ORIGINAL ARTICLE

Visual outcomes after Phacoemulsification with Intraocular Implantation surgeries among patients with and without Diabetes Mellitus

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ABSTRACT

Introduction: The aim of this study was to compare the visual outcomes of phacoemulsification with intraocular lens implantation (IOL) surgery in patients with and without diabetes mellitus (DM) in Malaysia over a 12-year period and to identify factors that may contribute to poor visual outcome.

Materials and Methods: Data was retrieved from the web-based Malaysian Cataract Surgery Registry (CSR). Peri-operative data for cataract surgery performed from 2007-2018 were analysed. Inclusion criteria were age ≥40 years, phacoemulsification and IOL and senile cataract. Combined surgeries, surgeries performed by trainees and ocular co-morbidities were excluded. Post-operative Best-Corrected Visual Acuity (BCVA) were compared. Factors affecting poor visual outcomes among those with DM were analysed using multivariate logistic regression to produce adjusted odds ratio (OR) for variables of interest.

Results: Total number of cases between 2007-2018 was 442,858, of whom 179,210 qualified for our analysis. DM group consisted of 72,087 cases (40.2%). There were 94.5% cases in DM group and 95.0% from non-DM group who achieved BCVA ≥6/12 (p<0.001). Among patients with DM, advanced age (70-79 years old, OR: 2.54, 95% Confidence Interva, 95%CI: 1.91, 3.40; 80-89 years old, OR: 5.50, 95%CI: 4.02, 7.51), ≥90 years, OR: 9.77, 95%CI: 4.18, 22.81), poor preoperative presenting visual acuity [<6/18–6/60] (OR: 2.40, 95%CI: 1.84, 3.14) and <6/60-3/60 (OR: 3.00, 95%CI: 2.24, 4.02), <3/60 (OR 3.63, 95%CI: 2.77, 4.74)], presence of intraoperative complication (OR 2.24, 95%CI: 1.86, 2.71) and presence of postoperative complication (OR 5.21, 95%CI: 2.97, 9.16) were significant factors for poor visual outcome.

Conclusions: Visual outcomes following phacoemulsification with IOL implantation surgery among cases with DM were poorer compared to cases without DM. Risk factors for poor visual outcomes among cases with DM were identified.

KEYWORDS:
Phacoemulsification, diabetes mellitus, visual outcome

INTRODUCTION

Diabetes mellitus (DM) is a non-communicable disease and its prevalence is on the rise in developing countries, including Malaysia. Malaysian National Health and Morbidity Survey (NHMS) in 2015 reported that there was an increase in the prevalence of diabetes in Malaysia from 15.2% in 2011 to 17.5% in 2015.[1] It is believed that population growth, age, urbanisation, sedentary lifestyle and obesity are among the contributing factors for an increasing number of patients with DM and the burden of disease.[2]

Klein et al., reported that cataracts occur at an earlier age and are 2-5 times more frequent in patients with DM.[3] Several theories such as the accumulation of sorbitol intracellularly, glycation of lens protein and impaired antioxidative mechanism of the lens proteins were proposed.[4,5] The Malaysian National Diabetes Registry (NDR) 2009-2012 reported the mean age of type-2 DM patients was 59.7 years, where the largest proportion was diagnosed at the age of 45 to 54 years, a major working population group.[6] Thus, visual loss occurring secondary due to DM may become an economic burden for the country.[7]

In general, the advancement of technology and techniques of cataract surgery, especially phacoemulsification had improved the visual outcomes of cataract surgery. However, in patients with DM, the outcomes may not be as predicted. Gupta reported in his study that there were non-significant results comparing mean post-surgical visual acuity in between the diabetic group and the control group. However, the diabetic group had a higher incidence of intraoperative and postoperative complications.[8]

This study aimed to compare the visual outcomes of phacoemulsification with IOL implantation surgery in patients with and without DM who presented for cataract

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surgery at the Ministry of Health (MOH) facilities over the past 12 year period. The factors that may contribute to the poor visual outcome among patients with DM were also studied. The results of this study would potentially contribute to the prediction of factors affecting visual outcomes in DM group. Data from this will be useful for healthcare planners to improve on outcomes for this group of patients.

