

## THE IMPACT OF TYPE 2 DIABETES MELLITUS ON POSTOPERATIVE PAIN INTENSITY FOLLOWING PHACOEMULSIFICATION SURGERY: A STUDY AT SILOAM HOSPITAL BEKASI SEPANJANG JAYA

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### ABSTRACT

**Objective :** This study aimed to examine the relationship between type 2 diabetes mellitus and postoperative pain intensity among patients undergoing phacoemulsification cataract surgery.

**Methods :** An analytical observational study was conducted using a cross-sectional design. The population comprised all patients in the post-anesthesia care unit who had undergone phacoemulsification surgery at Siloam Hospital Bekasi Sepanjang Jaya. A total of 52 patients were included using total sampling. Data were collected using a validated pain intensity scale, and the presence of type 2 diabetes mellitus was recorded from medical histories. Statistical analysis was conducted to assess the association between diabetes status and reported pain intensity.

**Results :** The findings showed that the majority of respondents (48.2%) reported mild postoperative pain. A substantial proportion of participants (80.8%) had a documented diagnosis of type 2 diabetes mellitus. Statistical analysis revealed a significant association between the presence of type 2 diabetes mellitus and higher levels of reported postoperative pain intensity ( $p = 0.001$ ), indicating that diabetic patients were more likely to experience moderate to severe pain following phacoemulsification compared to non-diabetic patients.

**Conclusion :** This study concludes that type 2 diabetes mellitus has a significant influence on postoperative pain intensity among phacoemulsification patients. These results suggest the need for more targeted pain management strategies for diabetic patients following ocular surgery, considering their increased vulnerability to higher pain perception during recovery.

**Keywords :** Diabetes Mellitus type 2, Pain, Cataract, Phacoemulsification surgery

### INTRODUCTION

Diabetes mellitus (DM) is a chronic, progressive metabolic disorder characterized by elevated blood glucose levels resulting from defects in insulin secretion, insulin action, or both. It has become a major global health burden, not only as a leading cause of premature mortality but also as a significant contributor to various long-term complications, including cardiovascular disease, nephropathy, neuropathy, and visual impairment. The World Health Organization (WHO) and the International Diabetes Federation (IDF) both emphasize the growing public health concern surrounding diabetes due to its increasing prevalence and the serious complications it can trigger across multiple organ systems.

According to the International Diabetes Federation (2021), approximately 537 million adults between the ages of 20 and 79 years were living with diabetes in 2021. This number is expected to escalate to 643 million by 2030 and reach 783

million by 2045. Among these individuals, more than 90% have type 2 diabetes mellitus (T2DM), a form of the disease strongly associated with modifiable lifestyle factors such as sedentary behavior, obesity, and unhealthy dietary patterns. These statistics highlight the urgency for effective strategies in early detection, prevention, and management of diabetes and its complications.

The consequences of T2DM are not limited to metabolic imbalance; they extend to microvascular and macrovascular complications that compromise patients' quality of life. One such complication is diabetic retinopathy, which affects the blood vessels of the retina and can result in vision loss. Another frequently occurring ocular manifestation among diabetic patients is cataract formation, a condition in which the lens of the eye becomes progressively opaque, leading to blurry vision and, in severe cases, blindness. It is well documented that the prevalence of cataracts is significantly higher in

individuals with diabetes than in the non-diabetic population.

Globally, cataracts remain the most common cause of reversible blindness. The WHO (2022) reports that an estimated 94 million people suffer from cataracts. This condition, although correctable through surgery, often coexists with diabetes, further complicating visual prognosis and postoperative outcomes. Cataracts in diabetic patients are believed to develop earlier and progress more rapidly due to chronic hyperglycemia, which leads to metabolic disturbances in the lens, including the accumulation of sorbitol that causes osmotic stress and clouding.

