Clinical Presentation, Severity and Progression of Primary Angle Closure in Malay and Chinese Patients

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SUMMARY

Objective: To compare the clinical presentation, severity and progression of primary angle closure between Chinese and Malays residing in Malaysia.

Methods: A comparative retrospective record review study was conducted involving one hundred (200 eyes) Malay and fifty eight (116 eyes) Chinese patients. They were selected from medical records of Hospital Universiti Sains Malaysia, Kelantan and Hospital Pulau Pinang, Penang, Malaysia. The selected patients were re-diagnosed based on the International Society of Geographical and Epidemiological classification. The clinical data on presentation including the presence of systemic diseases were documented. Progression of the disease was based on available reliable visual fields and optic disc changes of patients who have been on follow-up for at least five years.

Results: Malay patients presented at older age (61.4 years SD 8.4) compared to Chinese (60.6 years SD 8.3). There was significant higher baseline Intraocular Pressure (IOP) among Malays (34.7 SD 18.5mmHg) compared to Chinese (30.3 SD 16.7mmHg) (p=0.032). The Chinese patients presented with significantly better visual acuity (p<0.001) and less advanced cup to disc changes (p=0.001) compared to Malays. Malay patients progressed faster than the Chinese. Majority progressed within 1 year of diagnosis. Malays without laser peripheral iridotomy (LPI) have a 4 fold (95% CI 1.4, 10.9) risk of progression. Higher baseline IOP, more advanced visual field defect and absence of LPI was identified as significant predictors associated with progression.

Conclusion: The Malays presented with more advanced angle closure glaucoma as compared to the Chinese in Malaysia. Aggressive disease progression was observed in Malays with the onset of optic neuropathy. Effective public awareness and aggressive management is important to prevent blindness in the Malaysian population.

INTRODUCTION

Glaucoma is one of the major causes of blindness in the world.[1] It is estimated that half of the world's blindness is seen among the Asians and the majority of it is due to angle closure glaucoma (ACG).[2] ACG has been extensively studied in terms of epidemiology and clinical presentation especially among the Chinese but less emphasis is given in other Asian populations.[3] The Mongolian and Myanmar populations were reported to have the highest incidence of acute primary angle closure (APAC) followed by Singaporeans.[4-5] It is estimated that 3.5 million people in China were diagnosed with PACG and 28 million have narrow anterior chamber angles.[3]

Although the total world population of Chinese and Indians definitely outnumber the Malays, the Malays remain the third largest ethnic group in Asia, accounting for 5% of the world's population.[7] There is an estimated 300 to 400 million Malays in the Malay Archipelago with majority residing in Malaysia, Brunei, Indonesia, Thailand and Singapore.

In Malaysia, Malays and other Bumiputera groups make up 61.9% of the population followed by Chinese 22.5%, Indians 6.7% and other ethnic groups 0.7%.[8] A Malay is defined as a Malaysian citizen born to a Malaysian citizen who professes to be Muslim, habitually speaks the Malay language, adheres to Malay customs, and is domiciled in Malaysia or Singapore.[9] A Malaysian Chinese is a Malaysian of Chinese origin and the majority is from southern China. Most of the Malaysian Chinese are descendants of Chinese who arrived between the fifteenth and the mid-twentieth century in Malaysia.

Wong *et al* found that the Malay and Indian populations in Singapore only contribute to half of the rate of hospital admissions for Chinese with symptomatic PACG based on a retrospective review.[10] Based on our clinical observation, Malays tend to have more severe and rapid progression of angle closure glaucoma compared to the Chinese population. In addition, there is evidence to suggest that Malays have a higher percentage of progression in a retrospective study involving chronic angle closure glaucoma from Malaysia,

This article was accepted: 10 November 2014
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Hong Kong and Taiwan. However, this observation was based on only 22 Malay patients.[11] The aim of this study was to compare the clinical presentation, severity and progression of primary angle closure between Chinese and Malays residing in Malaysia. Factors associated with progression were also studied.

