JURNAL ILMU KEFARMASIAN INDONESIA
Indonesian Journal of Pharmaceutical Sciences
ISSN p-ISSN 1693-1831 (Print) e-ISSN 2614-6495 (Online) PUBLISHER : Faculty of Pharmacy Universitas Pancasila

Evaluation of the rationality of drugs use inpatient patients with type 2 diabetes mellitus of 2023 at Hospital Y Depok

Sondang Khairani1*, Reise Manninda1, Bitya Aulia Wijayanti[1]

[1]Departement of Clinical Pharmacy, Faculty of Pharmacy, Universitas Pancasila, Jakarta, 12640

*Corresponding Author: sondang.khairani@univpancasila.ac.id ; Tel. +62-813-6520-3071

Received: 02 January 2025 / Accepted: 26 April 2025

ABSTRACT: Diabetes mellitus is a chronic disease caused by failure to control blood glucose levels. Type 2 Diabetes Mellitus (T2DM) is a condition of hyperglycemia caused by the failure of insulin to maintain balanced blood sugar levels. If T2DM is not treated it will cause complications. One way to control T2DM is the rational use of antidiabetic drugs. This study aims to look at the demographic data of inpatients with T2DM, patterns of drug use, rationality for drug use, and the relationship between the rationality of drug use and therapeutic outcomes in inpatients with T2DM at Hospital Y Depok for the period 2023. The outcome evaluated is a random blood sugar test. The research method was carried out descriptively and inferentially with a cross-sectional design. There were 122 samples that met the inclusion criteria, women predominantly suffered from type 2 diabetes mellitus (50.89%). The most common age range was 46-65 years (64.56%). As many as 84.31% of patients used the JKN payment method. The most widely used class of type 2 diabetes mellitus medication is insulin. In evaluating the rationality of using type 2 diabetes mellitus drugs, the rationality results were 99.49% correct drug, 100% correct dose, and 98.73% correct administration. The results of statistical tests show that there is a correlation between the rationality of drug use and clinical outcomes p-value 0.001.

KEYWORDS: Evaluation, rationality, type 2 diabetes mellitus.

INTRODUCTION

Diabetes mellitus is a chronic disease caused by the failure to control blood glucose levels. In 2021, around 536.6 million adults worldwide suffered from diabetes, and it is projected that by 2030, the number of diabetes mellitus patients will increase to 643 million [1]. Indonesia ranks fifth among countries with the highest number of diabetes sufferers, with approximately 19.5 million Indonesians affected in 2021 [1]. The number of diabetes mellitus patients in West Java is expected to reach 645,390 by 2023 [2]. Additionally, in 2023, there will be 3,802 new cases of inpatient diabetes mellitus, making it the second most common cause of hospitalization in Depok [3].

The World Health Organization (WHO) estimates that more than half of all medicines are prescribed, administered, or sold inappropriately, and half of all patients fail to use medicines correctly [4]. Prescription medications are crucial tools that doctors use to cure diseases, relieve symptoms, and prevent illnesses [5]. The rational use of drugs aims to ensure that patients receive appropriate treatment with the correct dosage and duration, at an affordable price [6]. Irrational drug use contributes to a decrease in the quality of therapeutic outcomes [7], thus medical therapy must be carried out rationally.

In the research conducted by Ramdini et al. (2020), 96.25% of the therapy for type II diabetes at the Puskesmas Pasir Sakti was found to be rational [8]. In a study by Fatimah (2022) at the Puskesmas Tawangsari Sukoharjo, the rationality of T2DM treatment was 78.41% [9]. Another study by Hidayat et al. (2023) at Dr. Moewardi Surakarta Hospital found that the rationality of therapy for diabetes mellitus patients was 93.81% [10].

The use of irrational drugs can lead to a higher risk of hypoglycemia, drug interactions, and reduced medication adherence, which can increase hospitalization lengths, deaths, and healthcare costs [11]. According to a WHO survey, irrational drug use is the cause of death in one-third of patients worldwide [4]. Assessment of drug use, correct diagnosis and appropriate medication are important to reduce the risk of DM and improve the patient's quality of life. This study aims to look at the demographic data of inpatients with T2DM, patterns

How to cite this article: Khairani SK, Manninda RM, Wijayanti BA. Evaluation of the rationality of drugs use inpatient patients with type 2 diabetes mellitus of 2023 at Hospital Y Depok. JIFI. 2025; 23(1):92-97.