Indonesia is not exempt from this global trend. The country ranks fifth globally in terms of the number of people living with diabetes, with more than 19.47 million adults diagnosed in 2021. The national prevalence of diabetes among the Indonesian population, which stands at approximately 10.6%, continues to rise annually. Alarmingly, around 44% of diabetic individuals in Indonesia remain undiagnosed, according to IDF estimates (Pahlevi, 2021). The 2018 Basic Health Research (Rskesdas) report by the Ministry of Health revealed an increase in diabetes prevalence by about 8.5% compared to 2013. Only a quarter of diabetic individuals were aware of their condition, indicating a significant public health gap in disease awareness and early diagnosis. In West Java specifically, 1.7% of the population is known to have diabetes mellitus, while cataracts remain the leading cause of blindness, accounting for 81% of cases (Directorate General of Disease Prevention and Control, 2020).

One of the most effective surgical methods for cataract treatment is phacoemulsification, a technique introduced by Charles Kelman in 1967. This method involves emulsifying the cloudy lens using ultrasonic energy, aspirating the fragmented lens, and replacing it with an intraocular lens (IOL). The procedure is minimally invasive, requiring only a small incision (approximately 2.8 to 3.2 mm) and often performed under local anesthesia. Due to its advantages—short surgical time, no need for stitches, and rapid

postoperative recovery—phacoemulsification has become the gold standard for cataract surgery worldwide. However, despite its minimally invasive nature, postoperative discomfort and pain remain common complaints among patients undergoing phacoemulsification. Pain, as defined by the International Association for the Study of Pain (IASP), is a subjective experience involving both sensory and emotional components, often associated with actual or potential tissue damage. Pain perception is influenced by various factors, including psychological state, previous experiences, and comorbid conditions—such as diabetes.

Interestingly, research on pain perception in diabetic individuals has produced mixed results. While some studies report heightened pain sensitivity due to chronic inflammation, others suggest diminished pain sensation, likely attributed to diabetic neuropathy. Neuropathy, a common complication of T2DM, results from long-term hyperglycemia leading to damage of peripheral nerves. This condition can dull the nervous system's response to painful stimuli, causing patients to perceive less pain than non-diabetic individuals even after invasive procedures.

A study by Dadaci et al. (2016) found that although most patients undergoing phacoemulsification reported mild to moderate intraoperative pain, diabetic patients appeared to experience less postoperative discomfort, possibly due to neuropathic changes. Furthermore, preoperative use of analgesics and local anesthetics was noted to influence pain outcomes and improve patient satisfaction. These findings suggest the necessity of examining pain experiences specifically within diabetic populations to tailor pain management strategies more effectively.

Preliminary observations from Siloam Hospital Bekasi Sepanjang Jaya also support the relevance of this investigation. Data collected from January to April 2023 showed a steady number of patients undergoing phacoemulsification (ranging from 54 to 62 per month), with several individuals having a history of T2DM. A brief survey conducted during the

first week of April indicated that 4 out of 10 post-surgical patients with diabetes reported mild stabbing pain within the first hour after the procedure, with pain levels rated between 3 and 4 on a standard pain scale.

These early observations raise critical questions about whether diabetic status has a measurable effect on postoperative pain perception and intensity in patients undergoing phacoemulsification. Understanding this relationship is essential not only for optimizing patient comfort but also for developing individualized pain management protocols that take into account underlying health conditions like T2DM.

Given the growing prevalence of type 2 diabetes mellitus and its impact on surgical outcomes, particularly in ophthalmologic procedures, this study seeks to explore the influence of T2DM on postoperative pain intensity in patients undergoing phacoemulsification cataract surgery. Conducted at Siloam Hospital Bekasi Sepanjang Jaya in 2023, the research aims to determine whether there is a statistically significant difference in pain levels between diabetic and non-diabetic patients during the immediate postoperative period. Furthermore, the study intends to examine whether diabetic neuropathy—commonly present in long-term diabetes cases—may alter pain perception, potentially leading to underreporting or changes in pain thresholds. By identifying this relationship, the findings are expected to contribute to the refinement of pain management strategies, promote individualized patient care, and improve postoperative outcomes, especially in diabetic populations. Ultimately, this research addresses a critical gap in local clinical evidence and aims to support more effective and tailored perioperative interventions for patients with chronic metabolic conditions.

## METHODS

### Study Design

This study employed an analytical observational approach using a cross-sectional design to assess the relationship between type 2 diabetes mellitus and

postoperative pain intensity among patients undergoing phacoemulsification cataract surgery. The cross-sectional method enabled the researchers to observe and analyze variables at a single point in time, providing a snapshot of outcomes during the immediate postoperative period.