MATERIALS AND METHODS

A retrospective record review was conducted involving patients treated in Hospital Universiti Sains Malaysia (HUSM) Kelantan, Hospital Raja Perempuan Zainab II (HRPZII), Kelantan and Hospital Pulau Pinang (HPP), Penang, Malaysia, with primary angle closure suspect (PACS), primary angle closure (PAC) and primary angle closure glaucoma (PACG) that had completed at least 5 years of follow-up from their initial presentation. The states of Kelantan and Penang were chosen based on the population distribution. Approximately 94.7% of the Kelantan population are Malays (3.4% Chinese) and 45.5% of Penangites are Chinese (43.3% Malays); the highest percentage in one single state in Malaysia. These two states are the best representatives of the Malay and Chinese population in Malaysia.[8] This study received ethical approval from the research and ethics committee of the School of Medical Sciences, Universiti Sains Malaysia.

Demographic data including age at presentation, race and sex were documented. The details of the initial presentation were extracted from the available medical records, such as the signs and symptoms at presentation, presence of acute attack, intraocular pressure (IOP) using Goldman applanation tonometer, visual acuity using Snellen chart, gonioscopic evaluation using either two mirror or three mirror, slit lamp biomicroscopic findings, initial documentation on vertical cup to disc (VCDR) ratio and Humphrey visual field(HVF) 24-2 or 30-2 analysis (Carl Zeiss Meditec Inc, Dublin, CA). The name and registration number of patients recruited from HUSM were obtained from the computerized database. This database includes diagnosis which was entered by nurses on daily basis, after completion of the clinic in HUSM. The recruitment in two other hospitals was based on available data between February 2012 and April 2012 obtained by an ophthalmologist (NAZ) and trainee ophthalmologist (NGF) in HRPZII and HPP respectively. Based on the available documented data, the patients were re-diagnosed according to the consensus of the International Society for Geographical and Epidemiological Ophthalmology (ISGEO).[12] A total of 89 patients with incomplete data were excluded from the analysis. PACS is defined as an eye in which there is possibility of appositional contact between the peripheral iris and posterior trabecular meshwork. Acute presentation of angle closure (APAC) is also documented based on the presence of APAC at presentation or history of APAC. PAC is defined as an eye with an occludable drainage angle and features indicating that trabecular obstruction by the peripheral iris has occurred in the absence of glaucomatous optic disc damage. PACG is defined as PAC with evidence of glaucomatous damage. Both eyes were included as each eye has a different clinical course.

Past medical history such as hypertension, diabetes mellitus (DM), ischemic heart disease, hyperlipidemia and others were also documented. The initial and subsequent management including medical treatment, laser peripheral iridotomy or surgical peripheral iridectomy were also included. The visual acuity, HVF, vertical cup to disc ratio (VCDR) and IOP at the latest follow-up or at 5 years follow-up were then documented for definition of progression. The progression from PACS to PAC was based on IOP and available gonioscopic changes. Progression from PAC to PACG was based on HVF, IOP and VCDR. We divided the definition of progression into three categories; based on VCDR and HVF changes. The final progression was based on VCDR and HVF progression (changes from baseline to current data). At least six reliable HVF must be available for determination of progression. The evaluation of progression was done by the glaucoma specialist (LS). The time of progression was then documented. The changes of angle structure on gonioscopic findings were also included whenever available. The severity of PACG was defined based on Hodapp-Parrish (HODAPP) classification.[13] HODAPP classification is based on two criteria on HVF analysis. The first criterion considers the overall extent of damage, which is calculated by using both the mean deviation (MD) value and the number of defective points in HVF. The second criterion is based on the defect proximity to the fixation point. [13]

Statistical analysis was performed using PAWS software, version 18. Univariate analysis using Pearson chi-square, t-test and Fisher exact test were used. Multivariate analysis using multiple linear regressions and multiple logistic regressions were used to further determine the factor affecting the progression of ACG. Multiple logistic regressions for the Chinese patients were done independently. Stepwise multiple logistic regressions were also conducted on a combination of Malay and Chinese patients. For each analysis, model forward (reference) and backward was conducted. Selection of parameters with significant p-value (<0.05) were selected from each model. The final model comprised of the significant parameters and other parameters that were deemed clinically relevant e.g age, sex and APAC. P-value less than 0.05 were considered statistically significant.

