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Article

Profile of the Use of Oral Antidiabetic Drugs in Outpatients at the Lonrong Health Center, Ponre District, Bone Regency in 2023

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Abstract

Background: Diabetes mellitus is a chronic degenerative disease that requires precise pharmacological management to prevent complications. Inappropriate drug selection and dosing can lead to ineffective therapeutic outcomes. This study was prompted by the high prevalence of diabetes in Bone Regency, which reached 1.58% in 2018, necessitating an evaluation of prescribing patterns at primary healthcare facilities. **Objective**: This study aims to analyze the profile and rationality of oral antidiabetic drug (OAD) use among outpatients at Lonrong Health Center in 2023, based on the indicators of right drug, right dose, right indication, and right time of administration. **Methods**: A retrospective descriptive design was applied using medical records of 50 patients aged ≥18 years. Rationality was assessed according to the indicators of right drug, right dose, right indication, and right time of administration, based on the 2021 Indonesian Endocrinology Association (PERKENI) guidelines. **Results**: The majority of the 50 patients were female (82%) and aged > 60 years (38%). Hypertension was the most common comorbidity (30%). Metformin was the most frequently prescribed monotherapy (26%), while the combination of Metformin and Glimepiride was the most common dual therapy (22%). The rationality analysis revealed 100% accuracy for indication, dosage, and timing of administration. However, drug selection accuracy was 82%, with 18% of cases identified as inappropriate due to the use of monotherapy in patients with blood glucose levels > 212 mg/dL who required combination therapy. **Conclusion**: While the health center demonstrates high adherence to dosing and indication standards, improvements are needed in drug selection for patients with high initial glucose levels to ensure optimal glycemic control.

Keywords: Diabetes mellitus; Oral antidiabetic drugs; Rational prescribing; Bone Regency; PERKENI guidelines

1. INTRODUCTION

Diabetes mellitus is a degenerative chronic disease characterized by impaired insulin secretion, impaired insulin production, and impaired insulin sensitivity. Hyperglycemia is a condition in which blood glucose levels increase or exceed normal limits. One of the causes is damage to the pancreatic gland, which produces the hormone insulin, resulting in impaired metabolism of carbohydrates, fats, and proteins, which can lead to various symptoms and complications [1].

Two different types of DM have been recognized, namely Type 1 and Type 2. Type 1 DM (DMT1), also known as insulin-dependent diabetes mellitus, usually occurs in children and young adults and is caused by damage to pancreatic beta cells resulting in impaired insulin production due to autoimmune or idiopathic disease. Patients are therefore dependent on insulin. DM type 2 (DMT2), also known as insulin-dependent diabetes mellitus, is the most common type of diabetes and is characterized by the presence of insulin resistance. The condition of patients with long-term DMT2 causes prolonged stress on the beta cells of the pancreas. This leads to the death of the pancreatic beta cells. In type 2, insulin is not always needed; it is enough to be treated with diet and oral antidiabetic drugs [2].

The etiology of diabetes mellitus is a combination of genetic and environmental factors. Other etiologies of diabetes include insulin secretion or action, metabolic abnormalities that interfere with insulin secretion, mitochondrial abnormalities, and a group of other conditions that interfere with glucose tolerance. Diabetes mellitus can occur because of exocrine pancreatic disease when there is damage to most of the Langerhans of the pancreas. In addition, hormones that act as insulin antagonists, such as glucagon, can also cause diabetes [3].

