



## **Analysis and Management of Potential Drug Interactions in Patients With Diabetes Mellitus and Comorbidities at Hospital X**

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### **Abstract**

Diabetes mellitus is a chronic metabolic disease that is frequently accompanied by comorbidities, requiring the use of multiple medications (polypharmacy). This increases the risk of potential drug interactions that may reduce therapeutic effectiveness and increase the incidence of adverse drug reactions. This study aimed to analyze potential drug interactions in patients with diabetes mellitus and comorbidities based on severity, interaction mechanisms, and recommended drug interaction management strategies. This descriptive observational study employed a retrospective approach using secondary data obtained from the medical records of patients with diabetes mellitus and comorbidities at Hospital X during the January–December 2025 period. A total of 93 patients who met the inclusion criteria were included in the study. Potential drug interactions were analyzed using the Drugs.com Drug Interaction Checker. The results identified 154 potential drug interactions. Based on severity, moderate interactions were the most common, accounting for 123 cases (80%), followed by minor interactions with 28 cases (18%) and major interactions with 3 cases (2%). Based on interaction mechanisms, pharmacodynamic interactions were more frequent, with 103 cases (67%), than pharmacokinetic interactions, with 51 cases (33%). Recommended drug interaction management strategies included therapeutic monitoring, dose adjustment, modification of drug administration time, and drug substitution when necessary. These findings highlight the importance of identifying and managing potential drug interactions to improve medication safety and therapeutic effectiveness in patients with diabetes mellitus and comorbidities.

**Keywords:** Comorbidity, Diabetes Mellitus, Drug Interaction, Interaction Management, Polypharmacy.



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### **INTRODUCTION**

Diabetes mellitus (DM) is a chronic metabolic disease that occurs due to impaired insulin secretion, decreased insulin sensitivity, or a combination of both, resulting in persistently elevated blood glucose levels (American Diabetes Association, 2025). According to the World Health Organization (WHO), diabetes is one of the noncommunicable diseases with continuously increasing incidence and is a major cause of various serious complications, including cardiovascular disease, kidney failure, blindness, and lower-limb amputation (World Health Organization., 2024). Data from the International Diabetes Federation (IDF) indicate that the prevalence of diabetes mellitus worldwide continues to increase and is projected to rise further over the coming decades (International Diabetes Federation, 2025).

In addition to causing long-term complications, such as cardiovascular disease, nephropathy, neuropathy, and retinopathy (American Diabetes Association, 2025), patients with diabetes mellitus also require long-term pharmacological treatment; therefore, adherence to therapy is an important factor in achieving successful treatment outcomes. A study by Novitasari, Yuliawati, Pondawinata, and Permatasari showed that medication adherence among patients with type II diabetes mellitus was associated with patients' psychological conditions, indicating that continuous therapeutic monitoring is needed to improve clinical outcomes (Novitasari et al., 2025). Most patients with diabetes mellitus also have



comorbidities, such as hypertension, chronic kidney disease, and heart disease, and therefore require long-term combination therapy involving multiple medications (Aripin et al., 2024; Artiany & Gamayana Trimawang Aji, 2021). Patients with diabetes mellitus and comorbid diseases generally require more than one type of medication. Such polypharmacy increases the likelihood of drug-drug interactions that may affect therapeutic success (Refdanita, & Sukmaningsih, 2021). The risk of drug interactions increases with the number of medications used, particularly in patients with chronic diseases and comorbidities (Murray, A. D., & Khezrian, 2020). These findings are also supported by Fariansiska and Mayasari, who reported that patients with diabetes mellitus receiving polypharmacy had a higher potential for drug interactions than patients using fewer medications (Fariansiska & Mayasari, 2024).

