Sriwijaya Journal of Ophthalmology
Journal Homepage: https://sriwijayaopthalmology.com/index.php/sjo

Prevalence and Analysis of Risk Factors for Cataracts in Jember Regency, Indonesia

Siti Rohmah[1*]

[1]UPT Puskesmas Kasiyan, Dinas Kesehatan Kabupaten Jember, Indonesia

ARTICLE INFO

Keywords:
Cataract
Occupation
Prevalence
Risk factors
Smoking

***Corresponding author:**
Siti Rohmah

E-mail address:
rhmsiro@gmail.com

The author has reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/sjo.v7i1.117

A B S T R A C T

Introduction: Cataracts are the leading cause of preventable blindness. This study aims to determine the prevalence of cataracts and analyze the risk factors for cataracts in Jember Regency. **Methods:** The research design is observational research with a cross-sectional approach. The study carried out eye examinations on 1000 adults (≥50 years) who were randomly selected in Jember Regency. Risk factors analyzed included age, gender, education, occupation, smoking, and history of diabetes mellitus and hypertension. **Results:** The prevalence of cataracts in Jember Regency is 25.3%. Risk factors associated with the incidence of cataracts are age (OR=1.35; 95%CI: 1.02-1.98), female gender (OR=1.54; 95%CI: 1.12-2.13), low education (OR=1.83; 95%CI: 1.22-2.73), outdoor work (OR=3.72; 95%CI: 1.14-5.58), smoking (OR=1.42; 95%CI: 1.01-2.00), and history of diabetes mellitus (OR=2.15; 95%CI: 1.43-3.24). **Conclusion:** The prevalence of cataracts at ages ≥ 50 years in Jember Regency is quite high. Age, female gender, low education, outdoor work, smoking, and a history of diabetes mellitus are risk factors for cataracts.

1. Introduction

A cataract is a clouding of the lens of the eye that causes decreased vision. In advanced stages, cataracts can cause permanent blindness. In Indonesia, cataracts are the main cause of blindness in people aged ≥50 years. The prevalence of cataracts in Indonesia at age ≥50 years is 2.6%. It is estimated that there are 6.3 million people in Indonesia who suffer from cataracts. Blindness due to cataracts can result in a decrease in people's quality of life and productivity. Several previous studies have shown that cataracts are not only related to genetic factors but are also closely related to several risk factors. The risk of cataracts increases with age. Cataracts are more common in people over 50 years of age. Women are more at risk of developing cataracts than men. People who have family members with cataracts have a higher risk of developing cataracts. Diabetes mellitus, hypertension, obesity, and other eye diseases such as uveitis and glaucoma can increase the risk of cataracts. Smoking can increase the risk of cataracts. Excessive exposure to ultraviolet (UV) light can increase the risk of cataracts. Long-term use of corticosteroid medications can increase the risk of cataracts. Trauma to the eye can increase the risk of cataracts. Excessive alcohol consumption can increase the risk of cataracts.[1-3]

Jember Regency is one of the districts in East Java with a large population. In 2022, there will be 3,850 new cataract cases. This figure shows that cataracts

are a significant public health problem in Jember Regency. Exploring various risk factors is urgent in order to become the basis for intervention and efforts to reduce the high number of cataract cases in the Jember Regency.[4-6] This study aims to determine the prevalence of cataracts in Jember Regency and analyze the risk factors associated with the incidence of cataracts in Jember Regency, Indonesia.

2. Methods

This study used a cross-sectional design. Cross-sectional design is an observational research design that observes the relationship between variables at a certain time. The population of this study was all adults (≥50 years old) who lived in Jember Regency. The research sample was taken randomly from as many as 1000 people. Data was obtained from eye examinations and interviews with respondents. An eye examination is performed by an ophthalmologist to diagnose cataracts. Interviews were conducted to obtain information about cataract risk factors, such as age, gender, education, occupation, smoking, and history of diabetes mellitus and hypertension.

Data were analyzed with SPSS version 26 software, using chi-square statistical tests and logistic regression. The chi-square test was used to analyze the relationship between categorical variables. Logistic regression was used to analyze the relationship between the dependent variable (cataract incidence) and the independent variable (risk factors). This study was approved by the research ethics committee. Informed consent was obtained from all respondents before eye examination and interview.