RESULTS

A total of 100 Malays (200 eyes) and 56 Chinese patients (118 eyes) were included in this study (table I). Malay patients presented at a slightly older age than the Chinese patients. There was a significant predilection towards females in Malays with a ratio of 4:1 compared to the Chinese (table 1). In general, the Malay patients presented with a more advanced disease compared to the Chinese patients. They presented with more advanced VCDR and visual field defect (table I). A third of the Malay patients presented with poor visual acuity less than 6/60 with fourteen eyes already blind. The majority of the Chinese presented with good visual acuity (better than 6/24). Poor fundus visualisation was noted in 9% of eyes for both racial groups. However, nearly a third of Malay eyes presented with VCDR more than 0.8 and half presented with VCDR ≥0.6. Meanwhile 71.7% of Chinese eyes presented with VCDR ≤0.5. The mean IOP at presentation was significantly higher in Malays compared to Chinese (p=0.032). However, the majority of Malay and Chinese patients were asymptomatic with slightly higher percentage (47% versus 37.9%) of APAC in Malays.

Table I: Comparison of demographic data and clinical presentation at initial presentation between Malay and Chinese angle closure glaucoma patients based on univariate analysis

Characteristic	Malays N=100 (200 eyes)	Chinese N=58 (116 eyes)	X^2	p-value
Age at presentation (year)				
Mean (SD)	61.4 (8.4)	60.6 (8.3)		0.418*
Sex				
Female	77 (77.0)	35 (60.3)	9.87	**0.002**
Male	23 (23.0)	23 (39.7)		
APAC	94 (47.0)	44 (37.9)	2.45	0.117
Visual acuity at presentation				
6/6 - 6/12	88 (44.0))	68 (58.6)	13.02	**0.005**
6/15-6/4844 (22.0)	28 (24.1)			
≤6/60	54 (27.0)	19 (16.4)		
NPL	14 (7.0)	1 (0.9)		
Intraocular pressure (mmHg)				
Mean (SD)	34.7 (18.5)	30.3 (16.7)		**0.032***
Vertical cup to disc ratio (VCDR)				
<0.8	128 (64.0)	86 (74.2)		**0.014#**
0.8-0.9	41 (20.5)	20 (17.2)		
Fully cupped	13 (6.5)	--		
No fundus view	18 (9.0)	10 (8.6)		
HVF at presentation				
Mean deviation (MD) of HVF				
Mean (SD)	-13.26 (10.18)	-10.90 (9.43)		**0.035***
Pattern Standard Deviation (PSD)				
Mean SD	5.51(3.63)	4.73 (2.84)		0.187*
Diagnosis at presentation				
PACS	52 (26.0)	36 (31.6)	1.74	0.420
PAC	40 (20.0)	25 (21.9)		
PACG	108 (54.0)	53 (46.5)		

NPL: no perception to light, PACS: primary angle closure suspect, PAC: primary angle closure, PACG: primary angle closure glaucoma, APAC: acute presentation of angle closure.
p-value < 0.05 is based on Pearson chi-square test, # Fisher exact test and * student t-test.

Laser peripheral iridotomy procedures (LPI) were significantly conducted more in Chinese patients with angle closure (p<0.001). There was no significant difference in diagnosis at initial presentation between Malays and Chinese (p=0.420) but there were slightly higher incidences of PACG in Malays (table I).