According to a survey by the World Health Organization (WHO), Indonesia has the fourth highest number of diabetics in the world after India, followed by China and the United States (USA). In 2000, there were approximately 8.4 million people with diabetes, and it is estimated that by 2030, there will be approximately 21.30 million people with diabetes. Worldwide, diabetes is responsible for approximately 60.0% of mortality and 43.0% of morbidity. The International Diabetes Federation (IDF) has predicted that the number of people with diabetes mellitus will increase from 10.30 million in the last 4 years (2013-2017) to 16.70 million in 2045. The high mortality rate of DM reaching 58% makes diabetes a chronic disease group that has been identified as a major health problem in the world. WHO estimates that there will be 30 million people with diabetes mellitus in Southeast Asia in 2000, and this number may increase to 80 million in 2025 [4]. In South Sulawesi Province, it shows that the prevalence of diabetes mellitus in 2018, based on the measurement results, reached a value of 1.3%, with Wajo district reaching the highest level of 2.19%, followed by Bitter Melon district at 1.59% and Bone district at 1.58%. In the Bone district, South Sulawesi, there are several health service units such as regional general hospitals, health centers, and pharmacies. One of the health centers in Bone Regency is Lonrong Health Center.

The use of diabetes mellitus drugs can include a choice of sulfonylurea drugs, biguanid group, glinid group, thiazolidinedione group, DPP-4 inhibitor group, SGLT-2 inhibitor group, and α-glucosidase inhibitor group. This group can be used as monotherapy or combination therapy for glycemic control (Jia et al., 2015). The management of diabetes mellitus has the goal of maintaining plasma glucose levels in the normal range and preventing the possibility of acute complications [5]. The use of diabetes mellitus drugs can cause problems, namely, the goals of therapy are not suitable/not achieved due to the use of the drug itself. One of them is due to inappropriate drug selection, so that the purpose of therapy is not effective. Improper drug selection can be due to ineffective drugs, patients allergic to the drug, contraindications, resistant patients, or receiving drug combination therapy due to disease complications [6].

Drug accuracy assessment is the control of all types of drugs used by patients based on several benefits and risks obtained and determined by the appropriate selection of treatment groups, both single and combination treatments. Dosage accuracy is the accuracy of the frequency of administration, the appropriateness of the dose administered, and the route of administration of drugs to patients. Incorrect dosing can result in ineffective effects of drug use [7]. The accuracy of indications is that all drugs prescribed to the patient must be in accordance with the indications of the disease that the patient is

experiencing, and in accordance with the patient's pharmacotherapy needs. To find out the indication of the disease, it is established through the diagnosis, and if the diagnosis is wrong, the expected effect of the drug will not be achieved. Several studies in Indonesia that discuss the use of antidiabetic drugs, one of which is at Jember Regency Hospital, show that the accuracy of treatment in terms of the right indications is 100%, the right drug is 97.8%, and the right dosage is 91.1%. In the profile study of the use of oral antidiabetic drugs at Bogor Regency Hospital, it was found that the accuracy of drug use was 100% patient accuracy, 100% indication accuracy, 100% drug dose accuracy, and 72.48% drug accuracy. Research conducted at Pasir Sakti Health Center showed that the right indication was 97.5%, the right drug was 98.75%, the right dose, the right way of administration, the right time interval, and the adherence to taking the drug was 100% [8]. This study aims to evaluate the rationality of OAD use among outpatients at Lonrong Health Center, Bone Regency, Indonesia, in 2023. By analyzing prescribing patterns against the indicators of right drug, right dose, right indication, and right time of administration, this research provides novel insights into the quality of diabetes management at the primary care level and highlights areas for improvement to strengthen rational prescribing practices.

2. MATERIALS AND METHODS

2.1. Study Location and Design

This study was conducted at Lonrong Health Center, Ponre District, Bone Regency, South Sulawesi during the year 2023. A non-experimental retrospective descriptive design was applied, analyzing medical records of patients diagnosed with diabetes mellitus (DM) who received outpatient care.

2.2. Population and Sample

The study population consisted of all DM outpatients recorded at Lonrong Health Center in 2023. Inclusion criteria: patients aged ≥18 years, diagnosed with DM, and receiving oral antidiabetic drug (OAD) therapy with complete medical records. Exclusion criteria: incomplete or unreadable medical records and records of deceased patients. The sample size was determined using the Slovin formula:

$$n = \frac{N}{1 + N(e^2)}$$

where n = sample size, N = population size, and e = margin of error (0.1). Based on this calculation, 50 patient records were selected using purposive sampling.

