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Research Paper

A Study about the Effect of Cataract and Glaucoma on Quality Of Life in Various Populations

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ABSTRACT
Background: To examine the impact of cataracts on quality of life (QoL) for patients with cataracts and glaucoma.
Methods: Sociodemographic data, phakic/pseudophakic status, cataract grade according to the Lens Opacities Classification System (LOCS) III, visual acuity, and visual field test parameters were obtained. Binocular vision field loss was used to classify the severity of glaucoma. LOCS III criteria nuclear cataract ≥3/6.9, cortical cataract ≥3/5.9, or posterior subcapsular cataract ≥2/5.9 were used to determine visually significant cataracts.
Main Outcome Measures: Rasch-transformed scores from the Glaucoma Activity Limitation-9 (GAL-9) questionnaire were used to assess patients' quality of life. The association between cataract and GAL- 9 (logit) score was studied using multiple linear regression models.
Findings: Fifty-six (23.1%) of patients suffered at least one complication. Visible Cataract. At least one visually significant cataract (standardized coefficient [β] 1.19, 95 percent confidence interval 1.04– 1.34, P = 0.011) and poor visual field index (better eye) (β 1.47, 95% confidence interval 1.36–1.88, P < 0.001) were independently linked with a lower GAL-9 score.
Conclusions: Cataract has an impact on glaucoma-related QoL in all severity levels of glaucoma patients and is a major cause of potentially reversible visual impairment in glaucoma patients. The GAL-9 questionnaire, which has been Rasch-analysed, is a good metric for quantifying visual loss in glaucoma patients due to cataracts.
KEYWORDS: *Rasch analysis, cataract, glaucoma, quality of life*

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I. INTRODUCTION

A cataract is a clouding of the lens of the eye, which is ordinarily clear. Seeing through hazy lenses is similar to looking through a frosty or fogged-up window for persons with cataracts.

Cataracts can make it difficult to read, drive a car (especially at night), or notice the expression on a friend's face due to clouded vision.

Glaucoma is a collection of eye diseases that affect the optic nerve, which is essential for proper vision. Unusually high pressure in the eye is frequently the source of this injury. Glaucoma is one of the most common causes of blindness in persons over 60. It can affect anyone at any age, but it affects the elderly more frequently.

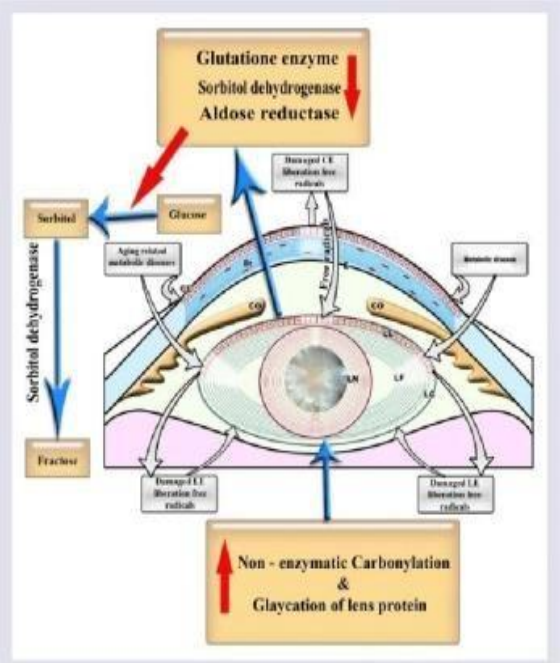

Fig 1: Mechanism of cataract formation

Glaucoma causes a significant amount of disease, which is only going to get worse. 60.5 million individuals were affected with OAG and ACG worldwide in 2010, and the number rose to 79.6 million by 2020 in which 74 percent people were having glaucoma. In the treatment of glaucoma patients, assessing the quality of life (QoL) is critical. QoL is a measure of an individual's general well-being and ability to live life to the fullest.