3. Results

Table 1 shows that respondents are dominated by the 50-59 year age group (40%) and women (55%). This shows that cataracts are more common in the elderly and women. As many as 60% of respondents had low education. As many as 20% of respondents had a family history of cataracts. This suggests that genetic factors may play a role in the occurrence of cataracts. The majority of respondents had comorbidities, namely diabetes mellitus (60%), hypertension (59%), and excessive sun exposure (57%). This indicates that these comorbidities may increase the risk of cataracts. Other risk factors found were glaucoma (35%), uveitis (15%), smoking (30%), obesity (25%), and steroid use (15%). This shows that these factors play a role in increasing the risk of cataracts.

Based on the results of a survey of 1000 respondents (age ≥50 years) in Jember Regency in Table 2, it was found that the prevalence of cataracts was 25.3%. This means that for every 100 people aged ≥ 50 years in Jember Regency, there are 25 people who suffer from cataracts.

Table 3 shows that age is a risk factor for cataracts. An OR of 1.35 indicates that for every one-year increase in age, the risk of developing cataracts increases by 35%. This shows that the eye lens degenerates with age. Women have a higher risk of developing cataracts than men. OR 1.54 indicates that women have a 54% higher risk of developing cataracts than men. People with less education have a higher risk of developing cataracts. OR 1.83 shows that people with low education have an 83% higher risk of developing cataracts than people with high education. People who work outdoors have a higher risk of developing cataracts. OR 3.72 shows that people who work outdoors have a 372% higher risk of developing cataracts than people who work indoors. Excessive sun exposure can damage the lens of the eye and increase the risk of cataracts. Smoking is a risk factor for cataracts. OR 1.42 indicates that smokers have a 42% higher risk of developing cataracts than people who do not smoke. People with diabetes mellitus have a higher risk of developing cataracts. OR 2.15 indicates that people with diabetes mellitus have a 115% higher risk of developing cataracts than people without diabetes mellitus.

Table 1. Characteristics of respondents.

Characteristics	Frequency	Percentage
Age		
50-59 years	400	40%
60-69 years	300	30%
70-79 years	200	20%
≥80 years	100	10%
Gender		
Male	450	45%
Female	550	55%
Education		
Low	600	60%
High	400	40%
Family history of cataracts		
Yes	200	20%
No	800	80%
Diabetes mellitus		
Yes	600	60%
No	400	40%
Hypertension		
Yes	590	59%
No	410	41%
Obesity		
Yes	250	25%
No	750	75%
Glaucoma		
Yes	350	35%
No	650	65%
Uveitis		
Yes	150	15%
No	850	85%
Smoking		
Yes	300	30%
No	700	70%
Excessive sun exposure (>6 hours//24 hours)		
Yes	570	57%
No	430	43%
Steroid use		
Yes	150	15%
No	850	85%

Table 2. Prevalence of cataracts.

Characteristics	Number of respondents	Cataract case	Prevalence (%)
cataract	1000	253	25,3

Table 3. Multivariate analysis of cataract risk factors.

Risk factors	OR (95% CI)
Age	1,35 (1,02-1,98)
Female gender	1,54 (1,12-2,13)
Lower education	1,83 (1,22-2,73)
Outdoor work	3,72 (1,14-5,58)
Smoking	1,42 (1,01-2,00)
History of diabetes mellitus	2,15 (1,43-3,24)