2.3. Data Analysis

Secondary data were extracted from patient medical records. The following variables were collected: (1) Patient demographics (age, gender); (2) Presence of comorbidities; (3) Type of OAD prescribed (monotherapy or combination therapy); (4) Dosage of OADs; (5) Indications for therapy based on diagnosis and blood glucose levels; and (6) Timing of drug administration. Data extraction was performed independently by two researchers to minimize bias. Any discrepancies were resolved through discussion until consensus was reached.

2.4. Data Collection Procedures

Data were analyzed using descriptive statistics (frequency distributions, percentages, and mean values). Rationality of OAD use was assessed according to the PERKENI 2021 guidelines, using four indicators: right drug, right dose, right indication, and right time of administration.

2.5. *Ethical Considerations*

This study uses secondary data from medical records and has received ethical approval by the Health Research Ethics Commission of the Muslim University of Indonesia with ethics license number 294/A.1/KEP-UMI/VII/2024.

3. RESULT AND DISCUSSION

This study evaluated the rationality of oral antidiabetic drug (OAD) use among outpatients at Lonrong Health Center, Bone Regency, Indonesia. The findings revealed that while accuracy in dosage, indication, and timing of administration was consistently high (100%), drug selection accuracy was lower (82%), with 18% of patients receiving monotherapy despite elevated blood glucose levels (>212 mg/dL) that warranted combination therapy. This study uses medical record data of outpatient diabetic mellitus patients with or without comorbidities at Lonrong Health Center, Ponre District, Bone Regency in 2023. There are 50 samples of medical records.

3.1. Patient Characteristics

3.1.1. Patient Characteristics Based on Gender

Based on Table 1. Patient characteristics based on gender for 50 patients with diabetes mellitus were sampled, and it was found that patients with female gender were more dominant, as many as 41 patients (82%), compared to 9 male patients (18%).

Table 1. Patient Characteristics Based on Gender

No.	**Gender**	**Number of patients**	**Percentage (%)**
1.	Male	9	18
2.	Female	41	82
	Total	**50**	**100**

Based on the above data, the percentage of female patients suffering from diabetes mellitus is higher than that of males. This is in line with the research conducted by Putri Ayu Sari (2023), which states that women tend to suffer from diabetes mellitus compared to men, where, in the study, as many as 77% of women and 23% of men suffered from diabetes mellitus. This is because physically, women have a large enough opportunity to increase their body mass index, the risk of obesity, which can interfere with insulin sensitivity, which is affected by the hormone estrogen during the occurrence of the monthly cycle syndrome (menstrual syndrome). In addition, post-menopause makes the distribution of fat in the body easier to accumulate [9]. In addition, women who have a history of childbirth with a birth weight of 4 kg or more, a history of diabetes during pregnancy (gestational diabetes), the use of oral contraceptives, high levels of stress, and obesity are also some of the factors that make women more at risk of developing diabetes than men [10].

3.1.2. Patient Characteristics Based on Age

Based on Table 2. Patient characteristics based on age, from 50 samples of medical record data, include patients of different ages. The most common age range was 19 patients (38%) who were > 60 years old, and the lowest patients who had a vulnerable age of 30-35 years, as many as 3 patients (6%).

Table 2. Patient Characteristics Based on Age

No	**Age**	**Number of patients**	**Percentage (%)**
1.	30 – 35	3	6
2.	36 – 41	5	10
3.	42 – 47	4	8
4.	48 - 53	8	16
5.	54 – 59	11	22
6.	> 60	19	38
	Total	**50**	**100**

Diabetes mellitus patients at Lonrong Health Center are more dominated by the elderly group with a vulnerable age of > 60 years. The prevalence of diabetes mellitus increases with age because, on average, people experience a rapid physiological decline after the age of 40. As we get older, the likelihood of a person suffering from diabetes mellitus also increases. Diabetes mellitus is a disease that results from the interaction of several risk factors that a person has. Diabetes mellitus increases with age.

