

**EVALUATION OF ANXIETY, DEPRESSION AND
QUALITY OF LIFE USING THE
HOSPITAL ANXIETY & DEPRESSION SCALE
AND GLAUCOMA QUALITY OF LIFE-36 IN
JUVENILE OPEN ANGLE GLAUCOMA
PATIENTS**

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Requirements for The Degree of Master of Medicine
(Ophthalmology)**



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DISCLAIMER

I hereby certify that the work in this dissertation is my own except for the quotations and the summaries which have been duly acknowledged.

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ABSTRAK

PENGENALAN

Penyakit glaukoma adalah penyebab kebutaan kekal yang tertinggi di seluruh dunia, yang mana penduduk benua Asia dan Afrika merupakan penghidap penyakit yang teramai. Glaukoma juvena adalah penyakit yang jarang ditemui. Kebiasannya bermula pada usia 5 hingga 35 tahun dan kebanyakan penghidapnya adalah lelaki. Secara umum, kesan glaukoma terhadap kualiti kehidupan dan kesihatan mental telah dibuktikan oleh kajian terdahulu. Namun hanya sedikit kajian yang menilai golongan glaukoma juvena secara khusus.

OBJEKTIF

Kajian ini bertujuan untuk menilai kebimbangan, kemurungan dan kualiti kehidupan dikalangan pesakit glaukoma juvena di Malaysia berbanding kumpulan kawalan serta mengenalpasti faktor berkaitan kebimbangan, kemurungan dan kualiti kehidupan dikalangan pesakit glaukoma juvena di Malaysia.

KAEDAH KAJIAN

Satu kajian bandingan rentas telah dijalankan yang melibatkan pesakit glaukoma juvena diantara bulan Jun 2018 hingga Disember 2020 di empat buah klinik mata di Malaysia: Hospital Universiti Sains Malaysia (HUSM), Hospital Raja Perempuan Zainab II (HRPZ II), Hospital Tengku Ampuan Afzan (HTAA) dan Hospital Selayang. Manakala data kumpulan kawalan diambil dari populasi di sekitarnya. Borang kajiselidik Hospital Anxiety and Depression Scale (HADS) versi Bahasa Malaysia dan borang kajiselidik Glaucoma-Quality of Life 36 (GlauQOL-36) versi Bahasa Malaysia telah diberikan kepada kedua-dua kumpulan bagi menilai tahap kebimbangan, kemurungan dan kualiti kehidupan dikalangan kedua-dua buah kumpulan.

Data demografi seperti usia, jantina, tahap pendidikan, status pekerjaan dan pendapatan bulanan isi rumah juga di ambil dari kedua-dua buah kumpulan. Kumpulan glaukoma juvena dinilai secara lanjut berdasarkan dapatan pemeriksaan klinikal.

Analisa univariansi telah dibuat bagi memeriksa kaitan di antara jumlah skor ketiga- tiga soalselidik itu dan faktor klinikal pesakit glaukoma juvena. Regresi linear berganda telah digunakan bagi mengenalpasti faktor-faktor berkaitan kualiti kehidupan, kebimbangan dan kemurungan.

KEPUTUSAN

Sejumlah 69 pesakit glaukoma juvena dan 202 orang kumpulan kawalan telah menyertai kajiselidik ini. Perbandingan purata skor pesakit glaukoma adalah 69.85 (10.43) iaitu lebih rendah berbanding kumpulan kawalan 83.29 (7.98) dalam aspek kualiti kehidupan. Kumpulan glaukoma juvena juga mempunyai kadar kebimbangan dan kemurungan yang lebih tinggi iaitu 6.31(4.04) dan 5.53 (4.02) berbanding kumpulan kawalan iaitu 3.20 (3.71) dan 3.27 (3.64) masing- masing. Terdapat hubungkait yang ketara antara skor GlauQOL-36 yang tinggi dengan golongan pesakit wanita ($p=0.052$), pendapatan isi rumah melebihi USD 500 ($p= 0.036$) dan penggunaan ubat titis mata dari kumpulan carbonic anhydrase inhibitor ($p=0.005$). Manakala bagi skor HADS-D pula, terdapat hubungkait yang ketara antara skor HADS-D yang tinggi dengan tahap pengajian tinggi ($p=0.009$), tahap medan penglihatan yang teruk ($p=0.013$) dan pesakit yang baru didiagnos sebagai pesakit glaukoma ($p=0.012$).

