Malaysian Journal of Ophthalmology

© Malaysian Journal of Ophthalmology 2025; 1:1-10
Original article
https://doi.org/10.35119/myjo.v7i1.394

Phacoemulsification with intraocular lens implantation in Hospital Kuala Lumpur: refractive outcomes and associated factors

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Abstract

Purpose: To determine the refractive outcomes of cataract surgery in Hospital Kuala Lumpur (HKL) and how they compare to international standards. To determine factors associated with it among cataract patients who underwent phacoemulsification surgery and intraocular lens implantation in HKL for quality improvement initiatives.
Study design: This is a retrospective study conducted based on the Malaysian Cataract Surgery Registry (CSR) records from January 1, 2021 to December 31, 2021 by the Department of Ophthalmology in HKL.
Methods: This study included all patients who underwent phacoemulsification during the study period. Poor cataract outcome was classified as spherical equivalent (SE) difference not within 1.0 dioptres (D) of predicted value. SE difference as a dichotomous dependent variable was used in a logistic regression model. Simple logistic regression was performed to determine the association between all risk factors and the outcome. Multiple logistic regression analysis was carried out to determine factors that may affect the probability of poor cataract outcome.
Results: The results showed that phacoemulsification procedures done in HKL achieved the benchmark standards, whereby 87.3% of the patients achieved

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post-phacoemulsification SE refraction within 1 D of predicted value, while 58.6% were within 0.5 D of predicted value. Female gender (p = 0.015), presence of age-related macular degeneration (ARMD) (p = 0.002), ultrasound biometry technique (p=0.045), and intraoperative posterior capsule rupture (PCR) (p = 0.018) were associated with poor cataract outcomes. The odds of getting a poor outcome for each factor were 1.73, 6.47, 2.00, and 6.42 times more, respectively.
Conclusion: This study showed that refractive outcomes in HKL are comparable to international standards. Risk factors for poor refractive outcome were female gender, ARMD, ultrasound biometry technique, and PCR.

Keywords: cataract surgery outcome, Malaysia, phacoemulsification, posterior capsule rupture, refractive outcome

Fakoemulsifikasi dengan Implantasi kanta intraokular di Hospital Kuala Lumpur: hasil refraktif dan faktor-faktor berkaitan

Abstrak

Tujuan: Untuk menentukan hasil refraktif pembedahan katarak di Hospital Kuala Lumpur (HKL) dan membandingkannya dengan standard antarabangsa. Kajian ini juga untuk mengenal pasti faktor- faktor yang berkaitan dengan hasil refraktif dalam kalangan pesakit katarak yang menjalani pembedahan fakoemulsifikasi dengan implantasi kanta intraokular di Hospital Kuala Lumpur (HKL) bagi inisiatif penambahbaikan kualiti.
Reka bentuk kajian: Kajian retrospektif ini dijalankan berdasarkan rekod Pendaftaran Pembedahan Katarak Malaysia (CSR) dari 1 Januari 2021 sehingga 31 Disember 2021 oleh Jabatan Oftalmologi HKL.
Kaedah: Kajian ini melibatkan semua pesakit yang menjalani pembedahan fakoemulsifikasi dengan implantasi kanta intraokular dalam tempoh kajian yang dijalankan. Dalam kajian ini, hasil pembedahan katarak yang tidak memuaskan dikelaskan sebagai perbezaan sfera ekuivalen (SE) di luar 1.0 diopter (D) daripada nilai yang diramalkan. Perbezaan SE sebagai pembolehubah bersandar dikotomi digunakan untuk analisis regresi logistik. Regresi logistik mudah digunakan untuk menentukan perkaitan semua faktor risiko dengan hasil refraktif. Analisis regresi logistik berganda dijalankan untuk menentukan faktor-faktor yang akan mempengaruhi kebarangkalian untuk mencapai hasil refraktif yang tidak memuaskan.
Keputusan: Hasil kajian menunjukkan bahawa prosedur fakoemulsifikasi di HKL

