

Association of Well-Being Index and Cognitive Impairment with Primary Open Angle Glaucoma Patients of Malaysia: A Case-Control Study

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Soumendra SAHOO¹, Thanigasalam THEVI², Htoo Htoo Kyaw SOE¹

¹ Melaka Manipal Medical College-Community Medicine, Jalan Batu Hampar Bukit Baru, 75150 Melaka, Malaysia

² Hospital Melaka-Ophthalmology, Jalan Mufti Haji Khalil, 75400 Melaka, Malaysia

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Abstract

The purpose of this study was to determine the association of well-being and cognitive impairment with primary open angle glaucoma (POAG) patients attending a tertiary care hospital in Malaysia. Fifty-four individuals were recruited for study as cases were matched with 60 individuals as the control subjects, and data were collected using the WHO well-being index and the validated 6-item cognitive impairment test dementia test. The results showed that there was no significant association between gender, ethnicity, socioeconomic status and POAG. Patients with POAG had significantly lower well-being index scores (mean 67.93) than the control group (mean 81.60) with P -value < 0.001 . Similarly, patients with POAG had a significantly higher score of cognitive impairment (CIT test) (mean 6.15) compared to the control group (mean 0.40) with P -value < 0.001 . Consequently, POAG is likely to be associated with higher cognitive impairment and lower well-being index.

Keywords: primary open angle glaucoma, cognitive, impairment

Introduction

Blindness is perceived as a curse for a person and for society. Denniston and Murray showed in 2006 that 0.7% of the Malaysian population is blind and that another 500 thousand are visually challenged. In recent years, the incidence of blindness has shifted in favour of chronic diseases such as glaucoma, age related macular degeneration, cataract and infections. Primary open angle glaucoma (POAG) is a disease characterised by apoptosis of ganglion cells of the retina, leading to progressive loss of visual function (1). Increasing age and raised intraocular pressure are two well-known risk factors for the disease. Consequent to increased

life expectancy across the globe, the incidence of POAG is also increasing. Although it is a common disease of the elderly, it mostly goes undetected, as it is asymptomatic until the very late stage. Due to its creeping nature and resilience to the existing forms of treatment, POAG is one of the leading causes of blindness all over the world.

Dementia is one of the most common cognitive disorders found in the elderly, and both POAG and dementia have common similarities, e.g. both are diseases of the elderly, have a familial pattern, are asymptomatic in the beginning and creeping in nature and are characterised by apoptosis of their cells. Several studies have been performed in the past to

ascertain the incidence of glaucoma in dementia, and some of them have reported a much higher incidence of glaucoma in patients with dementia (2, 3). However, some studies have failed to find an association between the two diseases (4). The findings may either be a sheer coincidence as both diseases affect the elderly population, or there may be a common genetic basis for the two diseases (5). Patients with cognitive disorders such as dementia are likely to forget the medications in time (6) and may be more vulnerable to neuro degeneration by POAG. Thus, a study was performed to determine the association of POAG with the well-being and cognitive impairment among the patients attending Hospital Melaka, Malaysia.

Patients and Methods

A case-control study was performed among patients (54 cases and 60 controls) who were attending the Eye Clinic of Hospital Melaka. The cases were patients who had POAG with an angle of Grade III or wider with any two of the three following criteria: 1) increased intraocular pressure of more than 25 mm Hg, 2) persistent glaucomatous visual field defects in Humphrey Field Analyser II perimeter, and 3) had a cup-disc ratio of more than 0.5.

Control subjects were patients who attended the same eye clinic in Hospital Melaka for some other eye related problems and were within the defined age group and same gender but not diagnosed with POAG. Patients diagnosed with narrow angle and secondary glaucoma, severe behavioral problems and terminally ill diseases were excluded. Age, gender and ethnicity data were collected from a fact sheet, and socio-economic status data were collected using a modified Udai Pareek scale (7). The WHO (05) well-being index was used, and it is a 5-scale Likert questionnaire measuring positive well-being related to the quality of life. This index included five items with the response of at no time (score 0) to all the time (score 5). The raw score was calculated by summing the values of the five answers. For dementia, a validated 6-item cognitive impairment test (6-CIT) dementia test was used in Asian population, and it is a screening tool to assess cognition or, more simply, memory loss. The 6-CIT dementia test was developed in the United States by Katzman et al. and was initially validated in 1983, and 6-CIT is an acceptably accurate test for assessing

cognitive disorders, because its performance is more sensitive than the mini-mental state examination (8). In this study, the English questionnaire was verbally translated by family members or the attending person if the patient was not well versed in English. The total score was calculated by taking the sum of the 6-CIT dementia test, and it ranged from 0 to 28, and a higher score indicates cognitive impairment.

The statistical package for social sciences (SPSS) software version 12.0 was used to analyse the data; and the frequency and percentage of age, gender, ethnicity and socioeconomic status of POAG and control for descriptive statistics was also described. Descriptive statistics of the sociodemographic characteristics of POAG were obtained, and an independent *t*-test was used to determine the well-being index score and the 6-CIT test score between POAG and control groups. The level of significance was determined as 0.05, and prior approval of ethical clearance was obtained from the Clinical Research Centre Hospital Melaka and the Research and Ethical Committee of Melaka Manipal Medical College, Malaysia.