KESIMPULAN

Golongan pesakit glaukoma juvena mempunyai kadar kebimbangan dan kemurungan yang lebih tinggi berbanding kumpulan kawalan. Manakala kuliti kehidupan pesakit glaukoma juvena adalah lebih rendah berbanding kumpulan kawalan. Faktor berkaitan kemurungan adalah tahap pengajian tinggi, tahap medan penglihatan yang lebih teruk dan pesakit yang baru didiagnos sebagai pesakit glaukoma. Terdapat hubungkait yang ketara antara skor GlauQOL-36 yang tinggi dengan pesakit wanita, pendapatan isi rumah melebihi USD 500 dan penggunaan ubat titis mata dari kumpulan *carbonic anhydrase inhibitor*. Penggunaan borang kajiselidik dapat membantu pengamal perubatan menilai pesakit secara keseluruhan. Pesakit glaukoma juvena perlu diberikan perhatian dari aspek kesihatan mental dan kualiti kehidupan kerana disebabkan oleh usia mereka yang muda dan jangka hayat yang panjang.

Abstract

Introduction

Glaucoma is the leading cause of blindness worldwide with a large number from Asia and Africa continents. Juvenile Open-Angle glaucoma is a rare subset of Primary open-angle glaucoma. It is usually diagnosed between the age of 5 to 35 years old and predominantly affecting men. The effect of glaucoma on quality of life, anxiety and depression have been shared by the previous studies. However, there are very few studies published specifically on the juvenile open angle glaucoma group.

Purpose:

This study aims to evaluate anxiety, depression and quality of life in among JOAG patients as compared to control. It also serves to identify factors affecting anxiety, depression and quality of life among JOAG patients in Malaysia.

Material and Method:

The Hospital Anxiety and Depression Scale (HADS) questionnaire and Glaucoma-Quality of Life 36 (GlauQOL-36) questionnaire were administered to 68 Juvenile Open Angle Glaucoma (JOAG) patients and 202 controls to evaluate their anxiety, depression and quality of life. Sociodemographic of both groups were evaluated. The clinical features of JOAG patients were further evaluated. Univariate and multivariate analysis were done using simple linear and multiple linear regression respectively on the variables to look at factors affecting anxiety, depression and quality of life.

Results:

The mean score for HADS-A and HADS-D and GlauQOL-36 among JOAG patients were, 6.31 (4.04), 5.53 (4.017) and 69.85 (10.43) respectively, while the mean among controls were 3.20 (3.71), 3.27 (3.64) and 83.29 (7.98) respectively. The scores among JOAG were significantly lower than control in all domains, namely daily life, driving, psychological wellbeing, self-image, anxiety, treatment burden and confidence in health care. The significant factor to account for the increase in HADS-D score were tertiary education ($p=0.009$), poorer MD worst eye ($p=0.013$) and shorter duration of diagnosis ($p=0.012$). The significant factor associated with better GlauQOL-36 were female ($p=0.052$), income more than USD 500 ($p=0.036$) and the use of topical carbonic anhydrase inhibitor (CAI) ($p=0.005$).

Conclusion:

The JOAG patients were significantly more affected in terms of anxiety, depression and quality of life as compared to the control group. The factors associated with depression were tertiary education, poorer MD worst eye ($p=0.013$) and shorter duration of diagnosis. The significant factor associated with better GlauQOL-36 were female, income more than USD 500 and the use of topical carbonic anhydrase inhibitor (CAI). The use of questionnaire in clinical setting may help in having a holistic evaluation of glaucoma patients. Healthcare providers need to pay attention to the Quality of Life and the psychological aspect of this group of patients and formulate personalised care.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Glaucoma is a chronic disease, characterised by glaucomatous optic disc changes causing visual field defect with or without raised intraocular pressure (IOP). As a result of an increase in Malaysian's life expectancy, the burden of the disease becomes more apparent.

