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Quality of Life Analysis of Primary Glaucoma Patients Based on *Glaucoma Quality of Life-15 Score* at Dr. Moewardi Hospital Surakarta

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ABSTRACT

Introduction: Visual acuity is vital for human's daily life. Glaucoma is a disease that affects visual acuity. In Indonesia, the number of glaucoma cases is quite high and its therapy focuses on eye health indicators. Whereas, Many studies have demonstrated that the quality of life of glaucoma patients diminishes. This research aimed to determine the quality of life of primary glaucoma patients in Dr. Moewardi hospital.
Method: This research was conducted using observational analytic method with cross sectional approach. Sampling process uses probability sampling with purposive sampling method. The subjects of this study were primary glaucoma patients in Dr. Moewardi hospital from July to November 2022. The sample size obtained from the formula was 38 people. Data were analyzed with independent t-test and one-way ANOVA.
Result: From the data analysis of GQL-15 questionnaire's answer, it was found that there was a decrease in quality of life marked by higher GQL-15 questionnaire score in older patients, longer duration of diagnosis, partially or totally blind and no history of surgery. There was no increase in GQL-15 questionnaire result on patients with higher level of education. GQL-15 score in patients with longer duration of diagnosis (p-value = 0.011) and lower visual acuity (p-value = 0,000) was statistically significant.
Conclusion: Older patient groups, patients with longer duration of diagnosis, blind patients (unilateral or bilateral), and those who had not undergone glaucoma surgery has a worse quality of life. Patients' visual acuity and duration of diagnosis are significantly correlated with their quality of life.

Keywords: primary glaucoma; glaucoma quality of life; Glaucoma Quality of Life-15 Score (GQL-15)

INTRODUCTION

Visual acuity is very important for everyday human life. With normal visual acuity, humans can do their regular activities without significant obstacles. However, some people lose their visual acuity. The condition of complete loss of visual acuity is referred to as blindness. One of the causes of blindness is glaucoma. Glaucoma is ranked second highest as a cause of global blindness cases, below cataracts [1].

Glaucoma is a disease that affects the human eye organs. Glaucoma damages the nerves of the eye so that the sufferer can experience a narrowing of the field of view, even worse, blindness. In Indonesia, the number of glaucoma cases is quite alarming. In 2017, the number of new outpatient cases

of glaucoma in Indonesian hospitals was 80.548[1]. The most common types of glaucoma cases are primary open-angle glaucoma and primary angle-closure glaucoma[2].

Primary glaucoma is glaucoma whose cause is unknown. The terms open and closed angles refer to the anatomy of the corners of the eyes when exposed to glaucoma. The corners of the eyes remain open so that the flow of aqueous humor remains smooth but the trabecular meshwork is dysfunctional. Closed eye corners inhibit the circulation of aqueous humor. As a result, intraocular pressure increases and compresses the nerves of the eye.

So far, indicators of glaucoma therapy success still revolve around the assessment of intraocular pressure (IOP), visual field, optical nerve status and retinal nerve fiber layer (RNFL) without noticing and focusing much on the patient's point of view and his/her quality of life[3]. Along with the advancement of medical science, research on glaucoma began to be developed towards the quality of life of its patients.

One study stated that the quality of life related to health and even the mental health of glaucoma patients tended to decline[4,5]. Vision-related quality of life was also reported to decrease in glaucoma sufferers[6,7,8]. Similar findings were also found on quality of life assessments with glaucoma specific questionnaires[9,10]. Based on the description above which is accompanied by supporting journals, the researcher is interested in conducting research using a glaucoma-specific questionnaire with the title "Quality Analysis Life of Glaucoma Patients Based on *Glaucoma Quality of Life-15 Score* at Dr. Moewardi Surakarta Hospital". The goal of this study is to explore the quality of life of Dr. Moewardi hospital's primary glaucoma patients.

METHOD

Research was analytical observational with cross-sectional research design, where the correlation between exposure (independent) and effect (dependent) was sought by collecting data simultaneously at one time between exposure and its effect (point time approach).