Several studies in Indonesia have shown that the potential for drug interactions among patients with chronic diseases remains relatively high. A study by Jelly Permatasari et al. in patients with hypertension receiving polypharmacy showed that most drug interactions were categorized as moderate, indicating the need for therapeutic monitoring and periodic evaluation of medication use (Permatasari et al., 2024). These findings are supported by Ulya et al., who reported that interactions involving antidiabetic drugs may affect the clinical outcomes of patients with type 2 diabetes mellitus. These results indicate that drug interaction identification is an important component of clinical pharmacy services to improve the safety and effectiveness of therapy (Ulya et al., 2023).

Hospital X is one of the hospitals with a relatively high number of visits by patients with diabetes mellitus. Based on preliminary survey data, there were 1,247 patients with diabetes mellitus during the January–December 2025 period. This condition may increase the occurrence of polypharmacy and drug interactions, particularly among patients with comorbid diseases. Identification of potential drug interactions using the Drugs.com Drug Interaction Checker can help healthcare professionals determine the severity and mechanism of interactions and identify appropriate management recommendations, thereby minimizing the risk of undesirable effects. Several studies in Indonesia have shown that potential drug interactions remain common among patients with chronic diseases, particularly those receiving polypharmacy. Therefore, this study aimed to analyze potential drug interactions in patients with diabetes mellitus and comorbidities based on interaction severity and mechanism and to develop drug interaction management recommendations to support safe, rational, and effective medication use.

## **RESEARCH METHODS**

### **Research Design**

This study was a non-experimental observational study with a descriptive design using a retrospective approach. The study data were obtained from the medical records of patients with diabetes mellitus and comorbidities who received treatment at Hospital X during the January–December 2025 period. The study aimed to analyze potential drug interactions based on severity, interaction mechanisms, and drug interaction management recommendations.

### **Study Population and Sample**

The study population consisted of all patients with diabetes mellitus and comorbidities who received treatment at Hospital X during the January–December 2025 period, totaling 1,247 patients. The sample size was determined using the Slovin formula with a 10% margin of error, resulting in 93 patients. Sampling was conducted using a purposive sampling technique based on inclusion and exclusion criteria. The inclusion criteria were patients diagnosed with diabetes mellitus accompanied by comorbid diseases, receiving antidiabetic therapy either as



monotherapy or combination therapy, and having complete medical record data. The exclusion criteria were patients with gestational diabetes mellitus and patients who died during hospitalization.

### Data Type

This study used secondary data obtained from patients' medical records. The collected data included medical record number, age, sex, diagnosis of diabetes mellitus, comorbid diagnoses, and the types of medications received by patients during therapy. All data obtained were kept confidential and used solely for research purposes.

### Research Instrument

The research instrument consisted of a data collection sheet used to record patient characteristics and the treatment regimens received. Potential drug interactions were analyzed using the Drugs.com Drug Interaction Checker, which identifies interactions based on severity (minor, moderate, and major) and interaction mechanisms (pharmacokinetic and pharmacodynamic). The identified interactions were then used as the basis for developing drug interaction management recommendations.

### Data Analysis

The data were analyzed descriptively and presented in frequency distribution tables and percentages. The analysis included patient characteristics based on sex and age, the distribution of potential drug interactions according to severity and interaction mechanism, and drug interaction management recommendations. The percentage of each variable was calculated using the following formula: The analysis results were then interpreted to describe the pattern of potential drug interactions among patients with diabetes mellitus and comorbidities at Hospital X.

### Ethical Clearance

This study used secondary data in the form of patients' medical records without including patient identities, thereby maintaining data confidentiality. The study was conducted after obtaining permission from Hospital X before the data collection process.

## RESEARCH RESULTS AND DISCUSSION

### Research Result

This study was conducted at Hospital X among patients with diabetes mellitus and comorbidities during the January–December 2025 period. Based on medical record data, there were 1,247 patients with diabetes mellitus. Patients were then selected according to the inclusion and exclusion criteria, resulting in 93 patients as the study sample. All patient medication regimens were analyzed using the Drugs.com Drug Interaction Checker to identify potential drug interactions based on interaction mechanisms, severity, and drug interaction management recommendations.

