

Patterns of Cataract Morphology, Clinical Risk Factors, and Visual Acuity at Al-Mouwasat University Hospital: A Retrospective Cross-Sectional Study

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Abstract

Objective

To describe the distribution of cataract morphology/stage, associated clinical risk factors, and visual acuity (VA) among patients presenting to the ophthalmology department and outpatient clinics of Al-Mouwasat University Hospital.

Methods

This retrospective cross-sectional chart review included 202 patients diagnosed with cataract at Al-Mouwasat University Hospital between 1 July 2025 and 31 January 2026. Demographic characteristics, smoking status, and associated clinical risk factors were analyzed at the patient level ($n = 202$). Cataract findings were additionally summarized at the patient-subtype presentation level ($n = 464$ presentations: 250 unilateral and 214 bilateral). Morphologic categories were nuclear, cortical, posterior subcapsular, and anterior subcapsular, whereas intumescent, mature, and hypermature cataracts were treated as stages of lens maturation. Because the source dataset did not reliably link unilateral presentations to a specific eye and allowed more than one presentation in the same eye, eye-specific associations with VA were treated as exploratory cross-tabulations rather than definitive eye-level inference. Data were summarized in Microsoft Excel and IBM SPSS Statistics version 28.

Results

The study included 202 patients. Most patients were 51–70 years old (60.4%), followed by those older than 70 years (22.8%). Men accounted for 51.5% of the cohort and women for 48.5%. Diabetes mellitus and hypertension were the most common associated clinical factors (36.6% and 30.7%, respectively). At the presentation level, posterior subcapsular and nuclear cataract were the most frequent recorded findings. In exploratory presentation-level analyses, nuclear cataract was most frequent in patients aged 51–70 years. Cross-tabulations with VA suggested that mature cataract and posterior subcapsular cataract tended to cluster in poorer VA categories, but these eye-specific findings should be interpreted cautiously because the source file did not uniquely assign unilateral cataract presentations to the right or left eye.

Conclusion

In this single-center retrospective cross-sectional study from Al-Mouwasat University Hospital, posterior subcapsular and nuclear cataract presentations were the most common recorded findings. Demographic and risk-factor summaries are most appropriately interpreted at the patient level, whereas morphology/stage counts are best interpreted at the presentation level. Apparent associations with VA

should be considered exploratory because definitive eye-level linkage was not available in the source dataset.

Introduction

Cataract remains the leading cause of blindness worldwide and an important cause of moderate and severe visual impairment. Global estimates indicate that cataract accounts for a substantial proportion of avoidable vision loss, particularly in ageing populations and in health systems with limited surgical capacity [1, 2].

The public health importance of cataract is expected to grow as life expectancy increases. Beyond its effect on vision, cataract reduces independence, impairs daily functioning, and increases demand for outpatient assessment and surgical treatment, thereby creating a sustained burden on health systems [1, 2].

Age is the dominant risk factor. Population-based studies have shown that lens opacity becomes markedly more common in older adults, with prevalence rising steeply after the sixth decade of life [3].

Cataract is not a single homogeneous entity. Nuclear, cortical, posterior subcapsular, and anterior subcapsular opacities differ in pathophysiology, slit-lamp appearance, and visual consequences. In addition, intumescent, mature, and hypermature cataracts are best understood as stages of lens maturation rather than primary morphologic subtypes [4, 5].

This distinction is clinically important because different morphologies may affect visual acuity in different ways and may present at different stages of severity. Although cataract surgery remains the only definitive treatment, careful characterization of morphology, laterality, and associated risk factors is essential for case description, service planning, and interpretation of preoperative visual status [5, 6].

Data from Syria remain relatively limited. Prior hospital-based Syrian studies have described cataract types and their effect on visual acuity, but more granular information on morphology/stage distributions and accompanying clinical risk factors in routine practice is still needed [7, 8].

Accordingly, the present study aimed to describe the distribution of cataract morphology/stage, associated clinical risk factors, and visual acuity among patients presenting to Al-Mouwasat University Hospital, while explicitly distinguishing patient-level summaries from presentation-level findings.

Methods

This retrospective study included patients diagnosed with cataract in the Department of Ophthalmology and the outpatient clinics of Al-Mouwasat University Hospital between 1 July 2025 and 31 January 2026.