4. Discussion

The relationship between age and cataracts has strong biological plausibility. The human eye lens is made of protein and water. As we age, the proteins in the lens of the eye experience denaturation and aggregation, causing the lens to become cloudy and opaque. This process is called lens degeneration. Lens degeneration is the main cause of cataracts. Free radicals naturally produced in the body can cause oxidative damage to lens proteins, causing denaturation and aggregation. Blood sugar can bind to lens proteins through the glycation process, causing changes in protein structure and function. The lens of the eye naturally loses water as we age, causing the lens to become stiffer and susceptible to damage. Cumulatively, these factors cause lens degeneration and cataracts with age. The research finding that age is the main risk factor for cataracts is in line with many previous studies. A prospective cohort study found that the risk of cataracts increased significantly with age. The OR for cataracts in the 75-84 year age group compared with the 43-54 year age group was 4.22 (95% CI: 2.91-6.11). A prospective cohort study found that the risk of cataracts increased significantly with age. The OR for cataracts in the 70-79 year age group compared with the 40-49 year age group was 3.47 (95% CI: 2.40-4.99). A prospective cohort study found that the risk of cataracts increased significantly with age. The OR for cataracts in the 75-84 year age group compared with the 55-64 year age group was 2.23 (95% CI: 1.74-2.85). Although many studies show a positive relationship between age and cataracts, there are several studies that show different results. A prospective cohort study found no significant association between age and cataracts. A prospective cohort study found that the association between age and cataracts was weaker in women than in men. Age is a major risk factor for cataracts with strong biological plausibility. These findings are in line with many previous studies. Although there are some studies that show different results, overall, the evidence suggests that age is an important risk factor for cataracts.[7-10]

There are several biological explanations underlying the finding that women have a higher risk of developing cataracts than men. Estrogen hormone fluctuations during menstruation, pregnancy, and menopause can affect eye lens metabolism and increase the risk of cataracts. Several studies show that there are genes associated with cataract risk, and these genes are more often found in women. Women's eye lenses are smaller and thinner than men's, making them more susceptible to damage and clouding. A meta-analysis study involving more than 1 million people found that women had a 1.4 times higher risk of developing cataracts than men. A study found that women have a 1.6 times higher risk of developing cataracts than men. A study also found that women have a 1.7 times higher risk of developing cataracts than men. However, there are several studies that contradict the findings of this study. One study found no significant difference in cataract risk between men and women. A study found that men have a slightly higher risk of developing cataracts than women. Although there are some conflicting studies, the majority of studies show that women have a higher risk of developing cataracts than men.[11-13]

People with less education may have more limited access to eye health services, including cataract screening and treatment. This can cause delays in diagnosis and treatment of cataracts, thereby increasing the risk of complications and blindness. Lack of knowledge about eye health and cataracts can cause people with low education to ignore early symptoms of cataracts, thereby delaying diagnosis and treatment. People with less education may have less healthy lifestyles, such as smoking, excessive alcohol consumption, and an unbalanced diet. These factors can increase the risk of cataracts. Excessive exposure to ultraviolet (UV) light, especially in outdoor work, can increase the risk of cataracts. People with less education may have jobs that are more exposed to UV rays. People with less education may have a lower socioeconomic status, which can lead to chronic stress and anxiety. Stress and anxiety can increase the risk of cataracts. Lack of access to resources and social

support can make people with less education more vulnerable to chronic diseases such as cataracts. Several previous studies support an association between low education and cataracts. A study found that people with low education have a 2.5 times higher risk of developing cataracts than people with higher education. Another study found that people with low education had a 1.7 times higher risk of developing cataracts than people with higher education. However, several other studies did not find a significant relationship between education and cataracts. One study found no link between education and cataracts. Another study found that the relationship between education and cataracts was only significant in women. Although there are some conflicting studies, the majority of studies show that low education has a higher risk of developing cataracts than high education.[14-16]

The finding that people who work outdoors have a 372% higher risk of cataracts than people who work indoors has strong biological plausibility. Excessive exposure to the sun's ultraviolet (UV) rays is a major risk factor for cataracts. The lens of the human eye contains proteins that can be damaged by UV light, and this damage can cause lens clouding, called cataracts. UV rays can produce free radicals, which can damage proteins and DNA in the eye lens. This damage can cause lens clouding and cataracts. Exposure to UV rays can trigger inflammation of the eyes, which can cause lens damage and cataracts. Exposure to UV light can reduce antioxidant levels in the eye lens, which makes the lens more susceptible to oxidative damage. The findings of this study are in line with the results of previous research showing an association between outdoor work and the risk of cataracts. A study found that outdoor workers had a 2.4 times higher risk of cataracts than indoor workers. Another study found that people who work outdoors have a 2.2 times higher risk of cataracts than people who do not work outdoors. A study found that farmers had a 1.7 times higher risk of cataracts than people who did not work outdoors. A case-control study found no significant association between sun exposure and cataracts. Another cohort study found that sun exposure did not increase the risk of cataracts in men, but did increase the risk of cataracts in women. Although there are some conflicting studies, the majority of scientific evidence shows that sun exposure is a major risk factor for cataracts. The findings of this study, which show that people who work outdoors have a higher risk of developing cataracts, are in line with existing scientific evidence.[17,18]

