



Prevalence and Predictors of Anxiety and Depression among Glaucoma Patients in a Tertiary Health Institution in South-South Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. The article conceptualization, data collection and processing, and the writing of the initial draft were done by NN Ani. G I Nathaniel did the literature search and edited the manuscript; then reviewed and wrote the final draft. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: To determine the prevalence and factors associated with Anxiety and Depression among glaucoma patients.

Study Design: It was a hospital-based cross-sectional study.

Place and Duration of Study: This study was carried out at the Department of Ophthalmology, University of Port Harcourt Teaching Hospital Port Harcourt, Nigeria. From February to June 2016.

Patients and Methods: Glaucoma patients aged 18 years or older with no history of coexisting ocular pathology or chronic systemic illness were included in the study. Hospital Anxiety and Depression Scale (HADS) questionnaires were administered. Ocular examinations done included visual acuity, applanation tonometry, and ophthalmoscopy. Perimetry was done using a standard achromatic perimetry with a fast threshold central 30-2 strategy. Data obtained from the subjects were analysed using SPSS (Version 20), and p value set at < 0.05.

Results: There were 141 males (47%) and 158 females (53%) giving a male: female ratio 1:1.12. The age range was 20-86 years with mean age of 53.61± 14.23 years. The prevalence of Anxiety and Depression were 37.5% and 34.1% respectively, while 53 subjects (17.7%) had both anxiety

and depression. The mean scores of anxiety and depression among the study subjects were 6.49 ± 3.851 (CI 6.05-6.93) and 5.78 ± 3.832 (95% CI 5.35-6.21) respectively. Family history (O.R=1.893;P-value=0.019), previous membership of a Glaucoma Society(O.R=2.633;P-value=0.007), and BCVA in the better eye(O.R=0.235;P-value=0.001), were significant predictors of anxiety while age(O.R=0.774;P-value=0.029), educational status (O.R=0.139;P-value=0.001), and BCVA in the better eye (O.R=4.865;P-value=0.001) were significant predictive factors for depression after adjustment for confounding factors.

Conclusion: There is high prevalence of Anxiety and Depression among this cohort of glaucoma patients. Combined management of glaucoma patients with Neuropsychiatrists will promote a holistic management with early detection of mental health challenges.

Keywords: Prevalence; anxiety; depression; glaucoma.

1. INTRODUCTION

Glaucoma is a major blinding disease globally [1]. In Nigeria, it is the second most common cause of blindness [2]. As an irreversible cause of visual loss, patients with glaucoma have been observed to have psychological, social and emotional challenges which over time can make them develop common mental health disorders such as anxiety and depression. Anxiety and depression have been known to constitute a greater percentage of these co-morbid psychiatric disorders in glaucoma patients, which often time are neglected by eye care practitioners who commonly emphasize on ophthalmic care of their patients [3-7].

Factors such as progressive vision loss, frequent follow-ups and lifelong application of multiple medications, financial burden occasioned by the disease and loss of productive capacity due to vision loss increase the comorbidity of mental disorders [3-10]. Vision loss generally is associated with reduced quality of life [11]. Anxiety and depression may cause a further deterioration in quality of life with increase vulnerability for health decline [12]. In addition, if these conditions are left untreated, they lead to worsening of glaucoma and compound the costs of treatment [13].

Studies have shown that glaucoma in blacks appears to be more severe and more refractory to medical therapy leading to a higher risk of visual impairment or blindness [14-16]. Consequently, this potential outcome of visual impairment or blindness often impose anxiety and depression on the patients [3,8]. Few studies in Nigeria have evaluated the prevalence of anxiety and depression among glaucoma patients and particularly the South-South part of the country which harbours the petrol wealth of the country. This study therefore aims to assess the prevalence and predictors of anxiety and

depression among glaucoma patients receiving treatment at the Ophthalmology clinic of the University of Port Harcourt Teaching Hospital, Port Harcourt, South-South Nigeria. The findings will help in policy formulation and enhance the standard operating procedure (SOP) for the holistic management of glaucoma patients at the University of Port Harcourt Teaching Hospital and Nigeria in general.

2. MATERIALS AND METHODS

This was a hospital-based cross-sectional study of the prevalence of Anxiety and Depression among glaucoma patients aged 18 years and older. The participants were recruited by simple random sampling technique at the Department of Ophthalmology, University of Port Harcourt Teaching, Port Harcourt (UPTH) from February to June 2016. Other inclusion criteria included: Patients with either Primary open angle glaucoma (POAG), Normal tension glaucoma, Juvenile onset open angle glaucoma or primary angle closure glaucoma with disease duration of at least 6 months and those with reliable perimetric result.

