculated minimum sample size was therefore 178. One hundred and eighty cases and 180 controls were recruited.

### Eligibility criteria

Patients were considered eligible as cases if they had glaucomatous optic nerve head changes, glaucomatous visual field defect, and gonioscopically determined open anterior chamber angles, with or without elevated intraocular pressure (IOP) in both eyes. Patients must be on medical therapy only, and where early lens opacity was present, it had to be visually insignificant, and not prevent adequate visualization of the optic disc. Refractive error of not less than 5 dioptre sphere (DS) or 2 dioptre cylinder was accepted. The control group consisted of patients with non-glaucomatous optic nerve head, normal visual fields, gonioscopically determined open anterior chamber angles, normal IOP in both eyes, no family history of glaucoma, fully corrected refractive error less than 5 DS or less than 2 DCyl of astigmatism, and a best-corrected visual acuity of 6/9 or better. Cataract if present should be visually insignificant.

### Exclusion criteria

Cases were excluded if they had primary angle-closure glaucoma, secondary glaucoma, and other causes of optic nerve abnormalities. Those already diagnosed with psychiatric disturbances and cognitive limitations such as dementia, hearing impairment, or systemic comorbidities such as diabetes mellitus, hypertension, and immunosuppression were also excluded.

In addition, participants were excluded as controls if they had suspicious disc (glaucoma suspects) or ocular hypertension (IOP > 21 mmHg).

### Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki, and approval for the study was obtained from the Ethics Committee of Federal Medical Centre, Owerri, Imo State. A permission letter was also gotten from the

Ophthalmology department. Written informed consent was obtained from each patient after proper explanation of the objectives of the study by signing or thumb printing.

### Data collection

Data on the demographics, medical, and ophthalmic history of participants were obtained using a questionnaire. A comprehensive ocular examination comprising distance visual acuity assessment using Snellen chart, near visual acuity using Jaeger chart, Goldmann applanation tonometry, binocular dilated funduscopy with +78 D lens, and gonioscopy using the 2-mirror Volk lens was done and recorded in a pro forma. Central visual field assessment using full threshold central 30-2 strategy (using Synemed EP-910) was used to grade glaucoma severity. Based on visual field perimetric indices and mean deviation (MD), glaucoma severity was grouped into mild, moderate, and severe glaucoma. Perimetric results were considered reliable if they had <30% false-positive and <30% false-negative errors, and <20% fixation losses. An MD representative of both eyes (MD OU) was calculated using a modification of the formula by Nelson-Quigg *et al.*<sup>[21]</sup>

$$\text{MD OU} = (\text{MD RE}^2 + \text{MD LE}^2)^{1/2}$$

Mild (grade 1) is characterized by a nasal step or paracentral scotoma and MD less than -6 dB. Moderate (grade 2) is characterized by an arcuate scotoma and an MD -6 dB to -12 dB.

Severe (grade 3) is characterized by an extensive visual field loss including defects within the central 5° and MD more than -12 dB.<sup>[22]</sup>

HADS consisting of 14 questions for assessment of mental health<sup>[23,24]</sup> was administered by the researcher. Scores higher than 8 in both HADS-A and HADS-D were considered as anxiety and depression. The translated Igbo language version was administered to respondents who were not literate in English. Care was taken to reduce any bias that could occur because of translation.

### Pilot test

A pilot test was done in Federal Medical Centre, Owerri, among 20 patients who were not included in the study to validate and test the reliability of the questionnaire.

### Data analysis

Data were analysed using the Statistical Package for the Social Sciences version 21 software. It was subjected to descriptive statistics. Evaluation of group differences was done using the *t*-test and analysis of variance for continuous variables. Chi-square was used for analysis of categorical data. *P*-value ≤ 0.05 was considered statistically significant.

### Results

A total of 360 patients were studied; 180 glaucoma patients and 180 non-glaucoma patients (control group). Thirty-one (8.6%) of the patients responded to the Igbo questionnaire.