A total of 202 patients were enrolled. Demographic and risk-factor analyses used the patient as the unit of analysis. Cataract morphology/stage was additionally summarized at the patient-subtype

presentation level (464 presentations: 250 unilateral and 214 bilateral). These 464 presentations should not be interpreted as 464 independent patients or 464 unique eyes, because some patients contributed more than one presentation and more than one subtype could coexist in the same eye.

Data were analyzed according to age group, sex, smoking status, associated clinical risk factors, cataract morphology/stage, and VA.

To keep the exploratory inferential component concise and clinically focused, presentation-level cross-tabulations centered on two prespecified associations: (1) age group versus cataract morphology/stage and (2) cataract morphology/stage versus VA.

VA in both eyes was assessed using a Snellen chart, defined as the patient's ability to identify letters or numbers at a standardized viewing distance. Patients were classified into four VA categories: $\leq 1/10$, 2–4/10, 5–7/10, and 8–10/10.

Smoking status was classified as current smoker, ex-smoker (cessation for at least 1 year), or non-smoker. For classification purposes, nuclear, cortical, posterior subcapsular, and anterior subcapsular opacities were treated as morphologic subtypes, whereas intumescent, mature, and hypermature cataracts were treated as stages of lens maturation rather than primary morphologic categories. The dataset did not contain eye-specific LOCS III scores, so retrospective numeric grading was not possible. Patients with diabetic retinopathy, hypertensive retinopathy, retinal dystrophy, or corrected vision were excluded regardless of age. Data were analyzed using Microsoft Excel and IBM SPSS Statistics version 28. Patient-level variables were summarized descriptively. Exploratory presentation-level cross-tabulations focused on age group versus cataract morphology/stage and cataract morphology/stage versus VA. Because repeated presentations from the same patient violate the independence assumption of simple contingency-table tests, these p values are reported as exploratory and hypothesis-generating only. A two-sided $p < 0.05$ was used to flag exploratory associations.

Results

Demographic characteristics

The study included 202 patients. Most patients were 51–70 years old (60.4%), followed by those older than 70 years (22.8%). Men accounted for 51.5% of the cohort and women for 48.5%. The detailed demographic distribution is presented in Table 1.

Table 1
Demographic characteristics of patients with
cataract (n = 202).

Demographic information	202 patients	
Age [years]	N	%
12–30	6	3%
31–50	28	13.9%
51–70	122	60.4%
Older than 70	46	22.8%
Gender	N	%
Male	104	51.5%
Female	98	48.5%
Smoking	N	%
Current smoker	39	19.3%
Ex-smoker	53	26.2%
Non-smoker	110	54.5%

Risk factors

The most frequently reported associated risk factors were diabetes mellitus and hypertension (36.6% and 30.7%, respectively). Additional clinical factors are summarized in Table 2.

Table 2
Associated risk factors and medical history
among patients with cataract (n = 202).

Risk factor & Medical history	N	%
Diabetes	74	36.6%
Hypertension	62	30.7%
Cardiovascular diseases	21	10.4%
Thyroid diseases	17	8.4%
Steroid therapy	16	7.9%
Eye trauma	13	6.4%
Dyslipidemia	10	5%
None reported	63	31.2%

Visual acuity distribution in both eyes

VA assessment showed that the largest proportion of eyes fell within the lowest VA category ($\leq 1/10$), followed by the 2–4/10 category. Smaller proportions of eyes were classified within the 5–7/10 and 8–10/10 categories. The detailed distribution for the right and left eyes is presented in Table 3.

Table 3
Distribution of VA in the right and left eyes among
patients with cataract (202 right eyes and 202 left
eyes).

Visual Acuity	Cataract placement	N	%
$\leq 1/10$	Right eye	80	39.6%
	Left eye	92	45.5%
2–4/10	Right eye	72	35.6%
	Left eye	62	30.7%
5–7/10	Right eye	28	13.9%
	Left eye	36	17.8%
8–10/10	Right eye	22	10.9%
	Left eye	12	5.9%

Cataract subtype distribution according to age group

In exploratory presentation-level cross-tabulations, unilateral and bilateral nuclear cataract presentations were most frequent in the 51-70-year age group (exploratory $p < 0.001$). Unilateral hypermature cataract was more frequent in the 31-50-year group, whereas bilateral hypermature cataract was distributed similarly between the 51-70-year and > 70 -year groups (exploratory $p = 0.011$). Overall, age was the clearest exploratory correlate of cataract morphology/stage in this dataset. The detailed age-group distribution is presented in Table 4.

