# Association Between Diabetes Mellitus Incidence And Cataract Incidence By Gender And Age

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## Article Info

## ABSTRACT

*Diabetes mellitus is a long-term disease that occurs when the pancreas cannot produce enough insulin or when the body cannot use the insulin produced effectively. The main effect of uncontrolled diabetes is hyperglycemia or elevated blood sugar which can damage many body systems, especially nerves and blood vessels. High glucose levels in people with diabetes mellitus (hyperglycemia) can also cause several health complications including cataracts. Cataract is a condition where the lens of the eye becomes cloudy. It can be caused by various conditions such as aging, exposure to ultraviolet light, diabetes mellitus. Cataract is the leading cause of blindness worldwide. **Research Objective:** To determine the relationship between the incidence of Diabetes Mellitus and the incidence of Cataract Based on Gender, Age. **Research Methods:** This research is a type of Observational Analytical research with a cross-sectional approach. The sampling technique used is non-random sampling, namely purposive sampling, which is a technique that is often used. Sampling techniques that use selected samples based on research subjectivity and are not randomized. **Results:** The number of samples in this study were 30 respondents. 10 respondents had cataracts (10%), 20 respondents had cataracts and diabetes mellitus (20%). Using the spearman correlation test, the p value = 0.001 (p 1) is obtained, which means that patients with diabetes mellitus are at greater risk of suffering cataracts than those without diabetes mellitus. **Conclusion:** Diabetes mellitus has a significant relationship with cataract incidence.*

## INTRODUCTION

Diabetes mellitus is a long-term disease that occurs when the pancreas cannot produce enough insulin or when the body cannot use the insulin produced effectively. The main effect of uncontrolled diabetes is hyperglycemia or elevated blood sugar which can damage many body systems especially nerves and blood vessels (Zia, 2017). Elevated blood glucose levels are a common symptom of a group of metabolic diseases known as type 2 diabetes mellitus (Widiasari et al., 2021).

According to WHO data worldwide, as many as 41 million people die from non-communicable diseases (NCDs) each year, equivalent to 71% of all deaths, with more than 15 million people dying from NCDs in the age range of 30 to 69 years, 85% of whom come from middle-income countries. The four diseases that contribute most to these NCD deaths are cardiovascular disease (17.9 million), cancer (9.3 million) and diseases.

According to the International Diabetes Federation (IDF) in 2019 there were 463 million people worldwide with diabetes or 9.3% of all people of that age. Indonesia ranks third in Southeast Asia with the number of people with diabetes mellitus at 11.3%, with 10.7

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million people. Indonesia ranks 7th out of 10 countries with the highest number of sufferers. Diabetes Mellitus increased from 6.9% to 10.9% in people over 15 years old (Hikmat, 2017).

According to NTB Health Service Data in 2022 diabetes patients in NTB had a total prevalence of 65,284 cases and the highest cases were in East Lombok 14,162 cases and in Central Lombok as many as 10,017 cases. The high number of diabetes cases causes many diabetics to experience hyperglycemia. Hyperglycemia is an increase in blood glucose levels above normal with several disease characteristics, especially diabetes mellitus and various other conditions (Soelistijo & et al, 2019).

High glucose levels in patients with diabetes mellitus (hyperglycemia) can also cause several health complications including cataracts (Sartiwi & Yusuf, 2019).

Cataract is a condition in which the lens of the eye becomes cloudy. It can be caused by various conditions such as aging, exposure to ultraviolet light, diabetes mellitus. Cataracts are the leading cause of blindness worldwide (Feriyani, 2021) Increased blood glucose causes the lens of the eye to swell, unclear or blurry vision, edema of the macula, bleeding of the eye nerve or retina which causes a decrease in vision (Sartiwi & Yusuf, 2019). This research is almost similar to the results of research by Rizkawati, 2012; (Kamil et al., 2020); (Santoso et al., 2022).

In this study using secondary data, the secondary data examined were data on cataract patients with diabetes, but in this study not only included those who were positive for cataracts and positive for diabetes mellitus but also those who were negative.

Based on the background description, the researcher is interested in analyzing data on the relationship between the incidence of diabetes mellitus and the incidence of cataracts in the elderly based on gender and age factors.

