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Analysis Of Risk Factors Associated With The Presence Of Cataract Among Ophthalmology Outpatients At Dian Harapan Hospital, Jayapura, Papua, In 2025

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A B S T R A C T
This study aimed to analyze risk factors associated with cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025, providing local evidence from Papua where facility-based epidemiological data remain limited. A quantitative analytic cross-sectional design was used with secondary data from medical records of 202 outpatients selected through purposive sampling from January to December 2025. The variables examined were age, ethnicity, occupation, history of diabetes mellitus, history of eye disease, history of ocular trauma, and history of eye surgery. Cataract was significantly associated with older age and history of ocular trauma. In multivariate analysis, history of ocular trauma was the most dominant factor. These findings support risk-based early detection and better prioritization of cataract services in referral eye care.

INTRODUCTION

Cataract is an opacity of the lens that causes reduced visual acuity and remains a leading cause of blindness globally and in Indonesia (AAO, 2021; WHO, 2026). In the public health context, cataract affects not only visual function but also quality of life, productivity, independence, and healthcare costs (WHO, 2026). In Indonesia, the burden of cataract continues to be substantial, while the need for surgery remains high and the distribution of eye care services is still uneven (Kemenkes RI, 2018; WHO, 2021).

Papua faces more complex eye care challenges because of geographical barriers, limited service distribution, and restricted access to specialist care (Kemenkes RI, 2013; WHO, 2026). Dian Harapan Hospital in Jayapura is one of the referral facilities that plays an important role in delivering ophthalmic services in this region. The high number of ophthalmology outpatients with cataract indicates the need for more specific epidemiological information to support earlier detection, better patient education, and more targeted service prioritization (WHO, 2026).

Cataract is a multifactorial condition. Increasing age is the most consistent risk factor, but other factors such as diabetes mellitus, ocular trauma, history of eye disease, history of eye surgery, occupation, and sociodemographic characteristics may also contribute to the presence of cataract (AAO, 2025; Martyana, 2024; Norsela et al., 2023; Xu et al., 2024). In medical record-based research, these factors can be assessed as initial determinants to explain the pattern of cataract occurrence among hospital patients.

The contribution of this study lies in the use of electronic medical records of ophthalmology outpatients at a referral hospital in Jayapura to assess multiple risk factors within a single analytical model. In addition to providing local empirical evidence, this study may support risk-based screening and improvement of clinical recording practices. Therefore, this study aimed to analyze risk factors associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025 (AAO, 2021; WHO, 2026).

THEORETICAL REVIEW

Cataract as a Public Health Problem

Clinically, cataract is a condition in which the lens loses its transparency, so that light cannot be focused optimally onto the retina. This process may occur gradually and lead to impaired daily activities, reduced independence, and functional blindness. Because surgical treatment generally provides good outcomes, cataract is regarded as an important health problem from the perspective of avoidable blindness management (Martyana, 2024; Rizal et al., 2023).

In the epidemiology of cataract, older age is considered the main determinant because the lens undergoes cumulative degenerative, oxidative, and metabolic changes over time. Aging causes the lens to become thicker, harder, less accommodative, and more prone to opacity formation (Ratnaningsih et al., 2024; Rizal et al., 2023). However, other risk factors also need to be considered

because they may accelerate lens opacification or influence the presence of cataract in the population (Martyana, 2024; Putri et al., 2023).

Risk Factors Examined

Age is regarded as the main biological factor. Ethnicity, in this study, is positioned as a social marker that may be related to access to health services, environmental exposure, and occupational characteristics. Occupation is also considered important because certain types of work are associated with prolonged ultraviolet exposure and working conditions that may increase the risk of eye injury, both of which are relevant to the presence of cataract (Martyana, 2024; Wati et al., 2023).

History of diabetes mellitus may accelerate lens opacity through mechanisms involving hyperglycemia, sorbitol accumulation, osmotic stress, and oxidative damage in the lens. These metabolic changes may contribute to earlier or faster cataract formation among patients with diabetes mellitus (Norsela et al., 2023; Pareza et al., 2025; Putri et al., 2023).

History of eye disease and history of eye surgery may reflect previous ocular conditions or interventions that affect lens health. History of eye trauma is also relevant because trauma may damage the lens capsule or lens fibers and subsequently trigger traumatic cataract (Martyana, 2024; Penne & Richards, 2026).