This research was conducted at the Ophthalmology Clinic of Dr. Moewardi Hospital and had received permission from the Professional Study Program Committee and the Health Research Ethics Committee of Dr. Moewardi Hospital with the number: 821/VI/HREC/2022. The subject of the study were glaucoma patients treated at the Ophthalmology Clinic of Dr. Moewardi Hospital in July – November 2022. The sampling technique used purposive sampling that matches the inclusion and exclusion criteria. Inclusion criteria included patients diagnosed with primary glaucoma, over 18 years of age, and willing to participate in the study and cooperative. Exclusion criteria included patients who resign or unwilling to be respondents and patients suffering from congenital and secondary glaucoma.

The minimum sample required for the study amounted to 38 patients. This amount was obtained from the calculation results of the proportion estimation formula. The independent variable in the study was quality of life. The dependent variable was primary glaucoma. The data from the study were tested bivariately using independent t-test and one-way ANOVA.

RESULT

The research was carried out from July 2022 to November 2022 at the Ophthalmology Clinic of Dr. Moewardi Hospital using a printed questionnaire *Glaucoma Quality of Life-15 Score* which had been translated into Indonesian.

Table 1 described the characteristics of study samples by sex, age, marital status, recent education, length of illness, diagnosis, visual acuity and history of surgery.

By gender, there were 18 (47.37%) primary glaucoma patients who were male. Another 20 (52.63%) patients were female. Most patients were over or equal to 60 years old, which were 24 people (63.16%). Patients under the age of 60 were 14 people (36.84%). All 38 patients (100%) were married.

No one was unmarried. Patient's educational background also varied. It was said to be poor if the patient was not in school or graduated from elementary school, moderate if the patient was a junior high or high school graduate, and high if the patient had a diploma or bachelor's degree. 15 patients (39.47%) were classified as poorly educated, followed by 13 patients (34.21%) moderately educated, and 10 patients (26.32%) highly educated. The number of patients suffering from primary glaucoma for less than one year was 13 people (34.21%). Next, 15 patients suffered primary glaucoma for one to three years (39.47%). 10 people (26.32%) had had primary glaucoma for more than three years. The results of the examination of the ophthalmologist confirmed the diagnosis of primary glaucoma patients. Most cases encountered were primary angle-closure glaucoma (PACG), which was 26 cases (68.42%). The remaining 12 cases (31.58%) were primary open-angle glaucoma (POAG). Patient's visual acuity data were collected and grouped. It was found that 4 patients (10.52%) had bilateral blindness, 18 patients (47.37%) were unilaterally blind, and 16 patients (42.11%) were not blind. 23 patients (60.53 %) had undergone glaucoma surgery while interviewed. 15 patients (39.47%) had never had glaucoma surgery.

Table 1. Characteristics of the Subject of Research

Characteristic	Frequency (N)	Percentage (%)
Gender		
Man	18	47.37
Woman	20	52.63
Age		
≥ 60 years	24	63.16
< 60 years	14	36.84
Marital Status		
Married	38	100
Unmarried	0	0
Educational Background		
Poor	15	39.47
Moderate	13	34.21
High	10	26.32
Duration of Diagnosis		
<1 year	13	34.21
1 - 3 years	15	39.47
>3 years	10	26.32
Diagnosis		
POAG	12	31.58
PACG	26	68.42
Visual Acuity		
Not blind	16	42.11
Unilateral blindness	18	47.37
Bilateral blindness	4	10.52
Surgery History		
Surgery	23	60.53
No surgery	15	39.47

Data Analysis Results

The data obtained were then analyzed bivariately using independent T-test and one way ANOVA test.

Quality of Life Analysis with Age

Table 2 showed the results of the quality of life analysis with age where from the 38 samples studied, patients with older age groups, namely those aged 60 years or older, had a higher average GQL-15 value of 27.75. Meanwhile, patients with younger age groups had an average GQL-15 score of 24.64. The independent t-test showed that the p-value is equal to 0.456. That value was greater than 0.05,

which means there was no statistically significant difference between the GQL-15 values of the two age groups. For the category of married status, the independent t-test cannot be carried out due to the homogeneous distribution of samples, where all samples were married. There was no unmarried sample.

