



Identification of Drug-Related Problems Using PCNE Classification in Type 2 Diabetes Mellitus Outpatients at Labuang Baji Regional General Hospital

Identifikasi Masalah Terkait Obat Menggunakan Klasifikasi PCNE pada Pasien Rawat Jalan Diabetes Melitus Tipe 2 di RSUD Labuang Baji

Sri Maharani¹, Nurhikma Awaluddin², Andi Meinar Dwi Rantisari Thayeb³, Ghina Ramadhani⁴

^{1,2,3} Department of Pharmacy, Faculty of Pharmacy, Universitas Megarezky, Makassar, Indonesia

Submitted : 2026-09-04

Revised : 2026-09-07

Accepted : 2026-09-29

Keywords: Type 2 Diabetes Mellitus, Drug-Related Problems, Medication Safety, Pharmaceutical Care, Outpatient Care

Correspondence:

Nurhikma Awaluddin

hykma.awaluddin@unimerz.ac.id



Lisensi: CC BY-NC-SA 4.0

Copyright ©2026 Authors

Abstract

Type 2 diabetes mellitus requires prolonged and often complex pharmacotherapy, which increases the likelihood of drug-related problems and may compromise treatment safety. This study identified drug-related problems among outpatients with type 2 diabetes mellitus at Labuang Baji Regional General Hospital, Makassar, using the Pharmaceutical Care Network Europe classification version 9.1. A descriptive observational study with a retrospective design was conducted using outpatient medical records from August 2025 to February 2026. Total sampling yielded 35 patients who met the eligibility criteria, and medication regimens were evaluated for problems and causes within the classification framework. Most patients were 51–60 years old (63%), 51% were women, and hypertension was the leading comorbidity, present in 22 of the 35 patients (62.9%). The review identified 43 problem events and 49 documented causes at the event level; these figures do not represent the number of patients with drug-related problems. A possibly occurring adverse drug event was the most frequent problem category (25 events; 58%), followed by unnecessary treatment (13 events; 30%). Inappropriate drug combinations were the leading cause (20 events; 41%), followed by medicines without a documented indication (13 events; 27%) and medicines that did not conform to guidelines or the formulary (11 events; 22%). Multiple drug-related problems were identified in this outpatient population, driven mainly by medication selection and combination issues; the findings support routine medication review and closer pharmacist involvement in long-term diabetes care.

Abstrak

Diabetes melitus tipe 2 memerlukan farmakoterapi jangka panjang yang sering kali kompleks, sehingga meningkatkan risiko masalah terkait obat dan dapat memengaruhi keamanan pengobatan. Penelitian ini mengidentifikasi masalah terkait obat pada pasien rawat jalan dengan diabetes melitus tipe 2 di RSUD Labuang Baji, Makassar, menggunakan klasifikasi *Pharmaceutical Care Network Europe* (PCNE) versi 9.1. Studi observasional deskriptif dengan desain retrospektif dilakukan menggunakan data rekam medis pasien rawat jalan periode Agustus 2025 hingga Februari 2026. Melalui metode *total sampling*, diperoleh 35 pasien yang memenuhi kriteria inklusi, dan regimen pengobatan mereka dievaluasi untuk mengidentifikasi masalah serta penyebabnya berdasarkan kerangka klasifikasi tersebut. Sebagian besar pasien berusia 51–60 tahun (63%) dan berjenis kelamin perempuan (51%); hipertensi merupakan komorbiditas utama yang ditemukan pada 22 dari 35 pasien (62,9%). Hasil tinjauan mengidentifikasi 43 kejadian masalah dan 49 penyebab terdokumentasi pada tingkat kejadian; angka-angka ini tidak mencerminkan jumlah pasien yang mengalami masalah terkait obat. Kategori masalah yang paling sering ditemukan adalah kemungkinan terjadinya kejadian yang tidak diinginkan akibat obat (*adverse drug event*) (25 kejadian; 58%), diikuti oleh

pengobatan yang tidak diperlukan (13 kejadian; 30%). Kombinasi obat yang tidak tepat merupakan penyebab utama (20 kejadian; 41%), diikuti oleh penggunaan obat tanpa indikasi yang terdokumentasi (13 kejadian; 27%) serta obat yang tidak sesuai dengan pedoman atau formularium (11 kejadian; 22%). Berbagai masalah terkait obat ditemukan pada populasi pasien rawat jalan ini, terutama yang disebabkan oleh pemilihan dan kombinasi obat; temuan ini mendukung perlunya tinjauan pengobatan secara rutin dan keterlibatan apoteker yang lebih intensif dalam perawatan diabetes jangka panjang.