MATERIALS AND METHODS

The study was conducted in accordance with the tenets of the Declaration of Helsinki. This was a retrospective registry analysis of data extracted from the Malaysian Cataract Surgery Registry (CSR) from 1st January 2007 to 31st December 2018 for patients who had undergone phacoemulsification with IOL implantation surgeries in all the MOH facilities. CSR is part of National Eye Database, a web-based password-protected surveillance system collecting data on eye diseases and clinical performance of the ophthalmology services in Malaysia. It consisted of systematic data entry according to predefined sets of preoperative, operative and outcome forms by designated paramedical staff. Details on the Malaysian CSR have been published elsewhere.[9,10]

Inclusion criteria were all patients aged 40 years old and above who have undergone phacoemulsification with IOL implantation surgery by qualified ophthalmologists. Patients were excluded if they had secondary cataract (non-senile), history of trauma, combined surgeries, previous non cataract surgeries, pre-existing ocular co-morbidities or had phacoemulsification surgery without IOL implantation. The two cohorts of cases were compared, based on the presence of DM at the time of surgery.

The demographic variables recorded included gender, age and ethnicity. Other variables included first or second eye surgery, any previous complication in the fellow eye, systemic illness such as hypertension, ischaemic heart disease, chronic renal disease, cerebrovascular accident, chronic lung disease or bronchial asthma, other associated systemic illness, presenting visual acuity (PVA), type of admission, type of anaesthesia given, laterality of the presenting eye, duration of surgery and presence of any intraoperative or postoperative complications.

Visual Impairment (VI) was classified according to the International Classification of Diseases 11 (2018); Mild – presenting visual acuity worse than 6/12, Moderate – presenting visual acuity worse than 6/18, Severe – presenting visual acuity worse than 6/60, Blindness – presenting visual acuity worse than 3/60.

Statistical analysis was performed using Statistical Package for Social Science, version 26.0 (SPSS, Inc., Chicago, III, USA) for Windows. Association of risk factors with visual outcomes were evaluated by logistic regression model. Adjusted Odds Ratio (OR) and its 95% CI were used to estimate a risk score for combinations of risk factors. A two-tailed p-value of <0.05 was considered as statistically significant.

RESULTS

The total number of cataract surgeries from 2007-2018 in the Malaysian MOH facilities was 442,858. After exclusion, the total number available for analysis was 179,210 cases. Among these, DM group consisted of 72,087 cases (40.2%), while non-DM group consisted of 107,123 cases (59.8%). (Figure 1)

The patients in the DM group were significantly younger and were more of females (percentage was also higher as compared to the non-DM group). (Figure 2) There were more cases in the DM group presenting with other systemic co-morbidities specifically hypertension, ischaemic heart disease, renal failure and cerebrovascular accident. (Figure 2) In both group, higher percentage of cases presented for the first eye surgery. Preoperatively, in terms of PVA, higher percentage of surgeries in the DM group were done at the level of severe visual impairment and blindness. There were significantly more cases done day-care in both groups although the percentage was lower in the DM group. There were higher percentage occurrence of posterior capsular rupture (PCR) and zonular dehiscence intraoperatively in the DM group. However, the difference in the percentage occurrence of infective endophthalmitis postoperatively was not significant. (Table I)

Postoperatively, in terms of BCVA, there was a significant difference in the percentage of eyes achieving BCVA≥6/12 between cases in DM group (81.0%) and cases in non-DM group (81.9%). In both groups, the percentage of postoperative PVA increased almost double folds upon correction (BCVA). (Table I)

DM was identified as one of the risk factors for BCVA<6/12 (poor VA). In the regression model, the percentage of cases achieving BCVA≥6/12 in patients with DM was significantly less than the percentage of patients with no DM (94.5% vs. 95.0%) likewise the percentage of cases achieving BCVA<6/12 in patients with DM was significantly higher than the percentage of patients with no DM (5.5% vs. 5.0%). (Table II) The percentages of BCVA≥6/12 in Table I and II were different; in Table I the denominators were the total number of each DM and non-DM group while the denominators in Table II were less due to missing data in the regression model.

Among patients with DM, advancing age, female gender, renal failure, cerebrovascular accident, first eye surgery, left eye, poor preoperative PVA (moderate visual impairment to blindness), duration of surgery, presence of intraoperative complication and presence of postoperative complication were the factors found contributing to the poor visual outcome. (Table III)

DISCUSSION

This study had a large sample size of information obtained from cataract surgery registry. Due to the online design and data collection processes, it was representative of the surgeries performed in all the MOH facilities throughout Malaysia.