Table 2. Quality of Life Analysis Results with Age

Age	Mean	SD	*p-value*
≥ 60 years	27,75	14,081	0,456
< 60 years	24,64	8,031	

Quality of Life Analysis with Educational Background

Table 3 showed the results of the analysis of sample's educational background with the values of the GQL-15 questionnaire. The average score of highly educated sample was 30.60, followed by the poorly educated category of 26.60, and finally the moderately educated category of 23.54. The one-way ANOVA test showed that the p-value was equal to 0.399. That value was higher than 0.05, which means there was no statistically significant difference between the GQL-15 value and the educational background of the sample.

Table 3. Quality of Life Analysis Results with Educational Background

Educational Background	Mean	SD	*p-value*
Poor	26,60	12,620	0,399
Moderate	23,54	8,511	
High	30,60	15,364	

Quality of Life Analysis with Duration of Diagnosis

Table 4 showed the results of the analysis of the quality of life with the duration of diagnosis. From the results of the analysis, samples suffering from primary glaucoma less than 1 year had an average of 21.23. Samples suffering from primary glaucoma for one to three years had an average of 25.13. Samples suffering from primary glaucoma for more than three years had an average of 35.80. The one-way ANOVA test resulted in a *p-value* equal to 0.011. The value was lower than 0.05, which means there was a statistically significant difference between the GQL-15 value and the duration of diagnosis from the sample's disease.

Table 4. Quality of Life Analysis Results with Duration of Diagnosis

Duration of Diagnosis	Mean	SD	*p-value*
<1 year	21,23	9,221	0,011
1-3 years	25,13	9,257	
>1 year	35,80	15,024	

Quality of Life Analysis with Visual Acuity

Table 5 showed the results of quality of life analysis with visual acuity. Based on the results of the ANOVA one-way test, the average GQL-15 questionnaire value obtained by the sample that wasn't blind was 23.19, while the unilaterally blind sample was 25.00, and the bilaterally blind sample was 47.50. The *p-value* was equal to 0.000, which indicated a statistically significant difference between the GQL-15 value and the visual acuity of the sample.

Table 5. Quality of Life Analysis Results with Visual Acuity

Visual Acuity	Mean	SD	*p-value*
Not blind	23,19	8,503	0,000
Unilateral blindness	25,00	11,309	
Bilateral blindness	47,50	9,434	

Quality of Life Analysis with Surgery History

Table 6 showed the results of quality of life analysis with a history of surgery. From the results of the analysis, samples that had undergone glaucoma surgery obtained an average of 26.48. The sample that had not been operated obtained an average of 26.80. The independent t-test issued a *p-value* equal to 0.938. This value was greater than 0.05 so there was no statistically significant difference between the GQL-15 value and the sample operation history.

Table 6. Quality of Life Analysis Results with Surgery History

Surgery history	Mean	SD	*p-value*
Surgery	26,48	8,503	0,938
No surgery	26,80	11,309	

DISCUSSION

In this study, most respondents were women, with a total of 20 people (52.63%). Male respondents totaled 18 people (47.37%). This is not in line with the research of Allison, Patel, and Alabi[11] where men have a 36% higher prevalence of glaucoma than women. However, research by Slettedal, Traustadóttir, Sandvik, Ringvold[12] in Norway showed that the prevalence of glaucoma in women was greater than that of men during 2004-2018. The prevalence of women was 15.6% per 1000 people compared to men of 14.3% per 1000 people. Women tend to get glaucoma more easily because after menopause, women lose the neuroprotective hormone estrogen. 17β estradiol strengthens endothelial-based nitric oxide synthase (NOS) activity that can regulate smooth muscle tone and vascular resistance. The enzyme receptors are located in the ciliary body and outflow system so that the secretion and excretion of aqueous fluid can be regulated[13].

The number of respondents who were over or equal to 60 years old (24 people, 63.16%) was more than those aged less than 60 years (14 people, 36.84%). This is in line with research in Iran[14] which recorded an increase in the prevalence of glaucoma from 0.9% in the age group of 40 – 44 years to 3.55% in the age group of 60 – 64 years. King, Azuara-Blanco, and Tuulonen's research also concluded similarly[15]. The prevalence of glaucoma in whites aged 40 years was 0.3%, but the rate increased rapidly to 3.3% in the 70-year-old population. This is due to the rapid depletion of RNFL in the elderly patient population. Progressive depletion of RNFL makes the elderly vulnerable to glaucoma [16].