Based on World Health Organization data, glaucoma is the second most common cause of blindness after cataract. In other words, glaucoma is regarded as the leading cause of irreversible blindness. (World Health Organisation, 1946) It is a preventable disease if it is diagnosed and treated during its early stage. It is projected that an estimated 80 million people will be affected by glaucoma by 2020, with 74% diagnosed with Open-Angle Glaucoma. (Wilkins *et al.*, 2009) In the year 2040, 111.8 million people are projected to have glaucoma, with most of them residing in Africa and Asia. (Tham *et al.*, 2014) The Malaysia National Eye Survey reported that glaucoma (6.6%) is the third cause of blindness after cataract (58.6%) and diabetic retinopathy (10.4%). (Chew *et al.*, 2018) Based on the 12th National Eye Database 2018 Report, the occurrence of glaucoma as comorbid is at 3.6%. (Aziz *et al.*, no date) and this is similar to the global prevalence of glaucoma which is 3.5%. (Tham *et al.*, 2014)

Based on the angle structures, glaucoma can be divided into 2 broad groups: open and closed-angle glaucoma. This 2 groups can be further subdivided into primary and secondary glaucoma (Quigley, 1996).

Due to the nature of the disease-causing irreversible blindness, early recognition and prompt treatment are vital. The treatment of glaucoma includes intraocular pressure-lowering agents

in the form of topical and systemic, lasers to facilitate aqueous drainage, and surgical techniques to bypass the conventional trabecular meshwork pathway. Ideally, each patient should receive treatment tailored to their own needs without failure or adverse effects. Traditionally the focus of management is controlling IOP to minimise disease progression. However, clinicians are too focus on minimising disease progression that we often overlook the burden of glaucoma on the vision-related quality of life and psychological disturbance experienced by the patients (Che Hamzah *et al.*, 2011).

1.1 Juvenile Open-Angle Glaucoma

Juvenile onset open-angle glaucoma is a subgroup of Open-Angle Glaucoma, which starts from 5 to 40 years old. It is a rare condition which is estimated to affect 1 in 50,000 individuals in the United States. (Marx-Gross *et al.*, 2017),(Das *et al.*, 2001). It is typically found higher among a population with consanguineous marriage. (Papadopoulos *et al.*, 2007) It is characterised by the young age of onset, severe raised in IOP with strong family history. (Goldwyn, Waltman and Becker, 1970)(Brenner *et al.*, 1993)

JOAG needs to be differentiated from primary congenital glaucoma. The clinical characteristics of primary congenital glaucoma include a presentation with photophobia, blepharospasm, and epiphora. Clinical examination will reveal Haab's striae, hazy cornea, increase cupping, and the sign of ocular enlargements such as buphthalmos and myopia. (Aponte, Diehl and Mohny, 2010)

The disease usually has a rapid progression that is difficult to control with medication alone. Most of the patients will require surgical intervention. It is found that JOAG has a male preponderance, myopia common ocular findings (Kwun *et al.*, 2016).

An increase in IOP is one of the important risk factors in developing glaucoma. Generally, an increase in IOP is due to an increase resistance in aqueous outflow. In primary open-angle glaucoma, there is an increase in resistance at trabecular meshwork particularly seen in the juvenile open-angle glaucoma (JOAG) subset whereby more than 80 mutations are identified in the myocilin gene, a protein that is found in trabecular meshwork cells, juxtacanalicular connective tissues, and trabecular beam (Hewitt, Mackey and Craig, 2008). These mutations can be inherited through an autosomal dominant fashion. The abnormally compact trabecular meshwork with an accumulation of extracellular matrix is seen in the histological section of the trabecular meshwork of JOAG patients. (Tawara and Inomata, 1984)

A local study published in 2014 among Malay JOAG patients in Malaysia suggested that mutation of the myocilin gene is responsible for the autosomal dominance disease with incomplete penetrance. The study was conducted included family members with 5 generations of JOAG. These patients mainly reside in Kelantan, Terengganu, and Pahang. Eleven family members were newly diagnosed with existing 21 members having the same disease during the course of this study (Mimivati *et al.*, 2014). Other gene mutations that have been linked to JOAG include Cytochrome P450 family 1, subtype B, polypeptide 1 (CYP1B1) genes, optineurin (OPTN), WD repeat domain 36 (WDR36), neurotrophin 4 (NTF4) (Willoughby *et al.*, 2004; Pasutto *et al.*, 2009; Janssen *et al.*, 2013; Gupta *et al.*, 2017).