Table I: The Profile of Cataract Surgery Population and The Association between Groups in Visual Outcomes (Malaysian Ministry of Health Facilities 2007 to 2018)

	DM group (n=72,087)		Non-DM group (n=107,123)		p-value[a]
	n	(%)	n	(%)	
Age (years):					
Mean (SD)	65.62 (8.21)	67.16 (8.83)	<0.001b		
Range	40, 100	40, 103			
Gender:					
Male	32,185	(44.6)	51,776	(48.3)	<0.001
Female	39,902	(55.4)	55,347	(51.7)	
Other systemic co-morbidity*:					
Hypertension	58,529	(81.2)	53,925	(50.3)	<0.001
Ischaemic Heart Disease	8,366	(11.6)	6,997	(6.5)	<0.001
Renal failure	2,231	(3.1)	1,168	(1.1)	<0.001
Cerebrovascular accident	1,126	(1.6)	1,104	(1.0)	<0.001
COAD/Bronchial asthma	2,270	(3.1)	5,093	(4.8)	<0.001
Other systemic illnesses	13,403	(18.6)	19,645	(18.3)	0.174
Surgery on:					
First eye	44,718	(62.0)	67,203	(62.7)	0.003
Second eye	27,320	(37.9)	39,842	(37.2)	
Laterality:					
Right eye	36,751	(51.0)	54,887	(51.2)	0.288
Left eye	35,336	(49.0)	52,236	(48.8)	
Pre-operative presenting visual acuity:					
VA ≥ 6/12 (Good vision)	4,273	(5.9)	6,451	(6.0)	<0.001
VA <6/12 – 6/18 (Mild VI)	6,948	(9.6)	10,431	(9.7)	
VA <6/18 – 6/60 (Moderate VI)	29,555	(41.0)	45,610	(42.6)	
VA < 6/60 – 3/60 (Severe VI)	5,977	(8.3)	8,078	(7.5)	
VA < 3/60 (Blindness)	24,178	(33.5)	34,562	(32.3)	
Type of admission:					
Day care	48,380	(67.1)	75,487	(70.5)	<0.001
Non-day care	22,753	(31.6)	30,163	(28.2)	
Intra-operative complications*:					
Posterior capsular rupture	1,053	(1.5)	1,392	(1.3)	0.004
Vitreous loss	450	(0.6)	593	(0.6)	0.054
Zonular dehiscence	334	(0.5)	392	(0.4)	0.001
Dropped nucleus	36	(0.0)	38	(0.0)	0.140
Suprachoroidal haemorrhage	1	(0.0)	3	(0.0)	0.535
Central corneal oedema	39	(0.1)	40	(0.0)	0.098
Others	468	(0.6)	631	(0.6)	0.110
Post-operative complications*:					
Infective endophthalmitis	21	(0.0)	49	(0.0)	0.084
Post-operative presenting visual acuity (PVA):**					
VA ≥ 6/12 (Good vision)	41,482	(57.5)	59,480	(55.5)	<0.001
VA <6/12 – 6/18 (Mild VI)	12,181	(16.9)	18,773	(17.5)	
VA <6/18 – 6/60 (Moderate VI)	10,879	(15.1)	18,103	(16.9)	
VA <6/60 (Severe VI)	391	(0.5)	611	(0.6)	
VA <3/60 (Blindness)	472	(0.7)	710	(0.7)	
Post-operative best corrected visual acuity (BCVA):**					
VA ≥ 6/12 (Good vision)	58357	(81.0)	87,769	(81.9)	<0.001
VA <6/12 – 6/18 (Mild VI)	1,621	(2.2)	2,142	(2.0)	
VA <6/18 – 6/60 (Moderate VI)	1,472	(2.0)	1,955	(1.8)	
VA <6/60 (Severe VI)	130	(0.2)	157	(0.1)	
VA <3/60 (Blindness)	195	(0.3)	319	(0.3)	

DM=Diabetes Mellitus; SD=Standard deviation; COAD=Chronic obstructive airway disease; VI=Visual impairment; IQR=Interquartile range, reported as 25th percentile–75th percentile.
Range was reported as minimum, maximum.
a Chi-square test.
b Independent t-test.
c Mann-Whitney U test.
* 1 patient can have more than 1 type of systemic co-morbidity, intra-operative complications and post-operative complications.
Result was reported based on available information; column percentage (%) was reported based on total number of each non-DM and DM group. The remaining unreported percentage is the missing value, adding up to 100%. All missing value is <10%, except for Sedation used (39.6% missing).
** A missing value of 9.0% PVA, and 14.0% on BCVA.

Table II: The Association between Diabetes Mellitus and other Risk Factors with Visual Outcomes (Malaysian Ministry of Health Facilities, 2007 to 2018)