For the quality of life value of GQL-15, in research conducted in India, it was seen that the average respondent aged more than or equal to 50 years was 27.5, while those under 50 years old were 21.9[17]. Ayele and friends also found the same thing in their research[9]. The average value of GQL-15 of respondents increases with age. The results of the quality of life analysis with the respondents' recent education were quite varied. The highest average was by respondents from higher education backgrounds (diploma or undergraduate graduates) with a score of 30.60. These results were in line with the research of Mushtaha and Eljedi[18]. Other studies have shown different results. In Ethiopia, the highest average was found in the samples with secondary education group equivalent to junior high school with a score of 37.7[9]. In India, the highest average was found in the samples with secondary education group with a score of 28.3[17]. In China it was slightly different, the highest average was for respondents with a high school education background with a score of 30.38[19]. The patient's educational background is particularly important in the assessment of glaucoma[20]. Education is an independent determinant of the quality of life of primary open-angle glaucoma patients.

The duration of diagnosis in which the patient suffers from primary glaucoma varies greatly. Researchers decided to group the duration of glaucoma diagnosis in three large groups to observe their quality of life. As a result, the longer the patient suffered from the disease, the higher the average GQL-15 questionnaire score. A similar fact was also found in India[17]. They grouped the patients per five years

based on the duration of the glaucoma diagnosis and found that there was a strong correlation between the duration of the glaucoma diagnosis and a higher GQL-15 score. Other research showed that the highest average GQL-15 score was in one to five years from diagnosis cases with an average of 49.6[9]. Cases under one year recorded an average of only 38.5 while those over five years recorded an average of 35.0. The study, conducted in Ethiopia, included a p-value of 0.0001 for the GQL-15 score variable with the duration of the glaucoma diagnosis. It is associated with the pathogenesis of glaucoma and the nature of glaucoma disease. Glaucoma is neurodegenerative. Apoptosis occurs in the retinal ganglion cells. As time goes by, more and more retinal ganglion cells degenerate. Specifically, the axons of retinal ganglion cells in optic nerve head experience swelling. Axonal swelling causes the transport of neurotrophic factors to the retinal ganglion cells to be disrupted. Neurotrophic factors functions as a signal that shows a stable relationship between neurons. The absence of neurotrophic factors has an impact on the degeneration of soma and axons of retinal ganglion cells[21].

Researchers who created the GQL-15 questionnaire had found that this questionnaire correlated significantly with visual acuity ($r=-0.39701$, $p<0.0001$)[22]. Researchers followed WHO guidelines to assess patient's visual acuity. Patients were said to be blind when visual acuity <3/60 and were not blind with visual acuity >3/60[23].

The results of this study were in line with studies in Ethiopia[9], Indonesia[24], and China[25] where visual acuity categorized as blind correlated significantly with lower GQL-15 scores. This was due to abnormalities found in the extracellular matrix of the retina and lamina cribrosa, in the form of dysfunctional retinal ganglion cells and RNFL depletion. As a result, the function of the eye nerve decreased and there was a narrowing of visual field. A decrease in ophthalmic nerve function can be observed in the phenomenon of "optic disc cupping" when assessing the cup-to-disc ratio (CDR)[21].

Surgery is a follow-up that the doctor performs after therapy with drugs has no effect. From the data analysis process, it was found that patients who had undergone surgery tended to have a higher GQL-15 score. This was also the case in studies in Padang[24] and India[17] where patients with a history of surgery recorded greater GQL-15 scores. Trabeculectomy changes the contours of the corneal surface, the depth of anterior chamber, and the axial length, which was related to refraction ability. These changes had an effect on the quality of life of the patient's visual acuity after surgery [26].

CONCLUSION

Clinically there had been a decrease in quality of life values in older patient groups, longer duration of diagnosis, blind (unilateral and bilateral), and those who had not undergone glaucoma surgery. It was characterized by an increase in the score of the GQL-15 questionnaire. However, statistically, there was a significant difference between GQL-15 values with sample's visual acuity and duration of diagnosis. The quality of life of primary glaucoma patients still needs to be considered so that health services are more thorough and do not focus on eye problems alone.

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CONFLICT OF INTEREST

The authors reported no competing interests.

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