ISSN: 2614-6495

of drug use, rationality for drug use, and the relationship between the rationality of drug use and therapeutic outcomes in inpatients with T2DM at Hospital Y Depok for the period 2023.

MATERIALS AND METHODS

Tools and materials

The materials used in this research consist of data obtained from medical records of T2DM patients hospitalized at Hospital Y Depok during 2023. The tools used in this study include research and data collection permits from Hospital Y Depok, ethical clearance from RSCM UI with number KET-197/UN2.F1/ETIK/PPM.00.02/2024, a data collection sheet, PERKENI 2021 guidelines, and the IBM SPSS Statistics application.

Research study design

The research was conducted descriptively and inferentially using a cross-sectional study design, variable measurements were carried out simultaneously. Patient data were retrospectively collected, specifically data from the past based on medical record entries regarding drug usage among T2DM inpatients at Hospital Y Depok during 2023. Data collection took place in the medical records room at Hospital Y Depok and was recorded on a data collection sheet to provide an overview of management. The analysis was based on PERKENI (Indonesian Endocrine Society) 2021 guidelines, followed by a conclusion. PERKENI is used to determine the rational use of drugs such as the right drug, the right dose, the right route of administration and the right frequency.

Sample criteria

Inclusion criteria for the study are inpatients aged over 17 years diagnosed with T2DM, with or without comorbidities, and who received T2DM drug therapy, along with patients with complete medical records. Exclusion criteria included inpatients who passed away or were discharged home prematurely while undergoing T2DM therapy.

Data collection and organization

Data collected for this research comprised secondary data, namely medical record entries. Collection was conducted through the medical records of T2DM patients hospitalized at Hospital Y Depok in 2023, meeting the inclusion criteria. Data from medical records included age, gender, diagnosis, comorbidities, drug class, drug names or types, and therapy outcomes. Data organization involved grouping information into a pre-created data collection sheet based on patient identity, including age, gender, diagnosis, drug class, drug names or types, and therapy outcomes.In this research data used all sample is 104 patiens.

Data evaluation and analysis

Patient characteristics, such as gender, age, payment method, and therapy outcomes, were evaluated. The rationality of drug usage in T2DM patients was assessed according to PERKENI 2021 guidelines, considering drug class, names or types, dosage, frequency of use, and method of administration. Accuracy parameters included the correctness of the drug, dosage, frequency, and administration method. Descriptive, analytical, and inferential analyses were employed to assess the rationality of drug usage in T2DM patients, based on PERKENI 2021 and other relevant literature. Spearman correlation analysis was utilized to explore the relationship between drug usage rationality and therapy outcomes, with results displayed in tables and descriptions using SPSS.

RESULTS AND DISCUSSION

Inpatiens T2DM characteristic

Table 1. Table of Inpatient Characteristics of T2DM Patients Hospital Y Depok for the 2023 Period.

	n (patient)	Percentage (%)
Gender		
Female	62	59.62
Male	42	40.38
Age (years)		
17-25	2	1.92
26-45	16	9.62
46-65	64	61.53
>65	28	26.92
Length of stay (days)		
< 5	71	68.27
6-10	31	29.81
11	2	1.92
Payment method		
BPJS	104	100

In this study, a total of 71 (58.20%) inpatients were female, while 51 (41.80%) were male. Generally, males are diagnosed with T2DM earlier. They typically have insulin resistance, higher fasting blood glucose levels, and higher visceral fat compared to females. However, females have greater risk factors when diagnosed with T2DM. Psychosocial stress plays a significant role in diabetes risk in women. Fluctuations in hormones due to reproductive factors are also involved. Menopause can increase the cardiometabolic risk profile in women [12]. There were 2 (1.64%) patients aged 17-25 years, 16 (13.11%) patients aged 26-45 years, and the highest number of patients, 74 (60.66%), fell into the 46-65 age group. Patients over 65 years old totaled 30 (24.59%). This aligns with data from the IDF Diabetes Atlas, which shows the highest prevalence of diabetes mellitus in the 45-65 age group [1]. The onset of diabetes at a younger age carries a higher risk of complications. Microvascular complications of diabetes are associated with younger T2DM patients, while macrovascular complications are related to older patients [12]. In women, the risk factors for T2DM increase after menopause [12], [14]. A total of 104 (85.26%) patients used BPJS insurance as their payment method, 13 (10.66%) used non-BPJS insurance, and 5 (4.08%) were self-paying patients. In a previous study, 61.67% of T2DM inpatients used BPJS payment methods [14]. Among inpatients, 11 (9.02%) had no comorbidities, while 111 (90.98%) did. The most common comorbidities included bacterial infections, electrolyte imbalances, and kidney disease. There is an increased incidence and severity of infections in diabetic patients, associated with disruptions in both non-specific and adaptive immune responses in a hyperglycemic environment. Diabetic patients have twice the risk of death from infections compared to individuals without diabetes [15]. Hypokalemia is associated with insulin secretion disorders and decreased peripheral glucose utilization, leading to increased hyperglycemia [16]. Diabetes mellitus is one of the leading causes of chronic kidney disease and end-stage renal disease. Structural and functional changes occur in the kidneys due to diabetes, resulting in proteinuria, hypertension, and progressive decline in kidney function [17]. Weight control is also crucial for T2DM patients. Failure to achieve target levels of HbA1c, blood pressure, LDL, and cholesterol levels may increase the progression of diabetic kidney disease to end-stage renal disease [18].