Table 4
Exploratory distribution of cataract presentations according to age group.

Type of Cataract	Unilateral or bilateral	Age [years]					P. value
			12–30	31–50	51–70	Older than 70	
		N	6	28	122	46	
Mature	Unilateral	23	1 [4.3%]	5 [21.7%]	13 [56.5%]	4 [17.4%]	0.873
	Bilateral	4	0 [0%]	0 [0%]	3 [75%]	1 [25%]	
Nuclear	Unilateral	69	1 [1.4%]	5 [7.2%]	44 [63.8%]	19 [27.5%]	< 0.001*
	Bilateral	76	0 [0%]	5 [6.6%]	49 [64.5%]	22 [28.9%]	
Cortical	Unilateral	40	1 [2.5%]	6 [15%]	26 [65%]	7 [17.5%]	0.984
	Bilateral	38	1 [2.6%]	5 [13.2%]	22 [57.9%]	10 [26.3%]	
Posterior subcapsular	Unilateral	77	2 [2.6%]	15 [19.5%]	46 [59.7%]	14 [18.2%]	0.430
	Bilateral	86	3 [3.5%]	11 [12.8%]	52 [60.5%]	20 [23.3%]	
Anterior subcapsular	Unilateral	15	1 [6.7%]	2 [13.3%]	10 [66.7%]	2 [13.3%]	0.186
	Bilateral	5	1 [20%]	1 [20%]	1 [20%]	2 [40%]	
Intumescent	Unilateral	15	0 [0%]	1 [6.7%]	9 [60%]	5 [33.3%]	0.058
	Bilateral	3	1 [33.3%]	0 [0%]	1 [33.3%]	1 [33.3%]	
Hypermature	Unilateral	11	2 [18.2%]	4 [36.4%]	3 [27.3%]	2 [18.2%]	0.011*
	Bilateral	2	0 [0%]	0 [0%]	1 [50%]	1 [50%]	

Exploratory distribution of cataract presentations according to sex

The distribution of cataract presentations across visual acuity categories in the right eye is presented in Table 5. In exploratory presentation-level cross-tabulations, unilateral cortical cataract was more common in males, whereas bilateral cortical cataract was more common in females (exploratory $p = 0.024$).

The distribution of cataract presentations across visual acuity categories in the right eye is presented in Table 5.

Type of Cataract	Unilateral or bilateral	Gender			P. value
			Female	Male	
		N	98	104	
Mature	Unilateral	23	8 [34.8%]	15 [65.2%]	0.375
	Bilateral	4	2 [50%]	2 [50%]	
Nuclear	Unilateral	69	29 [42%]	40 [58%]	0.409
	Bilateral	76	39 [51.3%]	37 [48.7%]	
Cortical	Unilateral	40	18 [45%]	22 [55%]	0.024*
	Bilateral	38	26 [68.4%]	12 [31.6%]	
Posterior subcapsular	Unilateral	77	33 [42.9%]	44 [57.1%]	0.306
	Bilateral	86	47 [54.7%]	39 [45.3%]	
Anterior subcapsular	Unilateral	15	8 [53.3%]	7 [46.7%]	0.802
	Bilateral	5	3 [60%]	2 [40%]	
Intumescent	Unilateral	15	7 [46.7%]	8 [53.3%]	0.857
	Bilateral	3	1 [33.3%]	2 [66.7%]	
Hypermature	Unilateral	11	6 [54.5%]	5 [45.5%]	0.918
	Bilateral	2	1 [50%]	1 [50%]	

Exploratory cross-tabulation of cataract presentation and VA in the right eye

Table 6 shows the exploratory cross-tabulation of cataract presentations and visual acuity categories in the left eye. In exploratory cross-tabulations with right-eye VA, mature cataract presentations clustered more often in poorer VA categories (exploratory $p = 0.023$). Because the dataset did not uniquely link

unilateral presentations to right versus left eyes, these findings should not be interpreted as definitive eye-level effects.