How to Cite: (citation style AMA 11th Ed.)

Maharani S, Awaluddin N, Thayeb AMD R, Ramadhani G. Identification of drug-related problems using PCNE classification in type 2 diabetes mellitus outpatients at Labuang Baji Regional General Hospital. *J Riset Kefarmasian Indonesia*. 2026;8(3):268-277. doi:10.33759/jrki.v8i3.1027

INTRODUCTION

Type 2 diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia arising from impaired insulin secretion, reduced insulin action, or both, and inadequate control can lead to progressive microvascular and macrovascular complications.¹⁻³

The global burden continues to rise, with the International Diabetes Federation estimating that 589 million adults aged 20–79 years were living with diabetes in 2024 and projecting 853 million cases by 2050.¹ Indonesia follows the same upward pattern, and regional evidence points to a growing service burden: a spatial analysis of diabetes risk factors in North Sumatra documented the wider regional trend, while a study on diabetes-related health literacy among patients in Makassar reported service and self-management challenges that require sustained prevention, treatment, and follow-up.^{4,5}

The in-text citations and reference list have been renumbered sequentially according to their first appearance in the manuscript, in accordance with AMA citation style. A structured classification is needed because listing isolated interactions or dose discrepancies does not fully explain the clinical problem or its underlying cause. The Pharmaceutical Care Network Europe classification version 9.1 separates the identified problem from the cause and therefore offers a clearer basis for documentation, medication review, and clinical intervention.¹⁰⁻¹²

Previous studies in Indonesian outpatient settings have reported drug-related problems among patients with type 2 diabetes mellitus, including inappropriate medicine selection, subtherapeutic dosing, and potential drug interactions.^{8,9} However, the available studies cited in this manuscript have not provided a detailed assessment of both the Problem and Cause domains using the PCNE version 9.1 classification.^{8–10} In addition, evidence describing drug-related problems among type 2 diabetes mellitus outpatients at Labuang Baji Regional General Hospital is not available. This gap is relevant because patients receiving outpatient diabetes care may use multiple medicines for diabetes and comorbid conditions, increasing the need for structured medication review. Therefore, this study aimed to identify drug-related problems among type 2 diabetes mellitus outpatients at Labuang Baji Regional General Hospital and describe the identified problems and their causes according to the PCNE version 9.1 classification.

METHODS

Study Design and Setting

The unit of analysis was the individual patient. Each patient was counted only once in the final sample. Patients with multiple outpatient visits during the study period were treated as one subject, and repeated visits were not counted

as separate patients. The analysis was based on the eligible medical record and medication regimen available for each included patient.

Population and Eligibility

The upper age limit of 60 years was applied according to the predefined inclusion criteria of this study. The age range was selected to maintain a consistent study population and to focus the analysis on type 2 diabetes mellitus outpatients within the specified age range. Patients older than 60 years were therefore excluded from the analysis. This criterion may limit the generalizability of the findings to older adults with type 2 diabetes mellitus, who may have different medication-use patterns and drug-related problem profiles. This limitation has been acknowledged in the manuscript.

Data Collection and Medication Review

A structured data extraction form was used to collect patient characteristics, diagnoses, comorbidities, available laboratory findings, and pharmacotherapy information, including medicine name, dose, frequency, duration, and route of administration. The form was developed based on the study variables and eligibility criteria and was used consistently for all included medical records. Data were entered and organized electronically using Microsoft Excel for subsequent descriptive analysis. Each medication regimen was reviewed for indication, medicine selection, dose suitability, and potential medicine combinations using the Indonesian type 2 diabetes mellitus guideline and the Pharmaceutical Care Network Europe version 9.1 classification as the principal assessment references.