mencapai standard penanda aras antarabangsa, iaitu 87.3% mencapai refraksi SE selepas fakoemulsifikasi di dalam julat 1D daripada nilai yang diramalkan, manakala 58.6% di dalam julat 0.5D yang diramalkan. Kehadiran komorbid mata memberi kesan ketara ke atas hasil refraktif. Pesakit jantina perempuan ($p = 0.015$), degenerasi makula berkaitan usia (ARMD) (p=0.002), teknik biometri ultrasound ($p = 0.045$) dan intraoperatif kepecahan kapsul posterior (PCR) ($p = 0.018$) dikaitkan dengan hasil pembedahan fakoemulsifikasi yang tidak memuaskan. Keberangkalian setiap faktor untuk mencapai hasil yang tidak memuaskan mengikut turutan adalah 1.73, 6.47, 2.00 dan 6.42 kali ganda.

Kesimpulan: Kajian ini menunjukkan bahawa hasil refraktif pembedahan fakoemulsifikasi di HKL setanding dengan standard antarabangsa. Jantina perempuan, degenerasi makula berkaitan usia, teknik biometri ultrasound dan intraoperatif kepecahan kapsul posterior adalah faktor- faktor risiko untuk hasil refraktif yang tidak memuaskan.

Keywords: hasil pembedahan katarak, Malaysia, fakoemulsifikasi, pecah kapsul posterior, hasil refraktif

Introduction

The National Eye Survey has identified cataract as the leading cause of reversible blindness and visual impairment in Malaysia.[1] Meanwhile, cataract surgery is the most common type of ocular surgery performed. Cataract surgery has evolved from intracapsular cataract extraction (ICCE) to extracapsular cataract extraction (ECCE) and phacoemulsification.[2,3] Phacoemulsification is the most commonly performed cataract procedure worldwide, including in Malaysia. Benchmark standards set by the Royal College of Ophthalmologists dictate that 85% of eyes should be within 1 dioptre (D) of the target refractive outcome, and 55% of patients should be within 0.5 D of the target refractive outcome.[4] This benchmark serves as a performance indicator in Malaysia.

It is important to identify the factors that affect the postoperative outcomes in a centre. Several patient factors, surgical factors, and intraoperative and postoperative complications can affect postoperative outcomes. Examples of intraoperative complications include posterior capsule rupture, nucleus drop, zonular dehiscence, and vitreous loss.[5] Thevi *et al.* found that the presence of ocular comorbidities, and postoperative complications affected surgical outcomes,[6] while, Nadiah *et al.* found that ocular comorbidities, surgeon status, and intraoperative and postoperative complications affected surgical outcomes.[7] The Royal College of Ophthalmologists recommended optimising A constants and using partial coherence interferometry whenever possible to achieve a postoperative spherical equivalent (SE) within 1 D of the predicted value.[8]

The objective of this study was to determine the percentage of cases that achieved post-surgical refractive outcomes based on standards set by the Royal College of Ophthalmologists. This study also aimed to identify risk factors associated with refractive outcomes within a postoperative period of 5–8 weeks among cataract patients who underwent phacoemulsification surgery in Hospital Kuala Lumpur (HKL). Therefore, with this data analysis, it helps for further improvement in delivering quality ophthalmology services in HKL.

Methods

Study type and design

This is a retrospective study on patients who underwent cataract surgery in HKL from January 1, 2021 to December 31, 2021. Patient data were extracted from the Malaysian Cataract Surgery Registry (CSR) database.

Study population

The study included all patients recorded in the Malaysian CSR who underwent cataract surgery in 1 eye or both eyes using phacoemulsification during the study period between January 1, 2021 and December 31, 2021.

Selection criteria

Patients aged above 18 years old with intraocular lens implanted during phacoemulsification surgery were included in this study. Patients excluded from the study were those who had phacoemulsification combined with other ocular surgeries, *e.g.*, vitreoretinal surgery, pterygium surgery, or glaucoma filtration surgery, and phacoemulsification surgeries that were converted to extracapsular cataract extraction (ECCE). Those without postoperative refraction done within 5–8 weeks were also excluded from the study.