Hypotheses Development

The presence of cataract among ophthalmology outpatients may not be explained by a single factor, but rather by the interaction of several determinants. Biological factors such as age may increase susceptibility to lens opacity through degenerative processes. Sociodemographic factors such as ethnicity and occupation may reflect differences in exposure and access to care. In addition, clinical factors including diabetes mellitus, history of eye disease, ocular trauma, and eye surgery may contribute to cataract formation through different pathological pathways. Therefore, based on the theoretical explanation and the results of previous studies, this study proposes the following hypotheses.

H1: Age is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H2: Ethnicity is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H3: Occupation is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H4: History of diabetes mellitus is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H5: History of eye disease is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H6: History of ocular trauma is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H7: History of eye surgery is associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

H8: Age, ethnicity, occupation, history of diabetes mellitus, history of eye disease, history of ocular trauma, and history of eye surgery are simultaneously associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025.

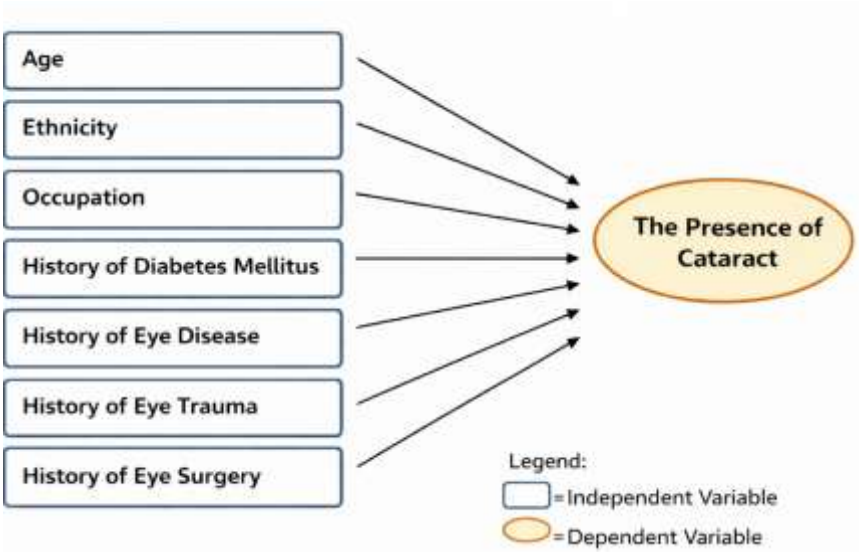

Figure 1. Conceptual Framework

METHODOLOGY

This study employed a quantitative analytic approach with a cross-sectional design. The research was conducted in the Medical Record Unit of Dian Harapan Hospital, Jayapura, Papua. The data analyzed were obtained from electronic medical records of ophthalmology outpatients during the period of January to December 2025, while data extraction and processing were carried out from February to March 2026.

The population consisted of all ophthalmology outpatient visits at Dian Harapan Hospital Jayapura in 2025, totaling 255,731 visits. Based on hospital records, the number of cataract cases during the same period was 35,681. The minimum sample size was determined using the Lemeshow formula for a single population proportion, and the result showed that at least 185 respondents were required. The sample was then selected using purposive sampling based on the availability and completeness of electronic medical record data that met the inclusion criteria. A total of 202 patients were finally included in the analysis, consisting of 151 patients with cataract and 51 patients without cataract.

The dependent variable was the presence of cataract. The independent variables included age, ethnicity, occupation, history of diabetes mellitus, history of eye disease, history of ocular trauma, and history of eye surgery. Univariate

analysis was performed to describe the distribution of respondent characteristics. Bivariate analysis was conducted using the Chi-square test with prevalence ratio as the measure of association. Multivariate analysis was performed using logistic regression to identify the most dominant factor associated with the presence of cataract. Variables with a p-value of less than 0.25 in the bivariate analysis were entered into the multivariate model.

RESEARCH RESULTS

Univariate Analysis

Table 1. Respondent Characteristics

Research Variables	n	%
Presence of Cataract		
Cataract	151	74.8
Non-Cataract	51	25.2
Age Category		
Older Adult (≥60 years)	87	43.1
Non-Older Adult (<60 years)	115	56.9
Ethnicity		
Papuan	120	59.4
Non-Papuan	82	40.6
Occupation		
Working	107	53.0
Not working	95	47.0
History of Diabetes Mellitus (DM)		
Yes	44	21.8
No	158	78.2
History of Eye Disease		
Yes	74	36.6
No	128	63.4
History of Ocular Trauma		
Yes	44	21.8
No	158	78.2
History of Eye Surgery		
Yes	47	23.3
No	155	76.7
Total	**202**	**100.0**

Based on Table 1, it shows that out of 202 respondents, the majority were in the presence of cataract, totaling 151 individuals (74.8%). The non-older adult age category accounted for 115 subjects (56.9%), Papuan ethnicity comprised 120 subjects (59.4%), and 107 subjects were working (53.0%). Furthermore, 158 subjects (78.2%) did not have a history of diabetes mellitus, 128 subjects (63.4%) did not have a history of eye disease, 158 subjects (78.2%) did not have a history of eye trauma, and 155 subjects (76.7%) did not have a history of eye surgery.