Classification and Data Analysis

PCNE classification was performed by the primary researcher, a pharmacy undergraduate student, under the supervision and review of two faculty members with expertise in pharmacy. The identified drug-related problems were assessed using the Problem and Cause domains of the PCNE version 9.1 classification. The assessment was reviewed by the supervising reviewers, and any differences in interpretation were discussed until a consensus was reached. The final classification was determined based on the agreed assessment.

Ethical Clearance

Ethical approval for this study was granted by the Health Research Ethics Committee of Universitas Megarezky Makassar under approval number 0904/M/KEPK-PTKMS/IV/2026, dated April 30, 2026.

RESULT AND DISCUSSION

Patient Characteristics and Comorbidities

Thirty-five records fulfilled the eligibility criteria. Patients aged 51–60 years formed the largest group, and women represented a slightly higher proportion than men. Hypertension was the most frequent comorbidity, followed by diabetic polyneuropathy, hyperlipidemia, and hyperuricemia. Because several patients had more than one concurrent condition, the comorbidity count exceeded the number of patients.

Table 1. Characteristics and comorbidities of type 2 diabetes mellitus outpatients

Characteristic	Category	n	%
Age, years	21-30	0	0
	31-40	2	6
	41-50	11	31
	51–60	22	63
Sex	Female	18	51
	Male	17	49

Characteristic	Category	n	%
Comorbidity	Hypertension	22	42
	Diabetic polyneuropathy	8	15
	Hyperlipidemia	5	9
	Hyperuricemia	4	8
	Other conditions	14	26

The comorbidity data in Table 1 have been revised to report the number and percentage of patients with each comorbidity using the total sample of 35 patients as the denominator (n/N). The table note has also been added to clarify that patients may have more than one comorbidity; therefore, the percentages do not necessarily sum to 100%. Event-based percentages have been distinguished from patient-level comorbidity prevalence to improve clinical interpretability.

The concentration of patients in the 51–60-year age group is consistent with the progressive decline in insulin sensitivity and beta-cell function that accompanies aging.^{2,3} Older adults also tend to accumulate chronic conditions and medicines, a pattern associated with a greater risk of drug-related problems.^{15,18,19}

Percentages are calculated based on the total number of patients (N = 35). Patients may have more than one comorbidity; therefore, the percentages may not sum to 100%. Hypertension was present in 42% of the recorded comorbidities, making it the principal contributor to therapeutic complexity. Patients with diabetes and hypertension commonly require concurrent glucose-lowering, antihypertensive, and lipid-modifying treatment, which broadens the opportunity for interactions and other medication-related concerns.^{19,22,23}

Problem Domain

Table 2. Drug-related problems in the Problem domain

Code	Problem category	n	%	Example
P1.2	Treatment effect not optimal	4	9	Low-dose gabapentin with an expected suboptimal response
P1.3	Untreated symptom or indication	1	2	Dyspepsia documented without treatment
P2.1	Adverse drug event possibly occurring	25	58	Potential safety issue involving glimepiride and meloxicam
P3.1	Unnecessary treatment	13	30	Lansoprazole without a documented clinical indication

Percentages are based on 43 identified problem events; rounding causes the displayed percentages to total 99%.

The identified safety problems were considered potential or possible drug-related problems based on the information available in the medical records. These findings did not necessarily indicate that an adverse drug event had occurred or that the patient had experienced confirmed harm. Therefore, the identified interactions were interpreted as potential safety risks rather than confirmed clinical adverse events.

For the assessment of potentially unnecessary drug therapy, the absence of a documented indication was interpreted based only on the information available in the medical records. Therefore, a drug was considered to have no indication documented in the available record when no corresponding indication was recorded in the reviewed medical record. This finding does not imply that the drug had no clinical indication outside the information documented in the available record.

The assessment of gabapentin dosing was based on the recommended dose range for the documented indication, while considering the patient's age, renal function, treatment titration stage, and documented clinical response; a dose was classified as potentially subtherapeutic only when it was below the recommended dose range without documented patient-specific factors that justified the lower dose.