Glaucoma patients with ocular comorbidities such as cataract, age-related macular degeneration (ARMD), diabetic retinopathy, previous incisional ocular surgery or Laser surgery in the previous 3 months, systemic preexisting conditions such as diabetes mellitus, hypertension and immunosuppression were excluded.

The sample size was calculated using the Leslie Kish formula [17]:

$$n = \frac{z^2 pq}{e^2}$$

Where:

n = desired sample size where population is greater than 10,000

z = the normal deviation usually set at 1.96.
 This corresponds to 95% confidence level
 p = 23% - 2009 prevalence of glaucoma in National Eye Centre, Kaduna [18].

e = degree of accuracy desired usually at 0.05%

q = 1.0-p

$$n = \frac{1.96^2 \times 0.23 \times (1 - 0.23)}{0.05^2}$$

n = 272

Allowance for attrition of 10% = 0.1 x 272 = 27

Therefore, minimum sample size = 272 +27 => n=299

The Hospital Anxiety and Depression Scale (HADS) questionnaire was administered to the participants by the first author (ANN) to screen them for Anxiety and Depression. To reduce any bias that could occur because of translation, the questionnaire was administered in pidgin English which is the prominent language used in Port Harcourt city.

Then all the patients had a comprehensive anterior segment examination, gonioscopy and slit lamp ophthalmoscopy with +78D Volk lens. The anterior chamber angle was graded using Schafer grading system. They also had achromatic standard automated perimetry 24-2 full threshold strategy using Hensen visual field analyzer.

2.1 Definition of Anxiety and Depression

The HADS questionnaire comprises seven questions for anxiety and seven questions for depression. The anxiety and depression questions are interspersed within the questionnaire, but the scoring is done separately. For both scales, scores of 7 or less indicate non cases [19].

2.2 Data Analysis

Data obtained from all participants were cross checked for correctness and completeness. Data

analysis was done using the Statistical Package for Social Sciences 20 (SPSS 20). The distribution of the clinical parameters of the subjects was presented as frequency charts and tables as appropriate.

Qualitative variables (anxiety and depression) were expressed as frequencies and proportions. The student's t test was used for differences between two groups. Chi-square and Fishers Exact tests were used as appropriate to determine statistically significant differences in proportions. A p value < 0.05 was considered statistically significant. Variables that were statistically significant were entered into a multivariate analysis model. Multivariate analysis, in the form of logistic regression and multiple linear regression was employed as appropriate to identify risk factors and control for possible confounders. Odds ratios were computed to measure the strength of association between variables. Confidence intervals were calculated at 95% level.

3. RESULTS

Two hundred and ninety-nine (299) glaucoma patients participated in this study. There were 141 males (47%) and 158 females (53%) giving a male: female ratio of 1:1.12. The age range was 20-86 years with a mean age of 53.61± 14.23 years (Table 2).

3.1 Educational, Occupational and Marital Status of Study Subjects

Majority of the study population had tertiary education 187 (62.5%) while 49 (16.4%) had secondary education and 63(21.1%) had primary education. Majority, 187 (62.5%) of the study population were employed with regular income while 69 (23.1%) were retired and depend on pension or children, 17 (5.7%) were students and 26 (8.7%) were unemployed. Majority, 271(90.6%) were married while lesser number, 28 (9.4%) were single.

Table 1. HADS score

For both scales, scores of less than 7 indicate non-cases	
8–10	Mild
11–14	Moderate
15–21	Severe

Note: Score anxiety and depression separately

Table 2. Age and gender distribution of the study population

Age Groups (Years)	Gender		Total Number (%)
	Male Number (%)	Female Number (%)	
<21	3(27.3)	8(72.7)	11(100.0)
21-30	0(0.00)	6(100.0)	6(100.0)
31-40	11(35.5)	20(64.5)	31(100.0)
41-50	32(42.1)	44(57.9)	76(100.0)
51-60	41(54.7)	34(45.3)	75(100.0)
61-70	39(52.0)	36(48.0)	75(100.0)
71-80	8(44.4)	10(55.6)	18(100.0)
81-90	7(100.0)	0(0.00)	7(100.0)
Total	141 (47.2%)	158 (52.8%)	299 (100.0%)

Fisher's Exact Test=20.107; p=0.004

Table 3. BCVA in the better and worst eye among the study population

BCVA	Better eye		Worst eye	
	No	%	No	%
Group 1 (6/4 6/9)	255	85.1	206	68.9
Group 2 (6/12-6/18)	25	8.4	37	12.4
Group 3 (6/24-6/36)	16	5.4	35	11.7
Group 4 (6/60-3/60)	3	1.0	1	0.3
Group 5 (< 3/60)	--	--	20	6.7
Total	299	100.0	299	100.0