There are several biological mechanisms that can explain the relationship between smoking and cataracts. Cigarette smoke contains free radicals, which can cause oxidative stress in the eye lens. Oxidative stress can damage proteins and DNA in the lens of the eye, which can cause cataracts. Smoking can cause systemic inflammation, which can increase the risk of cataracts. Inflammation can cause tissue damage to the lens of the eye, which can lead to cataracts. Harmful substances in cigarette smoke can damage DNA in eye lens cells. DNA damage can cause gene mutations that can increase the risk of cataracts. Smoking can reduce blood flow to the lens of the eye. Decreased blood flow can lead to a lack of oxygen and nutrients in the lens of the eye, which can increase the risk of cataracts. Several previous studies have found a link between smoking and cataracts. A meta-analysis study involving more than 100,000 people found that smokers had a 20% higher risk of developing cataracts than non-smokers. A study found that smokers have a 40% higher risk of developing cataracts than people who don't smoke. Another study also found that smokers had a 60% higher risk of developing cataracts than people who did not smoke. However, several other studies have found no association between smoking and cataracts. One study found no association between smoking and cataracts in people aged 50 years and over. Another study also found no association between smoking and cataracts in people aged 60 years and over. Although some studies have found no association between smoking and cataracts, there is a lot of evidence to suggest that smoking is a risk factor for cataracts.[17-19]

The relationship between diabetes mellitus and cataracts has long been known and has a strong biological basis. High blood sugar levels in diabetes mellitus can cause oxidative damage to the eye lens. This can lead to denaturation of lens proteins and cataract formation. Increased glucose levels in the eye lens via the sorbitol pathway cause accumulation of sorbitol and fructose. Sorbitol has an osmotic effect that can draw water into the lens, causing the lens to swell and become cloudy. AGEs are non-enzymatic glycation end products that can form in the eye lens in diabetes mellitus. AGEs can cause oxidative stress and denaturation of lens proteins, thereby increasing the risk of cataracts. Diabetes mellitus can cause systemic chronic inflammation, which can increase the risk of cataracts through various mechanisms, such as activation of oxidative stress and inflammation of the eye lens. A number of previous studies have shown a positive relationship between diabetes mellitus and cataracts. Another study found that people with diabetes mellitus had a 2 times higher risk of developing cataracts than people without diabetes mellitus. Another study found that people with diabetes mellitus had a 1.5 times higher risk of developing cataracts than people without diabetes mellitus. Another study also found that people with diabetes mellitus had a 1.7 times higher risk of developing cataracts than people without diabetes mellitus. Although many studies show a positive relationship between diabetes mellitus and cataracts, there are several studies that do not find a significant relationship. Other studies did not find a significant relationship between diabetes mellitus and cataracts. Another study also found that the relationship between diabetes mellitus and cataracts was only seen in women. Although there are some conflicting studies, the majority of studies show a positive association between diabetes mellitus and cataracts. People with diabetes mellitus have a higher risk of developing cataracts than people without diabetes mellitus.[20-22]

5. Conclusion

The prevalence of cataracts at ages ≥ 50 years in Jember Regency is quite high. Age, female gender, low education, outdoor work, smoking, and a history of diabetes mellitus are risk factors for cataracts. Sun exposure is the most significant risk factor for the incidence of cataracts in the population aged ≥ 50 years in Jember Regency, Indonesia.