Data collection

Data was extracted from the Malaysian CSR. CSR is part of the Malaysian National Eye Database, which is a web-based, password-protected surveillance system that collects data on eye diseases and clinical performance of ophthalmology services in Malaysia. It involves systematic data entry of predefined sets of preoperative, operative, and outcome forms by designated paramedical staff. Details on the Malaysian CSR have been published elsewhere.[9] In this study, the refractive outcome of cataract surgery was classified as good when the SE difference was within 1.0 D of predicted value and poor when it was not within 1.0 D of predicted value. Formulae for calculation are as below:

- SE = sphere power + ½ cylindrical power10
- SE difference = (SE postoperative refraction) – (preoperative target refraction).

Statistical analysis

Data were collected, cleaned, and calculated in Microsoft Excel 2021. Data analysis was performed using SPSS version 26. For description, quantitative variables were expressed as mean ± standard deviation (SD), and qualitative variables were expressed as frequency and percentage. Simple logistic regression analysis was carried out to determine the association between all risk factors and the outcome. Multiple logistic regression analysis was carried out to determine factors that may affect the probability of poor cataract outcome. The variables which were analysed in multiple logistic regression were age, gender, ethnicity, ocular comorbidities, surgeon status, intraoperative complications, and postoperative follow-up (in weeks). For all analyses, a *p*-value of less than 0.05 was considered statistically significant.

Privacy and confidentiality

The subjects' names were kept on a password-protected database and were linked only with a study identification number. These identification numbers were used on the subject data sheets instead of patient identifiers. All data were entered into a password-protected computer. On completion of the study, the data on the computer was copied to CDs, and the data on the computer was erased. CDs and any hardcopy data are stored in a locked office of the investigators and will be maintained for a minimum of 3 years after study completion, after which they will be destroyed. The subjects are not allowed to view their personal study data, as the data will be consolidated into a database, but they can write to the investigators to request access to the study findings.

Results

Demography and clinical profile

A total of 1588 cataract surgeries were performed in HKL in 2021. Of these, only 1148 cases were included for descriptive analysis and 872 cases for logistic regression analysis, as there were missing outcome data (Fig. 1).

The mean age was 65.6 years (range 23 to 94 years of age), with the majority (75.6%) within 60 to 79 years old, as shown in Figure 2. No gender predilection was seen, with 49.7% males and 50.3% females. The Malay community led the group (40.1%), followed by Chinese (23.2%) and Indian (19.1%).

A total of 36.0% of patients with ocular comorbidity and 88.4% of patients with systemic comorbidity. The most common ocular comorbidity was diabetic retinopathy (11.2%), followed by other unspecified ocular pathologies (8.4%), such as thyroid eye disease, other optic nerve disease, presence of orbital mass, and glaucoma (8.1%). Hypertension (67.1%) was the most common systemic comorbidity, followed by diabetes mellitus (51.2%), and dyslipidaemia (16.4%)