	BCVA*					
	Good VA≥6/12 (n=146,126)		Poor VA<6/12 (n=7,991)		Adj. OR (95% CI)	p-value
	n	(%)	n	(%)		
Diabetes Mellitus:						
Yes	**58,357**	**(94.5)**	**3,418**	**(5.5)**	**1.25 (1.19, 1.33)**	**<0.001**
No	87,769	(95.0)	4,573	(5.0)	1.00	
Age group:						<0.001
40–49 years	4,860	(96.6)	170	(3.4)	1.00	
50–59 years	24,603	(96.7)	844	(3.3)	1.04 (0.86, 1.27)	0.667
60–69 years	62,357	(96.1)	2,497	(3.9)	1.39 (1.16, 1.67)	<0.001
70–79 years	47,312	(93.4)	3,364	(6.6)	2.66 (2.21, 3.19)	<0.001
80–89 years	6,822	(86.7)	1,042	(13.3)	5.84 (4.81, 7.08)	<0.001
≥90 years	172	(69.9)	74	(30.1)	13.82 (9.57, 19.98)	<0.001
Gender:						
Male	68,146	(95.3)	3,370	(4.7)	1.00	<0.001
Female	77,980	(94.4)	4,621	(5.6)	1.19 (1.13, 1.25)	
Hypertension:						
Yes	92,004	(94.7)	5,107	(5.3)	0.90 (0.85, 0.95)	<0.001
No	54,122	(94.9)	2,884	(5.1)	1.00	
Ischaemic Heart Disease:						
Yes	12,627	(94.7)	707	(5.3)	0.92 (0.84, 1.01)	0.077
No	133,499	(94.8)	7,284	(5.2)	1.00	
Renal failure:						
Yes	2,566	(91.4)	240	(8.6)	1.70 (1.46, 1.98)	<0.001
No	143,560	(94.9)	7,751	(5.1)	1.00	
Cerebrovascular accident:						
Yes	1743	(92.5)	142	(7.5)	1.31 (1.07, 1.60)	0.008
No	144,383	(94.8)	7,849	(5.2)	1.00	
COAD/Bronchial asthma:						
Yes	6,089	(95.9)	262	(4.1)	0.80 (0.69, 0.92)	0.002
No	140,037	(94.8)	7,729	(5.2)	1.00	
Surgery on:						
First eye	91,262	(94.4)	5,433	(5.6)	1.35 (1.27, 1.43)	<0.001
Second eye	54,767	(95.5)	2,554	(4.5)	1.00	
Previous intra-operative complication:						
Yes	1,344	(94.6)	76	(5.4)	1.16 (0.89, 1.50)	0.270
No	134,746	(94.8)	7,356	(5.2)	1.00	
Laterality:						
Right eye	74,850	(95.0)	3,948	(5.0)	1.00	<0.001
Left eye	71,276	(94.6)	4,043	(5.4)	1.12 (1.06, 1.18)	
Pre-operative PVA:						
VA≥6/12 (Good vision)	9,108	(98.1)	181	(1.9)	1.00	
VA<6/12–6/18 (Mild VI)	14,887	(97.3)	407	(2.7)	1.30 (1.06, 1.59)	0.012
VA<6/18–6/60 (Moderate VI)	62,104	(95.2)	3,149	(4.8)	2.41 (2.02, 2.88)	<0.001
VA<6/60 – 3/60 (Severe VI)	11,454	(94.4)	683	(5.6)	3.03 (2.50, 3.68)	<0.001
VA<3/60 (Blindness)	46,158	(93.1)	3,445	(6.9)	3.65 (3.06, 4.35)	<0.001
Type of admission:						
Day care	102,704	(95.1)	5,259	(4.9)	1.00	0.042
Non-day care	41,583	(94.1)	2,621	(5.9)	1.06 (1.00, 1.12)	
Anaesthetic type:						
General	4,693	(92.8)	364	(7.2)	1.22 (1.07, 1.40)	0.003
Local	140,878	(94.9)	7,591	(5.1)	1.00	
Duration of operation, minutes:						
Mean (SD)	23.70	(9.83)	26.82	(11.15)	1.021 (1.017, 1.02)	<0.001
Intra-operative complications:						
Yes	2,964	(83.5)	585	(16.5)	2.09 (1.84, 2.38)	<0.001
No	143,130	(95.1)	7,401	(4.9)	1.00	
Post-operative complications:						
Yes	184	(77.6)	53	(22.4)	4.10 (2.83, 5.94)	<0.001
No	142,363	(94.8)	7,779	(5.2)	1.00	

Adj. OR = Adjusted odds ratio; CI = Confidence interval; PVA = Presenting Visual Acuity; BCVA = Best Corrected Visual Acuity.
The outcome coded as 1 is "VA <6/12". Frequency (n) and row percentage (%) are reported based on available information, adding up to 100%.
* 132617 data included in the multiple logistic regression analysis (46593 data missing [26%]).
** 125573 data included in the multiple logistic regression analysis (53637 data missing [30%]).