Bivariate Analysis
Chi-Square Analysis and Prevalence Ratio

Table 2. Bivariate Analysis of Risk Factors Associated with the Presence of Cataract

Variables	The Presence of Cataract		Total	p-value	RP
	Cataract	Non-cataract			
	n (%)	n (%)	n		Lower–Upper
Age					
Older adult (≥60 years)	81 (93.1)	6 (6.9)	87	0.000	1.53 (1,31-1,79)
Non-older adult (<60 years)	70 (60.9)	45 (39.1)	115		
Ethnicity					
Papuan	95 (79.2)	25 (20.8)	120	0.081	1.16 (0.97–1.38)
Non-Papuan	56 (68.3)	26 (31.7)	82		
Occupation					
Working	81 (75.7)	26 (24.3)	107	0.742	1.03 (0.87–1.21)
Not working	70 (73.7)	25 (26.3)	95		
History of diabetes mellitus					
Yes	37 (84.1)	7 (15.9)	44	0.107	1.17 (0.99–1.37)
No	114 (72.2)	44 (27.8)	158		
History of eye disease					
Yes	54 (73.0)	20 (27.0)	74	0.658	0.96 (0.81–1.13)
No	97 (75.8)	31 (24.2)	128		
History of eye trauma					
Yes	23 (52.3)	21 (47.7)	44	0.000	0.65 (0.48–0.86)
No	128 (81.0)	30 (19.0)	158		
History of eye surgery					
Yes	34 (72.3)	13 (27.7)	47	0.664	0.96 (0.79–1.17)
No	117 (75.5)	38 (24.5)	155		

Based on Table 2, the results of the bivariate analysis demonstrated that only age and history of ocular trauma were significantly associated with the presence of cataract ($p < 0.05$). Individuals classified as older adults (≥60 years) had a significantly higher likelihood of experiencing cataract compared to those in the non-older adult group (PR = 1.53; 95% CI: 1.31–1.79; $p < 0.05$). Furthermore, a history of ocular trauma was also significantly associated with the presence of cataract, with a protective direction of association (PR = 0.65; 95% CI: 0.48–0.86; $p < 0.05$).

In contrast, ethnicity, occupation, history of diabetes mellitus, history of eye disease, and history of eye surgery were not found to be significantly associated with the presence of cataract, as indicated by p-values greater than 0.05. These findings suggest that, within this study population, age and ocular trauma history are the primary factors associated with cataract occurrence at the bivariate level.

Multivariate Analysis
Logistic Regression

Table 3. Final Logistic Regression Model

Research Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Step 1[a]								
Age	-1.941	.474	16.796	1	.000	.144	.057	.363
Ethnicity	-.622	.382	2.656	1	.103	.537	.254	1.134
History of diabetes mellitus	-.561	.523	1.150	1	.284	.570	.204	1.591
History of eye trauma	.873	.409	4.565	1	.033	2.394	1.075	5.333
Constant	-.282	.362	.609	1	.435	.754		
Step 2[a]								
Age	-1.960	.473	17.185	1	.000	.141	.056	.356
Ethnicity	-.489	.360	1.841	1	.175	.613	.303	1.243
History of eye trauma	1.001	.392	6.509	1	.011	2.721	1.261	5.869
Constant	-.494	.307	2.595	1	.107	.610		
Step 3[a]								
Age	-1.988	.471	17.805	1	.000	.137	.054	.345
History of eye trauma	1.016	.387	6.879	1	.009	2.763	1.293	5.905
Constant	-.769	.235	10.712	1	.001	.464		

Variables with a p-value of less than 0.25 in the bivariate analysis were included in the multivariate model, namely age, ethnicity, history of diabetes mellitus, and history of ocular trauma.

Based on Table 3, the results of the final multivariate model demonstrated that a history of ocular trauma was the most dominant factor associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025. This finding is reflected by the highest Exp(B) value of 2.763, with a p-value of 0.009 and a 95% confidence interval of 1.293–5.905.

After controlling for other variables in the model, patients with a history of ocular trauma had approximately 2.763 times higher odds of having cataract compared to those without such a history. This indicates that ocular trauma remains a significant and independent predictor of the presence of cataract within the study population.