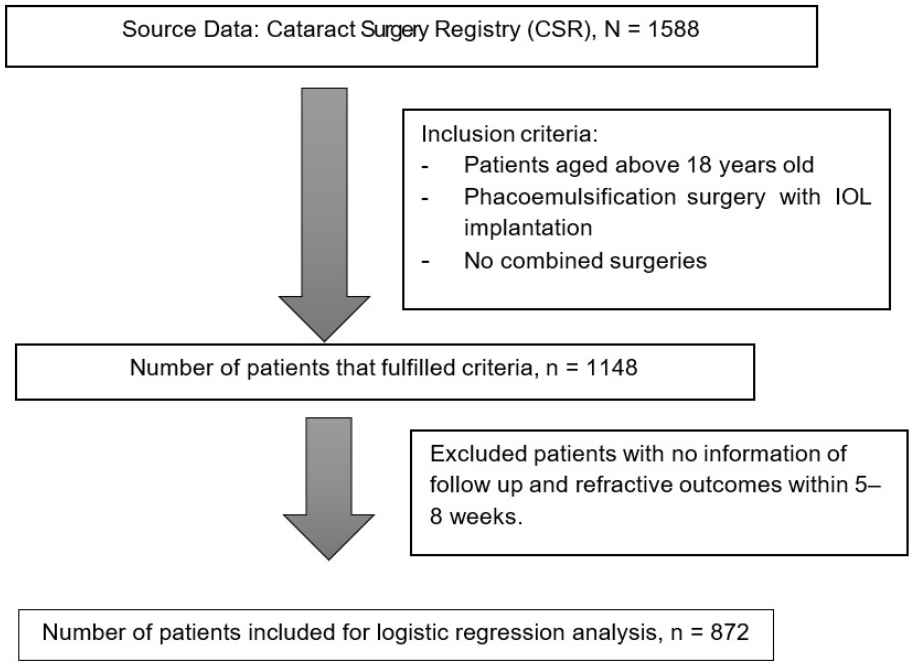

Fig. 1. Final sample size after inclusion and exclusion criteria.

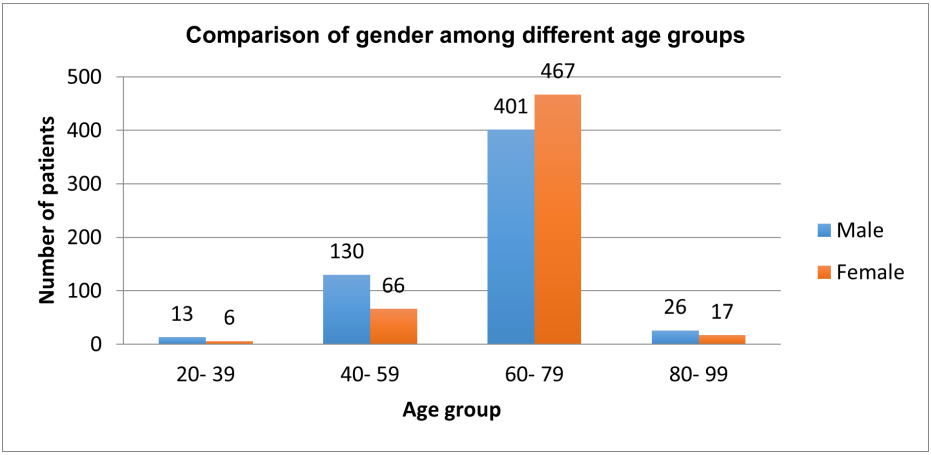

Fig. 2. Age groups of patients who underwent phacoemulsification surgery in Hospital Kuala Lumpur in 2021, *n* = 1148.

Table 1. Demographic data and clinical profile of patients who underwent phacoemulsification surgery and intraocular lens implantation in Hospital Kuala Lumpur 2021, *n* = 1,148

Demographic data and clinical profile	***n* (%)**
Age (years)	
Mean (SD), range	65.6 (9.2), 23–94
Gender	
Male	570 (49.7)
Female	578 (50.3)
Ethnicity*	
Malay	460 (40.1)
Chinese	266 (23.2)
Indian	219 (19.1)
Others	19 (1.7)
Ocular comorbidity	
Diabetic retinopathy	129 (11.2)
Other ocular pathology (unspecified)	96 (8.4)
Glaucoma	93 (8.1)
Previous ocular surgery	70 (6.1)
Age-related macular degeneration (ARMD)	16 (1.4)
Retinal detachment	9 (0.8)
Uveitis	4 (0.3)
Previous ocular trauma	3 (0.3)
Lens-related comorbidity	2 (0.2)
Systemic comorbidity	
Hypertension	770 (67.1)
Diabetes mellitus	588 (51.2)
Dyslipidaemia	188 (16.4)
Other systemic illness	164 (14.3)
Ischaemic heart disease	132 (11.5)
Renal failure	55 (4.8)
Chronic obstructive airway disease (COAD)	48 (4.2)
Cerebrovascular accident	35 (3.0)

SD: standard deviation.
*Ethnicity was missing for 184 patients 16%.