Table III: The Association between Risk Factors with Visual Outcomes among Patients with Diabetes Mellitus (Malaysian Ministry of Health Facilities, 2007 to 2018)

	BCVA*					
	Good VA≥6/12 (n=58357)		Poor VA<6/12 (n=3418)		Adj. OR (95% CI)	p-value
	n	(%)	n	(%)		
Age group:						<0.001
40–49 years	1761	(96.1)	71	(3.9)	1.00	
50–59 years	11,314	(95.7)	504	(4.3)	1.25 (0.93, 1.68)	0.143
60–69 years	26,768	(95.5)	1,267	(4.5)	1.50 (1.13, 2.00)	0.005
70–79 years	16,516	(92.9)	1,254	(7.1)	2.54 (1.91, 3.40)	<0.001
80–89 years	1,969	(86.5)	308	(13.5)	5.50 (4.02, 7.51)	<0.001
≥90 years	29	(67.4)	14	(32.6)	9.77 (4.18, 22.81)	<0.001
Gender:						
Male	25,965	(95.1)	1,351	(4.9)	1.00	<0.001
Female	32,392	(94.0)	2,067	(6.0)	1.22 (1.12, 1.32)	
Hypertension:						
Yes	47,435	(94.4)	2,801	(5.6)	0.95 (0.86, 1.06)	0.356
No	10,922	(94.7)	617	(5.3)	1.00	
Ischaemic Heart Disease:						
Yes	6,789	(94.7)	380	(5.3)	0.88 (0.78, 1.00)	0.059
No	51,568	(94.4)	3,038	(5.6)	1.00	
Renal failure:						
Yes	1,628	(90.2)	177	(9.8)	1.89 (1.58, 2.26)	<0.001
No	56,729	(94.6)	3,241	(5.4)	1.00	
Cerebrovascular accident:						
Yes	877	(91.7)	79	(8.3)	1.32 (1.01, 1.73)	0.042
No	57,480	(94.5)	3,339	(5.5)	1.00	
COAD/Bronchial asthma:						
Yes	1,855	(95.7)	83	(4.3)	0.84 (0.65, 1.07)	0.157
No	56,502	(94.4)	3,335	(5.6)	1.00	
Surgery on:						
First eye	36,257	(94.0)	2,309	(6.0)	1.35 (1.24, 1.48)	<0.001
Second eye	22,060	(95.2)	1,108	(4.8)	1.00	
Previous intra-operative complication:						
Yes	581	(95.4)	28	(4.6)	0.96 (0.63, 1.45)	0.841
No	53,648	(94.5)	3,140	(5.5)	1.00	
Laterality:						
Right eye	29,784	(94.7)	1,680	(5.3)	1.00	0.004
Left eye	28,573	(94.3)	1,738	(5.7)	1.13 (1.04, 1.22)	
Pre-operative PVA:						<0.001
VA ≥ 6/12 (Good vision)	3,574	(97.8)	80	(2.2)	1.00	
VA < 6/12–6/18 (Mild VI)	5,907	(97.1)	174	(2.9)	1.33 (0.98, 1.82)	0.070
VA < 6/18–6/60 (Moderate VI)	24,259	(94.9)	1,314	(5.1)	2.40 (1.84, 3.14)	<0.001
VA < 6/60 – 3/60 (Severe VI)	4,828	(94.1)	304	(5.9)	3.00 (2.24, 4.02)	<0.001
VA < 3/60 (Blindness)	18,917	(92.7)	1,498	(7.3)	3.63 (2.77, 4.74)	<0.001
Type of admission:						
Day care	39,871	(94.7)	2,234	(5.3)	1.00	0.869
Non-day care	17,784	(94.0)	1,139	(6.0)	1.01 (0.92, 1.10)	
Anaesthetic type:						
General	1,755	(92.6)	140	(7.4)	1.17 (0.94, 1.45)	0.151
Local	56,380	(94.5)	3,263	(5.5)	1.00	
Duration of operation, minutes:						
Mean (SD)	23.75	(9.79)	26.83	(11.34)	1.02 (1.02, 1.02)	<0.001
Intra-operative complications:						
Yes	1,261	(81.7)	282	(18.3)	2.24 (1.86, 2.71)	<0.001
No	57,088	(94.8)	3,135	(5.2)	1.00	
Post-operative complications:						
Yes	63	(70.0)	27	(30.0)	5.21 (2.97, 9.16)	<0.001
No	56,875	(94.5)	3,330	(5.5)	1.00	

Adj. OR = Adjusted odds ratio; CI = Confidence interval; PVA = Presenting Visual Acuity; BCVA = Best Corrected Visual Acuity.
The outcome coded as 1 is "VA <6/12". Frequency (n) and row percentage (%) are reported based on available information, adding up to 100%.
* 53172 data included in the multiple logistic regression analysis (18915 data missing [26%]).
** 50333 data included in the multiple logistic regression analysis (21754 data missing [30%]).