DISCUSSION

Characteristics of Respondents in the Presence of Cataract

The results of the univariate analysis showed that among 202 respondents, the majority were in the non-elderly age group, Papuan ethnicity, employed, and did not have a history of diabetes mellitus, history of eye disease, history of ocular trauma, or history of eye surgery. This description indicates that the respondents in this study had diverse characteristics and represent the general profile of ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025 .

The dominance of the non-elderly group in this study indicates that outpatient ophthalmology visits in hospitals are not only derived from the elderly population but also include individuals of productive age. The higher proportion

of respondents from Papuan ethnicity can also be understood as a reflection of the demographic context of the hospital's service area in Jayapura, while the proportion of respondents who were employed indicates that patients seeking treatment were still largely from socially and economically active groups. This pattern is consistent with a study conducted by Alberta in Keerom, Papua, which also showed that patients with eye disorders came from a wide age range, with an average age of 48.24 years, predominantly female, and cataract being the most common diagnosis (Alberta, 2023).

The high proportion of respondents without a history of diabetes mellitus, eye disease, ocular trauma, or eye surgery indicates that most patients in this study presented without specific clinical histories recorded in medical records. In studies using secondary data, such distributions are strongly influenced by patient characteristics, completeness of medical record documentation, and available variables in the healthcare recording system. Similar findings were reported by Pareza et al. (2025) and Martyana (2024), who described respondent characteristics as an initial overview before conducting association analysis.

The Association Between Age and the Presence of Cataract

The results showed that age was significantly associated with the presence of cataract among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025, with a cataract proportion of 93.1% in older adult group and 60.9% in the non-older adult group, RP = 1.53, and p-value = 0.000.

This finding indicates that older patients have a higher risk of developing cataract compared to younger individuals. This is consistent with findings by Martyana (2024) and Latebo et al. (2024), who reported a significantly higher likelihood of cataract occurrence in older age groups. Biologically, this can be explained by degenerative changes in the lens due to aging, including decreased elasticity, nuclear sclerosis, crystallin protein changes, and increased oxidative stress, which ultimately reduce lens transparency (Rizal et al., 2023).

The strong association between age and cataract in this study may also reflect cumulative biological processes and long-term environmental exposures in the elderly. In addition, since this study was conducted in a hospital-based outpatient population, elderly patients presenting for care are more likely to have clinically significant visual impairment, which may explain the higher proportion of cataract in this group. Therefore, elderly individuals represent a priority group for early detection, education, and screening in eye health services.

The Association Between Ethnicity and the Presence of Cataract

The results showed no significant association between ethnicity and the presence of cataract, with cataract proportions of 79.2% in Papuan respondents and 68.3% in non-Papuan respondents, RP = 1.16, and p-value = 0.081. Although descriptively higher in Papuan respondents, the difference was not statistically significant.

Ethnicity is better understood as a marker of social, environmental, behavioral, and healthcare access factors rather than a direct biological cause of cataract. Awidi et al. (2023) highlighted the role of social determinants of health in cataract outcomes and access to surgery, while Elam et al. (2022) emphasized

structural and social barriers in eye care disparities. Similarly, Ramke et al. (2023) explained that cataract-related vision loss is unevenly distributed and influenced by healthcare access inequities.

The lack of significance in this study may reflect indirect effects of ethnicity mediated through unmeasured variables such as occupation, environmental exposure, healthcare-seeking behavior, and access to eye care services. Additionally, ethnicity recorded in medical records represents social identity rather than actual exposure pathways. Therefore, the observed differences are more likely influenced by healthcare and social contexts rather than biological factors alone.

The Association Between Occupation and the Presence of Cataract

The results showed no significant association between occupation and the presence of cataract, with proportions of 75.7% among employed respondents and 73.7% among unemployed respondents, RP = 1.03, and p-value = 0.742.

Theoretically, certain occupations, particularly outdoor work with prolonged ultraviolet exposure, can increase cataract risk through photochemical damage and oxidative stress. Rizal et al. (2023) and Martyana (2024) identified occupation as a potential risk factor. However, other studies such as Das et al. (2021) found no statistically significant association, and Iwundu et al. (2024) reported inconsistent findings across studies.

The non-significant result in this study is likely due to limitations in measuring occupational exposure in medical records. The data only reflect current occupation at the time of hospital visit and do not capture previous occupational history or cumulative exposure. Additionally, many cataract patients were elderly and no longer working, which may obscure relevant exposure histories.