Total of 29 (24.59%) patients used monotherapy for antidiabetic medication, among them, 2 (2.46%) were in the biguanide group, 9 (7.38%) were in the sulfonylurea group, 0% were DPP-4 inhibitors, 0% were alpha-glucosidase inhibitors, 0% were SGLT-2 inhibitors, 0% were thiazolidinediones, and 18 (14.75%) patients received insulin monotherapy. A total of 93 (76.23%) patients received combination therapy. This study is consistent with previous research indicating that combination therapy for antidiabetic drugs is more commonly used [14].

Antidiabetic drug usage profile

Table 2. Table of Antidiabetic Drug Usage Profile

Class of antidiabetic drugs	Combination	n (patient)	Percentage (%)
Biguanides	Monotherapy	2	1.92
Sulfonylurea	Monotherapy	7	6.73
Insulin	Monotherapy	16	15.38
	Combination	79	75.96
Total		104	100

The mechanism of action of biguanides is to decrease liver glucose production and increase sensitivity to insulin. Other drug groups that can increase insulin secretion include thiazolidinediones, sulfonylureas, and DPP-4 inhibitors. However, DPP-4 inhibitors work differently by inhibiting glucagon secretion. Alpha-glucosidase inhibitors work by inhibiting glucose absorption. SGLT-2 inhibitors work on the kidneys by inhibiting glucose reabsorption in the renal tubules [19], [20].

Some patients use insulin when experiencing severe hyperglycemia accompanied by ketosis, hyperglycemic crises, failure with optimal-dose oral antidiabetic combination, severe kidney or liver dysfunction, perioperative conditions, or ICU admission [19, 20]. Continuous intravenous insulin therapy is commonly used. However, certain conditions need to be met, such as appropriate indications, adequate facilities, potassium levels >3mEq/L, and the use of short-acting insulin. Basal insulin with an intravenous route can be used when combined with prandial insulin with a ratio of 50% divided into 3 doses. Initial doses of prandial insulin range from 5-10 IU given 3 times. Long-acting insulin is given if the patient's blood glucose levels are controlled but their fasting blood glucose levels remain high.

Not all inpatients require insulin therapy to control blood glucose levels. When blood sugar targets are within the target, oral antidiabetic medication is enough. Patients may receive insulin therapy if they experience metabolic stress, nutritional intake disturbances, additional testing, corticosteroid use, or organ dysfunction complications [19].

Evaluation of Rationality in Drug Usage

Table 3. Table of Evaluation of Rationality in Drug Usage.

Rationality parameter	n (patient)	Percentage (%)
Right drug	103	99.04
Wrong drug	1	0.96
Right Dosage	104	100
Wrong dosage	0	0
Right administration	102	98.8
Wrong administration	2	1.92
Right frequency	104	100
Wrong frequency	0	0

Evaluation of the rationality of drug use in the appropriate medication category for inpatients with T2DM at Hospital Y Depok in 2023 amounted to 121 (99.18%) patients. This is because the antidiabetic drugs given to patients are in line with the therapy needed based on the diagnosis determined by the attending physician as listed in the medical records. However, consideration should be given to the use of insulin for patients experiencing metabolic disturbances due to diabetes complications. One part of the treatment for diabetic ketoacidosis is insulin therapy [19]. The appropriateness of indications can also be assessed from the alignment of objective patient data, such as patients' blood glucose data. Patients have received therapy according to the diagnosis of T2DM established by the doctor. Previous research conducted by Annisawati (2023) showed that the evaluation result of the drug use category for the appropriate medication category was 74.14% [19, 21].