**Table 1: Socio demographic distribution of cases and controls**

	Cases	Controls	Total
Age group (years)			
<30	5 (2.8%)	8 (4.4%)	13 (3.6%)
30–39	18 (10%)	14 (7.8%)	32 (8.9%)
40–49	22 (12.2%)	26 (14.4%)	48 (26.7%)
50–59	49 (27.2%)	50 (27.8%)	99 (27.5%)
60–69	46 (25.6%)	49 (27.2%)	95 (26.4%)
70+	40 (22.2%)	33 (18.3%)	73 (20.3%)
<b>Total</b>	<b>180 (100.0%)</b>	<b>180 (100.0%)</b>	<b>360 (100.0%)</b>
$\chi^2 = 15.703$	<b>df = 5</b>	<b>P = 0.85</b>	
Gender			
Male	66 (36.7%)	66 (36.7%)	132 (36.7%)
Female	114 (63.3%)	114 (63.3%)	228 (63.3%)
<b>Total</b>	<b>180 (100.0%)</b>	<b>180 (100.0%)</b>	<b>360 (100.0%)</b>
$\chi^2 = 0.625$	<b>df = 1</b>	<b>P = 1</b>	
Marital status			
Single	24 (13.3%)	15 (8.3%)	39 (10.8%)
Married	121 (67.2%)	119 (66.1%)	240 (66.7%)
Separated	7 (3.9%)	4 (2.2%)	11 (3.1%)
Widowed	28 (15.6%)	42 (23.3%)	70 (19.4%)
<b>Total</b>	<b>180 (100.0%)</b>	<b>180 (100.0%)</b>	<b>360 (100.0%)</b>
$\chi^2 = 8.791$	<b>df = 3</b>	<b>P = 0.032</b>	

**Table 2: Proportion of respondents with anxiety (using HADS scores)**

	Cases	Controls	Total
Anxiety	59	6	65
Percentage	32.8	3.3	18.1
Borderline	43	7	50
Percentage	23.9	3.9	13.9
Normal	78	167	245
Percentage	43.3	92.8	68.0
<b>Total</b>	<b>180 (100.0%)</b>	<b>180 (100.0%)</b>	<b>360 (100.0%)</b>
	<b>Value</b>	<b>Df</b>	<b>P-value</b>
Pearson chi-square	53.896	1	<0.001

HADS = Hospital Anxiety and Depression Scale

**Table 3: Proportion of respondents with depression (using HADS scores)**

	Cases	Controls	Total
Depression	39 (21.7%)	2 (1.1%)	41 (11.4%)
Borderline	40 (22.2%)	12 (6.7%)	52 (14.4%)
Normal	101 (56.1%)	166 (92.2%)	267 (74.2%)
<b>Total</b>	<b>180 (100.0%)</b>	<b>180 (100.0%)</b>	<b>360 (100.0%)</b>
	<b>Value</b>	<b>Df</b>	<b>P-value</b>
Pearson chi-square	28.048	1	<0.001

HADS = Hospital Anxiety and Depression Scale

The difference in the age groups and gender distribution of the cases and control were not statistically significant ( $P = 0.85$  and  $P = 1$ , respectively) [Table 1]. The difference in marital status between the two groups was statistically significant ( $P = 0.032$ ).

Fifty-nine (32.8%) glaucoma patients were anxious compared to six (3.3%) controls [Table 2]. This difference was statistically significant ( $P < 0.001$ ).

Thirty-nine (21.7%) glaucoma patients were depressed, whereas only two (1.1%) controls were depressed. The difference between the two groups was statistically significant ( $P < 0.001$ ) [Table 3].

The mean anxiety score for cases is  $6.02 \pm 4.816$  and that for controls is  $0.63 \pm 1.837$  [Table 4]. For depression, the mean score for cases is  $5.20 \pm 4.502$ , whereas for controls, it is  $0.64 \pm 2.113$ . The difference in the mean scores is statistically significant.

**Table 4: HADS-A and HADS-D comparison between cases and controls**

	Study group	Mean	Standard deviation	P-value
Anxiety scores	Cases	6.02	4.816	<0.001
	Controls	0.63	1.837	
Depression scores	Cases	5.20	4.502	<0.001
	Controls	0.64	2.113	

HADS-A = HADS anxiety, HADS-D = HADS depression

**Table 5: Relationship between anxiety/depression and severity of glaucoma**

Glaucoma severity	No of anxious patients	No of depressed patients	Total	P-value
Mild (<-6 dB)	6 (10.2%)	4 (10.3%)	10 (10.2%)	<0.001
Moderate (-6 dB to -12 dB)	24 (40.7%)	10 (25.6%)	34 (34.7%)	<0.001
Severe (>-12 dB)	29 (49.2%)	25 (64.1%)	54 (55.1%)	<0.001
<b>Total</b>	<b>59 (100.0%)</b>	<b>39 (100.0%)</b>	<b>98 (100.0%)</b>	<b>&lt;0.001</b>