On a 5 year follow-up, there was significant lower percentage of PACS in Malays (p<0.001). Almost two thirds of Malay (78.5%) and Chinese (75%) patients were diagnosed with PACG (table II).There was statistically significant difference in progression of the disease (change in diagnosis) in Malays compared to Chinese (table II). Malays progressed at a significantly shorter duration than the Chinese. The majority of the Chinese (80.8%) progressed after 2 years from the initial presentation. Malays had a tendency to progress within 2 years of presentation. Nearly a third of the eyes with PACG in Malays progressed from mild or moderate to severe. In total 30.2% of Chinese patients and 47.7% of Malay patients with PACG progressed. Meanwhile more than half of the eyes with PACG in Chinese remained as moderate glaucoma.

The predictor for progression in Malay patients with angle closure includes increasing age, the presence of glaucomatous damage at presentation and the absence of laser peripheral iridotomy.[14] However, there was no significant predictor for progression in Chinese patients (table IV). Stepwise MLR on both races: Malays and Chinese (table III) showed that the presence of ocular pain at presentation, history of systemic hypertension, treatment with topical timolol as initial management and absence of trabeculectomy were protective predictors against the progression of angle closure. The presence of red eye as part of APAC presentation increased the risk of progression 2.7 fold (95% CI 1.07, 6.93). The absence of laser peripheral iridotomy increased the risk of progression 3.4 fold (95% CI 1.23, 9.53). In general, the need for subsequent treatment with topical pressure lowering medication was associated with higher risk of progression (table III).

DISCUSSION

Contrary to the retrospective findings in Singapore,[10] acute angle closure is not uncommon amongst the Malay population in Malaysia. Malays and Indian represent half of the admissions of the Chinese with APAC in Singapore.[10] Since Malays form only a small percentage of the total Singaporean population, this finding comes as no surprise. For similar reasons, there was a lower prevalence of primary angle closure glaucoma in population-based studies involving Malays residing in Singapore, The Singapore Malay Eye Study (SiMES).[15] Furthermore, a population-based study in India involving large number of Indians found that

Table II: Comparison of subsequent management and progression of the disease between Malay and Chinese based on univariate analysis

Characteristics	Malay	Chinese	χ^2	p-value
Subsequent management				
Laser peripheral iridotomy	171 (85.5)	114 (98.3)	13.54	**<0.001**
Pressure lowering drugs				
Mono therapy	49 (24.5)	33 (28.4)		**0.003#**
Dual therapy	50 (25.0)	42 (36.3)		
Triple therapy	40 (20.0)	8 (6.9)		
Four therapy	3 (1.5)	5 (4.3)		
No therapy	58 (29.0)	28 (24.1)		
Lens extraction surgery	21 (10.5)	11 (9.5)	0.08	0.773
Trabeculectomy	31 (15.5)	15 (12.9)	0.39	0.533
Visual acuity				
6/6 - 6/12	100 (50.0)	69 (59.5)	9.91	**0.019**
6/15-6/48	48 (24.0)	30 (25.9)		
<6/60	20 (10.0)	12 (10.3)		
NPL	32 (16.0)	5 (4.3)		
Vertical cup to disc ratio				
<0.8	109 (54.5)	81 (69.8)		**0.004#**
0.8-0.9	45 (22.5)	25 (21.6)		
Fully cupped	45 (22.5)	10 (8.6)		
No fundus view	1 (0.5)	-		
Humphrey visual field analysis (HVF)				
Mean deviation (MD)	-13.97 (10.30)	-12.16 (9.83)		0.522*
Mean (SD)				
Pattern Standard Deviation (PSD)				
Mean (SD)	5.57(3.65)	4.80 (3.23)		0.134*
Diagnosis after at least 5 years follow up				
PACS	6 (3.0)	13 (11.0)	8.862	**0.012**
PAC	39 (19.5)	18 (15.3)		
PACG	155 (78.5)	87 (73.7)		
Progression				
Based on VCDR changes	N=181	N=106		
	50 (27.5)	31 (29.0)	0.08	0.784
Based on HVF changes	N=77	N=45		
	37 (48.1)	14 (31.1)	3.35	0.067
Final (VCDR and HVF changes)	N=184	N=107		
	72 (39.1)	41 (38.3)	0.02	0.891
Change of diagnosis	N=91	N=63		
No changes	22 (24.1)	25 (39.7)		0.008#
PACS to PAC	23 (25.3)	4 (6.3)		
PACS to PACG	23 (25.3)	20 (31.7)		
PAC to PACG	23 (25.3)	14 (22.3)		
Change in PACG stages	N=52	N=16		
Mild to moderate	6 (11.5)	4 (25.0)		<0.001#
Mild to severe	13 (25.0)	1 (6.3)		
Moderate to severe	23 (44.3)	1 (6.3)		
Severe to blindness	10 (19.2)	10 (62.4)		
No changes	N=57	N=37		
Remain severe	26 (24.1)	9 (17.0)		<0.001#
Remain moderate	11 (10.2)	28 (52.8)		
Remain mild	6 (5.6)	-		
Absolute glaucoma/blind	14 (12.9)	-		
Duration of progression				
Mean duration (SD) (months)	31.9 (31.8)	84.6 (61.2)		<0.001*
Range				
< 6 months	12 (10.3)	--		
6 months-1 year	27 (23.1)	1 (3.8)		0.011#
1 year- 2years	21 (17.9)	4 (15.4)		
>2 years	57 (48.7)	21(80.8)		