The management of JOAG often has multiple challenges. The disease itself is rapidly progressive and medical treatment is often temporary. This phenomenon could be attributed to patients' lack of understanding and compliance with medication which is a major obstacle in treating this disease. A study in Boston suggests that 83 % of JOAG patients will ultimately require surgical intervention (Wiggs *et al.*, 1995). The success rate of trabeculectomy without Mitomycin C (MMC) among JOAG was reported to be 74% at 3 years and 65% at 5 years (Pathania *et al.*, 2014). The younger age group is the most significant factor for bleb failure when it is performed without MMC. (Pathania *et al.*, 2014) The complication that often arises with the use of MMC is sight-threatening hypotonic maculopathy and bleb-related infection. The occurrence of hypotony maculopathy was reported to be as high as 20% (Tsai *et al.*, 2003). Another study suggested that 17% of children with childhood glaucoma developed a bleb-related infection (Sidoti *et al.*, 2000).

Glaucoma Drainage Device is a surgical option other than trabeculectomy. Children are found to fail later than adults following GDD implantation although the failure rate is similar. (Mandalos and Sung, 2017) However, the number of children who requires needling and tube repositioning is higher in the post-operative period than adults (Mandalos and Sung, 2017).

1.2 Quality of life

Health is defined as a “State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity”. (World Health Organisation, 1946) We

cannot emphasise enough the importance of treating the patient holistically, taking into account the physical, psychological, and social aspects.

Quality of life is defined by WHO, as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a multi-modal concept which affects the person's physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationships to salient features of their environment (World Health Organization, 2012).

Glaucoma clinic assessment particularly stresses on IOP control, the progression of glaucomatous optic nerve including visual field test and compliance to medication. However, what matters most to patients is their ability to perform daily task. It is difficult to measure using the clinical tools.

The negative effect of glaucoma has been established. Few factors that cause a dropped in quality of life have been found by other researchers such as an increase in age, advance of the disease, inability to drive (Hareevanan *et al.*, 2017) (Lim *et al.*, 2016) (Sun *et al.*, 2009). However, there are limited studies that look specifically at juvenile open angle glaucoma. To the best of our knowledge there is only one study which was done in India. This study used the utility score to measure quality of life and they suggested decreasing vision in better eye and need to use medication as factors associated with reduce quality of life among JOAG patients (Gupta *et al.*, 2011).

1.3 Depression and anxiety

Depression and anxiety are common psychological disturbances seen in patients with chronic illness. Both are commonly termed as tip of the iceberg phenomenon whereby most symptoms and signs are often masked.

The National Health and Morbidity Survey 2015 (Malaysia), found that the prevalence of poor mental health, in the age group 16 years old and above, has increased from 10.7% in 1996 to 29.2% in 2015.

A study done at North Carolina University on a large population of 4.4 million showed the prevalence of anxiety is 17%, while depression is 22% within this cohort. (Zhang *et al.*, 2017). This result is comparable with other studies reported in Japan where the prevalence of anxiety is 13% while in Turkey, it is 13.5%. However, prevalence of depression in Turkey is 24% (Tastan *et al.*, 2010).

There are several factors that have been identified that caused anxiety, depression, and quality of life in these patients. A study in Japan using Hospital Anxiety Depression Scale (HADS) concluded that the prevalence of anxiety in patients was more likely to occur at a younger age while older patients were more prone to develop depression. It also stated that the severity of glaucoma in the better eye was associated with depression, however there was no association between anxiety with the severity of glaucoma or gender in this study (Mabuchi *et al.*, 2012).