## MATERIALS/METHOD

This study used an analytic observational research design, namely research to determine the relationship between the incidence of diabetes mellitus and the incidence of cataracts in the elderly. Based on time including cross-sectional research where data on independent variables (relationship between diabetes mellitus, gender and age) and dependent variables (cataract incidence) are carried out simultaneously in one meeting. This study was conducted at Patut Patuh Patju Hospital with a population of people with diabetes mellitus who have cataract disease. The number of samples used was 30 samples from patients with diabetes mellitus and cataract disease in the Patut Patuh Patju Hospital work area. The sampling technique used was purposive sampling. The type of data used is secondary data. This research was conducted starting from obtaining permission letters, collecting data which included identifying the results of eye poly cataract examination data, identifying diabetes mellitus respondents who had been diagnosed with cataracts based on gender, identifying diabetes mellitus respondents who had been diagnosed with cataracts based on age, then processing data on the results of cataract examinations on respondents who had diabetes mellitus, analyzing data on the results of cataract examinations on respondents who had diabetes mellitus in the eye clinic, then making conclusions and reports.

## RESULTS AND DISCUSSION

Based on secondary data, namely data derived from medical records of cataract patients who came for treatment to the Eye Clinic of Patut Patuh Patju Hospital, West Lombok. The total data is 30 complete medical record data containing medical record number, gender, and history of cataracts and blood sugar history. The following is a table of data on the results of blood glucose examination of cataract patients undergoing treatment at Patut Patuh Patju Hospital:

**Tabel 1.** Data on Blood Glucose Examination Results of Cataract Patient Undergoing Treatment at Patut Patuh Patju Hospital

| No | Sample Code | Male/Female Gender | Age (year) | Glucose Levels (mg/dl) | Category (Cataract/Diabetes Mellitus) |
|---|---|---|---|---|---|
| 1. | S1 | M | 84 years | 333 mg/dl | Cataract, Diabetes mellitus |
| 2. | S2 | F | 65 years | 190 mg/dl | Cataract |
| 3. | S3 | F | 72 years | 150 mg/dl | Cataract |
| 4. | S4 | F | 46 years | 220 mg/dl | Cataract, Diabetes mellitus |
| 5. | S5 | F | 50 years | 244 mg/dl | Cataract, Diabetes mellitus |
| 6. | S6 | F | 44 years | 132 mg/dl | Cataract |
| 7. | S7 | F | 50 years | 183 mg/dl | Cataract |
| 8. | S8 | F | 62 years | 114 mg/dl | Cataract |
| 9. | S9 | M | 58 years | 290 mg/dl | Cataract, Diabetes mellitus |
| 10. | S10 | F | 66 years | 240 mg/dl | Cataract, Diabetes mellitus |
| 11. | S11 | F | 63 years | 255 mg/dl | Cataract, Diabetes mellitus |
| 12. | S12 | F | 55 years | 140 mg/dl | Cataract |
| 13. | S13 | M | 63 years | 270 mg/dl | Cataract, Diabetes mellitus |
| 14. | S14 | F | 80 years | 155 mg/dl | Cataract |
| 15. | S15 | F | 75 years | 241 mg/dl | Cataract, Diabetes mellitus |
| 16. | S16 | F | 56 years | 300 mg/dl | Cataract, Diabetes mellitus |
| 17. | S17 | F | 64 years | 169 mg/dl | Cataract |
| 18. | S18 | F | 69 years | 238 mg/dl | Cataract, Diabetes mellitus |
| 19. | S19 | F | 64 years | 229 mg/dl | Cataract, Diabetes mellitus |
| 20. | S20 | M | 60 years | 244 mg/dl | Cataract, Diabetes mellitus |
| 21. | S21 | M | 64 years | 304 mg/dl | Cataract, Diabetes mellitus |
| 22. | S22 | M | 66 years | 292 mg/dl | Cataract, Diabetes mellitus |
| 23. | S23 | F | 53 years | 290 mg/dl | Cataract, Diabetes mellitus |
| 24. | S24 | F | 57 years | 266 mg/dl | Cataract, Diabetes mellitus |
| 25. | S25 | F | 63 years | 253 mg/dl | Cataract, Diabetes mellitus |
| 26. | S26 | F | 57 years | 233 mg/dl | Cataract, Diabetes mellitus |
| 27. | S27 | F | 69 years | 280 mg/dl | Cataract, Diabetes mellitus |
| 28. | S28 | M | 79 years | 154 mg/dl | Cataract |
| 29. | S29 | F | 49 years | 161 mg/dl | Cataract |
| 30. | S30 | M | 61 years | 245 mg/dl | Cataract, Diabetes mellitus |

Based on (table 1), the normal blood sugar results were obtained as many as 10 people and 20 data were obtained with poor glucose, based on gender, there were more females as many as 22 people and followed by males as many as 8 people.