P-value <0.05 is considered significant based on Pearson chi-square test, Fisher exact test# and student t-test*.
PACS: primary angle closure suspect, PAC: primary angle closure, PACG: primary angle closure glaucoma. NPL: no perception to light, VA: visual acuity.

Table III: Stepwise multiple logistic regressions on predictors for progression of angle closure in both Chinese and Malay patients in Malaysia

N=311	Odds ratio (95% CI)	Std error	z	p-value
Sex				
Female	0.57 (0.31, 1.04)	0.17	-1.84	0.066
Ocular pain	0.41 (0.18, 0.97)	0.18	-2.02	0.043
Presence of red eye	2.72 (1.07, 6.93)	1.30	2.10	0.035
Systemic hypertension	0.50 (0.26, 0.97)	0.17	-2.05	0.041
Initial LPI (without)	3.42 (1.23, 9.53)	1.79	2.35	0.019
Topical timolol	0.52 (0.30, 0.97)	0.166	-2.04	0.041
Subsequent topical treatment				
Monotherapy	16.01 (1.50, 170.47)	19.32	2.30	0.022
Dual therapy	9.72 (0.94, 101.07)	11.61	1.90	0.057
Triple therapy	76.47 (6.19, 945.26)	98.11	3.38	0.001
>3 medications	18.85 (1.04, 341.43)	27.86	1.99	0.047
No topical treatment	3.80 (0.35, 41.24)	4.62	1.10	0.272
Trabeculectomy (without)	0.28 (0.15, 0.54)	0.09	-3.84	<0.001

The goodness of fit of the backward model was checked using the Hosmer-Lemenshow test; p=0.710, area under ROC curve = 0.811. This result gives no evidence of lack of fit of the model.

Table IV: Stepwise multiple logistic regressions on predictors for progression of angle closure in Chinese patients in Malaysia

	Odds ratio (95% CI)	Std error	z	p-value
Sex				
Female	0.63 (0.26, 1.50)	0.28	-1.05	0.296
Age at presentation	1.01 (0.95, 1.06)	0.03	0.26	0.796
Presence of red eye	1.20 (0.43, 3.31)	0.62	0.35	0.726
Initial LPI (without)	1.41(0.54,2.36)	0.37	1.31	0.191

The goodness of fit of the backward model was checked using the classification test; p=0.707, area under ROC curve = 0.616. This result gives no evidence of lack of fit of the model.

angle closure was not uncommon with the prevalence almost similar to the Chinese population.[16,17] Since there was no population-based study in Malaysia, this retrospective analysis is important to shed some light on the possible differences in the disease behaviour of angle closure between the Malays and Chinese; the two major races in Malaysia.