(Table 1).

The operative characteristics of the study population are shown in Table 2. No postoperative complications were documented up to 8 weeks of follow-up. Cataract surgery was performed by specialists on 1073 patients, 19 (1.8%) of whom had intraoperative complications, whereas medical officers performed surgery on 75 patients, 7 (9.3%) of whom had intraoperative complications. The details of each complication are shown in Table 3.

Table 2. Operative characteristics of the study population, *n* = 1,148

Operative characteristics	**n (%)**
Surgery on*	
First eye	687 (59.8)
Second eye	460 (40.1)
Eye laterality	
Right	559 (48.7)
Left	589 (51.3)
Biometry technique	
Ultrasound	961 (83.7)
Optical	187 (16.3)
Surgeon status	
Specialist	1073 (93.5)
Medical officer	75 (6.5)
Type of admission	
Day care	943 (82.1)
Non-day care	205 (17.9)
Type of anaesthesia*	
General	32 (2.8)
Local	1,104 (96.2)
Wound placement	
Superior	1,027 (89.5)
Temporal	121 (10.5)
Type of lens	
Monofocal	1,140 (99.3)
Monofocal toric	7 (0.6)
Multifocal	1 (0.1)
Duration of surgery (minutes)	

Operative characteristics	n (%)
Mean (SD)	28.3 (12.6)
Intraoperative complications	
Posterior capsular rupture	14 (1.2)
Posterior capsular rupture with vitreous loss	5 (0.4)
Zonular dehiscence	4 (0.3)
Others	3 (0.3)
Refractive outcome difference	
Within 0.5 D	673 (58.6)
Within 1 D	1,002 (87.3)
Not within 1 D	146 (12.7)

*There were missing values for 1 patient (0.1%) on surgery on first or second eye and for 12 patients (1%) on type of anaesthesia.

Table 3. Distribution of intraoperative complications among specialists and medical officers

Intraoperative complication	Specialists n (%)	Medical officers n (%)
Posterior capsular rupture	10 (0.9)	4 (5.3)
Posterior capsular rupture with vitreous loss	4 (0.4)	1 (1.3)
Zonular dehiscence	3 (0.3)	1 (1.3)
Others	2 (0.2)	1 (1.3)

Refractive outcomes

Postoperatively, 673 (58.6%) patients achieved refractive outcomes within 0.5 D, while 1002 (87.3%) patients were within 1 D of predicted value, as shown in Table 2. The distribution of demographic data, clinical profiles, and operative characteristics was done for SE difference between within 1 D and not within 1 D (Table 4). The number of patients was higher in group within 1 D SE difference in all categories except for intraoperative complications and duration of surgery.

Table 4. Distribution of demographic data, clinical profiles, and operative characteristics between postoperative refractive outcomes within 1.0 D and not within 1.0 D

Variables	SE difference	
	Within 1D (*n* = 1,002) n (%)	**Not within 1D (*n* = 146) n (%)**
Age (year)		
Mean (SD)	65.4 (9.3)	66.9 (8.7)
Gender		
Male	510 (89.5)	60 (10.5)
Female	492 (85.1)	86 (14.9)
Ethnicity		
Malay	408 (88.7)	52 (11.3)
Chinese	228 (85.7)	38 (14.3)
Indian	187 (85.4)	32 (14.6)
Other	16 (84.2)	3 (15.8)
Ocular comorbidity		
Diabetic retinopathy	113 (87.6)	16 (12.4)
Other	82 (85.4)	14 (14.6)
Glaucoma	77 (82.8)	16 (17.2)
Previous ocular surgery	60 (85.7)	10 (14.3)
Age-related macular degeneration	9 (56.3)	7 (43.8)
Retinal detachment	7 (77.8)	2 (22.2)
Uveitis	3 (75.0)	1 (25.0)
Previous ocular trauma	3 (100.0)	0
Lens-related	2 (100.0)	0
Biometry technique		
Ultrasound	835 (86.9)	126 (13.1)
Optical	167 (89.3)	20 (10.7)
Surgeon status		
Specialist	940 (87.6)	133 (12.4)
Medical officer	62 (82.7)	13 (17.3)