### Study Setting and Population

The research was conducted at the postoperative recovery unit of Siloam Hospital Bekasi Sepanjang Jaya, a private hospital in East Bekasi, throughout 2023. The study population comprised all patients who had undergone phacoemulsification cataract surgery during the data collection period.

### Sample and Sampling Technique

A total sampling method was utilized, in which all eligible patients meeting the inclusion criteria were included in the study. The final sample consisted of 52 participants. Inclusion criteria were as follows: patients aged over 18 years, fully conscious postoperatively, able to communicate, and willing to provide informed consent. Patients with cognitive impairment, those under sedation, or those with incomplete medical records were excluded from participation.

### Research Instruments

Data for this study were collected using two main instruments. First, patient medical records were reviewed to identify the presence or absence of type 2 diabetes mellitus. Second, pain intensity was assessed using the Numerical Rating Scale (NRS), a widely validated tool that allows patients to rate their pain on a scale from 0 (no pain) to 10 (worst imaginable pain). This scale is commonly used in clinical settings due to its simplicity, reliability, and ease of administration. Pain scores were recorded within one hour after the surgery while the patient was in the postoperative recovery room. To ensure consistency and accuracy, the data collection was carried out by trained nurses under the supervision of the research team.

### Data Collection Procedure

Data collection was carried out in the post-anesthesia recovery room during the immediate postoperative phase, typically within one hour following surgery. Trained nursing personnel, under the supervision of the research team, recorded the pain scores reported by each patient and cross-checked the medical record data to determine diabetes status. Participants were first briefed about the study and asked to provide written informed consent prior to any data being recorded.

### Data Analysis

Data analysis was conducted in two stages. Univariate analysis was used to describe the distribution of key variables, including demographic characteristics (such as age and gender), diabetes status, and reported pain intensity. This analysis provided an overview of the sample's characteristics and pain experiences. To assess the relationship between type 2 diabetes mellitus and postoperative pain intensity, bivariate analysis was performed using the Chi-square test. This statistical test was

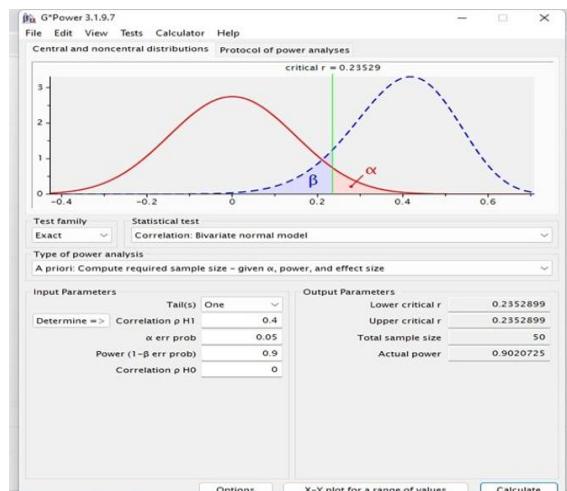
chosen to examine the association between two categorical variables: diabetes status (yes/no) and pain intensity (mild/moderate/severe). A p-value of less than 0.05 was considered statistically significant, indicating a meaningful correlation between the presence of diabetes and the level of postoperative pain experienced.

### Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of Siloam Hospitals Group. All ethical principles, including respect for human dignity, informed consent, confidentiality, and the right to withdraw, were strictly upheld throughout the study. Participants were informed of the purpose, procedures, and potential risks of the study and were assured that their participation was voluntary and that their data would remain confidential. The study complied with the ethical guidelines outlined in the Declaration of Helsinki and applicable national regulations

The sample obtained using the *G Power formula* as follows:

Figure 1:G power



## RESULT

Table 1. Frequency Distribution of Respondent Characteristics Based on Age, Education and Type Sex

Characteristics	Frequency	Percentage
<b>Age</b>		
46-55 years	7	13.5
56-65 years	30	57.7