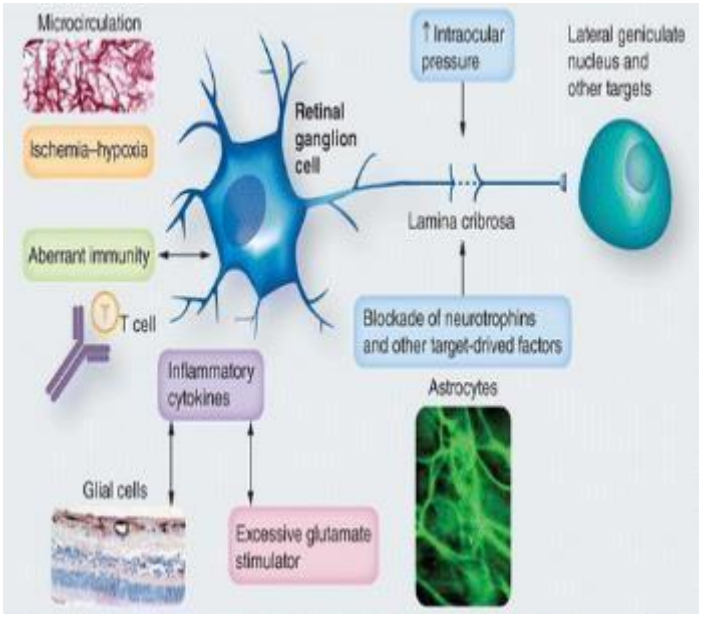

Fig 2: Pathogenesis of Glaucoma

Glaucoma has a significant influence on patients' quality of life, owing to diminished visual function and resulting activity limitations. However, it is still unknown how much concurrent ocular pathology affects QoL in glaucoma patients.

Reduced contrast sensitivity, light sensitivity, and localized, well-defined visual field abnormalities are all symptoms of glaucomatous optic nerve dysfunction. Contrast discrimination skills, peripheral vision-dependent activities, and light/dark adaptation are the most affected. Cataract has been demonstrated to affect glaucoma patients' vision-related QoL; however, the impact of cataracts has never been assessed using a glaucoma-specific, Rash-analysed questionnaire. Furthermore, it is unknown if the cataract has a higher or

lower impact on visual morbidity depending on the severity of glaucoma.
The Glaucoma Activity Limitation-9 (GAL-9) questionnaire was used to evaluate the association between the existence and severity of cataract, visual function, and QoL in individuals with open-angle glaucoma.

II. METHODS

Glaucoma, cataract, and visual impairment are all assessed

This study required participants to be over the age of 40 as well as the capacity to communicate, read, and comprehend fluency in English. To be considered for the glaucoma program, you must have a family history of glaucoma. Participants in this group had to have a chronic illness diagnosis. One or both eyes have open-angle glaucoma.

The Humphrey Visual Field Analyser (Humphrey Instruments, Inc., Zeiss Humphrey, San Leandro, CA, USA) was used to identify open-angle glaucoma, which was characterized by distinctive optic disc alterations and/or glaucomatous visual field loss, as well as an open anterior chamber angle on gonioscopy. Patients with ocular hypertension or suspicion without enough glaucomatous field loss or optic nerve abnormalities to be diagnosed with glaucoma served as controls.

Both the better and worse eye's clinical measures of visual function may influence vision-related QoL; however, the better eye signs are usually more significant. As a result, in regression modeling, we used clinical indices of visual function from the better eye (VA, MD, pattern standard deviation [PSD], and VFI).

The Nelson glaucoma staging system was used to categorize the severity of glaucoma. There were three types of patients: 'mild' (unilateral deficit of less than half of the visual field), 'moderate' (unilateral deficit of more than half of the visual field, or deficit of less than half of the visual field in each eye), and 'severe' (unilateral deficit of more than half of the visual field, or deficit of less than half of the visual field in each eye) (loss of more than half of the visual field in each eye). The perimetric MD and PSD estimated from binocularly integrated data substantially correspond with this glaucoma staging scheme.

The study included patients with cataracts of any degree. Patients with any non- glaucomatous disorder impacting visual function in the last three months, such as non- glaucomatous optic neuropathy, retinal or macular pathology, or ocular laser or surgery, as well as patients lacking accurate visual field test indices, were excluded from the study (based on previously defined criteria).

Assessment of Quality of Life

The GAL-9, which was created from the Glaucoma Quality of Life questionnaire, was used to assess QoL. The Glaucoma Quality of Life questionnaire was originally intended as a 15-item survey in which patients subjectively assess their ability to do visually demanding daily chores. Rasch analysis was used to modify the Glaucoma Quality of Life-15 questionnaire, which was re-engineered as the GAL-9 questionnaire with improved psychometric qualities. The GAL-9 is a nine-item questionnaire that measures the severity of visual field loss. Each item-level response was coded on a one-to-five scale, with one indicating no difficulty and five indicating significant difficulty.