In contrast, a study conducted in Singapore using Hamilton Depression Rating Scale found that risk factors for depression which included the female gender, recorded that the worse eye

had higher logMAR vision, higher cup-disc ratio, and lower MD in the better and worse eye. Risk factors for anxiety using the Hamilton Anxiety Rating Scale included lower MD in worse eye and lower quality of life score (Lim *et al.*, 2016).

A study conducted in Turkey mentioned that the risk of developing anxiety is 7.5 times higher in unmarried women, and depression tends to occur more in unmarried patients than married patients by 2.94 times. As a result of anxiety and depression, patients' quality of life is affected (Tastan *et al.*, 2010) (Tastan *et al.*, 2010). A study carried out in Nigeria using HADS reported that 44% of patients with POAG had anxiety, while 41.8% had depression. The factors identified to have caused patients experiencing both anxiety and depression were advanced in the development of the disease as well as blindness (Onwubiko *et al.*, 2020). However, to the best of our knowledge there has been no study carried out specifically looking at anxiety and depression among juvenile open angle glaucoma patients.

1.4 Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale was developed in 1983 by Zigmond and Snaith. The aim was to assist clinicians in identifying patients with anxiety and depression in a nonpsychiatric clinic. The test is divided into anxiety and depression with 7 items each. It is widely used in Turkey and Japan population studies to evaluate anxiety and depression among glaucoma patients. A systematic review of HADS suggests that it is a great tool for clinicians, however, improvement is needed to address its psychometric strength. The result should be interpreted with caution as its ability to differentiate between anxiety and depression is unclear (Cosco *et al.*, 2012).

The Malay validated HADS questionnaire was made available since 2015 when a study conducted by Health Campus USM using Malay HADS followed by Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Rating Scale (HAM-A) and crossed check with the fourth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) to form a diagnosis. They found that the best cut-off point was 8/9 with sensitivity and specificity for anxiety is 90% and 86.2% respectively. As for depression, the sensitivity is 93.2% while specificity is 90.8% (Fariza Yahya and Othman, 2015).

1.5 Glaucoma Quality of life 36

The Glaucoma Quality of life 36 is a questionnaire that consists of 36 questions grouped into 7 domains: Psychological Wellbeing, Self-image, Daily Life, Burden of Treatment, Driving, Anxiety, and Confidence in Health Care. In 2008, Alain et al. concluded that Glacu- QoL is a specific and valid tool that shows good correlation with disease progression.

This questionnaire was translated into the Malay language to aid in the understanding of the questions as the official language of the country is the Malay Language. It has been used before in a study conducted in UKMMC. The internal consistency of the translated questions was measured by Chronbach alpha 0.85 (Chandramohan *et al.*, 2017). This questionnaire was chosen because it is a glaucoma-specific QOL evaluation with solid validity evidence and good theory-based developmental characteristic of the disease (Vandenbroeck *et al.*, 2011).

1.6 RATIONAL OF STUDY

The main aim of glaucoma treatment is to get patients to be active and able to function normally. In Juvenile onset, the disease occurs among the young, active, reproductive age group. Male makes up the majority of patients. They often carry a high responsibility in the community to provide for their family and parents. At this working age, the ability to cope with the disease, its lifelong treatment and follow-up has a huge effect on patients' quality of life and psychology.

Depression and anxiety are often masked. During an ophthalmology clinic visit, doctors often emphasise on good IOP control, reliable visual field test, and compliance with medication. This might not reflect the patient's quality of life and psychological stress. Hence this study is carried out to address those issues which are often overlooked. Until now, there are limited studies that were published on the quality of life among JOAG. To the best of our knowledge, this is the first study to look at anxiety and depression among JOAG patients.

The rationale of the study includes to evaluate psychological effect among JOAG patients. The outcome of this study will guide clinicians in patients'-tailored management. The detection of anxiety and depression among JOAG patients will improve compliance and adherence to treatment. While the detection of a modifiable factors will help to improve the quality of life in JOAG. As such, special attention must be given to the group that has the associated risk factor to develop anxiety, depression and experience lower quality of life.

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CHAPTER 2

STUDY OBJECTIVES

2.STUDY OBJECTIVES

2.1 GENERAL OBJECTIVE

To evaluate anxiety, depression and quality of life using the Glaucoma Quality of Life-36 (Glau-QoL 36) and Hospital Anxiety & Depression Scale (HADS) in juvenile open-angle glaucoma patients.