> 65 years	15	28.8
<b>Total</b>	<b>52</b>	<b>100.0</b>
<b>Education</b>		
No school	8	15.4
Base	24	46.2
Intermediate	14	26.9
Tall	6	11.5
<b>Total</b>	<b>52</b>	<b>100.0</b>
<b>Gender</b>		
Man	30	57.7
Woman	22	42.3
<b>Total</b>	<b>52</b>	<b>100.0</b>

Based on the table above, it can be seen that of the 52 respondents studied, the majority were aged 56-65 years as many as 30 people (57.7%), aged >65 years as many as 15 people (28.8 %), and aged 46-55 years as many as 7 people ( 13.5 %). Based on education, the majority of the 52 respondents had basic education (elementary school/junior high school) as many as 24 people ( 46.2 %), those with secondary education (high school/equivalent) as many as 14 people ( 26.9 %) , those with higher education as many as 6 people (11.5%) and those who did not attend school as many as 8 people (15.4%). Based on gender , the majority of the 52 respondents were male, 30 people (57.7%), and 22 people ( 42.3 %) were female .

Table 2. Frequency Distribution of Pain Intensity in *Postoperative* Patients  
*Phacoemulsification*

No	Pain Intensity	Frequency	%
1.	No pain	0	0.0
2.	Mild pain	25	48.1
3.	Moderate pain	20	38.5
4.	Severe pain	7	13.5
<b>Amount</b>		<b>52</b>	<b>100.0</b>

Based on the table above, it can be seen that of the 52 respondents, the majority experienced pain with mild pain intensity. as many as 25 people ( 48.1 %), moderate pain as many as 20 people (38.5%), severe pain as many as 7 people (13.5%) and respondents who did not experience pain were not found (0%).

Table 3. Frequency Distribution of Type 2 DM Disease History in *Post- Phacoemulsification* Surgery Patients

No	History of Type 2 DM Disease	Frequency	%
1.	There is a history	42	80.8
2.	No history	10	19.2
<b>Amount</b>		<b>52</b>	<b>100.0</b>

Based on the table above, it can be seen that of the 52 respondents, the majority had type 2 DM, as many as 42 people ( 80.8 %), and respondents who did not have a history of type 2 DM were 10 people (19.2%).

Table 4. The Effect of Type 2 Diabetes Mellitus on Pain Intensity in Postoperative Patients  
*Phacoemulsification*

History of Type 2 DM Disease	Pain Intensity						Total	P. Value		
	Mild pain		Moderate pain		Severe pain					
	F	%	F	%	F	%				
There is a history	15	35.7	20	47.6	7	16.7	42	100.0		
No history	10	100.0	0	0.0	0	0.0	10	100.0		

<b>Total</b>	<b>25</b>	<b>48.1</b>	<b>20</b>	<b>38.5</b>	<b>7</b>	<b>13.5</b>	<b>52</b>	<b>100.0</b>	<b>0.0</b>	<b>0</b>
										<b>1</b>

Based on the table above, it can be seen that out of 42 Respondents who had a history of type 2 DM mostly experienced pain with moderate pain intensity of 20 people (47.6%), of the 10 respondents who did not have a history of type 2 DM, all experienced pain with mild pain intensity of 10 people (100%). *Cross tabulation* results between history variables Type 2 DM disease with pain intensity in post -

## **DISCUSSION**

### **Pain Intensity in Post-Phacoemulsification Surgery Patients**

From the research results, it can be seen that of the 52 respondents, the majority experienced pain with mild pain intensity. as many as 25 people (48.1%), moderate pain as many as 20 people (38.5%), severe pain as many as 7 people (13.5%) and respondents who did not experience pain were not found (0%).

Pain is an unpleasant sensory and emotional experience resulting from actual or potential tissue damage. Pain is always the first reason for someone to seek health care assistance (Smeltzer, 2015). *The International Association for The Study of Pain* or IASP defines pain as "a subjective unpleasant sensory and emotional experience associated with actual or potential tissue damage or experienced during the event in which I perceive such damage." (Potter & Perry, 2017).