Table 6
Exploratory cross-tabulation of cataract presentations and VA categories in the right eye.

Type of Cataract	Unilateral or bilateral		VA								P. value
			≤ 1/10		2–4/10		5–7/10		8–10/10		
		eyes	R	L	R	L	R	L	R	L	
		N	80	92	72	62	28	36	22	12	
Mature	Unilateral	23	16 [69.6%]		5 [21.7%]		0 [0%]		2 [8.7%]		0.023
	Bilateral	4	0 [0%]		3 [75%]		1 [25%]		0 [0%]		
Nuclear	Unilateral	69	28 [40.6%]		22 [31.9%]		12 [17.4%]		7 [10.1%]		0.639
	Bilateral	76	29 [38.2%]		30 [39.5%]		11 [14.5%]		6 [7.9%]		
Cortical	Unilateral	40	18 [45%]		13 [32.5%]		6 [15%]		3 [7.5%]		0.113
	Bilateral	38	13 [34.2%]		19 [50%]		6 [15.8%]		0 [0%]		
Posterior subcapsular	Unilateral	77	31 [40.3%]		24 [31.2%]		11 [14.3%]		11 [14.3%]		0.395
	Bilateral	86	32 [37.2%]		37 [43%]		12 [14%]		5 [5.8%]		
Anterior subcapsular	Unilateral	15	4 [26.7%]		5 [33.3%]		3 [20%]		3 [20%]		0.671
	Bilateral	5	3 [60%]		2 [40%]		0 [0%]		0 [0%]		
Intumescent	Unilateral	15	5 [33.3%]		6 [40%]		4 [26.7%]		0 [0%]		0.475
	Bilateral	3	1 [33.3%]		2 [66.7%]		0 [0%]		0 [0%]		
Hypermaturation	Unilateral	11	5 [45.5%]		5 [45.5%]		1 [9.1%]		0 [0%]		0.471
	Bilateral	2	0 [0%]		2 [100%]		0 [0%]		0 [0%]		

Exploratory cross-tabulation of cataract presentation and VA in the left eye

In exploratory cross-tabulations with left-eye VA, mature cataract presentations and posterior subcapsular cataract tended to cluster in poorer VA categories (exploratory $p = 0.013$ and $p = 0.020$, respectively). Taken together, the VA cross-tabulations suggest that cataract stage and selected morphologies may be related to worse presenting vision, although these findings remain exploratory because eye-specific linkage for unilateral presentations was not available in the source dataset.

Table 6
Exploratory cross-tabulation of cataract presentations and VA categories in the left eye.

Type of Cataract	Unilateral or bilateral		VA								P. value	
			≤ 1/10		2–4/10		5–7/10		8–10/10			
			eyes	R	L	R	L	R	L	R		L
			N	80	92	72	62	28	36	22		12
Mature	Unilateral	23	17 [73.9%]		1 [4.3%]		4 [17.4%]		1 [4.3%]		0.013*	
	Bilateral	4	4 [100%]		0 [0%]		0 [0%]		0 [0%]			
Nuclear	Unilateral	69	27 [39.1%]		24 [34.8%]		12 [17.4%]		6 [8.7%]		0.110	
	Bilateral	76	39 [51.3%]		26 [34.2%]		10 [13.2%]		1 [1.3%]			
Cortical	Unilateral	40	18 [45%]		10 [25%]		9 [22.5%]		3 [7.5%]		0.457	
	Bilateral	38	16 [42.1%]		16 [42.1%]		6 [15.8%]		0 [0%]			
Posterior subcapsular	Unilateral	77	27 [35.1%]		26 [33.8%]		14 [18.2%]		10 [13%]		0.020*	
	Bilateral	86	43 [50%]		24 [27.9%]		17 [19.8%]		2 [2.3%]			
Anterior subcapsular	Unilateral	15	7 [46.7%]		5 [33.3%]		2 [13.3%]		1 [6.7%]		0.751	
	Bilateral	5	4 [80%]		0 [0%]		1 [20%]		0 [0%]			
Intumescent	Unilateral	15	6 [40%]		7 [46.7%]		1 [6.7%]		1 [6.7%]		0.402	
	Bilateral	3	3 [100%]		0 [0%]		0 [0%]		0 [0%]			
Hypermaturation	Unilateral	11	8 [72.7%]		3 [27.3%]		0 [0%]		0 [0%]		0.298	
	Bilateral	2	2 [100%]		0 [0%]		0 [0%]		0 [0%]			

