

## Original Research Article

Title: **Prevalence** of Coexisting Systemic and Ocular Diseases among Cataract Surgery Patients: A Study in a Teaching Hospital in North East Malaysia

### ABSTRACT

**Aim:** To determine the prevalence of coexisting systemic and ocular diseases among the cataract surgery patients in a teaching hospital in north east Malaysia.

**Method:** in this retrospective study, the medical records of patients who were operated for cataract over a period of three years by a single surgeon in the teaching Hospital University Sains Malaysia were analyzed for the coexisting systemic and ocular diseases. Some patients were operated in both eyes.

**Results:** Out of 218 patients who underwent cataract surgery, one or more systemic diseases were present in 113 patients (51.8%). The most common associated systemic disease was diabetes mellitus (24.3%), followed by hypertension (22.4%). A total of 324 eyes were operated in these patients. In addition to cataract, one or more ocular diseases were present in 129 eyes (39.8%). The most common ocular disease in cataract eyes was pterygium (9.8%), followed by diabetic retinopathy (8.9%).

**Conclusion:** Ophthalmologist has to identify the coexisting systemic and ocular diseases present among cataract surgery patients. These diseases should be adequately controlled before surgery in order to avoid intraoperative and postoperative complications, and to achieve better quality of life for the patients..

*Keywords: Cataract; diabetes mellitus; hypertension; ischemic heart disease; pterygium; open angle glaucoma; diabetic retinopathy; age related macular degeneration.*

### INTRODUCTION

Globally, the leading causes of vision impairment are uncorrected refractive errors and cataracts. The majority of people with vision impairment are over the age of 50 years [1]. Excellent potential for good visual outcome (6/12 or better) has been reported after cataract extraction and intraocular lens implantation in the developed [2] and developing countries [3]. Cataract surgery is one of the most common and safe ophthalmic operation performed all over the world. Presence of preoperative systemic and ocular diseases can have a significant effect on the outcomes of cataract operation [4].

The literature search revealed varying prevalence of preoperative coexisting systemic diseases in cataract patients ranging from 32.81% to 92.52%% in different countries [5-12]. There is a need for extra health care services and availability of resources for cataract patients with systemic comorbidities. Wide range of prevalence of coexisting ocular diseases in cataract operated patients (8.0% - 71.81%) has been reported from different countries [5-10,12]. The associated ocular diseases should be treated adequately before undertaking cataract surgery to avoid intraoperative and postoperative complications and to achieve useful vision after the operation.

The literature search revealed only one report from Ministry of Health Malaysia hospital [10] in which the data of Melaka hospital were taken from the national cataract surgery registry and analyzed for the

40 coexisting systemic and ocular diseases along with many other variables. Therefore, this retrospective  
41 study was undertaken to determine the prevalence of coexisting systemic and ocular diseases among the  
42 cataract operated patients in a teaching university hospital in north east Malaysia.

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## 45 MATERIAL AND METHODS

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47 Kelantan is one of the states located in north east Malaysia with population of 1.86 million (0.94 million  
48 males and 0.92 million females) [13]. It is an agricultural state and majority of people live in rural areas.  
49 There are two tertiary hospitals in this state viz Hospital Kota Bharu (ministry of health state hospital) and  
50 Hospital University Sains Malaysia (teaching hospital of School of Medicine, University Sains Malaysia in  
51 Kubang Kerian, Kota Bharu district). The patients from different health centres of the state are referred for  
52 cataract surgery to these two hospitals.

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54 In this retrospective study, the medical records of cataract patients operated, over a period of three years, in  
55 the teaching University Sains Malaysia hospital were reviewed for the coexisting systemic and ocular  
56 diseases. There were six medical lecturers and ten postgraduate students in the ophthalmology department  
57 of the teaching hospital. The operation days were twice a week and thus the theatre facilities were shared  
58 by three specialists and five postgraduate students on each day.