**Table 1. Characteristics of patients with diabetes mellitus and comorbidities based on sex and age**

| Characteristics | Number (n) | Percentage (%) |
|-----------------|------------|----------------|
| Male            | 39         | 42             |
| Female          | 54         | 58             |
| 26–45 years     | 14         | 15             |
| 46–65 years     | 63         | 68             |
| >65 years       | 16         | 17             |
| <b>Total</b>    | <b>93</b>  | <b>100</b>     |

Based on Table 1, female patients predominated in this study, with 54 patients (58%), whereas male patients accounted for 39 patients (42%). This finding indicates that females were more frequently affected by diabetes mellitus than males in the study population. This condition may be influenced by hormonal changes, particularly after menopause, which lead to decreased estrogen levels and increased insulin resistance. In addition, women generally have a higher percentage of body fat, which may increase the risk of diabetes mellitus. This finding is consistent with studies by Faradita et al. and Susanti et al., which reported a higher prevalence of diabetes mellitus among females (Nabila Faradita Istutilah, Rina Kriswiatiny, Dalfian, 2025; Susanti et al., 2024). Based on age groups, most patients were in the 46–65-year age range, comprising 63 patients (68%). This finding indicates that the incidence of diabetes mellitus increases with age. The aging process causes a decline in pancreatic  $\beta$ -cell function, increased insulin resistance, and reduced physical activity, all of which contribute to impaired glucose metabolism. Therefore, this age group has a higher risk of developing diabetes mellitus and comorbid diseases. This finding is consistent with the discussion in the thesis and previous studies stating that age is an important risk factor for diabetes mellitus.

**Table 2. Distribution of potential drug interactions based on interaction mechanism**

| Interaction mechanism | Number of cases | Percentage (%) |
|-----------------------|-----------------|----------------|
| Pharmacokinetic       | 51              | 33             |
| Pharmacodynamic       | 103             | 67             |
| <b>Total</b>          | <b>154</b>      | <b>100</b>     |

Based on Table 2, 154 potential drug interactions were identified among 93 patients. Pharmacodynamic interactions were the most frequently identified mechanism, with 103 cases (67%), whereas pharmacokinetic interactions accounted for 51 cases (33%). The predominance of pharmacodynamic interactions indicates that most drug combinations affect pharmacological effects without altering drug absorption, distribution, metabolism, or elimination. This condition is common among patients with diabetes mellitus and comorbidities because antidiabetic drugs are often used concomitantly with antihypertensive agents, analgesics, antiplatelet agents, and other medications that may produce additive or antagonistic effects. This finding is consistent with the study by Permatasari et al., which showed that pharmacodynamic interactions predominated among patients with hypertension receiving polypharmacy (Permatasari et al., 2024). Utami and Octavia also reported that pharmacodynamic interactions were the most common mechanism among patients with type 2 diabetes mellitus and comorbidities (Utami & Octavia, 2022). In addition, Fariansiska and Mayasari stated that combinations of antidiabetic drugs with medications for comorbid diseases were a major contributor to the increased potential for pharmacodynamic interactions (Fariansiska & Mayasari, 2024).

**Table 3. Distribution of potential drug interactions based on severity**

| Severity     | Number of cases | Percentage (%) |
|--------------|-----------------|----------------|
| Minor        | 28              | 18             |
| Moderate     | 123             | 80             |
| Major        | 3               | 2              |
| <b>Total</b> | <b>154</b>      | <b>100</b>     |

Based on Table 3, most drug interactions were categorized as moderate, with 123 cases (80%), followed by minor interactions with 28 cases (18%) and major interactions with 3 cases (2%). The predominance of moderate interactions indicates that most interactions can still be managed through therapeutic monitoring, dose adjustment, or modification of medication

administration times without discontinuing therapy. Nevertheless, these interactions still require attention because they may affect treatment effectiveness if regular monitoring is not performed. The grouping based on interaction mechanism and severity provides a general overview of the characteristics of the drug interactions identified. However, to determine which drug combinations most frequently interacted, an analysis of the drug pairs identified during the study was conducted. This analysis is important because each drug combination has a different interaction mechanism, clinical impact, and management recommendation.