2.2 SPECIFIC OBJECTIVES

1. To compare the mean score of HADS among juvenile glaucoma patients and control.
2. To compare the mean score of GlauQOL-36 among juvenile patients and control.
3. To identify the associated factors affecting anxiety and depression among juvenile open-angle glaucoma patients using HADS (A) and HADS (D).
4. To identify the associated factors of affecting quality of life among juvenile open-angle glaucoma patients using GlauQOL-36.

CHAPTER 3.1

MANUSCRIPT 1

Title Page

Title: Quality of life among Juvenile Open-Angle Glaucoma; what are the factors associated with it?

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Abstract

Purpose: The purpose of this study is to determine and compare the mean quality of life scores between juvenile open-angle glaucoma (JOAG) cases and a control group in Malaysia and evaluate the factors affecting them.

Materials and methods: The Glaucoma-Quality of Life 36 (GlauQOL-36) questionnaire were administered to 68 JOAG patients and 202 controls. Sociodemographic data was also collected. Clinical data of JOAG patients were further evaluated. Linear regression was used to identify the factors affecting it.

Result: The mean score for GlauQOL-36 in JOAG cases and control was 69.85 ± 10.43 and 83.29 ± 7.98 , respectively. All domains of the GlauQOL-36 were significantly lower among JOAG cases compared to the controls. Factors associated with a higher GlauQOL-36 score were female sex ($p = 0.052$), income over USD 500 ($p = 0.036$), and the use of a topical carbonic anhydrase inhibitor (CAI) ($p = 0.005$).

Conclusion: Significantly lower quality of life was observed among JOAG patients. Female gender, higher income, and use of topical CAI were associated with higher QOL.

Keywords: juvenile open-angle glaucoma, quality of life, GlauQOL-36

Introduction

Glaucoma is the fourth leading cause of blindness globally.¹ By the year 2040, 111.8 million people are projected to have glaucoma, with most of them residing in Africa and Asia.² The occurrence of glaucoma as an ocular comorbidity is 3.6% in Malaysia.³ This is similar, to the global prevalence of glaucoma which is 3.5%.²

Juvenile open-angle glaucoma (JOAG) is a subgroup of open-angle glaucoma, which occurs between the age of 5 and 35 years old.⁴ It is a rare condition that is estimated to affect 1 in 50,000 individuals in the United States.⁴ In Germany, the prevalence of JOAG is 0.17%, while in a tertiary hospital in India, JOAG accounts for 3.3% of glaucoma admissions.^{5,6} It is characterised by a young age of onset, severe raised IOP and strong family history.^{7,8} It is mostly found in population with consanguineous marriage.⁹ It is found that JOAG has a male preponderance and myopia is a common ocular finding in these patients.¹⁰ It is inherited in an autosomal dominant fashion, with incomplete penetrance. Mutations in the MYOC myocilin gene are found among Malaysian JOAG patients.¹¹ The disease usually has a rapid progression that is difficult to control with medication alone. Most of the patients will require surgical intervention.¹²

The negative effect of glaucoma on Quality of Life (QOL) has been established by previous studies.¹³⁻¹⁶ However, there is limited data published on QOL among JOAG. A study in India suggested a reduction in the vision of the better eye and the need to use medication as factors associated with reduced quality of life among JOAG patients.¹⁷

The aims of this study are: (1) to determine QOL among JOAG patients; and (2) to investigate factors affecting the QOL among JOAG patients in Malaysia.

Methodology

This is a multicentre comparative cross-sectional study that was conducted from May 2019 to December 2020. The patients were recruited from four tertiary centres in Malaysia, namely Hospital Universiti Sains Malaysia, Hospital Raja Perempuan Zainab II, Hospital Tengku Ampuan Afzan, and Hospital Selayang. This study has obtained approval from the Medical Research and Ethics Committee of the Ministry of Health Malaysia (NMRR-18-3702-44486) as well as the Human Research Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/18110616).