The results of this study are in line with the results of a study conducted by Diantari (2022) which stated that post-cataract surgery patients had an average pain intensity of moderate with a pain scale of 4.70. Sari's study (2022) also stated that the pain intensity in post-cataract surgery patients had an average pain intensity with a pain scale of 5. In line with a study conducted by Turk J Ophthalmol (2016) with the results that 68 patients (73.9%) reported pain after surgery. In line with a study by porele Tiihonen et al (2013) in Dadaci et al (2016) found that 34% of patients complained of post-operative pain with 10% describing very severe pain the day after surgery and some said pain 2

*phacoemulsification* surgery patients shows the results of the *Chi-Square statistical test* obtained a value of P.0.00 1 ( *P.Value* < 0.05) which means there is a significant influence between the history of Type 2 DM disease with pain intensity in post - *phacoemulsification* surgery patients .

hours post-operatively, not only cataract surgery with phacoemulsification *alone* , a study conducted by Chiu YH, et al (2018) said the results showed that type 2 DM is related to the intensity of post-operative pain in various other types of surgery.

According to the researcher's assumption that the pain felt by the patient is moderate pain that causes restless pain and can still be tolerated by the patient. The pain felt by the patient is caused by the surgical procedure performed.

### **Type 2 DM Disease in Post- Operative Patients Phacoemulsification**

From the research results, it can be seen that of the 52 respondents, the majority had type 2 DM, as many as 42 people (80.8%), and respondents who did not have a history of type 2 DM were 10 people (19.2%).

Diabetes mellitus is a metabolic disorder in which found inability to oxidize carbohydrates due to disturbance in the normal insulin mechanism. People with diabetes mellitus will have higher blood sugar levels than people normal. One of the complications of diabetes mellitus is complications chronic microvascular that can affect the eyes. Microvascular complications such as cataracts are often found when a diagnosis of diabetes mellitus is made. One of the most common causes of cataracts is DM. DM is a metabolic disease that continues to increase every year due to population growth and lifestyle changes in modern times. In the long term, high blood sugar levels in DM sufferers can be one of the things that influences the development of further complications that continue to

other organs, such as the eyes (Astri et al., 2018).

The results of this study are in line with the results of Rizky Alifzan's study (2021) which stated that from a total sample of 163 people, 132 people suffered from senile cataracts, of which 87 people were diagnosed positive for DMT2. Meanwhile, 31 people from the total sample were included in other types of cataracts, of which 12 people were diagnosed positive for DMT2.

From the J Clin Med (2019) study, it was stated that Diabetes Mellitus is a dry eye syndrome where research in hospitals showed that 54.0% of diabetes patients suffer from this, the development of symptoms with dry eyes in patients with Diabetes Mellitus is associated with diabetic neuropathy, epithelial lesions are found in 64% of diabetes patients and are more common in type 2 diabetes mellitus than type 1 diabetes.

According to the researcher's assumptions, the research results show that the majority of *post-operative* respondents *phacoemulsification* has a type 2 DM disease of 80.8%, this is because DM is at risk of various diseases including cataracts. Diabetes affects lens metabolism by increasing sorbitol levels in the lens due to high blood sugar. Sorbitol creates high osmotic pressure on the lens, causing it to become over-hydrated and is associated with the development of cataracts.

### **The Effect of Type 2 Diabetes Mellitus on Pain Intensity in Post - Phacoemulsification Surgery Patients**

From the results of the study it can be seen that of the 42 respondents who had a history of type 2 DM, most experienced pain with moderate pain intensity as many as 20 people (47.6%), of the 10 respondents who did not have a history of type 2 DM, all experienced pain with mild pain intensity as many as 10 people (100%). The results of cross tabulation between the variables of type 2 DM history and pain intensity in *post - phacoemulsification* surgery patients showed the results of the *Chi-Square* statistical test obtained a value of P.0.001 (P.Value <0.05) which means there is a

significant influence between the history of type 2 DM and pain intensity in *post-phacoemulsification* surgery patients .

Diabetes has been found to be one of the most important factors causing higher analgesic requirements in the postoperative period and increased complications in orthopedic surgery, especially if uncontrolled. Patients with diabetes mellitus undergoing surgery have been reported to have higher postoperative pain intensity compared to non-diabetic patients (Martínez-Alpuche, et al, 2021).

The results of this study are in line with the results of Rocio Adriana's research. (2021) who stated that 60% of diabetic patients experienced severe pain (NRS  $\geq$  8) compared to 20% of non-diabetic patients (P = 0.006). The time to onset of postoperative pain was approximately 35 minutes in both groups.