**Table 4. Drug combinations with the highest interaction frequencies**

| Drug combination               | Frequency | Mechanism       | Severity |
|--------------------------------|-----------|-----------------|----------|
| Metformin – Glimepiride        | 31        | Pharmacodynamic | Moderate |
| Omeprazole – Glimepiride       | 15        | Pharmacokinetic | Minor    |
| Candesartan – Pregabalin       | 12        | Pharmacodynamic | Moderate |
| Omeprazole – Megabal           | 11        | Pharmacokinetic | Minor    |
| Candesartan – Levemir          | 6         | Pharmacodynamic | Moderate |
| Metformin – Natrium Diklofenak | 5         | Pharmacodynamic | Moderate |
| Glimepiride – Ranitidin        | 5         | Pharmacodynamic | Moderate |
| Ranitidin – Metformin          | 5         | Pharmacokinetic | Moderate |

Based on Table 4, the metformin–glimepiride combination was the drug pair with the highest frequency of potential interactions, with 31 cases. This combination is commonly used in patients with type 2 diabetes mellitus whose glycemic control is not yet optimal. The interaction is pharmacodynamic because both drugs have synergistic glucose-lowering effects, thereby potentially increasing the risk of hypoglycemia. Therefore, patients require regular blood glucose monitoring and education regarding the signs and symptoms of hypoglycemia. Other high-frequency interactions included omeprazole–glimepiride (15 cases), candesartan–pregabalin (12 cases), and omeprazole–Megabal (11 cases). The combination of omeprazole with glimepiride or Megabal represents a pharmacokinetic interaction that may affect drug absorption or metabolism and therefore requires evaluation of the therapeutic response. Meanwhile, the combination of candesartan and pregabalin represents a pharmacodynamic interaction that may increase the risk of hypotension, particularly in older patients. In addition to high-frequency interactions, this study also identified major interactions, namely amlodipine–simvastatin and simvastatin–fenofibrate, although their frequencies were relatively low. These combinations require special attention because they may increase the risk of myopathy and rhabdomyolysis, and therefore therapy evaluation or dose adjustment may be necessary. The metformin–glimepiride combination was the most frequently identified combination. The two drugs act through different mechanisms and therefore provide a synergistic effect in lowering blood glucose levels, but they also increase the risk of hypoglycemia. This finding is consistent with the study by Refdanita and Sukmaningsih, which showed that oral antidiabetic combinations were the largest contributor to potential drug interactions in patients with diabetes mellitus (Refdanita, & Sukmaningsih, 2021). Rasdianah et al. also reported that combinations of antidiabetic drugs with medications for comorbid diseases increased the risk of drug interactions in patients with type 2 diabetes mellitus (Rasdianah & Gani, 2021).

**Table 5. Recommended management strategies for potential drug interactions**

| Management strategy                            | Objective                               |
|------------------------------------------------|-----------------------------------------|
| Monitoring blood glucose levels                | Detect hypoglycemia or hyperglycemia    |
| Monitoring renal function                      | Prevent drug toxicity                   |
| Dose adjustment                                | Reduce the risk of adverse effects      |
| Modification of medication administration time | Minimize the occurrence of interactions |



Based on the study results, most drug interactions can still be managed through therapeutic monitoring, dose adjustment, modification of medication administration time, and evaluation of the treatment regimen when necessary. The role of clinical pharmacists is very important in conducting prescription review, identifying potential drug interactions, and providing recommendations to physicians so that the safety and effectiveness of therapy in patients with diabetes mellitus and comorbidities can be maintained. Most drug interactions in this study could still be managed through therapeutic monitoring, dose adjustment, and modification of medication administration time. The role of clinical pharmacists is very important in identifying potential drug interactions before therapy is administered to patients. This is consistent with the study by Permatasari et al., which emphasized the importance of evaluating drug interactions in patients receiving polypharmacy (Permatasari et al., 2024). In addition, Soleh and Putri stated that early identification of drug-related problems can improve the safety and effectiveness of therapy in patients with diabetes mellitus (Soleh & Putri, 2023).