The previous finding on indirect comparison between small numbers of Malays and larger numbers of Chinese found that Malays demonstrated higher frequency of progression.[11] This raised the important question on the possibility of different disease course in Malays. We found that Malays in Malaysia presented with a more advanced stage of PACG. Our earlier publication on Malay patients with PACG found that Malay patients with PACG have 16 folds risk of progression.[14] Late presentation is one of the important factors. We postulated that this could be due to a lack of awareness and ineffective public campaigns among Malays.[14] Education and economic status may also play a role in the late detection of angle closure.[18,19] The state of Kelantan has recorded the highest illiteracy rate and is the poorest state in Peninsular Malaysia, while Penang has one of the highest literacy rates. On the other hand, in spite of the better literacy rate and economic status as compared to Kelantan, late presentation among Chinese patients in Penang is not uncommon.[20] We did not include such an important data due to major irregularities and lack of availability of this information in our record system.

There is a possibility that the disease itself behaves differently in Malays compared to Chinese. Both racial groups demonstrated high incidences of asymptomatic angle closure that behaved similarly to primary open angle glaucoma (POAG) due to lack of symptoms at the early stage of the disease.[21] There was significant difference of ocular biometry between PACG and POAG.[21] The incidence of acute presentation in both Malays and Chinese was almost similar to other Asian population.[22] In fact, the Malays presented with a higher incidence of acute presentation compared to the Chinese.[14] Liza-Sharmini et al reported 47% of Malay patients presented with APAC in a retrospective record review study. [14] The similarity to clinical presentation of POAG,[21] perhaps explains the higher percentage of patients presented with glaucomatous changes at the initial presentation. Malays presented with more advanced HVF and higher percentage (26.5%) of patients with VCDR> 0.8 compared to Chinese patients. Combining this data, most likely those presented with APAC were those of acute on chronic PACG. It was even more alarming to note that 14 eyes among Malay patients had already developed absolute glaucoma at initial presentation compared to just one eye among Chinese patients.

Females are known to be more susceptible to angle closure. Our findings concur with this, as there was a significant higher female preponderance in Malays (4:2) compared to Chinese (3:2). Chinese women in Singapore were 3 times at a higher risk of developing angle closure compared to non-Chinese men.[10,23,24] Women tend to have shallower anterior chamber depth and narrower angle than men that is believed to predispose them to angle closure.[25,26] Based on another SiMES outcome, Malays have a similar narrow angle

on anterior segment optical coherence tomography (AS-OCT).[27] However, this population-based study was unable to associate the angle structure changes with the risk of angle closure due to a rather small number of participants and lower prevalence of angle closure in Malays residing in Singapore. In addition, there was no difference in anterior chamber depth (ACD) after adjusting the age between 1,826 Chinese and 216 non-Chinese (Malays and Indians) in a cross sectional study involving patients attending primary care clinics in Singapore.[22] Due to irregularities in the clinical record, we did not include the ACD in our study. Perhaps, there are different mechanisms that predispose Malays to angle closure.

Although Malays presented with a higher percentage of APAC, most likely there are acute on chronic PACG. Perhaps, this may be responsible for a higher percentage of advanced disease at initial presentation and LPI was deemed ineffective. Combination of these reasons lead to significant lower percentage of laser peripheral iridotomy (LPI) conducted in Malay eyes. The success of LPI in preventing the progression of angle closure among the Asian population is not as good when compared to Caucasians.[28] There were studies reporting the disease progression among Asians in spite of the presence of a patent LPI.[24,29] The absence of LPI was found to increase the risk of progression 3.4 fold (95%CI 1.2, 9.5) in both Malays and Chinese in the present study. LPI still conferred some protective effect to both Malays and Chinese in the Malaysian population.