GAL-9 was subjected to a Rasch analysis

Using the Andrich rating scale model and Winsteps software (version 3.81, Winsteps (R), Chicago, IL, USA), Rasch analysis was utilized to analyze the psychometric features of the GAL- 9.

The following psychometric parameters are assessed as part of the Rasch analysis to see if the scale 'fits' the Rasch model: I acceptable item 'fit' to the underlying characteristic; (ii) use of response categories; (iii) measurement precision; (iv) unidimensionality; (v) item difficulty targeting (vi) differential item functioning, patients' abilities, this occurs when subgroups of participants respond to a given item predictably, despite having identical amounts of underlying talent; and (vii) a person who is physically fit.

Statistical analysis

The four glaucoma severity groups were compared on demographic factors, better eye visual metrics (VA, VFI, MD, PSD), mean binocular LOCS scores, and GAL-9 (logit) score (controls, mild, moderate, and severe glaucoma).

The nonparametric Kruskall–Wallis analysis of ranks and analysis of variance for parametric data were used to determine intergroup significance. P-values were corrected for age using analysis of covariance for parametric data and Kruskall-Wallis analysis for non- parametric age-stratified data (less than 60, 60–69, 70–79, and 80 or older). Before the examination of covariance, the intergroup homogeneity of regression was determined.

For parametric data, Pearson's correlation test was used, while for non-parametric data, Spearman's and Kendal tau b correlation tests were used. Strong (>0.8) correlations between variables were detected, and one of the strongly linked pairs was removed from regression modeling.

III. RESULT

	Total	GS	PPG	EG	AG	*P* Value
No. of eyes (No. patients)	465 (338)	88 (69)	128 (108)	147 (129)	102 (90)	
Age, mean ± SD, y	65.6 ± 11.4	63.9 ± 12.2	63.0 ± 11.1	64.4 ± 10.1	62.8 ± 12.6	0.69*
Sex, No.						0.22†
Male	129	25	50	45	57	
Female	209	46	58	84	53	
Eye laterality, No.						0.94†
Right	219	41	58	72	48	
Left	246	47	70	75	54	
HRT follow-up time, mean ± SD, y	6.5 ± 2.1	6.6 ± 2.1	6.3 ± 2.2	6.6 ± 2.1	6.6 ± 2.0	0.66*
Visual field follow-up time, mean ± SD, y	6.6 ± 2.1	6.6 ± 2.1	6.4 ± 2.3	6.7 ± 2.1	6.7 ± 2.0	0.67*
No. HRT measurements, mean ± SD	3.8 ± 1.1	3.8 ± 0.9	3.7 ± 0.9	3.9 ± 1.1	4.0 ± 1.3	0.66*
No. visual field measurements, mean ± SD	8.9 ± 4.0	6.5 ± 2.9	8.3 ± 3.9	9.4 ± 3.8	10.8 ± 4.3	<0.001*
Race/ethnicity, No.						0.48‡
White	239	50	84	93	55	
African American	17	2	4	7	6	
Asian	64	12	16	22	24	
Hispanic	18	5	4	7	5	
Lens status, No. of eyes						0.40†
Phakic	370	71	104	120	75	
Pseudophakic	95	17	24	27	27	
Comorbidity, No.						
Hypertension	70	17	30	20	14	0.06†
Diabetes	29	9	8	9	6	0.42†
LogMAR BCVA, mean ± SD	0.10 ± 0.11	0.07 ± 0.09	0.09 ± 0.10	0.11 ± 0.12	0.13 ± 0.14	0.01*

AG, moderate/advanced glaucoma; BCVA, best corrected visual acuity; EG, early glaucoma; GS, glaucoma suspect; PPG, preperimetric glaucoma.
* Kruskal-Wallis test.
† χ^2 test.
‡ Fisher's exact test.