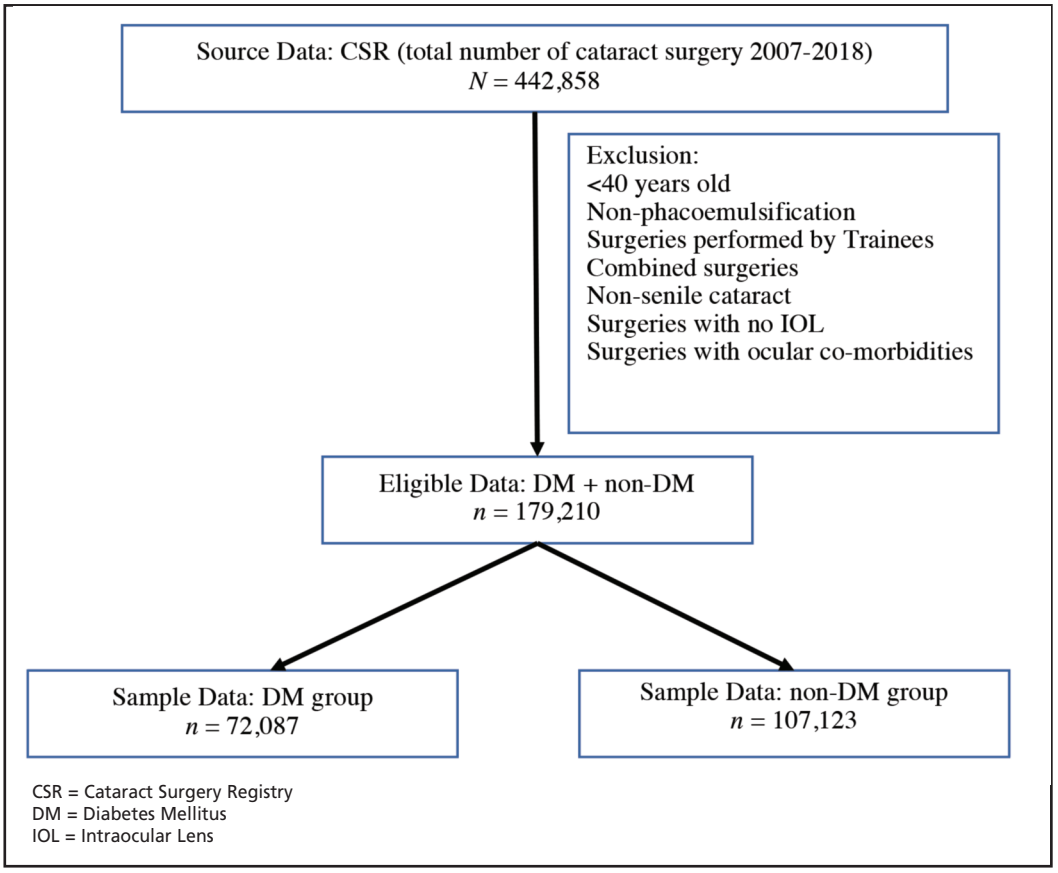

Fig. 1: Size of sample/cohort after exclusion.