The American Diabetes Association (ADA) (2014) states that age 45 and older is a risk factor for diabetes. In the elderly, physiological body functions will be reduced due to aging, so they can experience apoptosis (death) of pancreatic β cells, insulin and glucose products in the liver (hepatic glucose production) increase, and hypertension (HT)insulin resistance in peripheral tissues such as muscle cells, liver cells, and fat cells (adipocytes).

3.1.3. Concomitant Diseases

From the data taken from the physician's diagnosis and the patient's complaints recorded in the medical record, a patient may have several complications of the disease, such as hypertension (HT), dyslipidemia, gonarthrosis (arthritis), and others. The most common comorbidities experienced by patients are hypertension (HT) with 15 cases (30%), while patients diagnosed have a history of the 2 most common comorbidities, namely hypertension (HT) and neuropathy, with 7 cases (14%) out of a total of 50 cases.

Table 3. Concomitant Diseases

Disease	**Number of patients**	**Percentage (%)**
No Accompaniment		
Diabetes mellitus without concomitant	8	16
1 Inclusions		
Hypertension (HT)	15	30
Dyslipidemia	8	16
Gonarthrosis	4	8
Ulcus diabetic	3	6
2 Inclusions		
HT + Neuropathy	7	14
Ulcus diabetic + HT	5	10
Total	**50**	**100**

In this study, the patients with the most complications were diabetic mellitus patients with hypertension complications as high as 30%. This is higher than complications from other diseases. Hypertensive disease can make pancreatic beta cells insensitive to insulin, leading to insulin resistance (Mihardja, 2009). The main cause of complications of hypertension in people with diabetes mellitus is an increase in blood pressure due to increased sodium retention caused by the action of the hormone insulin. Insulin can convert glucose into glycogen, but it can also regulate sodium retention in the kidneys. Therefore, when insulin resistance occurs, the breakdown of glucose into simpler molecules does not occur, which can trigger an increase in blood pressure [11].

The next complication is dyslipidemia, with a percentage of 16%. High cholesterol is also one of the risk factors for diabetes mellitus. High LDL levels can be harmful by sticking to the walls of blood vessels, which can inhibit glucose in the blood. High blood sugar can raise LDL levels and lower HDL levels because it cannot be fully absorbed by the body's cells [12]. Hyperlipidaemia is a condition in which there is an increase in blood fat levels, including an increase in total cholesterol, LDL (low-density lipoprotein) cholesterol, and triglycerides. Cholesterol is one of the parameters of hyperlipidaemia [13]. Moreover, in this study, diabetic ulcers were as much as 6%, and ulcers that are commonly found in people with diabetes mellitus are leg ulcers. In people with diabetes mellitus, foot ulcers can be caused primarily by neuropathy or by infection, which can aggravate the ulcer condition. A sensation of pain that is not felt can also cause diabetic ulcers to go unnoticed,

and then the wound can grow and develop into a more serious ulcer. The legs of diabetic mellitus patients who have ulcers must be treated mostly by amputation.

3.2 Type of Antidiabetic Drug Used

In Table 4. The most widely used OAD (antidiabetic drug) in single therapy is metformin with 26%, followed by glibenclamide with 20% and glimepiride with 16%. In combination therapy, the most used OAD is glimepiride and metformin at 22%, followed by combination therapy with metformin and glibenclamide at 16%.