Table 4. Mean defect in the better eye and worst eye among the study population

MD	Better eye		Worst eye	
	No	%	No	%
mild (≥ -6 dB)	239	79.9	210	70.2
moderate(-6.01dB to -12dB)	40	13.4	33	11.1
advanced(-12.01dB to -20dB)	20	6.7	42	14.0
severe(> -20dB)	--	--	14	4.7
Total	299	100.0	299	100.0

3.2 Clinical Information of Study Population

Majority of the study population, (n=203; 67.9%) did not have any family history of glaucoma compared to 32.1% who had a positive family history. Almost all the subjects (n=292; 97.7%) had POAG, only 2.3% had PACG and secondary glaucoma (SG). Most of the study subjects (n=175; 58.5%) were able to personally handle the financial implication (cost of regular follow-up visits and medications) compared to 41.5% who depended on their children or relatives for financial support or hospital visits.

Most of the study population (269) have had glaucoma for 10 years (90%) or less while 2.3% (7) have had glaucoma for over 21 years, and 7.7% (22) have had for between 11 to 20 years.

About 85% of study subjects had visual acuity of 6/4 of 6/4 6/9 in the better eye. None of the better eye had a visual acuity of < 3/60 however 6.7% of the worst eye has visual acuity of < 3/60 Table 3.

About 20.1% of the better eye had moderate to advanced mean defect and 29.8% had moderate to advanced mean defect in the worst eye as shown in Table 4.

3.3 Anxiety and Depression among Study Subjects

The mean score of anxiety among the study population was 6.49 ± 3.851 . Most subjects (62.5%) did not have anxiety; however, 37.4% had anxiety and those with mild anxiety were

more (21.7%) than those with moderate (14.4%) or severe (1.3%) anxiety. (Fig. 1).

The mean score of depression among the study population was 5.78 ± 3.832 ; 34.1% were depressed. More than 80% of subjects with depression have mild form. (Fig. 1).

Table 5 shows that 19.7% of the study subjects had only anxiety, 16.6% only depression and 17.7%, both anxiety and depression.

The prevalence of anxiety among study subjects therefore was 37.5 % (95% C.I:37.3% - 37.7%), while it was 34.1% (95% C.I: 34.0% - 34.2%) for depression.

3.4 Relationship between Anxiety and Depression and the various Clinical Parameters

The difference in the proportion of age categories among subjects with and without anxiety and depression were statistically significant ($X^2=19.567$ $p = 0.007$ and $X^2= 23.123$; $p= 0.002$ respectively). A hundred percent (100%) of patients aged 21-30 years have anxiety while only 50% of subjects in the same age group have depression.

There was no association between anxiety ($X^2=7.773$; $p=0.051$) or depression ($X^2=6.289$; $p=0.098$) with occupational status.

There is an association between anxiety and depression with source of financial support ($p=0.038$ for anxiety and 0.016 for depression). About 33% of subjects with anxiety and 28.6% of those with depression can support their hospital bills themselves. There is a significant association between anxiety and depression with BCVA in the better eye ($p=0.001$ for anxiety and 0.003 for depression). All study subjects with BCVA 6/60-3/60 had anxiety. However, there is no association between anxiety with marital status ($p=0.064$), type of glaucoma ($p=0.172$), Mean Defect in the better ($p=0.920$) or worst eye ($p= 0.463$). There was also no association between depression with marital status ($p=0.057$), type of glaucoma ($p=0.247$), Mean Defect in the better ($p=0.987$) or worst eye ($p=0.640$). There is however an association between anxiety and family history of glaucoma ($p=0.021$), previous membership of a Glaucoma Society ($p=0.004$) and BCVA in the worst eye ($p=0.001$); no such association was seen in depression ($p=0.396$ for family history; $p= 0.243$) for previous membership of a Glaucoma Society and $p=0.309$ for BCVA in the worst eye). There is also no association between anxiety across gender ($p=0.664$) educational status ($p=0.217$) and duration of glaucoma ($p=0.211$). However, depression was significantly associated with gender ($p=0.048$), educational status ($p=0.001$), and for duration of glaucoma ($p=0.045$).