Fig 3: Study Group Demographics and Clinical Characteristics Based on Diagnosis and Glaucoma Severity

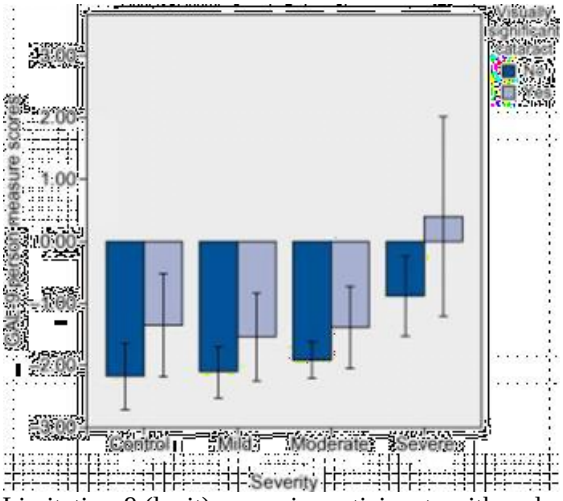

Fig 4: Glaucoma Activity Limitation-9 (logit) scores in participants with and without visually significant cataracts, broken down by glaucoma severity. Quality of life (QoL) deteriorates with severity (P 0.001) and cataract (P 0.001), according to the analysis of covariance.

Two hundred and forty-two people were enrolled in the study: 50 (20.7 percent) healthy people, 67 (27.7%) mild, 80 (33.1%) moderate, and 45 (16.6%) severe glaucoma sufferers. One hundred thirty men (53.7%) were male, with a mean age of 70.8 years (standard deviation 10.3).

As glaucoma severity grew, better eye VA deteriorated significantly: significance was maintained on age sub stratification in individuals aged less than 60 and 70–79 (P 0.05). After adjusting for age, the significance of GAL-9 (logit) scores rose with increasing glaucoma severity (P 0.001).

At least one visually significant cataract was present in 56 (23.2%) of the individuals. The four glaucoma severity groups did not have significantly different distributions. Individuals with at least one visually significant cataract scored higher on the GAL-9 (logit) scale than those without.

IV. DISCUSSION

One of the most significant and influential variables in a patient's health and well-being is their quality of life. Glaucoma has fewer articles on quality of life than other progressive illnesses. One of the fundamental goals of glaucoma treatment is to maintain the quality of life of people with this neurological progressive disease.

Glaucoma requires lifelong therapy and, like many chronic diseases, has a low adherence rate, which leads to disease progression. On the other hand, glaucoma treatment is well known for its local and systemic

adverse effects, which can be reduced to enhance patient QOL.

Our research discovered that, regardless of glaucoma severity or other clinical characteristics, the presence of cataracts is associated with a lower GAL-9 (logit) score in patients with glaucoma. A Cataract is a common cause of possibly reversible vision loss in glaucoma patients of all severity levels, and it should be treated as soon as possible to improve their vision.

At all levels of glaucoma severity, the effect of cataracts on the GAL-9 (logit) score was reasonably stable (Fig. 4). This recommends that patients with glaucoma of any severity level who have considerable visual morbidity from cataracts should have it treated to improve their vision.

VFI was found to be an independent predictor of a lower GAL-9 (logit) score. Other visual function markers, such as VA and PSD, were predictive of GAL-9 (logit) score in univariate regression analysis, but they were not independent predictors in multivariate regression analysis. This shows that VFI and/or visually significant cataracts had an impact on visual function in this group.

Cataract surgery carries hazards that can negatively impact vision-related QoL. Patients with ocular pathology other than cataract and glaucoma were not included in this study, therefore some patients with serious sequelae from cataract surgery may have been left out. As a result, the findings of this study should be regarded with caution, and the decision to have cataract surgery in glaucoma patients should be based on a thorough understanding of the risks and benefits.

V. CONCLUSION

When dealing with patients, especially those with a progressive disease pattern, QOL is a key feature of the management plan for each condition and should be kept in mind. Cataract has an impact on glaucoma-related QoL in all severity levels of glaucoma patients and is a major cause of potentially reversible visual impairment in glaucoma patients. The GAL-9 questionnaire, which has been Rasch- analysed, is a good metric for quantifying visual loss in glaucoma patients due to cataracts. Despite the drawbacks, cataract is considered a significant, potentially changeable predictor of visual function in glaucoma patients of all severity levels. Rasch-analyzed glaucoma- related visual function questionnaire is used to quantify the impact of cataracts on glaucoma patients' eyesight.

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