Table 4. Type of antidiabetic drug used

Drug Group	Medications given	Number of patients	Percentage (%)
Biguanid	Metformin	13	26
Sulfonilurea	Glimepiride	8	16
	Glibenclamide	10	20
Drug Class Combinations	Metformin + Glimepiride	11	22
	Metformin + Glibenclamide	8	16
Total		**50**	**100**

The biguanide group (metformin) is used as the first choice for monotherapy or combination therapy for patients with diabetes mellitus. This biguanide drug has a working mechanism to improve insulin sensitivity, which can inhibit the formation of glucose in the liver, so that it can reduce low-density lipoprotein and triglyceride levels, and this drug is also able to suppress appetite. Side effects that may be caused are gastrointestinal disorders (gastrointestinal tract), and the drug metformin is contraindicated for people with liver and kidney function disorders [14]. This recommendation is used because metformin is a drug that has a glucose-lowering effect, relatively low cost, low hypoglycemic effect, and does not cause weight gain in patients [15]. Metformin can control the state of glycemia to normal and reduce the toxic effect of glucose on the pancreas, so it can improve beta cell function.

The most used class of drugs for patients with diabetes mellitus after the biguanide group is the sulfonylurea group. The use of sulfonylurea drugs is quite high, which may be because the sulfonylurea group is the drug of choice for new patients for adults diagnosed with diabetes mellitus, with normal or underweight, and this group of drugs generally has relatively mild side effects and a low incidence. Sulfonylurea drugs have a mechanism of action that can stimulate or increase insulin secretion by pancreatic beta cells. Side effects that may be caused include gastrointestinal disorders such as nausea, diarrhea, and abdominal pain [14].

The treatment of diabetes mellitus begins with the modification of a healthy lifestyle first, or the use of a drug of choice, which is a single therapy of oral antidiabetic drugs, then if a single therapy of oral antidiabetic drugs can not control blood sugar levels in the body. Then it can be used in combination therapy with antidiabetic drugs with different modes of action or different classes of antidiabetic drugs [5]. Combination therapy of 2 types of drugs can be given to patients if, within a span of 3 months after using a single oral antidiabetic therapy, blood sugar levels do not improve [16].

3.3 Assessment of the Rationale for the Use of Antidiabetic Medications

3.3.1. Right Medication

Proper drug selection is the suitability in the selection of a drug that has indications of diabetes mellitus using the literature that has been established. Based on the results of a study of 50 patients obtained from the medical district, the distribution of antidiabetic drugs can be seen in Table 5 below.

Based on the results of the research in Table 5. It can be seen above that in the evaluation of drug accuracy, the results obtained from 50 medical records, namely 41 patients got the right drug selection, and the percentage obtained was 82%, while for improper drug selection, as many as 9 patients had a percentage obtained of 18%.

Table 5. Precise medication

Drug Accuracy	Number of Patients	Percentage (%)
Appropriate	41	82
Not Exactly	9	18
Total	**50**	**100**

In this study, 9 patients were not correct in drug selection because they got blood glucose levels (GDS) of >212 mg/dl to get monotherapy treatment, which should get treatment therapy with 2 or 3 combinations of antidiabetic drugs, where if the patient has been given treatment with 2 drugs for 3 months but the blood glucose level has not decreased properly, then the patient can be given drug combination therapy with 3 types of drugs antidiabetic.

The accuracy of the drug in this study is the suitability of drug selection for patients, in addition to seeing the diagnosis and indications, but also antidiabetic drugs based on the type or class of drugs and combinations of drugs that have been proven to be safe and beneficial for patients with diabetes mellitus. The inaccuracy of drug selection in this study was caused by inappropriate drug combinations and inappropriate drug selection.

3.3.2. Right Dosage

The dose given must be in accordance with the patient's condition and the dose determined according to the 2021 perennial. Based on the results of research on 50 patients obtained from medical records, the distribution of dose accuracy can be seen in Table 6 as follows:

Table 6. Right dosage

Dose Accuracy	Number Of Patients	Percentage (%)
Appropriate	50	100
Not Exactly	0	0
Total	**50**	**100**

Based on Table 6. The accuracy of the dosage of the use of drugs in 50 patients was obtained with a percentage of 100% correct dose. The dose of medication given to patients with diabetes mellitus who are under outpatient treatment at Lonrong Health Center, Bone Regency is the correct dose, where metformin is given as much as 500 mg, glibenclamide 5 mg, and glimepyride 2-4 mg, in accordance with Perkeni 2021 guidelines, where the given dose does not exceed or is not less than the range. It can be seen in Table 7 as follows:

Table 7. Drug dosage at the health center is based on the Indonesian Endocrinology Association in 2021.