Variables	SE difference	
	Within 1D (*n* = 1,002) n (%)	**Not within 1D (*n* = 146) n (%)**
Intraoperative complications		
Posterior capsular rupture	7 (50.0)	7 (50.0)
Posterior capsular rupture with vitreous loss	2 (40.0)	3 (60.0)
Zonular dehiscence	2 (50.0)	2 (50.0)
Others	1 (33.3)	2 (66.7)
Duration of surgery (minutes)		
Mean (SD)	28.0 (12.3)	30.4 (14.7)
Postoperative follow-up (weeks)		
Mean (SD)	6.5 (2.2)	6.4 (1.9)

Factors associated with poor refractive outcome

Using simple logistic regression, a few factors were identified to be associated with poor cataract outcome (Table 5). There was a significant difference in outcome for female gender (p = 0.042), presence of age-related macular degeneration (ARMD) (p = 0.002), ultrasound biometry technique (p = 0.021), and intraoperative complication of posterior capsular rupture (p = 0.004). Multiple logistic regression confirmed that female gender, presence of ARMD, ultrasound biometry technique, and posterior capsular rupture were factors that increased the likelihood of poor postoperative refractive outcome by 1.73, 6.47, 2.00, and 6.42, respectively. Hosmer and Lemeshow indicated that the model fits well. The classification table showed that 86.7% of outcomes were correctly classified.

Table 5. Factors associated with refractive outcomes within 5–8 weeks follow-up

Factors	SLR			MLR		
	Crude OR	**95%**	***P***	**Adj OR**	**95%**	***p***
Age (year)	1.02	(0.99,1.04)	0.110			
Gender						
Male	1					
Female	1.51	(1.02,2.24)	**0.042**	1.73	(1.11,2.68)	**0.015**
Ocular comorbidity						
Previous ocular surgery	1.33	(0.66,2.71)	0.428			

Factors	SLR			MLR		
	Crude OR	95%	*P*	Adj OR	95%	*p*
Glaucoma	1.75	(0.94,3.26)	0.078			
Diabetic retinopathy	1.08	(0.57,2.06)	0.816			
ARMD	5.84	(1.93,17.69)	**0.002**	6.47	(1.98,21.21)	**0.002**
Other	1.21	(0.63,2.31)	0.571			
Biometry technique						
Ultrasound	2.15	(1.13,4.11)	**0.021**	2.00	(1.02,3.95)	**0.045**
Optical	1					
Surgeon status						
Specialist	1					
Medical officer	0.98	(0.46,2.12)	0.964			
Duration of surgery (minute)	1.01	(1.00, 1.03)	0.138			
Intraoperative complications						
Posterior capsular rupture	8.96	(1.98,40.58)	**0.004**	6.42	(1.39,29.81)	**0.018**

SLR: Simple logistic regression; MLR: Multiple logistic regression; OR: Odds ratio; Adj OR: Adjusted odds ratio; ARMD: Age-related macular degeneration

Discussion

Demography and clinical profile

The mean age of the patients was 65.6 years, which was similar to the mean age (64.5 years) reported by the Malaysian CSR in 2015.[11] The demographic spread of the patients corresponded to the ethnic distribution of the Malaysian population. The proportion of patients that underwent second eye surgery (40.6%) was higher in this study compared to the Malaysian CSR (33%).[10] This can be explained by the availability of financial aid in recent years, such as the Peduli Kesihatan (PEKA) B40 scheme and welfare lenses that aim to provide free lenses for patients with financial constraints. Patients' perceptions of cataract surgeries have also evolved over the years, and they are more open-minded about second eye surgeries.