**Table 6: The effect of sociodemographic variables on HADS scores for cases**

Variables	HADS-A	HADS-D	T-value/F-ratio (HADS-A) (HADS-D)	P-value (HADS-A) (HADS-D)
Gender				
Male	7.8 (±5.0)	6.7 (±5.0)	(3.8)	(0.01) (A)
Female	4.9 (±4.4)	4.3 (±3.9)	(3.3)	(0.383) (D)
Age (years)				
<30	9.0 (±0.0)	7.3 (±2.3)	(2.4)	(0.041) (A)
30-39	3.7 (±4.9)	3.9 (±5.5)	(2.7)	(0.021) (D)
40-49	5.6 (±5.0)	2.7 (±3.4)		
50-59	5.0 (±3.9)	4.8 (±3.5)		
60-69	6.6 (±5.4)	5.7 (±5.0)		
70+	7.6 (±4.5)	6.58 (±4.4)		
Marital status				
Single	6.7 (±5.6)	6.9 (±6.0)	(3.086)	(0.229) (A)
Married	5.6 (±4.8)	4.5 (±4.2)	(1.453)	(0.229) (D)
Separated	7.0 (±0.0)	7.0 (±0.0)		
Widow	7.4 (±4.4)	6.8 (±4.2)		
Formal education				
None	6.6 (±3.7)	5.7 (±2.2)	(2.5)	(0.058) (A)
Primary	7.6 (±5.2)	6.2 (±4.6)	(1.6)	(0.192) (D)
Secondary	6.8 (±5.2)	5.9 (±4.9)		
Tertiary	5.0 (±4.5)	4.4 (±4.5)		
Occupation				
Professional	2.2 (±2.3)	1.5 (±2.3)	(5.4)	(<0.001) (A)
Skilled	5.6 (±4.9)	5.4 (±4.8)	(4.4)	(0.002) (D)
Unskilled	5.6 (±4.7)	4.8 (±4.2)		
Student	8.3 (±1.6)	6.5 (±1.9)		
Unemployed	8.1 (±5.0)	6.8 (±4.8)		

HADS = Hospital Anxiety and Depression Scale, HADS-A = HADS anxiety, HADS-D = HADS depression

Majority of the anxious patients had severe glaucoma followed by those who had moderate glaucoma [Table 5]. This pattern also occurred in patients who had depression. There was a statistically significant relationship between severity of glaucoma and anxiety, and depression.

The sociodemographic variables that may influence anxiety and depression scores were analysed using multivariate linear regression methods [Table 6]. Education and occupation significantly affected anxiety and depression scores of the patients.

## Discussion

The glaucoma patients in the present study showed evidence of poor mental health with a significantly ( $P < 0.001$ ) higher number anxious (32.8%) and depressed (21.7%) than the controls [Tables 2 and 3]. This finding implies that many individuals living with glaucoma also have comorbid psychological problems. The fearful possibility of blindness that is caused by this disorder may be the source of anxiety in these patients. Anxiety can result from patient's fear of battling with lifelong management of the disease, threat

to losing one's vision, and expensive and time-consuming use of medications. Those patients who have started losing their vision are likely to be depressed as a result of inability to do previous tasks, which hitherto, they were able to accomplish easily. This is similar to findings from previous studies. Sharma *et al.*<sup>[25]</sup> observed that out of 100 eligible glaucoma cases, 44% were anxious, whereas 35% were depressed. Mabuchi *et al.*<sup>[26]</sup> also found that the prevalence of primary open angle glaucoma patients with anxiety (13.0%) was significantly higher ( $P = 0.030$ ) than that of controls (7.0%) while the prevalence for depression at 10.9% was also significantly higher ( $P = 0.026$ ) in the cases. Similar evidence was also reported in other studies with varying prevalence.<sup>[27-31]</sup> In contrast, Wilson *et al.*<sup>[32]</sup> found no significant difference in depression scores between glaucoma patients and control groups. This may be attributed to the fact that majority of the respondents in Wilson *et al.*<sup>[32]</sup> study were elderly and retired and so probably had little or no fear of job loss and its attendant economic implications.