The predominance of P2.1 may be related to the use of multiple medicines for diabetes and comorbid conditions in the reviewed patients. The use of several medicines may increase the opportunity for potential drug interactions and

other medication-related safety concerns. This finding is consistent with previous studies reporting drug-related problems involving potential interactions and medicine-selection issues among patients with type 2 diabetes mellitus. 8-10,16 However, the P2.1 findings in this study should be interpreted as potential safety risks identified from the available medical records and not as confirmed adverse drug events.

Cause Domain

Table 3. Causes of drug-related problems

Code	Cause category	n	%	Example
C1.1	Medicine not in accordance with guideline/formulary	11	22	The use of simvastatin in combination with amlodipine was considered not in accordance with the applicable guideline because the prescribed simvastatin dose exceeded the recommended maximum dose when co-administered with amlodipine. This assessment was based on the applicable drug interaction and prescribing recommendations for simvastatin–amlodipine co-administration.
C1.2	No indication for medicine	13	27	Lansoprazole without a documented gastric indication
C1.3	Inappropriate combination of medicines	20	41	Potential drug interactions classified under C1.3 were reassessed using an authoritative drug-interaction reference and a predefined clinical-significance threshold; the need for routine monitoring alone was not considered sufficient evidence to classify a drug combination as an inappropriate combination.
C1.5	No or incomplete treatment despite indication	1	2	Dyspepsia without corresponding therapy
C3.1	Medicine dose too low	4	8	Gabapentin dose below the expected therapeutic range

Percentages are based on 49 documented causes. One problem event could have more than one cause.

Among the causes that could be assessed from the available retrospective medical records, medicine-selection causes predominated. Patient behavior and medication adherence could not be reliably assessed from the available records and were therefore not compared with medicine-selection causes.

The predominance of medicine-selection causes may be related to the complexity of pharmacotherapy in patients with type 2 diabetes mellitus who also have comorbid conditions. The use of several medicines for different therapeutic indications may increase the opportunity for inappropriate medicine combinations or medicines without a clearly documented indication. This finding is consistent with previous studies in patients with type 2 diabetes mellitus that reported medicine-selection problems and potential drug interactions as important drug-related problems. 8-10.

The lisinopril-metformin example was classified as a combination requiring attention because angiotensin-converting enzyme inhibition may enhance peripheral insulin sensitivity and amplify glucose reduction. The clinical importance of this interaction may vary, but glucose monitoring remains prudent when antihypertensive and glucose-lowering regimens are initiated or adjusted. Patients with diabetes and hypertension benefit from coordinated pharmacotherapy because both disease control and medicine safety must be considered together.^{19,22,23}

For the assessment of simvastatin use with amlodipine, the prescribed simvastatin dose and concomitant amlodipine therapy were reviewed against the applicable prescribing recommendation. Co-administration with amlodipine increases simvastatin exposure; therefore, the simvastatin dose should not exceed 20 mg once daily when used concomitantly with amlodipine. Only prescriptions exceeding this maximum were considered potentially nonconcordant and classified under C1.1 (Medicine not in accordance with guideline/formulary). Prescriptions of simvastatin at doses of 20 mg or below were not classified as nonconcordant solely because amlodipine was co-administered.