The Association Between History of Diabetes Mellitus and the Presence of Cataract

The results showed that diabetes mellitus was not significantly associated with cataract, although the proportion was higher among diabetic patients (84.1%) compared to non-diabetic patients (72.2%), RP = 1.17, and p-value = 0.107.

Theoretically, diabetes accelerates cataract formation through hyperglycemia-induced sorbitol accumulation, osmotic stress, and oxidative damage. This is supported by Putri et al. (2023) and Martyana (2024). However, this finding is consistent with Norsela et al. (2023), who also found no significant association.

This may be due to limitations in the data, as medical records only indicate the presence or absence of diabetes without assessing duration, glycemic control, or severity. Therefore, the biological effect of diabetes may not be fully captured.

The Association Between History of Eye Disease and the Presence of Cataract

No significant association was found between history of eye disease and cataract, with proportions of 73.0% and 75.8%, RP = 0.96, and p-value = 0.658.

Certain eye diseases, especially those involving chronic inflammation or steroid use, may contribute to cataract formation, such as uveitis (Al-Essa & Alfawaz, 2022). However, in this study, eye disease history mainly included

infections with broad variability, making the effect difficult to assess (Cabrera-Aguas et al., 2022; Gangwe et al., 2022).

Thus, the lack of association is likely due to the broad categorization and limited specificity of medical record data.

The Association Between History of Ocular Trauma and the Presence of Cataract

A significant association was found between ocular trauma and cataract (p-value = 0.000; RP = 0.65; 95% CI = 0.48–0.86), indicating a statistically protective effect.

Theoretically, ocular trauma is a known cause of traumatic cataract due to lens capsule damage and metabolic disruption (Latebo et al., 2024; Okoye GS, 2023; Soleimani et al., 2024). However, the protective effect observed in this study likely reflects data characteristics rather than true biological relationships.

The trauma variable included various conditions such as chemical exposure, irritation, and eye rubbing, not all of which directly lead to cataract. Additionally, patients with trauma may present with acute complaints unrelated to cataract, thus entering the non-cataract group.

The Association Between History of Eye Surgery and the Presence of Cataract

No significant association was found (p-value = 0.664; RP = 0.96).

Although intraocular surgeries such as vitrectomy may accelerate cataract formation (Markatia et al., 2023), most surgical histories in this study were pterygium surgeries, which are not directly related to lens pathology (Agarwal et al., 2022; Sharma et al., 2021).

Thus, the lack of association is likely due to the heterogeneity of surgical types and limitations of secondary data.

The Most Dominant Factor

Multivariate analysis showed that history of ocular trauma was the most dominant factor, with Exp(B) = 2.763, p-value = 0.009, and 95% CI = 1.293–5.905.

Patients with a history of ocular trauma had 2.763 times higher odds of developing cataract compared to those without such history. This finding highlights the importance of considering ocular trauma in clinical assessment, screening, and risk evaluation.

However, interpretation should be cautious due to the broad definition of trauma and limitations in medical record data, which may introduce heterogeneity and affect the strength of association.

CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicate that among ophthalmology outpatients at Dian Harapan Hospital, Jayapura, Papua, in 2025, age and history of ocular trauma were significantly associated with the presence of cataract ($p < 0.05$). Older adults (≥60 years) had a higher prevalence of cataract compared to non-older adults (PR = 1.53; 95% CI: 1.31–1.79; p = 0.000), while history of ocular trauma showed a statistically significant association with the presence of cataract with a protective direction (PR = 0.65; 95% CI: 0.48–0.86; p = 0.000).

Meanwhile, ethnicity, occupation, history of diabetes mellitus, history of eye disease, and history of eye surgery were not significantly associated with the presence of cataract ($p > 0.05$).

The results of the multivariate analysis showed that history of ocular trauma was the most dominant factor associated with the presence of cataract, with the highest Exp(B) value (Exp(B) = 2.763; 95% CI: 1.293–5.905; p = 0.009), indicating a stronger contribution compared to other variables in the final model.

Recommendations

Health service providers are encouraged to strengthen early detection and screening programs for cataract, particularly among older adults and patients with a history of ocular trauma as identified high-risk groups. Efforts to improve the completeness and accuracy of medical record documentation are also essential to support better identification and monitoring of risk factors.

Health professionals should enhance patient education regarding the importance of regular eye examinations, early recognition of visual impairment, and prevention of ocular trauma, including protective measures in daily activities and occupational settings.

FURTHER STUDY

Future researchers are recommended to include additional variables such as ultraviolet exposure, duration and control of diabetes mellitus, steroid use, nutritional status, and access to eye care services, as well as to utilize more comprehensive data sources, in order to better understand factors associated with the presence of cataract.

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