According to the researcher's assumption from the results of the study conducted at Siloam Hospital, the majority of respondents had type 2 Diabetes Mellitus with moderate pain of 47.6%. This shows that diabetes mellitus can affect all human health. Diabetes mellitus is a disease with disorders that occur in the metabolism of carbohydrates, fats and proteins where insulin does not work optimally, so that it can interfere with the health of the body and can trigger all kinds of diseases such as kidney, heart, eyes, and nervous system. Therefore, untreated diabetes can cause heart disease, stroke, kidney disease, blindness, and nerve damage in the legs .

In this study titled "The Impact of Type 2 Diabetes Mellitus on Postoperative Pain Intensity Following Phacoemulsification Surgery: A Study at Siloam Hospital Bekasi Sepanjang Jaya", no prior research was found that specifically addresses this topic. Most existing studies focus more generally on pain levels before and after phacoemulsification, without examining the influence of type 2 diabetes mellitus as a determining factor. Through this study, it is expected that patients with type 2 diabetes who maintain stable blood glucose levels and receive appropriate medical management will experience more manageable postoperative pain.

Conversely, poorly controlled or fluctuating blood sugar levels may negatively affect wound healing and increase the risk of complications after surgery. Therefore, effective communication and collaboration between ophthalmologists and internists is essential to ensure proper monitoring and regulation of blood glucose levels, in alignment with established clinical guidelines and care programs.

## CONCLUSION

This study demonstrates a significant relationship between type 2 diabetes mellitus and the intensity of postoperative pain in patients who have undergone phacoemulsification cataract surgery. The results revealed that most diabetic patients reported moderate pain intensity, while all non-diabetic patients experienced only mild pain. These findings suggest that the presence of type 2 diabetes mellitus may influence pain perception and response following cataract surgery, potentially due to underlying pathophysiological mechanisms such as diabetic neuropathy or persistent hyperglycemia that affects tissue healing and nerve sensitivity. The high prevalence of type 2 diabetes among the study participants further underscores the importance of routine screening and integrated perioperative management for diabetic patients undergoing eye surgery. It is essential for clinicians, particularly ophthalmologists and internists, to collaborate closely in managing blood glucose levels before and after surgery to minimize complications and optimize postoperative outcomes. By identifying the association between diabetes status and pain intensity, this study contributes valuable insights for the development of individualized pain management strategies in surgical settings. Further research with a larger sample size and a multi-center approach is recommended to validate and expand upon these findings. Ultimately, ensuring optimal glycemic control and early intervention in diabetic patients can play a key role in reducing postoperative discomfort and enhancing overall recovery after phacoemulsification procedures.

## REFERENCE

Aini, AN, & Santik, YDP (2018). Senile Cataract Incidence at Tugurejo Regional Hospital. HIGEIA (Journal of Public Health Research and Development), 2(2), 295–306. <https://doi.org/10.15294/higeia.v2i2.20639>

Astri, N. et al. (2018) 'Diabetes Mellitus as a Risk Factor for Cataracts In The Wonosari Hospital', pp. 1–9.

Chiu YH, et al. (2018). The Effects of Diabetes on Postoperative Pain Outcomes: A Systematic Review. PLOS ONE, 13(9)

Dadaci, Z. Borazan, M. Acir, NO (2016). Pain Perception in Phacoemulsification with Topical Anesthesia and Evaluation of Factors Related to Pain . Accessed via <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5200818/>.

Diantari, (2021). The Effect of Lavender Aromatherapy on Pain Intensity of Post-Cataract Surgery Patients in the Recovery Room of Siloam Hospitals Bali

Gurnani, B. & Kaur, K. (2022). Phacoemulsification. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK576419/#:~:text=Phacoemulsification%20is%20a%20modern%20cataract,mm%2C%20giving%20perfect%20visual%20outcomes> .