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60 Two hundred and eighteen patients aged above 50 years with cataract causing visual disability in daily  
61 occupational work and scheduled for surgery were included in this study. Those patients with traumatic  
62 cataract, eyes with signs of inflammation, and eyes with no perception of light were excluded. The gender,  
63 age and race of patients, eye operated, coexisting systemic and ocular diseases were noted. Cases  
64 operated by a single surgeon (author) only were included in this study. After the routine work up, informed  
65 consent was taken for surgery. Standard microsurgical procedure of extracapsular cataract extraction with  
66 polymethyl methacrylate posterior chamber intraocular lens implantation was performed in all the patients  
67 under infiltration local anaesthesia.

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69 The data variables were analyzed by SPSS programme using version 16 software. Categorical variables  
70 were presented as frequencies (%). Prevalence rates for systemic diseases were person specific and ocular  
71 diseases were eye specific. This study was approved by ethics committee of School of Medicine, University  
72 Sains Malaysia.

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## 74 RESULTS

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76 Out of 218 patients who underwent cataract surgery, females were slightly more (52.3%) than males  
77 (47.7%). Majority of patients were Malays (70.6%). Nearly three-fourths (73.4%) of patients were above the  
78 age of 60 years. A total of 324 eyes were operated; 106 patients underwent operation in both eyes (Table1).  
79 One or more coexisting systemic diseases were present in 113 out of 218 cataract patients (51.8%). The  
80 most common systemic disease was diabetes mellitus (24.3%), followed by hypertension (22.4%), and  
81 ischemic heart disease (4.5%), Table 2. In addition to cataract, one or more coexisting ocular diseases

82 were present in 129 out of 324 eyes (39.8%). The most common ocular disease was pterygium (11.1%),  
 83 followed by diabetic retinopathy (8.9%) and open angle glaucoma (7.1%), Table 3.

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85

86 **Table 1. Demographic characteristics of cataract patients (n=218)**

87	Parameter	Number	Percentage
88	<b>Gender</b>		
89	Male	104	47.7%
90	Female	114	52.3%
91	<b>Age</b>		
92	51 – 60 years	58	26.6%
93	61 – 70 years	94	43.1%
94	71 – 80 years	58	26.6%
95	81 – 90 years	8	3.7%
96	<b>Race</b>		
97	Malay	154	70.6%
98	Chinese	52	23.8%
99	Indian	12	5.5%
100	<b>Eye operated</b>		
101	Right eye	62	28.4%
102	Left eye	50	22.9%
103	Both eyes	106	48.6%

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106 **Table 2. Coexisting systemic diseases in cataract patients (n=218)\***

107	Systemic disease	Number	Percentage
108	Diabetes mellitus	53	24.3%
109	Hypertension	49	22.4%
110	Ischemic heart disease	10	4.5%
111	Asthma	8	3.6%
112	Leprosy	3	1.4%
113	Gout	3	1.4%
114	Hemiplegia	3	1.4%
115	Tuberculosis	2	0.9%
116	Hyperthyroidism	2	0.9%
117	Syphilis	1	0.4%
118	Breast carcinoma	1	0.4%
119	Non Hodgkins lymphoma	1	0.4%

120 \* some patients had more than one associated systemic disease.

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123 **Table 3. Coexisting ocular diseases in cataract eyes (n=324 eyes)\***

124	Eye disease	Number	Percentage
125	Pterygium	32	9.8%
126	Diabetic retinopathy	31	9.5%
127	Open angle glaucoma	23	7.1%
128	Central corneal opacity	14	4.3%
129	Pseudo exfoliation of lens	8	2.4%
130	Hypertensive retinopathy	6	1.8%
131	Myopic degeneration	6	1.8%
132	Acute congestive glaucoma	6	1.8%
133	Chronic dacryocystitis	4	1.2%
134	Age related macular degeneration	4	1.2%
135	Retinitis pigmentosa	2	0.6%
136	Divergent squint	2	0.6%
137	Healed central choroiditis	2	0.6%
138	Optic atrophy	2	0.6%
139	Macular hole	1	0.3%
140	Coloboma of iris	1	0.3%

141 \* some eyes had more than one associated eye disease.

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## 144 DISCUSSION

145 Cataract is the most common cause of preventable blindness in the world. Most of these patients are elderly  
 146 and are likely to have various associated systemic diseases. Preoperative assessment is important to  
 147 determine the prevalence of systemic diseases to prevent preoperative, operative and postoperative  
 148 complications and mortality in patients undergoing cataract surgery. Persons undergoing cataract extraction  
 149 may have higher mortality than patients of comparable age, sex and race undergoing other surgical  
 150 procedures [14].