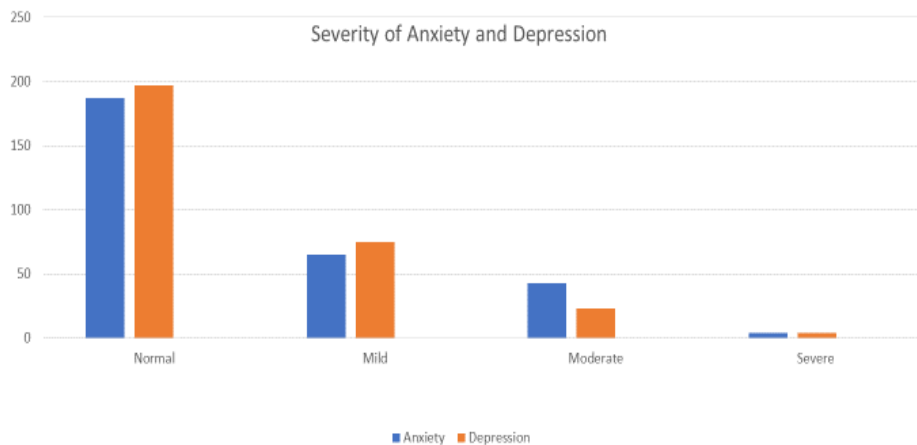


Fig. 1. Severity of Anxiety and Depression among Subjects

Table 5. Levels of anxiety and depression among study population

Variables	Frequency	Percentage	% CI
Presence of both Anxiety and Depression	53	17.7	13.3% - 22.1%
Anxiety alone	59	19.7	15.3% - 24.1%
Depression alone	49	16.4	12.0% - 20.8%
None	139	46.2	40.7% - 51.7%
Total	299	100.0	

Table 6. Logistic regression analysis to assess risk factors for anxiety and depression

Variables	B (dependent)	Adjusted O.R (EXP β)	95% CI	P-value
(Anxiety) Family history of glaucoma	0.638	1.893	1.109-3.231	0.019*
Membership of Glaucoma Society	0.968	2.633	1.302-5.328	0.007*
BCVA better eye (Depression)	1.447	0.235	0.116-0.478	0.001*
Age	-0.256	0.774	0.615-0.974	0.029*
Educational status	-1.972	0.139	0.064-0.305	0.001*
BCVA (better eye)	1.582	4.865	2.206-10.731	0.001*

*= significant p value

Therefore, age, family history of glaucoma, source of financial support, previous membership of a Glaucoma Society, BCVA in the better and worst eye were all associated with anxiety. However, after adjusting for confounding factors and using logistic regression to assess the predictive analysis, family history, previous membership of a Glaucoma Society and BCVA in the better eye showed to be the only significant predictors of anxiety. Patients with a family history of glaucoma were observed to be 1.9 times (p value =0.019) more likely to have anxiety than those without a family history of glaucoma. As the BCVA in the better eye worsens subjects were more likely to have anxiety (O.R=0.235; p-value=0.001. Table 6.

Similarly, age, gender, educational status, source of financial support, duration of glaucoma and BCVA in the better eye were associated with depression. However, after adjusting for confounding factors and using logistic regression to assess the predictive analysis; age, educational status and BCVA in the better eye were shown to be the only predictive factor for depression. Increasing age is 0.8 times more likely to be associated with depression while worsening BCVA in the better eye was also 4.9 times more likely to be associated with depression than those with better vision Table 6.

4. DISCUSSION

This study showed a higher relative frequency of anxiety among participants compared to other

studies [7, 20-22]. This may be because the study by Dawodu *et al* was more than a decade older than this study and at that time the awareness of glaucoma was not as obvious as it is now [20]. Mabuchi *et al* did not include participants with mild anxiety in his study [7]. Zhou *et al* on the other hand used a different methodology from the one in this study [21]. Okudo and colleagues compared POAG and cataract patients [22]. This study reported a lower frequency than the studies in Enugu, South-East Nigeria, Pakistan and Singapore [23-24,6]. The reason may be due to the fact that this study excluded subjects with other systemic and ocular pathology while the study in Pakistan did not and the study in Singapore used Hamilton Anxiety Rating Scale which was a different scale from the one used in this study. The study by Onwubiko and colleagues had majority of the patients with advanced primary angle glaucoma [23].

It is worthy to note that despite the different frequencies / prevalence reported, the facts still remains that there is a high frequency of anxiety among glaucoma patients and this needs to be addressed in managing these patients. The mean score for anxiety reported in this study was 6.49 ±3.85- lower than the finding of Fasih *et al* and may be because they did not exclude participants with systemic illnesses or who had previous history of anxiety [24]. We however reported a higher mean anxiety score than that reported (6.21±4.74) by another Nigerian study [22].