J Clin Med, (2019). *Candida* sp. Infection in Diabetes Mellitus Patients. [https://www.ncbi.nlm.nih.gov.translate.goog/pmc/articles/PMC6352194/?\\_x\\_tr\\_sl=en&\\_x\\_tr\\_tl=en&\\_x\\_tr\\_hl=en&\\_x\\_tr\\_pto=tc](https://www.ncbi.nlm.nih.gov.translate.goog/pmc/articles/PMC6352194/?_x_tr_sl=en&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=tc)

Ministry of Health Directorate General of Health Services. (2022). Pain Management. Accessed through [https://yankes.kemkes.go.id/view\\_artikel/1052/manajemen-penyeri#:~:text=Pain%20is%20a%20common%20problem%20in%20patients%20with%20diabetes%20mellitus](https://yankes.kemkes.go.id/view_artikel/1052/manajemen-penyeri#:~:text=Pain%20is%20a%20common%20problem%20in%20patients%20with%20diabetes%20mellitus)

20form%20of%20discomfort%20good,react%20to%20eliminate%20pain.

Ministry of Health of the Republic of Indonesia. (2021). Stay Productive, Prevent and Treat Diabetes Mellitus. Accessed via <https://www.kemkes.go.id/downloads/resources/download/pusdatin/infodatin/Infodatin%202020%20Diabetes%20Melitus.pdf>.

Makarim, (2019). Diabetes Can Cause Cataracts, Here's Why. <https://www.halodoc.com/artikel/diabetes-bisa-sebabkan-katarak-ini-alasannya>

Martínez-Alpuche, R. , Brindis-Fuentes, E. , Guzmán-Priego, C. , Valenzuela-Priego, F. , Parra-Flores, L. and Torres-López, J. (2021) Diabetic Patients Develop Greater Intensity of Postoperative Pain Than Non-Diabetics After Cholecystectomy Open: A Pilot Study. *Journal of Biosciences and Medicine* , 9, 67-75. doi: [10.4236/jbm.2021.96006](https://doi.org/10.4236/jbm.2021.96006) .

Pahlevi Reza, ( 2021 ) . The Number of Diabetes Sufferers in Indonesia is the Fifth Largest in the World. <https://databoks.katadata.co.id/data/publish/2021/11/22/the-number-of-diabetics-in-indonesia-is-the-fifth-largest-in-the-world>

Potter, PA & Perry, AG (2017). *Nursing Fundamentals Textbook: Concepts, Processes, and Practices*. Vol 2 . Jakarta: EGC

Rocío Adriana et all (2021). Diabetic Patients Develop Greater Intensity of Postoperative Pain than Non-Diabetics after Open Cholecystectomy: A Pilot Study. *Journal of Biosciences* and Medicines, 2021, 9, 67-75 <https://www.scirp.org/journal/jbm>

Rizky Alifzan (2021) *The Relationship Between Type 2 Diabetes Mellitus and Cataracts at the Eye Polyclinic of Wahidin Sudirohusodo Hospital in the Period January - December 2019*. Thesis, Hasanuddin University

Sari (2022). The Effect of Deep Breathing Relaxation Techniques and Dhikr on Reducing Post-Cataract Surgery Pain Scale. *Babul Ilmi\_ Scientific Journal of Multi Science Health* <https://jurnal.stikes-aisiyah-palembang.ac.id/index.php/Kep/article/view/126> Vol. 14, No. 2, December 2022, Pages 65-76 e-ISSN 2622-6200 | p-ISSN 2087-8362

Smeltzer, S., & Bare. (2015). *Textbook of Medical Surgical Nursing* . Jakarta: EGC.

Turk J Ophthalmol. (2016). Pain Perception in Phacoemulsification with Topical Anesthetics and Evaluation of Factors Associated with Pain. *Turkish Journal of ophthalmology*. [https://www.ncbi.nlm.nih.gov.translate.google/pmc/articles/PMC5200818/?\\_x\\_tr\\_sl=en&\\_x\\_tr\\_tl=id&\\_x\\_tr\\_hl=id&\\_x\\_tr\\_pto=tc](https://www.ncbi.nlm.nih.gov.translate.google/pmc/articles/PMC5200818/?_x_tr_sl=en&_x_tr_tl=id&_x_tr_hl=id&_x_tr_pto=tc)

World Health Organization. (2022). Blindness and vision impairment. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment>.

World Health Organization. (2023). Diabetes. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/diabetes>.