151 The prevalence of systemic comorbidities in the present study (51.8%) is higher than the figures reported in  
 152 some studies [6,11,12] and lower than other studies reported from different countries (Table 4).

153 **Table 4. Prevalence of systemic diseases in cataract patients in different countries**

154	Author	Place &	Total No.of	Systemic
155		country	patients	comorbidities
156	Arthur et al [5]	Pondichery, India	448	32.81%
157	Shrestha et al [6]	Pokhara, Nepal	675	59.4%
158	Riley et al [7]	Auckland, New Zealand	480	80.0%
159	Pham et al [8]	Sydney, Australia	615	92.52%
160	Abdelmoaty et al [9]	Kuwait, Kuwait	325	61.5%
161	Thevi & Godinho [10]	Melaka, Malaysia	12992	33.79%

162	Ram et al [11]	Chandigarh, India	6103	17.2%
163	Al- Qahtani et al [12]	Riyadh, Saudi Arabia	421	82.66%
164	PRESENT STUDY	Kelantan, Malaysia	218	51.8%%

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166 The percentage of the common systemic diseases that include diabetes mellitus, hypertension and heart  
 167 disease (ischemic heart diseases, angina, myocardial infarction, cardiac arrhythmia, cardiac failure)  
 168 reported from different countries in cataract patients is shown in Table 5.

169 **Table 5. Frequency of common systemic diseases in cataract patients in different countries**

170	Author	Diabetes mellitus	Hypertension	Heart disease	Asthma
171	Arthur et al [5]	13.62%	9.38%	1.12%	1.79%
172	Shrestha et al [6]	14.7%	17.8%	7.7%	---
173	Riley et al [7]	20.41%	45.83%	22.5%	11.25%
174	Pham et al [8]	27.47%	56.26%	35.12%	12%
175	Abdelmoaty et al [9]	37.53%	36.3%	15.38%	---
176	Thevi & Godinho [10]	42.30%	55.23%	9.93%	3.3%
177	Ram et al [11]	3.75%	2.7%	1.39%	3.67%
178	Al- Qahtani et al [12]	61.04%	64.13%	15.67%	10.45%
179	PRESENT STUDY	24.3%	22.4%	4.5%	3.6%

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181 Cataracts in patients with diabetes most commonly present as cortical or posterior subcapsular cataracts  
 182 that occur at an earlier age in patients with poor blood sugar control as compared to age-matched controls.  
 183 These cataracts often progress more rapidly and are more closely related to poor glucose control than  
 184 duration of the disease. Classic diabetic cataracts consist of snowflake cortical opacities that may either  
 185 resolve spontaneously or mature rapidly within a short period of time. These cataracts occur due to a high  
 186 level of glucose present in the aqueous humor, which diffuses into the lens. Within the lens, glucose is  
 187 metabolized by aldose reductase into sorbitol, which then accumulates within the lens. This results in a  
 188 subsequent osmotic over-hydration of the lens substance. In mild cases, this change may affect the  
 189 refractive index of the lens, which can then lead to fluctuations in refraction related to changes in plasma  
 190 glucose levels. Cortical fluid vacuoles can also develop in these patients, which can evolve into more dense  
 191 opacities [15].

192 Haddad et al [16] reported that cataract extraction in diabetic patients as compared to non-diabetic patients  
 193 is associated with higher risks of reported complications such as capsular contraction and opacification as  
 194 well as post-surgical worsening of macular edema and diabetic retinopathy. Therefore, the surgeon has to  
 195 be vigilant in a cataract operated eye in diabetic patient during postoperative follow up.

196 Eyes of diabetic patients showed more severe corneal endothelial cell damage following cataract surgery  
 197 and delayed recovery of corneal edema as described previously [17]. Other anterior segment complications  
 198 such as severe iritis, posterior synechiae, pupillary block, and pigmented precipitates on the intraocular  
 199 lens are more frequently observed in diabetic patients [18]. Diabetic patients may have increased risk of  
 200 postoperative endophthalmitis which may be associated with a poor visual prognosis [19].