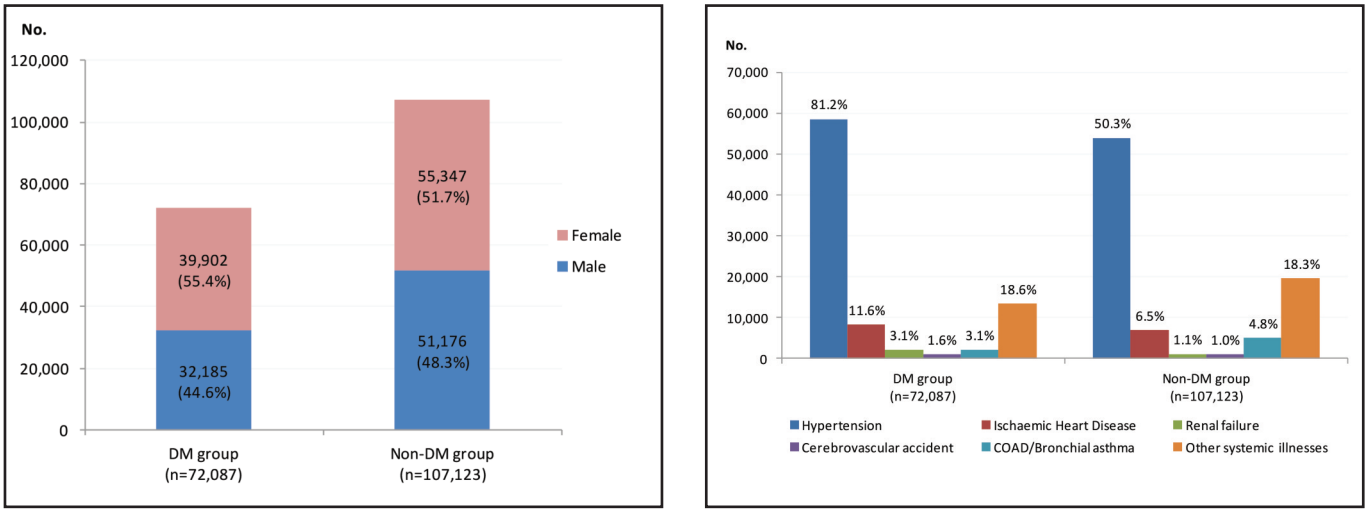

Fig. 2: Demographic profile and Concomitant Comorbidities of patients underwent phacoemulsification surgery, DM group and non-DM group patients (Malaysian Ministry of Health Facilities, 2007 to 2018).

As reported by Murkesh et al., patients with DM have relative risk of 1.1-2.9 of formation of various types of cataract, compared to patients without DM.[11] This was reflected in our data, where patients with DM who had undergone phacoemulsification surgery were younger. This finding also concurred with other studies.[3]

Hypertension, ischaemic heart disease, chronic renal disease and cerebrovascular accident were more frequently seen among our patients with DM. This could be contributed to the macrovascular and microvascular complications of DM. In our study, hypertension was present in 83.5% of patients with DM, higher as compared to what was reported by Squirrel et al, which was 58%.[12]

Majority of patients in DM group were females. In studies done in India, United Kingdom and a global study involving low-middle income countries, their findings showed similarity, i.e., more women had cataract than men.[13-15] It was assumed that the differences in albumin/total protein ratio and serum triglyceride level and postmenopausal oestrogen deficiency may be contributing factors for this finding.[16]

In both groups, one third of patients presented for the first eye surgery through all age groups. This was seen throughout the years in the registry since MOH commenced its data collection in 2002.[10] In general, this could be attributed to the lack of access to cataract surgical services within the population in particular those living in the remote areas. Nationwide strategies and efforts are underway to increase the cataract surgical rate and cataract surgical coverage by introducing cataract outreach programmes. This is being done by deploying screening and surgical teams to the targeted areas to capture patients with operable cataracts. A report in 2018 showed an increasing trend of patients presenting for second eye surgery.[10]

It was shown in this study that patients with DM had significantly worse presenting VA, with higher percentages of patients presenting in the category of severe visual impairment and blindness. Among the possible reasons for the late presentation among them were ignorance of symptoms, poor awareness regarding occurrence of eye complications, physical disabilities preventing them from seeking treatment or individual and cultural priorities where the other organ disabilities were given greater emphasis. Findings from the Malaysian National Diabetic Registry (NDR) also revealed that only 44.0% of patients with DM at the primary care level underwent scheduled funduscopic screening in the year 2012.[17] This low number may explain the failure of early reporting of symptom or early detection and referral of operable cataract, hence the late presentation. The percentage of cases which were done as day-care was lower in the DM group as compared to the non-DM group. This could be attributed to the admission to the ward for blood pressure and blood glucose optimisation preoperatively.

There were higher percentage occurrence of posterior capsular rupture (PCR) and zonular dehiscence intraoperatively in the DM group. Higher probability of eyes in patients with DM which had poor pupillary dilatation and more advanced or dense cataract resulting in more intraoperative manipulation and intraoperative complications such PCR and zonular dehiscence.[8,18] However, this could not be verified in this study due to the non-mandatory reporting of technical factors encountered intraoperatively (dense brown, white cataract, pseudoexfoliation and pupil problems).

The impaired immune status among the patients with DM may result in the increased risk of postoperative complications such as postoperative endophthalmitis.[19] In previous studies, about 14-21% of patients with endophthalmitis were diabetic.[20,21] However, the findings in this study did not show any difference in the percentage occurrence of infective endophthalmitis postoperatively between DM and non-DM group.