The prevalence of depression among subjects in this study was higher than that reported in other studies in Nigeria [20,22,25]. The difference may be attributed to the fact that the study in Benin used new referrals to glaucoma clinic while Akindipe *et al* used a different scale to assess depression [20,25]. Another possible reason for this difference may be the difference in the socio-demographic factors between these and our study. The studies in Japan and China also recorded lower values [7,21]. The study in Japan excluded those with mild depression [7]. Although Lim *et al* used the Hamilton Depression Rating Scale (HAM-D), he got a frequency value closer to the one recorded in this study, however, the reason is not immediately apparent [6]. Even though the frequency values in these different studies differ, depression is still reflected as being high among glaucoma patients.

The prevalence of depression is lower than that of anxiety in this study and this was also reported by studies in South-South, South-West and South-East Nigeria; Pakistan, Singapore and China [20,22-24,21,6]. Even a study in Korea that used a different questionnaire (the Spielberg's State-Trait Anxiety Inventory (STAI) and Beck Depression Inventory (BDI) recorded similar result [26]. This is not surprising because patients diagnosed with a disease - in this case glaucoma, will be anxious and develop a sense of doubt and vulnerability about the outcome of a threatening visual loss and how it will affect their future.

The mean score for depression was 5.78 ± 3.83 and was lower than the finding of Fasih *et al* [24]. This may be because they did not exclude subjects with systemic illnesses or who had previous history of depression. Similar to other studies, most of the participants in this study were not depressed.

In this study, we noted that age, source of financial support, BCVA in the better eye, family history of glaucoma and previous membership of glaucoma society are the factors associated with anxiety. However, after adjusting for confounding factors and using logistic regression to assess the predictive analysis; family history, previous membership of a Glaucoma Society and BCVA in the better eye showed to be the only significant predictors of anxiety. Onwubiko *et al* in their study reported severity of the glaucoma and reduced visual acuity as the significant predictors of anxiety [23]. Similarly, Okudo *et al* reported severity of glaucoma in addition with young age

as the significant risk factors associated with anxiety [22]. In the China study by Zhou *et al*, younger age, female gender, moderate and heavy economic burden were reported as the independent predictors for anxiety [21]. A study in the Philippine reported age and mean deviation in better eye as the independent risk predictors for anxiety [27]. Mabuchi *et al* reported age as the only independent predictor for anxiety [28].

Depression was also associated with several factors in our study. These include age, gender, educational status, source of financial support, duration of glaucoma and BCVA in the better eye. However, age, educational status and BCVA in the better eye were shown to be the only predictive factor for depression. Onwubiko *et al* reported that severity of glaucoma, reduced visual acuity, occupation, and intraocular pressure $<21\text{mmHg}$ were significantly associated with depression [23]. Okudo *et al* in their study reported severity of glaucoma, age and employment status as the significant factors associated with depression [22]. Mabuchi *et al* observed that age and mean deviation in better eye were the independent predictors for depression in their glaucoma patients while Zhou *et al* in their own study identified duration of glaucoma and the Chinese version Glaucoma Quality of life-15(CHI-GQL) score as predictors for depression [28,21].

As a hospital-based study, the findings cannot be stretched to the general population. This is a major limitation of this study. However, this study has shown that mental health disorders are major comorbidities in glaucoma patients. Therefore, for holistic management of these patients, the presence of these psychiatric problems must be considered and addressed.

Membership of patients' Glaucoma society (Association) was a novel variable we considered in this study, and we noted that it was a significant risk factor for anxiety but not for depression. Glaucoma patients Association creates a platform for the patients to cooperate and share experiences on how they manage their condition. Such forum will help many of the patients to have a better understanding of the condition and provide somewhat encouragement on how to cope with the low vision associated with it. Patients who become members of such Association over time would have developed such knowledge to manage and cope with the

disease and therefore will have less chance of developing mental health disorders.

Further study may be necessary to evaluate the impact of Glaucoma patients Society (Association) on glaucoma patients with anxiety and depression.

5. CONCLUSION

There is high prevalence of Anxiety and Depression among this cohort of glaucoma patients. Family history of glaucoma, previous membership of a Glaucoma Society and BCVA in the better eye were the significant predictors of anxiety while age, educational status and BCVA in the better eye were shown to be the predictive factors for depression.

Combined management of glaucoma patients with Neuropsychiatrists will promote a holistic management with early detection of mental health challenges.

ETHICAL APPROVAL AND CONSENT

Ethical approval was obtained from the Health Ethics and Research Committee of University of Port Harcourt Teaching Hospital. The study was conducted in conformity with the Helsinki Declaration on the use of Human Subjects for Research. Informed written consent was obtained from all the subjects.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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