The mean scores for anxiety and depression were  $6.02 \pm 4.8$  and  $5.20 \pm 4.5$  respectively for glaucoma patients while the control group had  $0.63 \pm 1.8$  and  $0.64 \pm 2.1$  respectively for both depression and anxiety [Table 4]. There was a statistically significant difference between these mean scores. Hwang *et al.*<sup>[31]</sup> found a similar result of mean scores for cases. They had  $6.5 \pm 4.1$  for anxiety and  $5.3 \pm 4.1$  for depression but had higher mean scores for their control groups  $4.8 \pm 3.8$  for anxiety and  $6.5 \pm 4.1$  for depression. This difference maybe as a result of differences in methodology. While the present study excluded glaucoma suspects, and used equal numbers of cases and controls, their study included glaucoma suspects and had fewer number of participants as controls.

A comparison of HADS scores and severity of glaucoma revealed that respondents with severe glaucoma were more anxious and/or depressed [Table 5]. Mabuchi *et al.*<sup>[26]</sup> found that increasing glaucoma severity was a risk factor for depression in patients with glaucoma. This was also corroborated by a Singapore study,<sup>[33]</sup> which reported that one of the risk factors for depression and anxiety disorder is having a more severe form of the disease. It is therefore pertinent to note that just as psychosocial stress can translate into illness that will require treatment, some physical illnesses such as glaucoma can cause psychiatric disorders severe enough to require treatment by specialists.

This study revealed that males had higher depression and anxiety scores than females [Table 6]. Similarly, Dawodu *et al.*<sup>[27]</sup> found all depressed patients in their study to be males even though the sample size was small. This is at variance with the report by Lim *et al.*<sup>[33]</sup> and Eshun<sup>[34]</sup> of higher depression and anxiety in females than male glaucoma patients. This difference could be due to differences in methodology including study location. Hwang *et al.*<sup>[31]</sup> reported higher anxiety in males than females and more depression scores in females than males.

The HADSs compared with age ranges of the study sample revealed that the younger age group was more anxious and depressed ( $9.0 \pm 0.0$  and  $7.3 \pm 2.3$ , respectively) compared to the older age group [Table 6]. Other studies corroborate this finding.<sup>[27]</sup> The severity of glaucoma and the deep-seated desire for the aging to retire peacefully without health challenges and physical handicap may result in psychological disorders, especially when faced with lifelong visual challenges.

Marital status was not significantly associated with anxiety and depression for glaucoma patients [Table 6].

Other studies also found no significant association between anxiety/depression and marital status of glaucoma patients.<sup>[25,31]</sup> Occupation was significantly associated with anxiety ( $P < 0.001$ ) and depression ( $P = 0.002$ ). Similar results were found by other studies.<sup>[25]</sup> This implies that the socioeconomic level of a patient is a very important factor to be considered while managing glaucoma patients. This is not surprising as the treatment of glaucoma is lifelong and basically expensive requiring a steady income for the patients to be able to purchase their drugs. This study found that a higher level of education was not significantly associated with anxiety ( $P = 0.058$ ) and depression ( $P = 0.192$ ) [Table 6]. Tertiary level of education had the least mean score for anxiety  $5.0 (\pm 4.5)$  and depression  $4.4 (\pm 4.5)$ , whereas primary level of education had the highest mean score for anxiety  $7.6 (\pm 5.2)$  and depression  $6.2 (\pm 4.6)$ . It is possible that with the higher level of education, the patients have a better understanding of the disease, present earlier, and follow through with their management processes. Lower level of education is usually associated with poorer income. This may be a source of worry for patients who have to source for funds for a lifelong treatment and also manage their family and social responsibilities.

## Conclusion

Primary open-angle glaucoma patients experience some level of anxiety and depression. Variables such as age, gender, occupation, level of education, and severity of glaucoma have a significant effect on the mental health of patients.

## Recommendation

A multidisciplinary approach is advocated for the management of glaucoma patients. Primary health physicians are usually the first port of call for glaucoma patients. They should be able to aid diagnosis and referral to ophthalmologists, interact with family members, and encourage family screening and psychotherapy for patients.

Patients may be encouraged to form and join support groups as this will help to alleviate the psychological burden of glaucoma.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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