The most common ocular comorbidity was diabetic retinopathy (11.2%), followed by other unspecified ocular pathologies (8.4%), and glaucoma (8.1%). According to the National Diabetes Registry Report 2020 in Malaysia, there were 902,991 active diabetes patients in Malaysia by the end of 2020, 10,187 (11.5%) of which had retinopathy.[12] The Beaver Dam Eye Study reported that diabetes is associated with earlier cataract formation and increased frequency of cataract surgery.[13]

The prevalence of glaucoma (8.1%) in this study was higher than that reported in the Malaysian CSR (6.5%). This could be attributed by active glaucoma screening in our Malaysian population. Increased awareness among the public and general practitioners has led to earlier glaucoma detection. A study done by Hayashi *et al.* also showed that cataract surgery is beneficial in reducing intraocular pressure and the number of medications used in glaucomatous eyes, with the effects more prominent in angle-closure glaucoma.[14] As HKL is a tertiary centre that includes all ophthalmology subspecialties that received referrals from many centres, it comes as no surprise that other ocular pathologies (8.4%), such as thyroid eye disease, other optic nerve disease, and presence of orbital mass, were also common.

According to the National Institute for Health and Care Excellence (NICE) guidelines on the management of cataracts in adults, it is recommended to use optical biometry to measure axial length in patients undergoing cataract surgery and to use ultrasound biometry if optical biometry is not possible or when optical biometry does not provide accurate measurements, such as in cases of dense cataracts.[15] In HKL, the most common biometry technique is ultrasound, followed by optical biometry. This shows that our centre has a huge number of patients still blinded by cataract, and the disruptions from the COVID-19 pandemic have further increased the number of backlogged cataract surgeries.

According to our analysis, most of the complications occurred in surgeries performed by medical officers (9.3%) while specialists only had a complication rate of 1.8%. Therefore, medical officers should be strictly guided, and surgeries should be taken over by specialists if complications are anticipated. Even though in this study surgeon experience did not statistically affect the postoperative refractive outcome, care should still be taken to reduce the complication rate. There should be a balance between teaching medical officers and providing optimal service to patients.

Refractive outcome

The results showed that phacoemulsification procedures performed in HKL achieved the benchmark standards, whereby 87.1% of the patients achieved post-phacoemulsification SE refraction within 1 D of predicted value and 58.5% within 0.5 D of predicted value. As mentioned above, benchmark standards set by the Royal College of Ophthalmologist dictate that 85% of eyes should be within 1 D of target refractive outcome and 55% of patients should be within 0.5 D of target refractive outcome.[4]

Factors associated with poor refractive outcome

Multiple logistic regression showed that 4 variables were significantly associated with poor postoperative refractive outcome. Female gender ($p = 0.015$), presence of ARMD ($p = 0.002$), ultrasound biometry technique ($p = 0.045$), and intraoperative posterior capsule rupture ($p = 0.018$) were associated with poor cataract outcome.

The odds of getting poor outcome for each factor were 1.73, 6.47, 2.00, and 6.42 times more, respectively.

A systematic review and meta-analysis by Ye *et al.* summarised that females still experienced a significant barrier to accessing cataract surgery. The gender inequity can be explained by the work roles, education, and decision-making power between genders. Females generally have higher rates of illiteracy and fewer financial resources to pay for eye care and transportation to hospitals compared to males. As a result, females present later to the hospital at an older age group, when their cataracts are denser, making cataract surgeries more challenging, leading to more complications, and affecting postoperative outcomes.[16] This is reflected in HKL, where there were more females (467) than males (401) in the 60–79 age group, while there were more males than females in all age groups younger than 60 years old, as shown in Figure 2. Cataract outreach programmes should target females to increase awareness and cataract surgeries should be made more accessible for females.