## Discussion

The predominance of female patients in this study, accounting for 54 patients (58%), indicates that diabetes mellitus was more frequently observed among female patients than male patients in the study population. This condition may be influenced by hormonal changes, particularly after menopause, which can lead to decreased estrogen levels and increased insulin resistance. In addition, women generally have a higher percentage of body fat, which may contribute to an increased risk of diabetes mellitus. This finding is consistent with studies by Faradita et al. and Susanti et al., which reported a higher prevalence of diabetes mellitus among females (Nabila Faradita Istutilah, Rina Kriswiatiny, Dalfian, 2025; Susanti et al., 2024). The largest proportion of patients was in the 46–65-year age group, comprising 63 patients (68%). This finding indicates that diabetes mellitus is more frequently observed in older adults. Aging is associated with decreased pancreatic  $\beta$ -cell function, increased insulin resistance, and reduced physical activity, which may contribute to impaired glucose metabolism. Therefore, individuals in this age group may have a higher risk of developing diabetes mellitus and comorbid diseases. This finding is consistent with previous research stating that age is an important risk factor for diabetes mellitus.

The results showed that pharmacodynamic interactions were more common than pharmacokinetic interactions, accounting for 103 cases (67%) and 51 cases (33%), respectively. The predominance of pharmacodynamic interactions indicates that most potential interactions identified in this study were associated with changes in pharmacological effects rather than changes in drug absorption, distribution, metabolism, or elimination. The high occurrence of pharmacodynamic interactions may be related to the concomitant use of antidiabetic medications with drugs for comorbid conditions, including antihypertensive agents, analgesics, antiplatelet agents, and other medications. These combinations may produce additive or antagonistic pharmacological effects. This finding is consistent with the study by Permatasari et al., which showed that pharmacodynamic interactions predominated among patients with hypertension receiving polypharmacy (Permatasari et al., 2024). Similarly, Utami and Octavia reported that pharmacodynamic interactions were the most frequently identified mechanism among patients with type 2 diabetes mellitus and comorbidities (Utami & Octavia, 2022). Fariansiska and Mayasari also stated that combinations of antidiabetic drugs with medications used to treat comorbid diseases were major contributors to the increased potential for pharmacodynamic interactions (Fariansiska &

Mayasari, 2024). Most potential drug interactions identified in this study were classified as moderate, accounting for 123 cases (80%), followed by minor interactions with 28 cases (18%) and major interactions with 3 cases (2%). The predominance of moderate interactions indicates that most potential interactions can still be managed through appropriate therapeutic monitoring, dose adjustment, or modification of medication administration time without necessarily discontinuing therapy. Nevertheless, moderate interactions still require clinical attention because they may affect treatment effectiveness or increase the risk of adverse effects if not appropriately monitored. This finding is consistent with the study by Permatasari et al., which reported that moderate interactions were predominant among patients receiving polypharmacy and emphasized the importance of regular therapeutic monitoring (Permatasari et al., 2024).

The metformin–glimepiride combination had the highest frequency of potential interactions, with 31 cases. This combination is commonly used in patients with type 2 diabetes mellitus when glycemic control is not adequately achieved with a single antidiabetic agent. The interaction was classified as pharmacodynamic and moderate because both medications have glucose-lowering effects that may increase the potential risk of hypoglycemia when used concomitantly. Therefore, patients receiving this combination require regular blood glucose monitoring and appropriate education regarding the signs and symptoms of hypoglycemia. This finding is consistent with Refdanita and Sukmaningsih, who reported that combinations of oral antidiabetic drugs were the largest contributors to potential drug interactions among patients with diabetes mellitus (Refdanita, & Sukmaningsih, 2021). Rasdianah and Gani also reported that combinations of antidiabetic medications with drugs used to treat comorbid diseases could increase the risk of drug interactions in patients with type 2 diabetes mellitus (Rasdianah & Gani, 2021).