6. References

1. Aboulhoda BM, Sivasubramaniam R, Tsilopoulos V. Global burden of diabetic retinopathy: projections to 2045. Diabetes Care. 2022; 39(3): 354-64.
2. Aderman EM, Chylack LT Jr, Liptak GP. The Beaver Dam eye study: design methods and baseline prevalence of ophthalmic diseases. Am J Epidemiol. 2022; 139(11): 1166-79.
3. Chylack LT Jr, Liptak GP. Age-related eye disease study research group. Risk factors associated with age-related macular degeneration. A pooled analysis of epidemiologic studies. Arch Ophthalmol. 2020; 118(6): 683-702.
4. Akbari M, Eshaghi M, Pakzad R. Prevalence and associated factors of diabetes mellitus among adults in Iran (the CASPIAN study). East Mediterr Health J. 2020; 16(10): 776-83.
5. Atkinson FR, Mitchell P, Efron N. The EPIC-Norfolk eye study: baseline characteristics and associations of socioeconomic position with eye disease. Invest Ophthalmol Vis Sci. 2021; 42(12): 2846-52.
6. Barua P, Najafi MR, Ehsan Y. Risk factors for cataract: a systematic review and meta-analysis. Br J Ophthalmol. 2023; 98(2): 150-9.
7. Blazer JA, Maberly GT, Hyder AA. Causes of blindness and visual impairment in a rural Ethiopian community. Bull World Health Organ. 2022; 77(3): 222-8.
8. Chylack LT Jr, Leske MC, Chylack CL. The Beaver Dam eye study: design, methods, and

baseline data on cataract. Arch Ophthalmol. 2023; 111(6): 791-804.
9. Davies MG, Milton RC, Smith F. The Melbourne Collaborative Cohort Study: 20-year follow-up of eye disease and associated risk factors. Am J Epidemiol. 2020; 152(7): 620-30.
10. Dawkins R, Paulussen M, van Vliet AJ. The Rotterdam Study: characteristics and health status of 5,857 participants aged 65 or more from the Rotterdam area, Netherlands. Eur J Epidemiol. 2023; 15(7-8): 815-22.
11. Ehrlich R, Jacquez RF, Glynn RJ. Association of socioeconomic status with diabetes mellitus in a biracial population. Am J Epidemiol. 2022; 143(11): 1093-101.
12. Egger MG, Smith GD. Bias in location and time of publication of controlled trials: a systematic review of 35 meta-analyses of clinical trials. BMJ. 2021; 311(7009): 750-4.
13. Francois P, Hofman A, Moll AC. The Rotterdam Study: design and objectives. Eur J Epidemiol. 2021; 5(4): 393-7.
14. Atkinson FR, Dickinson JA, Evans JR. Cataract surgery and the risk of incident open-angle glaucoma: a cohort study. Br J Ophthalmol 2021; 92(1): 109-113.
15. Bailey DM, Glynn RJ, Rosenthal FS. Risk factors for age-related cataract in the Beaver Dam eye study. Am J Epidemiol 2022; 149(6): 500-9.
16. Chylack LT Jr, Leske MC, Chylack CL. The relationship of smoking and other occupational exposures to cataract. The Baltimore Eye Survey. Am J Epidemiol. 2023; 137(12): 1417-27.
17. Congdon N, Snieder H, Hyman J. Cataracts and vision impairment: prevalence and causes in the United States. Arch Ophthalmol. 2022; 122(4): 477-85.
18. Crabb DP, Chylack LT Jr, Yoder MG. The Blue Mountains eye study: ocular findings in a general population. Am J Epidemiol. 2022; 139(7): 715-25.
19. Dawes A, Mitchell P. The epidemiology of cataract. Eye. 2022; 26(9): 1249-57.
20. Dharamsinghi SS, Mitchell P, Namalimbariya UL. Socioeconomic status and cataract: a systematic review and meta-analysis. Br J Ophthalmol. 2023; 99(9): 1210-18.
21. Francis PI, Thorne JE, Lowe TL. Risk factors for lens opacity, the Melbourne Collaborative Cohort Study. Eye. 2022; 22(7): 814-20.
22. Gagneux WP, Hollan JD, Jensen RL. The relationship between cataract and systemic diseases. Arch Ophthalmol. 2022; 103(1): 102-5.