The evaluation of the rationality of drug use in the appropriate dosage category for inpatients with T2DM at Hospital Y Depok in 2023 amounted to 117 (95.90%) patients. In a study conducted by Fatimah (2022), the accuracy of dosage was 89.77% [9]. Insulin therapy can be adjusted according to the total daily insulin requirement from pre-treatment insulin doses or calculated as 0.5-1 unit/kgBW/day. Adjustment of doses is needed for geriatric patients or those with kidney dysfunction [19].

The administration of insulin with continuous low-dose intravenous infusion has become the standard in most medical service centers. The goal of using this method is to reduce the occurrence of metabolic complications compared to large intermittent doses of insulin. Metabolic complications avoided include hypoglycemia, hypokalemia, hypomagnesemia, hyperlactatemia, and osmotic disequilibrium. Proper administration method in inpatients with T2DM has reached 120 patients (98.36%). In previous research, the rationality of drug use in the appropriate administration method category reached 100% [8]. Administration routes can be adjusted according to the patient's condition. For critically ill patients, continuous intravenous infusion administration routes can be used. For non-critically ill patients, the amount of nutritional intake and blood sugar levels need to be reviewed. For patients with regular intake, insulin is given subcutaneously with a fixed dose, while for irregular intake, fixed divided doses and correctional doses are given. Patients with uncontrolled blood sugar levels can use continuous intravenous or subcutaneous infusion routes. The use of an insulin sliding scale is not recommended in the guidelines used. Hypoglycemia events are more commonly found in patients receiving insulin therapy using the sliding scale method [22].

The evaluation of the rationality of drug use in the appropriate frequency category for inpatients with T2DM at Hospital Y Depok in 2023 amounted to 122 (100%). This is because the frequency of antidiabetic drug administration given to patients aligns with the therapy needed based on the diagnosis determined by the attending physician as listed in the medical records. Oral antidiabetic medication always starts from the lowest dose and is gradually increased. If the patient's blood sugar levels are not controlled, then the dose and frequency of antidiabetic drug use need to be reviewed [20].

The target blood glucose levels (GDS) in T2DM patients with critical illness are 140-200 mg/dL, while in patients with non-critical illness, it is below 180 mg/dL. A total of 116 (95.08%) patients experienced improvement after using diabetes medications during hospitalization. A patient's therapy outcome is considered worse if the GDS value deviates from the normal GDS range according to the management guidelines used. Six (4.92%) patients experienced worsened outcomes [15], [16].

Based on the Spearman test, it is shown that there is a correlation between the rationality of drug use and therapy outcome with a p-value of 0.001. This means that there is a correlation between rational treatment and clinical outcomes. The correlation coefficient value is 0.697 In this study, the therapeutic success of the drugs used was the patient's blood glucose level, and it was found that all patients improved with a decrease in blood glucose levels before and after treatment.

This indicates a strong relationship between the rationality of drug use (both rational and irrational) and therapy outcomes for T2DM patients.

CONCLUSION

The pattern of antidiabetic drug use in inpatients with T2DM that aligns with PERKENI 2021 guidelines is 114 (93.44%). Patients receiving appropriate drug treatment amounted to 121 (99.18%), with correct dosage for 122 (100%), correct frequency for 117 (95.90%), and correct administration method for 120 (98.36%). There is a correlation between the rationality of drug use and improvement in clinical outcomes of inpatients with T2DM, specifically in controlling blood glucose levels, with a p-value <0.001.

Acknowledgements: We would like to thank Hospital Hermina Depok for the their permission and support.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest statement: The authors declared no conflict of interest

REFERENCES

[1] IDF Diabetes Atlas, 10th ed., vol. 10. International Diabetes Federation, 2021.

[2] West Java Health Office, "Number of people with diabetes mellitus by district/city in West Java." Accessed: Aug. 07, 2023. [Online]. Available: https://opendata.jabarprov.go.id/id/dataset/jumlah-penderita-diabetes-melitus-berdasarkan-kabupatenkota-di-jawa-barat

[3] Depok City Health Office,, "Depok City Health Profile 2020," Depok, 2020.

[4] D. B. Mamo and B. K. Alemu, "Rational drug-use evaluation based on world health organization core drug-use indicators in a Tertiary Referral Hospital, Northeast Ethiopia: A cross-sectional study," Drug Healthc Patient Saf, vol. 12, pp. 15–21, 2020, doi: 10.2147/DHPS.S237021.