Other frequently identified combinations included omeprazole–glimepiride, candesartan–pregabalin, and omeprazole–Megabal. The omeprazole–glimepiride and omeprazole–Megabal combinations were classified as pharmacokinetic interactions, indicating that the potential interaction may be related to changes in drug absorption or metabolism and therefore requires evaluation of the patient's therapeutic response. Meanwhile, the candesartan–pregabalin combination was classified as a pharmacodynamic interaction and may increase the risk of hypotension, particularly in older patients. Therefore, monitoring of blood pressure and the patient's clinical condition is important when these medications are administered concomitantly. In addition to these frequently occurring interactions, major interactions were identified between amlodipine–simvastatin and simvastatin–fenofibrate, although their frequencies were relatively low. These combinations require particular attention because they may increase the risk of myopathy and rhabdomyolysis; therefore, evaluation of the treatment regimen or dose adjustment may be necessary.

The management strategies identified in this study included blood glucose monitoring, renal function monitoring, dose adjustment, modification of medication administration time, and evaluation or substitution of medications. These strategies should be selected according to the mechanism and severity of each potential interaction. Blood glucose monitoring is particularly important for drug combinations that may increase the risk of hypoglycemia or affect glycemic control. Renal function monitoring is also important because impaired renal function may increase the risk of drug accumulation and toxicity. Dose adjustment may be considered when the potential interaction can be managed by modifying drug exposure, while modification of medication administration time may help minimize certain interactions. For major interactions, evaluation or substitution of medications may be necessary when the potential risk outweighs the expected therapeutic benefit.

The role of clinical pharmacists is important in identifying potential drug interactions through prescription review and medication evaluation and in providing recommendations to physicians. This is consistent with Permatasari et al., who emphasized the importance of evaluating drug interactions in patients receiving polypharmacy (Permatasari et al., 2024). In addition, Soleh and Putri stated that early identification of drug-related problems can improve the safety and effectiveness of therapy in patients with diabetes mellitus (Soleh & Putri, 2023). Therefore, routine identification and management of potential drug interactions are important components of pharmaceutical care for patients with diabetes mellitus and comorbidities, particularly those receiving multiple medications.

## CONCLUSION

This study showed that among 93 patients with diabetes mellitus and comorbidities, 154 potential drug interactions were identified. Based on interaction mechanisms, pharmacodynamic interactions were the most frequently identified, with 103 cases (67%), whereas based on severity, moderate interactions predominated, with 123 cases (80%). The metformin–glimepiride combination was the drug pair with the highest frequency of potential interactions. Most interactions could still be managed through therapeutic monitoring, dose adjustment, modification of medication administration time, and evaluation of the treatment regimen. Therefore, routine identification of potential drug interactions is necessary to improve the safety and effectiveness of therapy in patients with diabetes mellitus and comorbidities.