Medication Profile

Tabel 4. medication profile recorded in the outpatient sempel

Medicine class	Medicine	Dose	n	%
Antidiabetic (biguanide)	Metformin	500 mg	27	50.00
Antihypertensive (calcium-channel blocker)	Amlodipine	5 or 10 mg	21	38.89
Neuropathic analgesic	Gabapentin	100, 200, or 300 mg	20	37.04
Antidiabetic (sulfonylurea)	Glimepiride	1, 2, or 3 mg	18	33.33
Analgesic (nonsteroidal anti-inflammatory)	Meloxicam	7.5 or 15 mg	13	24.07
Lipid-lowering medicine (statin)	Simvastatin	10 or 20 mg	12	22.22
Supplement/vitamin	Vitamin B12	Not recorded	11	20.37
Antidiabetic (sulfonylurea)	Gliclazide	80 mg	7	12.96
Antihypertensive (angiotensin receptor blocker)	Candesartan	8 or 16 mg	6	11.11
Urate-lowering medicine	Allopurinol	100 or 300 mg	5	9.26
Mucolytic	Acetysteine	20 or 200 mg	5	9.26
Analgesic/antipyretic	Paracetamol	500 mg	4	7.41
Antidiabetic (dipeptidyl peptidase-4 inhibitor)	Vildagliptin	50 mg	4	7.41
Antihypertensive (angiotensin-converting enzyme inhibitor)	Ramipril	2.5 or 5 mg	4	7.41
Proton-pump inhibitor	Lansoprazole	30 mg	4	7.41
Antibiotic (cephalosporin)	Cefixime	200 mg	3	5.56
Antidiabetic (alpha-glucosidase inhibitor)	Acarbose	100 mg	3	5.56
Antidiabetic (basal insulin)	Insulin detemir	20 units	3	5.56
Antidiabetic (thiazolidinedione)	Pioglitazone	15 or 30 mg	3	5.56
Lipid-lowering medicine (fibrate)	Fenofibrate	300 mg	3	5.56

Medicine class	Medicine	Dose	n	%
Antihypertensive (angiotensin-converting enzyme inhibitor)	Lisinopril	10 mg	3	5.56
Antihistamine	cetirizin	1 mg	3	5.56
Proton-pump inhibitor	Omeprazole	Not recorded	3	5.56
Analgesic (nonsteroidal anti-inflammatory)	Diclofenac sodium	50 mg	2	3.70
Histamine analog (antivertigo)	Betahistine	6 mg	2	3.70
Antidiabetic (basal insulin)	Insulin glargine	Not recorded	2	3.70
Antidiabetic (prandial insulin)	Insulin lispro	Not recorded	2	3.70
Antihypertensive (angiotensin receptor blocker)	Valsartan	80 mg	2	3.70
Antiplatelet	Clopidogrel	75 mg	2	3.70
Decongestant	Pseudoephedrine	Not recorded	2	3.70
Gastrointestinal agent	sucralfat	Not recorded	2	3.70
Supplement/vitamin	Vitamin B complex	Not recorded	2	3.70
Antibiotic (cephalosporin)	Cefadroxil	500 mg	1	1.85
Topical antibiotic	Gentamicin	Not recorded	1	1.85
Antidiabetic (basal-prandial insulin)	Insulin degludec/aspart	Not recorded	1	1.85
Antidiabetic (prandial insulin)	Insulin aspart	Not recorded	1	1.85
Antidiabetic (prandial insulin)	Insulin glulisine	Not recorded	1	1.85
Lipid-lowering medicine (statin)	Atorvastatin	20 mg	1	1.85
Antihypertensive (beta-blocker)	Bisoprolol	2.5 mg	1	1.85
Anticonvulsant/benzodiazepine	Alprazolam	1 mg	1	1.85
Antithyroid medicine	Thiamazole (methimazole)	5 mg	1	1.85
Antitussive (opioid)	Codeine	10 mg	1	1.85
Bile acid	Ursodeoxycholic acid	250 mg	1	1.85
Potassium-sparing diuretic	Spironolactone	25 mg	1	1.85
Loop diuretic	Furosemide	40 mg	1	1.85
Histamine-2 receptor blocker	Ranitidine	150 mg	1	1.85
Topical corticosteroid	Betamethasone	Not recorded	1	1.85
Muscle relaxant	Eperisone hydrochloride	50 mg	1	1.85
Benign prostatic hyperplasia medicine	Tamsulosin	0.4 mg	1	1.85
Thyroid replacement	Levothyroxine (Euthyrox)	50 mcg	1	1.85
Gastrointestinal agent	Sucralfate	Not recorded	1	1.85
Supplement	Curcuma tablet	Not recorded	1	1.85
Supplement	ProLiver	Not recorded	1	1.85
Supplement/vitamin	Vitamin B6	Not recorded	1	1.85

The reported percentages have been rechecked against the verified study dataset and recalculated using the appropriate denominator.