Analysis of data of postoperative visual outcomes revealed an increased percentage of eyes with VA≥6/12 (good vision) in both groups upon correction. For example, in the DM group, the postoperative PVA was 57.5%. Upon correction (BCVA), it increased to 81%. This could be due to the issues of biometric measurement. Similar to access for cataract surgery, it has been acknowledged that nationwide and efforts are underway to identify and rectify the issue. The results from this study also revealed that the percentages of BVCA≥6/12 among both groups were significantly different; eyes in DM group had lower percentage than eyes in the non-DM group (94.5% vs. 95.0%). This result differed with other studies, where their small-scale studies showed that non-diabetic group achieved better visual outcome, but the differences were insignificant.[22-24] Elsewhere in other studies it has been reported that causes of poor visual outcomes among diabetic group had been described as due to presence of macula oedema, posterior capsular opacity, cornea decompensation and higher incidence of postoperative endophthalmitis.[25-28] However, this study could not identify the causes (BCVA<6/12) due to the non-mandatory registry reporting for this specific data postoperatively. From the analysis of postoperative data with poor visual outcomes (BCVA<6/12 among eyes in DM group), it was shown that advancing age, female gender, presence of systemic illness such as chronic renal disease, cerebrovascular accidents, first eye surgery, poorer presenting visual acuity (<6/18–6/60 and <6/60), long duration of surgery, presence of intraoperative complications and postoperative endophthalmitis were the significant factors found to contribute to the poor visual outcome.

Older age, especially 70 years old and above has positive impact on poor visual outcomes among patients with DM. From a review article by TY Wong, it was shown that very elderly patients usually presented with multiple systemic illness and ocular comorbidities. They had higher risk of complications such as posterior capsule rupture, postoperative infection, raised intraocular pressure and cornea oedema. All these could be contributing factors for poor visual outcomes.[29]

Females were shown to have poorer visual outcomes among patients with DM, similar to other studies. Furthermore, they had higher incidence of posterior capsular opacities formation, probably due to their hormonal and biological differences.[30]

The presence of chronic renal disease and cerebrovascular accident were found to be contributing factors of poor visual outcomes. These findings correlated with Liu et al, showing that the presence of kidney disease had an adjusted OR of 1.04.[31] The presence of renal disease and cerebrovascular accidents could indicate the prolonged duration of DM and serve as a spectrum of vascular retinopathies in those patients. Patients with cerebrovascular accidents may have persistent visual field defect which persist after the cataract surgery and contributed to poor visual outcome.[32]

Patients undergoing cataract surgery for the first time might be more anxious compared to those who had cataract surgery done before. Hence, patients with first eye might be having high blood pressure, became uncooperative and had high vitreous pressure intraoperatively, leading to longer operating time and increased risk of complications.

Timing of when to perform cataract surgery in eyes of patients with DM has changed compared to what it was a decade ago. Recently, earlier cataract surgery among patients with DM had been advocated to allow better visualisation and timely management for proliferative diabetic retinopathy and macula oedema as both are the main cause of poor visual outcomes. In a study conducted by Wahab et al., they performed early cataract extraction on patients of older than 40 years with cataract grade I or II according to LOCS III (Lens opacification classification system III), to allow optimal visualisation of posterior segment. This allowed early detection of clinically significant macula oedema (CSME), monitoring and management of CSME.[33] However, to the best of our knowledge, there is no definite guideline available as yet for the indication and timing of cataract surgery among the patients with DM. In current practice, cataract surgery is recommended to patients if they are symptomatic or if the cataract obstructs the proper examination of fundus. In this study, eyes with poorer presenting visual acuity (possibly late presentation) was one of the risk factors for poor visual outcome after phacoemulsification surgery for eyes in the DM patients. We believe that scheduled screening in patients with DM is important to identify, therefore refer patients with operable cataract as it may potentially reduce the risk of poor visual outcomes. When these patients present to the hospital, earlier cataract surgery before fundus examination becomes difficult, preoperative optimisation and proper planning of cataract surgery to avoid intraoperative and postoperative complications should then be recommended to achieve better visual outcome post phacoemulsification surgery.

STUDY LIMITATIONS

This was a retrospective secondary data analysis study. Hence, there were some potential limitations. Firstly, some patients did not return for postoperative follow up, hence were excluded from the visual outcome analysis. It was possible that among these cases, which were not included in the study, may have been cases with poorer outcomes, which would have skewed out results to seem more favourable. Secondly, the study was limited by risk of reporting errors from the registry; however, this limitation was mitigated by inclusion of a very large patient sample size and regular monitoring of errors by NED officers appointed by the committee throughout the country. Thirdly, as this was a data analysis study, some data fields were not mandatory to allow for some degree of data collection compliance hence the missing data in some parts of the analysis. Nevertheless, the final sample data was sufficiently large to be analysed and used for the purpose of the study.

CONCLUSION

This study revealed poorer visual outcomes and higher percentage of intraoperative complication in phacoemulsification surgery with IOL implantation among eyes of patients with DM compared to those with no DM. Risk factors for poor visual outcome were identified. Scheduled screening, proper operative planning and anticipation of any intraoperative complications hence are mandatory to improve postoperative visual outcome for this group of patients.

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COMPETING INTERESTS

None

ETHICS APPROVAL

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