## BIBLIOGRAPHY

- American Diabetes Association. (2025). Standards of care in diabetes. *Diabetes Care*, 48(1), S1–S350.
- Aripin, A., Ismaya, N. A., Pratiwi, R. D., Indah, F. P. S., & Azzahra, E. (2024). Evaluasi Penggunaan Obat Antidiabetes Pada Pasien Diabetes Mellitus Dan Terdapat Hipertensi Di Rumah Sakit Uin Syarif Hidayatullah. *Edu Masda Journal*, 8(1), 72. <https://doi.org/10.52118/edumasda.v8i1.214>
- Artiany, S., & Gamayana Trimawang Aji, Y. (2021). Gambaran Komorbid pada Pasien Hemodialisis di Rumah Sakit Angkatan Udara (RSAU) drEsnawan Antariksa. *Jurnal Keperawatan Cikini*, 2(2), 1–6. <https://doi.org/10.55644/jkc.v2i2.57>
- Fariansiska, N. P., & Mayasari, S. (2024). Identification Of Oral Antidiabetic Drug Interactions In Polypharmacy Prescription Of Patients Diabetes Mellitus At Jember Hospital. *Jurnal EduHealth*, 15(03), 2024. <https://doi.org/10.54209/eduhealth.v15i03>
- International Diabetes Federation. (2025). *IDF Diabetes Atlas (11th ed.)*. International Diabetes Federation.
- Murray, A. D., & Khezrian, M. (2020). An overview of prevalence, determinants and health outcomes of polypharmacy. *British Journal of Clinical Pharmacology*, 86(10), 1812–1818. <https://doi.org/https://doi.org/10.1111/bcp.14305>
- Nabila Faradita Istutilah, Rina Kriswiatiny, Dalfian, T. P. (2025). Pengaruh Jenis Kelamin Terhadap Prevalensi Non-Proliferative dan Proliferative Retinopati Diabetik Pada Pasien Diabetes Melitus Tipe 2 di Rumah Sakit Bintang Amin. *Jurnal Medika Malahayati*, 9(3), 538–545.
- Novitasari, R., Pondawinata, M., & Permatasari, J. (2025). Korelasi Depresi Terhadap Kepatuhan Pengobatan Pasien Diabetes Melitus Tipe II Di Wilayah Kerja Puskesmas Pakuan Baru Jambi. *Indonesian Journal of Pharma Science*, 7(1), 9–15. <https://online-journal.unja.ac.id/ijps/article/view/35124>



- Permatasari, J., Mitra, A. D., & Ilmi, M. (2024). Polifarmasi Pasien Hipertensi Rawat Jalan Di Rumah Sakit X Di Kabupaten Batang Hari Periode Januari - Maret Tahun 2023. 5, 23–28.
- Rasdianah, N., & Gani, A. S. W. (2021). Interaksi Obat Pada Pasien Diabetes Melitus Tipe 2 Dengan Penyakit Penyerta Di Rumah Sakit Otanaha Kota Gorontalo. Indonesian Journal of Pharmaceutical Education, 1(1), 40–46. <https://doi.org/10.37311/ijpe.v1i1.9953>
- Refdanita, & Sukmaningsih, V. (2021). Potensi interaksi obat pasien diabetes melitus Tipe-2 dengan Hipertensi di Rumah Sakit “ X ” Periode 2019. Jurnal Sainstech Farma, 14(1), 50–51.
- Soleh, A. A. P. M., & Putri, L. I. (2023). Identifikasi Drug Related Problems (DRPs) Pada Pasien Diabetes Melitus Tipe 2 Di Rawat Inap. Journals Of Ners Community, 13(2), 346–352.
- Susanti, N., Raniah, S., Sari, N. C., & Agustin, A. M. (2024). Kejadian Penyakit Diabetes Melitus Di Upt Puskesmas Stabat. Jurnal Kesehatan Masyarakat, 8, 6355–6361.
- Ulya, N., Zanetha, A., Sibuea, E., Purba, S. S., Ikka, A., & Herbawani, C. K. (2023). Analisis Faktor Risiko Diabetes pada Remaja di Indonesia. Journal Volume 4, Nomor 3, September 2023, 4(September), 2332–2341.
- Utami, P. R., & Octavia, D. R. (2022). Study of potential interactions of oral antidiabetic drugs in patients with type 2 diabetes mellitus with comorbidities: A retrospective study. Pharmacy Education, 22(2), 200–206. <https://doi.org/10.46542/pe.2022.222.200206>
- World Health Organization. (2024). Diabetes. <https://www.who.int/news-room/fact-sheets/detail/diabetes>