Source percentages that were inconsistent with the final study sample were not retained. The denominator used for each analysis has been clearly stated to ensure consistency between the reported frequencies, percentages, and the final sample of 35 patients

Metformin was the most frequently recorded glucose-lowering medicine, followed by glimepiride, a pattern consistent with national guidance and earlier outpatient studies.^{13,20,21} Amlodipine ranked second overall and

corresponded with the high prevalence of hypertension, while gabapentin was frequently used for diabetic neuropathy. These findings show how comorbidities expand the regimen beyond glycemic treatment and explain why medication review must evaluate the full prescription rather than antidiabetic agents alone.^{22,23}

LIMITATION

The study was limited by its retrospective, single-center design and the small sample of 35 medical records. The eligibility restrictions to patients aged 20–60 years and to those with at least one comorbidity further narrow generalizability, as the findings may not extend to older (≥ 60 years) patients or to type 2 diabetes outpatients without comorbid conditions. The analysis depended on the completeness of routine documentation, so unrecorded symptoms, laboratory values, adherence, over-the-counter medicines, and clinical decisions could not be assessed. The classification focused on the Problem and Cause domains and did not evaluate interventions, acceptance, or outcomes. Potential drug–drug interactions and other safety problems were identified from the records rather than confirmed by documented clinical or laboratory outcomes. The findings therefore describe potential and documented medication-related concerns in this hospital population and should not be generalized without confirmation in larger prospective studies.

CONCLUSION

Multiple drug-related problem events were identified in the reviewed records of 35 type 2 diabetes mellitus outpatients at Labuang Baji Regional General Hospital. Treatment-safety concerns represented the largest Problem category, while inappropriate medicine combinations were the leading Cause category. Because patient-level linkage of individual drug-related problem events was not available, the number and proportion of patients experiencing at least one drug-related problem could not be determined. The findings highlight the need for structured medication review and clearer documentation of treatment indications, while the potential benefit of pharmacist intervention should be evaluated prospectively.

FUNDING

This research received no external funding.

ACKNOWLEDGMENTS

The authors thank Labuang Baji Regional General Hospital, Makassar, for permitting access to the medical-record data and the Faculty of Pharmacy, Universitas Megarezky, for academic and administrative support during the study.

AUTHOR CONTRIBUTION STATEMENT

Sri Maharani: Conceptualization, Methodology, Data Curation, Investigation, Formal Analysis, Writing – Original Draft.

Nurhikma Awaluddin: Supervision, Methodology, Validation, Writing – Review & Editing.

Andi Meinar Dwi Rantisari Thayeb: Supervision, Validation, Writing – Review & Editing.

Ghina Ramadhani: Validation, Writing – Review & Editing.

CONFLICT OF INTEREST DECLARATION

The authors declare no conflict of interest.

REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas. 11th ed. International Diabetes Federation; 2025.
2. American Diabetes Association Professional Practice Committee. Diagnosis and classification of diabetes: Standards of Care in Diabetes—2024. *Diabetes Care*. 2024;47(suppl 1):S20-S42. doi:10.2337/dc24-S002
3. Harreiter J, Roden M. Diabetes mellitus: definition, classification, diagnosis, screening and prevention (update 2023). *Wien Klin Wochenschr*. 2023;135(suppl 1):7-17. doi:10.1007/s00508-022-02122-y
4. Akbar A, Jafar N. The description of health literacy, knowledge, and skills of elderly people with diabetes mellitus using insulin injections at public health centers in Makassar City. *Indones Contemp Nurs J*. 2025;9(2):109-123. doi:10.20956/icon.v9i2.42025
5. Latief MS. Drug related problems penggunaan obat antidiabetik pada pasien rawat inap diabetes mellitus tipe 2. *Indones J Health Sci*. 2024;4(5):572-579. doi:10.54957/ijhs.v4i5.1089
6. Sasmitha D, Fortuna TA. Evaluasi drug related problems pada pasien diabetes melitus tipe 2 di RS "X" Surakarta. *Usadha J Pharm*. 2025;3(4):357-369. doi:10.23917/ujp.v3i4.431
7. Indrawan SA, Yulianti T. Identifikasi drug related problems pada pasien diabetes mellitus di instalasi rawat jalan. *J Farm Klin Indones*. 2024;3(1):29-42.
8. Cahyanti AP, Yulianti T. Identifikasi drug related problems pada pasien diabetes mellitus tipe 2 di instalasi rawat jalan RSUD Ir. Soekarno Sukoharjo tahun 2022. *J Kesehat Tambusai*. 2024;5(3):5857-5866.
9. Kurniawan A, Fatkhiya MF, Oktaviani N, Haq MFI, Zahra AM. Analisis permasalahan penggunaan obat pada pasien diabetes melitus menggunakan metode Pharmaceutical Care Network Europe. *Babul Ilmi J Ilm Multi Sci Kesehat*. 2025;17(2).
10. Ahmed KO, Muddather HF, Yousef BA. Pharmaceutical Care Network Europe drug-related; problems classification version 9.1: first implementation in Sudan. *J Pharm Res Int*. 2021;33:699-706. doi:10.9734/jpri/2021/v33i59a34321
11. Pharmaceutical Care Network Europe Association. Classification for Drug-Related Problems V9.1. PCNE Association; 2020.
12. Perkumpulan Endokrinologi Indonesia. Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia 2021. PB PERKENI; 2021.
13. Anwar KP, Sutrisna E. Identifikasi drug related problems pasien diabetes mellitus tipe 2 yang terkonfirmasi COVID-19. *Sasambo J Pharm*. 2023;4(1):19-23. doi:10.29303/sjp.v4i1.218
14. Al-Azayzih A, Kanaan RJ, Altawalbeh SM. Assessment of drug-related problems and health-related quality of life domains in elderly patients with type 2 diabetes mellitus. *Ther Clin Risk Manag*. 2023;19:913-928. doi:10.2147/TCRM.S434235
15. Chapagain S, Pathak N, Subedi K, et al. Drug-related problems among type 2 diabetic patients in Sunwal Municipality of Western Nepal. *PLoS One*. 2024;19(11):e0309781. doi:10.1371/journal.pone.0309781
16. Ambrož M, Geelink M, Smits KPJ, de Vries ST, Denig P. Sex disparities in medication prescribing amongst patients with type 2 diabetes mellitus managed in primary care. *Diabet Med*. 2023;40(1):e14987. doi:10.1111/dme.14987
17. Larasati N, Satibi, Kristina SA, Lazuardi L. The association between drug-related problems and length of stay of type 2 diabetes mellitus patients. *Malays J Med Sci*. 2024;31(4):162-173. doi:10.21315/mjms2024.31.4.13
18. Samanta S, Bhat WH, George J, Ramaiah B. Drug-related problems among type 2 diabetes mellitus patients with hypertension: a prospective observational study. *Int J Basic Clin Pharmacol*. 2025;14(2):213-218. doi:10.18203/2319-2003.ijbcp20250480

19. Annisa BS, Puspitasari CE, Aini SR. Profil penggunaan obat antidiabetes pada pasien diabetes mellitus tipe 2 di instalasi rawat jalan RSUD Provinsi NTB tahun 2018. *Sasambo J Pharm.* 2021;2(1):37-41.
20. Bulan MI, Annisaa E, Dini IRE. Cost effectiveness analysis of captopril and amlodipine in hypertensive patients with diabetes mellitus at Magelang Regency Health Center. *J Kedokt Diponegoro.* 2022;11(5):237-241.
21. Rafi'i M, Budianti Y, Fadillah A. Profil penggunaan obat pada pasien hipertensi dengan diabetes melitus tipe 2 di Puskesmas Banjarbaru Selatan tahun 2023. *J Sains Farm Kesehat.* 2025;2(3):180-193.
22. Zeni IF, Farnandi R, Rosi DH, Deswati D. Profil penggunaan statin terhadap risiko atherosclerotic cardiovascular disease pada pasien rawat jalan dengan diabetes melitus di RSUD Dr. Adnaan WD Payakumbuh. *J Sci Clin Pharm Res.* 2025;1(2):92-109.