**Tabel 2.** Distribution of Diabetes Mellitus Respondents with cataract disease Based on Gender in the Working Area of RSUD Patuh Patut Patju

| Gender | Frequency (n) (DM, Cataract) | Frequency (n) (Katarak) | Pecentage % |
|---|---|---|---|
| Male | 7 | 1 | 26 % |
| Female | 13 | 9 | 73,3 % |
| Total | 20 | 10 | 100 % |

Based on (Table 2) it is known that of the 30 Diabetes Mellitus data affected by Cataracts, 20 people with a percentage of female sex are greater than male sex, namely 8 people with a history of cataract disease caused by Diabetes Mellitus and 1 person who only has a history of cataract disease, while women are 22 people with a history of cataract disease caused by Diabetes Mellitus, namely 13 people and 9 people with a history of cataracts alone. From the results of this study it can be concluded that based on gender, women with diabetes mellitus will be more at risk of cataract disease than men.

**Tabel 3**. Distribution of Diabetes Mellitus Respondents with cataract disease Based on Age in the Working Area of Patut Patut Patju Hospital

| Age | Frequence (n) | Percentage % |
|---|---|---|
| 40-49 | 3 | 10 % |
| 50-59 | 8 | 26,67 % |
| 60-69 | 14 | 46,67 % |
| 70-89 | 5 | 16,67 % |
| Jumlah | 30 | 100 % |

Based on (Table 3) it is known that of the 30 cataract data found in the Patut Patuh Patju Hospital work area, the largest group of cataracts is age 60-69, and the least cataract data is age 40-49, as many as 2 people. From the results of this study it can be seen based on the age range, that the age of 60-69 will be more at risk of cataract disease caused by Diabetes Mellitus compared to people who do not have a history of Diabetes Mellitus.

**Tabel 4.** Frequency Distribution of Respondents Based on History of Cataract Disease in the
Working Area of Patut Patut Patju Hospital

| Number | Characteristic | Frequency (n) | % |
|---|---|---|---|
| 1. | Diabetes Mellitus | 20 | 66% |
| 2. | Not Diabetes Mellitus | 10 | 33% |

Based on (Table 4), it is known that out of 30 samples, 20 data were obtained with a history of cataract disease caused by diabetes mellitus and 10 people with a history of cataract disease without diabetes mellitus.

**Tabel 5.** Relationship between diabetes mellitus incidence and cataract incidence

| Correlations | | | Age | Blood Glucose Levels |
|---|---|---|---|---|
| Spearman's rho | Age | Correlation Coefficient | 1.000 | .726[**] |
| | | Sig. (2-tailed) | . | <,001 |
| | | N | 30 | 30 |
| | Blood Glucose Levels | Correlation Coefficient | .726[**] | 1.000 |
| | | Sig. (2-tailed) | <,001 | |
| | | N | 30 | 30 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | |

The results of statistical analysis using the Sperman correlation test obtained a p value = 0.001 (p < 0.05) and a correlation value (726). This means that there is a significant relationship between Diabetes Mellitus and cataract incidence.

Based on the results of this study, there are many risk factors for cataracts, one of which is caused by Diabetes Mellitus. The increase in blood sugar metabolism in the lens causes sorbitol which is thought to be associated with osmotic changes, and can eventually cause clouding of the lens of the eye (Pollreisz & Schmidt-Erfurth, 2010).

Based on table number 1 a person who has cataracts caused by diabetes mellitus is 20 people and 10 people who have cataracts without being caused by diabetes mellitus. the characteristics of respondents in this study were mostly in the age group 60-69 years as many as 14 patients (46.67%), followed by age 50-59 years as many as 8 patients (26.67%), age

70-79 years as many as 5 patients (16.67%), age 40-49 years as many as 3 patients (10%). Based on gender, 22 patients (73.3%) were female, and 8 patients (22%) were male.

Respondents who suffered from cataracts in this study were 30 patients, where most of the cataract patients in the age group 60-69 years were 46.67% and the age group 50-59 years were 26.67%. This is in line with research conducted by Puspita (2019) that the highest prevalence of cataract incidence is 50% at the age of 60-69 years.(Puspita et al., 2019) The main risk factor for cataracts is age, due to the physiological aging process of the eye which increases lens opacity and the accumulation of oxidative stress over the years. The main risk factor for cataracts is age, as the physiological aging process of the eye leads to an increase in lens opacity and the accumulation of oxidative stress over the years (Hugosson & Ekström, 2020).