Even though the most common ocular comorbidities were diabetic retinopathy, glaucoma, and other unspecified ocular pathologies, they did not significantly affect the postoperative refractive outcome, but ARMD did. This can be due to the fact that data was collected for the presence of each ocular comorbidity, but not their severity. ARMD is the leading cause of visual impairment in Western countries, and its incidence is increasing globally.[17] Patients require increasing magnification for their glasses and also benefit from low vision aids. Even though ARMD is associated with a poorer outcome postoperatively, it should not deter a patient from cataract surgery. Multiple studies have concluded that patients with ARMD still benefit from cataract surgery in terms of visual function and quality of life.[18-20] However, care should be taken intraoperatively as patients who received intravitreal therapy have a slightly higher risk of posterior capsule rupture and postoperative endophthalmitis.[21]

Multiple logistic regression showed that ultrasound biometry (p = 0.045) was significantly associated with poor cataract outcome, increasing the likelihood of poor refractive outcome by 2.00 compared to optical biometry. Therefore, more efforts should be directed at performing biometry using optical technique, as recommended by NICE guideline.

The posterior capsule rupture rate in this study was 0.01%, which is low compared to the UK Cataract National Database (1.9%).[22] After adjustment for the possible confounding factors, posterior capsule rupture remains a significant risk factor for poor outcome. The most frequent complications of posterior capsule rupture are retinal detachment, cystoid macula oedema, endophthalmitis, increased intraocular pressure, and persistent corneal oedema, all of which contribute to poor postoperative outcomes.[23] The need for a second surgery delays rehabilitation and incurs in greater costs to the patient and healthcare system. The Auckland Cataract Study IV suggested performing risk stratification

on all patients undergoing cataract surgery, as this allows identification of "high risk cases", therefore allowing appropriate surgeon allocation and reducing intraoperative complications.[24]

Preoperative counselling is important, as patients must be aware of the possible intraoperative complications and the presence of any ocular comorbidities. They must be informed regarding guarded visual prognosis or potential further interventions.[25]

Limitations

In this study, 276 patients (24%) were excluded from logistic regression analysis due to missing data. More emphasis should be placed on the quality and completeness of documentation. Improved data accuracy can reduce the number of records that are documented as "unknown" or "others". This is a retrospective study, and as such was dependent on the documentation of details in the CSR. Therefore, records were limited, and we were unable to obtain other variables that could affect refractive outcome, such as the severity of ocular comorbidities, axial length, and K-reading. Lastly, we were unable to standardise the optometrist conducting A-scan, which is operator dependent, and postoperative refraction.

A prospective study is recommended to include the analysis for correlation between severity of ocular comorbidities, axial length, and K-reading with postoperative outcome, to standardise surgeons and optometrists, and to use a fixed formula for intraocular lens power calculation.

Conclusion

This study showed that refractive outcome in HKL is comparable to international standards. Female gender, presence of ARMD, ultrasound biometry technique, and intraoperative posterior capsule rupture increased poor cataract outcome by 1.73, 6.47, 2.00, and 6.42 times, respectively. Risk stratification for all patients allows surgeons to anticipate possible intraoperative complications, so meticulous care can be taken to avoid such events. Preoperative counselling is also important to ensure patients are well informed and prepared.

Declarations

Ethics approval and informed consent

Prior to data collection, ethical approval was obtained from the Medical Research and Ethics Committee, Ministry of Health, Malaysia (NMRR ID-22-00864-CLC) on June 20, 2022. Approval was also obtained from the Malaysian CSR for data collection. This study was conducted in compliance with the ethical principles

outlined in the Declaration of Helsinki and the Malaysian Good Clinical Practice Guideline.

Competing interests
The authors declare no conflict of interest.

Funding
The authors received no financial support for the research, authorship, and/or publication of this article.

Acknowledgements
The authors would like to thank the optometrists and medical officers at HKL for their contribution in updating the National Cataract Registry with full dedication. I would also like to thank the Clinical Research Centre in HKL for their continual support.

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