Result

A total of 54 cases with POAG and 60 control subjects participated in this study. Table 1 shows the sociodemographic characteristics of the POAG and control groups. For the POAG cases, 13% were younger than 60 years old, 40.7% were between 60 and 69 years old, 37% were between 70 and 79 years old, and 9.3% were older than 80 years old. For the control subjects, 25% of the individuals were younger than 60 years old, 51.7% were between 60 to 69 years old, 21.7% were between 70 to 79 years old, and 1.7% were older than 80 years old. In addition, 37% of the POAG group and 45% of the control group were female, while 63% of the POAG group and 55% of the control group were male. In both POAG and control groups, the Chinese population was the highest. They comprised 44.4% in the POAG and 48.3% in control group, and the Malay population was the second highest by comprising 37% in the POAG group and 35% in the control group. The Indian population was the lowest in both groups by comprising 18.5% in the POAG group and 16.7% in the control group. Regarding socioeconomic status, most of the participants were in middle socioeconomic status, comprising 67.9% in the POAG group and 70% in the control group. In addition, 22.6% of

the POAG group and 20% of the control group were in high socioeconomic status, and 9.4% of the POAG group and 10% of the control group were in low socioeconomic status (Table 1).

Table 2 shows the well-being index score and cognitive impairment using 6-CIT dementia test score between the POAG and control groups. Patients with POAG had significantly lower well-being index scores (mean 67.93) than patients in the control group (mean 81.60) with a *P*-value < 0.001. Similarly, patients with the POAG group had significantly higher 6-CIT scores (mean 6.15) than patients in the control group (mean 0.40) with *P*-value < 0.001.

Discussion

In our study, the patients with POAG had significantly lower well-being index scores than patients in the control group. The results also show that gender and ethnicity had no effect on POAG. In contrast, there was a 10-year study of patients in the Shanghai Eye and Ear Nose and Throat Hospital where the mean age for POAG was 46 years old (6). The findings in this study agree with the study by Su et al., who found that patients with POAG older than 60 years old and were significantly associated with an increased risk of dementia compared to those without glaucoma (HR=1.28, 95% CI=1.07–1.54) (9, 10).

Keenan et al. found that POAG was modestly associated with later development of vascular dementia presumably due to shared vascular risk factors, but the risk was not elevated for development of Alzheimer’s disease (11). In addition, Keenan et al. showed that dementia patients were more likely to have POAG than the control subjects (CI): 1.12–1.85; *P* < 0.01) (11), which matches with the results from our study (the CIT score is significantly higher in POAG patients) Hung et al. also showed that POAG patients had a higher risk of

Table 1. Sociodemographic characteristics of the POAG (*n* = 54) and control (*n* = 60) groups

Variables	POAG (<i>n</i> = 54) <i>n</i> (%)	Control (<i>n</i> = 60) <i>n</i> (%)
Age		
< 60	7 (13.0)	15 (25.0)
60–69	22 (40.7)	31 (51.7)
70–79	20 (37.0)	13 (21.7)
≥ 80	5 (9.3)	1 (1.7)
Gender		
Female	20 (37.0)	27 (45.0)
Male	34 (63.0)	33 (55.0)
Ethnicity		
Malay	20 (37.0)	21 (35.0)
Chinese	24 (44.4)	29 (48.3)
Indian	10 (18.5)	10 (16.7)
Socioeconomic status		
Low	5 (9.4)	6 (10.0)
Middle	36 (67.9)	42 (70.0)
High	12 (22.6)	12 (20.0)

Alzheimer’s Disease compared with the control subjects (12). Another recent study by Bulut et al. has indicated that there could be similar risk factors in glaucoma and neurodegenerative disorders that may have caused deterioration in cognitive performance. They also compared the low mini mental state examination (MMSE) scores of the POAG and normotensive glaucoma patients with the scores of healthy participants to support their hypothesis (13). The limitation of our study is the relatively small sample size and the omission to consider the various glaucoma medications.

Table 2. Well-being index score and 6-CIT score between the POAG and control groups

Variables	Mean (SD)		Mean Difference (95% CI)	<i>t</i> -statistics (df)	<i>P</i> -value ^a
	POAG <i>n</i> = 54	Control <i>n</i> = 60			
Well-being index percentage score	67.93 (22.91)	81.60 (16.21)	-13.67 (-20.98, -6.37)	-3.71 (112)	< 0.001
6-CIT Score	6.15 (4.70)	0.40 (0.96)	5.75 (4.52,6.98)	9.26 (112)	< 0.001

^aIndependent *t*-test

Conclusion

In conclusion, POAG is possibly associated with higher cognitive impairment and lower well-being in comparison to the control group.

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Conflict of Interest

Authors had no conflict of interest while undertaking the study

Authors' Contributions

Conception and design: SS
 Analysis and interpretation of the data: HHKS
 Drafting of the article: SS, TT
 Critical revision of the article for important intellectual content: SS, TT
 Final approval of the article: SS
 Provision of study materials: SS, TT
 Statistical expertise: HHKS
 Administrative, technical, or logistic support: SS
 Collection and assembly of data: SS, TT

Correspondence

Prof Dr Soumendra Sahoo
 MBBS (Utkal University, India), MS (Sambalpur University, India), PhD(Utkal University, India),
 CMCL-FAIMER Fellow in Medical Education Head,
 Ophthalmology
 Melaka Manipal Medical College,
 Jalan Batu Hampar Bukit Baru,
 Melaka 75150, Malaysia.
 Tel: +06 289 6662
 Fax: +06 281 7977
 E-mail: dr_soumendra@yahoo.com

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