Based on univariate analysis, angle closure in the Malays progressed at a shorter duration than the Chinese. Even in cases where optic neuropathy had already set in, Malay patients still progressed from mild to moderate (6, 5.6%) and from moderate to severe (23, 21.3%). This suggests the aggressiveness of angle closure in Malays. The majority of the Chinese progressed 2 years after the first presentation. None of the Chinese patients progressed within 6 months of presentation. A total of 30.2% of our Chinese patients with PACG progressed, which was similar to Chinese patients residing in Singapore.[26] However, our study and study conducted on Chinese patients in Singapore[26] was not directly comparable due to the difference in definition of progression and the duration of follow-up. We postulated that the majority of angle closure in Malays behaved like a chronic asymptomatic disease mimicking POAG. Unfortunately, there was no available data on the progression rate of POAG in Malay patients for comparison. IOP control by either medical or surgical intervention is important in halting the progression of the disease. However, the IOP measurement throughout the length of follow up was not included in this study. Compliance to treatment and follow up is also important factors related to progression. In the current study these issues were not addressed.

The symptoms of APAC were identified as one of the important predictors for progression in both Malays and Chinese. While ocular pain plays a protective role against progression, the presence of red eye increased the risk of progression. On the contrary, APAC was not found as a significant predictor for progression of angle closure in our study. A retrospective review on Chinese PACG patients residing in Singapore found that the presence of APAC was associated with visual field progression.[30] Another retrospective review on 89 Chinese PACG patients in Taiwan found that shorter axial length was associated with visual field progression.[31] However, when analysed on Chinese patients alone, there was no single significant predictor associated with progression of the disease in Chinese residing in Malaysia. The availability of the data in retrospective review and the difference in management in three different recruitment centres may cause the biasness in our study.

Inclusion of both eyes in a disease like glaucoma is controversial. We included both eyes in this study due to the different disease progression between the two eyes in a single patient. One eye may progress faster to PACG, while the other maintains as PACS for years. Definition of progression based on visual field defect using HODAPP definition is perhaps not the best definition. Using HODAPP based on the mean defect of Humphrey Field analysis was not really ideal especially in a retrospective study.

Initial treatment with topical timolol was found to protect against progression of angle closure (OR 0.52; 95%CI 0.30, 0.97). A large number of angle closure patients in this study were initially treated at the era when timolol was the most popular effective first line medication for glaucoma. This may also indicates the potential aggressive initial medical treatment of angle closure in preventing the progression of angle closure. The risk of progression increases significantly with the increase of number of topical medications for subsequent treatment. Triple topical medications increased the risk of progression 76 folds (95% CI 6.2, 945.3). Higher IOP leads to the need of more medications to achieve target pressure. High IOP was found to increase the risk of progression in POAG.[32] Furthermore, pretreatment IOP was known to associate with visual field defect in PACG patients.[33]

On contrary, absent of trabeculectomy (surgical intervention) was found to protect against progression (OR 0.28; 95% CI 0.15, 0.54). There was no evidence to suggest that trabeculectomy success was poorer in PACG patients[34,35] Non-augmented trabeculectomy was conducted in majority of the cases included in this study. However, the number of trabeculectomy was too small to compare with those without trabeculectomy. This may be responsible for this contradictory outcome. Based on the findings in this retrospective study, managing angle closure is challenging with higher risk of progression with medical treatment, ineffective LPI and poor success with surgical treatment.

CONCLUSION

Malays with angle closure presented with more advanced disease compared to Chinese patients. Once optic neuropathy has developed, faster disease progression was observed in Malays compared to Chinese. Perhaps, prompt treatment, vigilant follow-up after APAC and appropriate treatment is important to slow down the aggressive behaviour of angle closure among Malays. Better preventive measures should be strategized including more effective awareness programmes which should be planned to prevent blindness due to angle closure in Malaysia.

ACKNOWLEDGEMENT

We thank Ms Che Nur Ayuni Che Zainul Bahri for her secretarial work. This study is partially funded by Universiti Sains Malaysia research university grant 1001\PPSP\812101

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