201 Significant bleeding is extremely rare during phacoemulsification cataract surgery and even large incision  
 202 extracapsular or intracapsular cataract surgery. In a study of 734 hypertensive patients, who had no  
 203 perioperative intervention for elevated blood pressure, had no significant difference in surgical complications  
 204 compared with normotensives [20]. In a prospective study of 108 cases of suprachoroidal haemorrhage  
 205 complicating cataract surgery from 13 centres participating in the United Kingdom British Ophthalmological  
 206 Surveillance Unit [21], univariate analysis of potential risk factors found no significant effect of hypertension.  
 207 However, good control of hypertension preoperatively as well as postoperatively is important to prevent the  
 208 possibilities of post operative bleeding in the eye (hyphema, vitreous haemorrhage, and suprachoroidal  
 209 haemorrhage) in a cataract eye.

210 In a population based cohort study, Hu et al [22] reported that the cataract patients undergoing cataract  
 211 surgery were associated with a higher risk of ischemic heart disease compared with those cataract patients  
 212 without surgery ( $P < 0.05$ ). If asthma is not controlled adequately before the cataract operation, there is  
 213 usually cough in these patients. Adequate control of asthma is very important before cataract operation to  
 214 avoid the possible postoperative complications such as wound gape, shallow anterior chamber/ iris  
 215 prolapse, hyphema and raised intraocular pressure because of persistent cough in these patients.

216 The prevalence of ocular comorbidities in the present study (39.8%) is lower than the figures 71.81% [11]  
 217 and higher than the other studies reported from different countries (Table 6).

218 **Table 6. Prevalence of coexisting ocular diseases in cataract patients in different countries**

219 Author	220 Place & Country	Total No. of eyes	Ocular comorbidities
221 Arthur et al [5]	Pondichery, India	448	14.73%
222 Shrestha et al [6]	Pokhara, Nepal	675	8.0%
223 Riley et al [7]	Auckland, New Zealand	488	26.0 %
224 Pham et al [8]	Sydney, Australia	653	35.98%
225 Abdelmoaty et al [9]	Kuwait, Kuwait	350	9.7%
226 Thevi & Godinho [10]	Melaka, Malaysia	12992	71.81%
227 Al- Qahtani et al [12]	Riyadh, Saudi Arabia	421	15.43%
228 PRESENT STUDY	Kelantan, Malaysia	324	39.8%

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231 The percentage of the common ocular diseases that include open angle glaucoma, diabetic retinopathy and  
 232 age related macular degeneration reported from different countries in cataract patients is shown in Table 7.

233

234 **Table 7. Frequency of common ocular diseases in cataract patients in different countries**

235 Author	POAG	DR	ARMD
236 Arthur et al [5]	1.12%	3.35%	---
237 Shrestha et al [6]	1.04%	0.3%	0.3%
238 Riley et al [7]	9.2%	7.6%	5.1%

239	Pham et al [8]	10.6%	9.0%	12.6%
240	Abdelmoaty et al [9]	2.85%%	1.42%	0.57%
241	Thevi & Godinho [10]	6.78%	10.8%	1.55%
242	Al- Qahtani et al [12]	4.6%	5.1%	0.2%
243	PRESENT STUDY	7.1%	9.5%	1.2%

244 POAG= primary open angle glaucoma, DR= diabetic retinopathy, ARMD= age related macular degeneration  
245

246 Open angle glaucoma is quite often associated with cataract in the same eye. If the intraocular pressure is  
247 not controlled adequately before cataract surgery with medications, the eye is at high risk for intraoperative  
248 vitreous loss/ suprachoroidal haemorrhage during operation. Uncontrolled post operative intraocular  
249 pressure will lead to glaucomatous cupping and possibility of not achieving good vision in these eyes.  
250 Earlier, trabeculectomy was performed in the eyes with uncontrolled pressure on glaucoma medications.  
251 Recently, after control of intraocular pressure with medication, glaucoma triple procedure (cataract  
252 extraction + IOL implantation + trabeculectomy) is the treatment practiced by many surgeons.