Female respondents in this study experienced more cataracts, namely 73.3% compared to men only (26%). This is in line with research conducted by Karunika (2022) which found that 70.3% of people suffering from cataracts were female (Karunika et al, 2022). Women are more at risk of suffering from cataracts than men due to decreased estrogen levels in menopausal women, where estrogen plays an important role in protecting the lens from oxidative stress (Hugosson & Ekström, 2020).

The results of statistical testing of data using spearman correlation showed a value of p = 0.001 (p < 0.05) indicating that there was a significant relationship between diabetes mellitus (independent variable) and cataract incidence (dependent variable) at Patut Patuh Patju Hospital. In addition, the OR value of ,726 with a 95% confidence interval indicates that patients with diabetes mellitus have a 608 times greater risk of suffering cataracts than patients who do not have diabetes mellitus.

Accumulation of sorbitol in the lens, changes in lens hydration, increased nonenzymatic glycosylation of lens proteins, and increased oxidative stress caused by changes in lens metabolism are among the factors that may increase the likelihood of cataracts in patients with diabetes mellitus (Linda M. Tsai & 2020-2021, 2023). The main pathway leading to diabetic cataract is the sorbitol pathway, or polyol pathway. Hyperosmotic conditions lead to accumulation of sorbitol due to glucose that cannot be broken down into fructose. This draws aquatic fluid into the lens, damaging the lens structure and causing cataracts (Mrugacz et al., 2023). In addition to diabetes mellitus, some risk factors that can lead to cataracts include age, smoking history, exposure to ultraviolet (UV) light, hypertension, use of corticosteroid medications, ocular trauma, genetics, high myopia, nutrition, exogenous estrogen use, increased Body Mass Index (BMI), and history of alcohol consumption (Linda M. Tsai & 2020-2021, 2023).

## CONCLUSIONS

There is a significant relationship between the incidence of Diabetes Mellitus and the incidence of cataracts by obtaining a value of P = 0.001 with a correlation value of 726 which means that there is a significant relationship between the two variables.

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## REFERENCE

Asih, E.S., Pramudianti, D. and Gunawan, L. S. (n.d.). Perbandingan Hasil Pemeriksaan Hemoglobin Metode. 2019.

Becker, C., Schneider, C., Aballéa, S., Bailey, C., Bourne, R., Jick, S., … Meier, & C. (2018). Becker, C., Schneider, C., Aballéa, S., Bailey, C., Bourne, R., Jick, S., … Meier, C. (2018). Cataract in patients with diabetes mellitus — incidence rates in the UK and risk factors. Eye, 1028–1035.

Endiyasa., Pancawati A., dan U. (2018). Perbedaan Kadar Glukosa Darah Metode Poin of Care Testing (POCT) Dengan Photometer pada Sampel Serum Diwilayah Kerja Puskesmas Jereweh. Jurnal Analis Medika Biosains.

Feriyani, S. N. A. (2021). Prevalensi Penderita Katarak Pada Diabetes Mellitus Tipe 2 Di Rumah Sakit Umum Meuraxa Banda Aceh Tahun 2016. Sains Riset, 11(2), 253–259.

Lestari, L., & Zulkarnain, Z. (2021). Diabetes Melitus: Review etiologi, patofisiologi, gejala, penyebab, cara pemeriksaan, cara pengobatan dan cara pencegahan. In Prosiding Seminar Nasional Biologi Vol. 7(1), 237-241.

Linda M. Tsai, M., & 2020-2021, L. M. R. (2023). Basic and Clinical Science Course, Section 11: Lens and Cataract.

Lukitasari, A. (2011). Katarak Diabetes. Jurnal Kedokteran Syiah Kuala, 11(1), 42–47.

Riamah. (2022). Perilaku Kesehatan Pasien Diabetes Melitus. Pekalongan: NEM. (hal.67).

Rizkawati. (2012). Hubungan Antara Kejadian Katarak Dengan Diabetes Melitus Di Poli Mata RSUD Soedarso Pontianak. 66, 37–39.

Salsabila, D. (2023). Hubungan Tekanan Darah dengan Kadar Glukosa Darah pada Usia Produktif Masyarakat Desa Karangsari.

Santoso, D. B., Doringin, F., Simarmata, M. M., & Sasia, K. (2022). Hubungan Kejadian Katarak dengan Diabetes Melitus di Puskesmas Tanjung Harapan, Marga Tiga, Lampung Timur. Jurnal Mata Optik, 3(2), 37–44.

Soelistijo, S. A., & et al. (2019). Pengelolaan Dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia. PB Perkeni, 133.

Syamsiyah, N. (2022). (2022). Berdamai dengan Diabetes. Jakarta: Bumi Medika.(hal.166).