Discussion

Age-related cataract remains one of the leading causes of visual impairment and blindness worldwide. Reports from China [9, 10], Canada [11], Japan [12], Denmark [13], Latin America [14], and India [15] consistently identify cataract as a major contributor to visual disability.

Published epidemiological data further demonstrate the public health impact of cataract. Surveys from Africa, South Asia, and Europe have shown that cataract prevalence increases substantially with age and remains among the principal causes of blindness in older adults.

In the present study, most patients were 51–70 years old (60.4%), followed by those older than 70 years. At the exploratory presentation level, nuclear cataract was recorded most often in the 51-70-year age group, whereas unilateral hypermature cataract appeared more frequently in the 31-50-year group. Although these presentation-level findings do not establish causality, they suggest that age was the clearest clinical correlate of cataract morphology/stage within the current dataset.

Diabetes mellitus and hypertension were the most common associated clinical factors in this cohort. At the presentation level, posterior subcapsular and nuclear cataract were the most frequent recorded findings. Because morphology/stage was summarized as 464 patient-subtype presentations rather than 202 independent patients or uniquely identified eyes, the most informative exploratory relationships in this dataset were age versus cataract morphology/stage and cataract morphology/stage versus VA.

Exploratory cross-tabulation of cataract presentation and VA in the right eye

In exploratory right-eye cross-tabulations, mature cataract presentations clustered more often in poorer VA categories. This pattern is clinically plausible because more advanced lens opacification would be expected to correspond to greater visual impairment. However, the absence of unique eye-level linkage means that these patterns remain hypothesis-generating rather than confirmatory.

Exploratory cross-tabulation of cataract presentation and VA in the left eye

In exploratory left-eye cross-tabulations, mature cataract and posterior subcapsular cataract also clustered more often in poorer VA categories. Overall, the repeated appearance of these patterns across VA analyses supports a clinically meaningful relationship between cataract stage/morphology and worse presenting vision, but not a definitive eye-specific estimate from the current dataset.

As with other retrospective studies, data collection was limited by the quality and completeness of archival records. Additional limitations include the single-center design, the absence of multivariable adjustment for potential confounders, and the lack of a reliable eye-level link between unilateral cataract presentations and right/left VA. These issues limit formal inference and support cautious interpretation of the two highlighted exploratory relationships: age with cataract morphology/stage, and cataract morphology/stage with VA.

Conclusion

Posterior subcapsular and nuclear cataract presentations were the most frequent recorded findings in this cohort. Demographic and risk-factor summaries are most robust at the patient level, whereas morphology/stage counts are best interpreted at the presentation level. Apparent associations with VA should be considered exploratory because definitive eye-level linkage was not available in the source dataset.

Abbreviations

VA: visual acuity.

Declarations

Ethics approval and consent to participate

This retrospective cross-sectional study was reviewed and approved by the Ethics Committee of the Faculty of Medicine, Damascus University. The study was conducted in accordance with the Declaration of Helsinki. Because this study used routinely collected clinical records and all data were analyzed anonymously, the requirement for informed consent to participate was waived by the Ethics Committee of the Faculty of Medicine, Damascus University. No approval or reference number was issued.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Conflict of interest

The authors declare that they have no competing interests.

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Authors' contributions

M.A.F., T.A., M.A., M.G.A., and M.A.Z. contributed to the conception and design of the study. Data collection and curation were performed by the research team in coordination with the ophthalmology department. Statistical analysis and interpretation were carried out collaboratively by the authors. M.A.Z. contributed to manuscript preparation, critical revision, correspondence, and administrative

coordination. The initial manuscript draft was prepared by the lead authors, and all authors critically revised the manuscript for important intellectual content, approved the final version, and agreed to be accountable for all aspects of the work.

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