253 Breakdown of the blood-aqueous and blood-retinal barriers may worsen postoperative inflammation after  
254 cataract surgery in both extracapsular cataract extraction and phacoemulsification, and this vicious cycle  
255 may instigate or expedite diabetic retinopathy progression [23]. Dowler et al [24] reported that  
256 uncomplicated phacoemulsification cataract surgery does not accelerate progression of diabetic  
257 retinopathy as smaller incision size and shorter surgical time in phacoemulsification decrease inflammation  
258 and may induce less breakdown of the blood-ocular barrier. Similarly, Shah and Chen [25] reported that  
259 recent studies do not support the generalized conclusion that phacoemulsification causes progression of  
260 retinopathy and macular oedema in all diabetic patients.

261 The UK diabetic retinopathy electronic medical record users group authors found that the risk of "treatment-  
262 requiring DME" increased sharply after surgery and peaked in the 3–6 months' period. The risk of macular  
263 oedema was associated with preoperative grade of retinopathy; the risk of DME in the 1st year  
264 postoperatively was 1.0% (no diabetic retinopathy preoperatively), 5.4% (mild non proliferative diabetic  
265 retinopathy - NPDR), 10.0% (moderate NPDR), 13.1% (severe NPDR), and 4.9% (proliferative diabetic  
266 retinopathy). This large real-world study proves that the risk of treatment requiring DME increases sharply  
267 in the 1st year after cataract surgery and that those with moderate and severe NPDR are most at risk of  
268 such progression [26].

269 All patients diagnosed with NPDR should undergo detailed retinal examination within 3 months before  
270 cataract extraction. Patients with diabetes, especially those with proliferative retinopathy or those with  
271 inadequate view of the retina before cataract extraction, should be evaluated closely after surgery for  
272 monitoring retinal status [27].

273 Wang et al [28] reported that pooled findings from two large population-based cohorts (Bever Dam and Blue  
274 Mountain Eye studies) support the hypothesis that cataract surgery in older persons without pre-existing  
275 neovascular ARM or gyrate atrophy may be associated with an increased subsequent risk for developing

276 late-stage ARM, particularly neovascular type. In such patients, the operating surgeon should inform  
277 guarded visual prognosis after cataract surgery.

278 Pterygium (9.8%) was the most common ocular disease seen in cataract patients in the present study. It  
279 causes visual problems due to induced corneal astigmatism (in most of the cases) or direct encroachment  
280 onto the visual axis (in advanced cases). Astigmatism is increased with increase in the size of the  
281 pterygium. Pterygium surgery (bare sclera technique or with additional conjunctival autograft technique) will  
282 improve visual acuity significantly by reducing the astigmatism. Amniotic membrane graft and conjunctival  
283 autograft are better surgical techniques than bare sclera technique in reducing astigmatism is concerned  
284 [29].

285

286 If the pterygium surgery is done before cataract surgery and the power of intraocular lens (IOL) is calculated  
287 four weeks later (after complete corneal healing), the power of the IOL will be more accurate. Some  
288 surgeons tend to excise the pterygium in one sitting (excision of pterygium done first and then cataract  
289 operation) so that the patient need not come second time for pterygium excision. The combined operation  
290 procedure leads to change in the corneal astigmatism after the cataract surgery which requires optical  
291 correction post operatively to achieve better vision.

292

## 293 **LIMITATIONS**

294 The number of cataract patients in this study is small. This is mainly because only single surgeon (author)  
295 cases are included in this study. Many surgeons and postgraduate trainees in the department shared the  
296 operation theatre time, which was only twice a week. Moreover, there was another government state  
297 hospital to which patients from ministry of health centers and district hospitals were referred for cataract  
298 surgery.

299

## 300 **CONCLUSION**

301 Ophthalmologists come across systemic diseases and other ocular diseases quite often in cataract patients  
302 in their surgical practice. Comprehensive medical assessment is important to detect the coexisting systemic  
303 diseases to prevent preoperative, operative and postoperative complications and mortality in patients  
304 undergoing cataract surgery. Adequate control of the coexisting ocular diseases is important before  
305 undertaking cataract surgery to avoid intraoperative and postoperative complications, and to achieve useful  
306 vision after the operation. In case of advanced stage of the concurrent eye disease present before the  
307 cataract operation, guarded visual prognosis should be explained to the patient. If the surgeon treats the  
308 possible post-operative complications in time, the patient's quality of life can be improved.

309

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