After getting patients' consent, patients with a known case of JOAG were recruited through convenience sampling. The patients were diagnosed based on age, intraocular pressure (IOP), and cup disc ratio (CDR) by ophthalmologists. Only confirmed JOAG patients who were above 18 years old were included. Patients who were diagnosed with secondary glaucoma or had underlying psychiatric illness were excluded. We also excluded patients who were on medications that may cause psychiatric illness, such as digoxin or steroids. A group of controls was recruited, and their sociodemographic data and GlauQOL-36 scores were evaluated. Controls aged between 20 and 50 years were included. However, those with underlying psychiatric illness, ocular pathology, history of ocular injury, or ocular surgery were excluded.

Sociodemographic history, diagnosis, and treatment history were collected through interviews and review of patients' medical notes. A thorough ophthalmological examination was performed, and the case was evaluated by a glaucomatologist at each hospital. This includes best-corrected visual acuity (BCVA), IOP, gonioscopy, optic disc examination, and Humphrey visual field assessment, looking at the Mean Deviation (MD) 25-2.

Evaluation of QOL

The Glaucoma Quality of Life 36 (GlauQOL36) questionnaire is a glaucoma-specific QOL questionnaire. It comprises of 36-item, validated questionnaire with seven domains, including daily life, driving, psychological wellbeing, self-image, anxiety burden of treatment, and confidence in healthcare. The highest score is 100, which is interpreted as a good QOL. Each item was ranked on a range of 0 to 3 or 0 to 4. Higher scores indicate a better quality of life in the psychological wellbeing, self-image, and treatment burden domains. However, for driving, anxiety, and confidence in healthcare domains, lower scores indicated a better quality of life. This has been proven to be a valid and specific questionnaire for assessment of disease progression.¹⁸ It has been translated into Bahasa Malaysia and validated, with a Cronbach alpha of 0.85.¹⁹ This questionnaire was chosen because it is a glaucoma-specific QOL evaluation with a reliable and valid evidence and good theory-based developmental characterisation of the disease.²⁰

Statistical analysis

For statistical analysis, categorical data was presented as frequency and percentage while numerical data was presented as mean and standard deviation (SD). We used t-Test to evaluate the demographic data. Multifactorial ANOVA was then used to control demographic factors. We applied ANOVA and Simple Linear Regression (SLR) tests in the univariate analysis. Significant variables in the univariate analysis were selected for the multivariate analysis. Then, we used the Multiple Linear Regression (MLR) test in multivariate analysis to obtain a prediction model. A forward, backward, and stepwise selection method was used to determine the final model. All assumptions for the tests were met. Variables compared with a p-value of less than 0.05 was considered significant. The data was analysed using SPSS software version 26 (SPSS Inc, Chicago, IL)

Results

Demographic and clinical features

A total of 68 patients agreed to participate in this study. As reflected in **Table 1**, the mean age of the patients was 33.7 ± 10.7 years old, , while the mean age of control was 35.82 ± 5.982 years old, ranging between 18 to 68 years. There was no statistical significance between the two groups in terms of race and gender. There was statistically significant difference between education, employment, income and living arrangement in both groups. The majority of JOAG patients were male (57.4%), of Malay ethnicity (89.7%), married (63.2%), with no family history of glaucoma (60.3%). The majority of the participant have tertiary education (52.9%), are employed (66.2%), and have an income of more than USD 500 (52.9%).

As shown in **Table 2**, better condition, the mean Logarithm of the Minimum Angle of Resolution (logMAR) of BCVA in the better eye was 0.21 (0.42), the mean IOP was 13.88 (5.15) mmHg, the mean CDR was 0.78 (0.16), and the mean MD 24-2 is -12.04 (11.25). The mean number of medication was 2.41 ± 1.48 . The most frequent medication used by the patients was prostaglandin analogues (76.5%), followed by beta-blockers (64.7%), carbonic anhydrase enzyme inhibitors (58.8%), and alpha agonists (41%). Eighty five percent of the patients had undergone glaucoma surgery. The mean number of surgeries performed was $2.13 (\pm 1.96)$ The remaining 15% was only treated with medicine. Eleven patients were not on any medication following filtering surgeries.