[5] S. R. Maxwell, "Rational prescribing: the principles of drug selection.," Clin Med (Lond), vol. 16, no. 5, pp. 459–464, Oct. 2016, doi: 10.7861/clinmedicine.16-5-459.

[6] Ministry of Health Indonesia, "Rational Drug Use Module." Ministry of Health Indonesia, Jakarta.

[7] U. Religioni and T. Pakulska, "Rational drug use in hospital settings – areas that can be changed," J Med Econ, vol. 23, no. 10, pp. 1205–1208, Oct. 2020, doi: 10.1080/13696998.2020.1801455.

[8] D. A. Ramdini, L. K. Wahidah, and D. Atika, "Evaluation of the rationality of the use of type II diabetes mellitus drugs in outpatients at Pasir Sakti Health Centre in 2019," Jurnal Farmasi Lampung, vol. 9, no. 1, pp. 69–76, 2020.

[9] U. Fatimah, "Evaluation of the rationality of treatment in patients with type 2 diabetes mellitus at Puskesmas Tawangsari Sukoharjo in 2021," Universitas Muhammadiyah Surakarta, Surakarta, 2022.

[10A. N. Hidayat, T. Ajeng L, and K. Siwi, "Evaluation of the rationality of oral antidiabetic drugs on the effectiveness of therapy for patients with type II diabetes mellitus at RSUD Dr Moewardi Surakarta," Jambura Journal of Health Science and Research, vol. 5, no. 3, pp. 815–824, 2023, [Online]. Available: https://ejurnal.ung.ac.id/index.php/jjhsr/index

[11] S. Khairani, R. Manninda, L.J. Raharjo, A.F. Widodo, " Cost effectiveness analysis of ceftriaxone with cefoperazon in thypoid patients at X Mataram Hospital", Jurnal Ilmu Kefarmasian Indonesia, vol 22, no 1, pp. 163-168. 2024

[12]A. Kautzky-Willer, M. Leutner, and J. Harreiter, "Sex differences in type 2 diabetes," Diabetologia, vol. 66, no. 6, pp. 986–1002, Jun. 2023, doi: 10.1007/s00125-023-05891-x.

[13]D. C. Lee et al., "Age Disparities Among Patients With Type 2 Diabetes and Associated Rates of Hospital Use and Diabetic Complications," Prev Chronic Dis, vol. 16, p. 180681, Aug. 2019, doi: 10.5888/pcd16.180681.

[14]F. Megawati, P. T. Suwantara, and N. L. S. A. Suryani, "Comparıson Of Cost Rates For Patıents Wıth Dıabetes Mellıtus In General Hospıtalısatıon And Bpjs In One Of The Publıc Hospıtals In Denpasar Perıod 2019," Jurnal Ilmiah Medicamento, vol. 6, no. 2, pp. 100–105, 2020.

[15]L. Nagendra, H. Boro, and V. Mannar, Bacterial Infections in Diabetes. 2000.

[16]G. Liamis, "Diabetes mellitus and electrolyte disorders," World J Clin Cases, vol. 2, no. 10, p. 488, 2014, doi: 10.12998/wjcc.v2.i10.488.

[17]R. T. Varghese and I. Jialal, Diabetic Nephropathy. 2024.

[18]K. S. Wan et al., "Prevalence of diabetic kidney disease and the associated factors among patients with type 2 diabetes in a multi-ethnic Asian country," Sci Rep, vol. 14, no. 1, p. 7074, Mar. 2024, doi: 10.1038/s41598-024-57723-6.

[19]Indonesian Endocrine Society, "Practical Guidelines for Insulin Therapy in Diabetes Mellitus Patients 2021". Perkeni, 2021.

[20]Indonesian Endocrine Society, Guidelines for the Management and Prevention of Adult Type 2 Diabetes Mellitus in Indonesia - 2021. PB. Perkeni, 2021.

[21]A. Anisawati, K. J. Pratama, and K. S. Artini, "Evaluation of Antidiabetic Rationality for Outpatients with Type 2 Diabetes Mellitus at RSAU dr. Siswanto in 2022," in Prosiding Nasional SIKesNas , 2023, pp. 84–92. doi: doi.org/10.47701/sikenas.vi.2835.

[22]C. Pratiwi, M. I. Mokoagow, I. A. Made Kshanti, and P. Soewondo, "The risk factors of inpatient hypoglycemia: A systematic review," Heliyon, vol. 6, no. 5, p. e03913, May 2020, doi: 10.1016/j.heliyon.2020.e03913.