Drug Name	Dose/Day (Puskesmas)	Dosage/Day (Perkeni 2021)
Metformin	500 mg	500 – 3000 mg
Glibenklamid	5 mg	2,5 – 20 mg
Glimepirid	2-4 mg	1 – 8 mg

3.3.3. Right Indications

Exactly this indication can be enforced in 2 ways, namely checking the blood glucose level and checking the fasting blood glucose level. Out of a total of 50 cases obtained from the patient's medical records, the analysis was performed for the correct indications.

Based on Table 8. The accuracy of indications for drug use from 50 patients was obtained with a percentage of 100% indications. All antidiabetic drugs prescribed to patients at Lonrong Health Center are in accordance with the indications of the disease experienced by the patient and in accordance with the patient's pharmacotherapy needs. This is in line with

the research conducted by Tias Kurniawati (2021), which stated that the evaluation of the accuracy of indications obtained the result of an indication accuracy percentage of 100% with a total of 109 patients. Correct indication is the administration of appropriate drugs, and it is important to determine drug therapy in accordance with the accuracy of dosage and complaints of the patient. The accuracy of indications is related to the determination of drug therapy to be given to the patient and can be seen from the administration of oral antidiabetic drugs and antihypertensive drugs based on the diagnosis set by the doctor [17].

Table 8. Right indications

Accuracy of Indications	Number Of Patients	Percentage (%)
Appropriate	50	100
Not Exactly	0	0
Total	**50**	**100**

Drug selection for patients is not only based on diagnosis and indications, but also on several factors such as safety, side effects, price, access, and limitations of drugs in pharmacies or pharmaceutical facilities in hospitals. This study shows that the evaluation of the right indication meets the criteria where the drug given to the patient in accordance with the diagnosis of patients affected by diabetes mellitus has data on the results of checking blood glucose levels at >200 mg/dl or fasting blood glucose levels >126 mg/dl [5].

3.3.4. Timely Feeding

Of the total 50 cases obtained from the patient's medical records, timely analysis was performed; the data can be seen in Table 9 below:

Table 9. Right indications

Information	Number of Patients	Percentage (%)
Appropriate	50	100
Not Exactly	0	0
Total	**50**	**100**

Based on Table 9. Out of 50 patients suffering from diabetes mellitus in Lonrong Health Center, the results of on-time evaluation of administration were as much as 100%. The time of administration of drugs given to patients with diabetes mellitus under outpatient treatment at Lonrong Health Center, Bone Regency, is on time, where metformin is taken after meals, while glibenclamide and glimepiride are taken before meals. This is consistent with the 2021 Perkeni guidelines, where metformin is taken with or after meals, while glibenclamide and glimepiride are taken before meals. This is in line with the research conducted by Dwi Aulia Ramdini (2020), who stated that the evaluation of timeliness of administration obtained a percentage of 100% on time, with a total of 80 patients.

This study provides one of the first systematic evaluations of OAD rationality in a primary health care setting in Bone Regency. Unlike previous hospital-based studies, our findings highlight prescribing patterns at the community level, where resource limitations and physician workload may influence treatment decisions. By identifying specific gaps, particularly in drug selection, this research contributes evidence that can inform local health policy and training programs for primary care providers.

A major strength of this study is the use of real-world medical record data, which reflects actual prescribing practices. The stepwise evaluation using PERKENI 2021 guidelines ensures clinical relevance. However, limitations include the relatively small sample size (50 patients), retrospective design, and reliance on medical records, which may not capture all clinical decision-making factors. Future studies with larger samples and prospective designs are needed to validate these findings and explore the reasons behind inappropriate

drug selection. Improving rational prescribing at the primary care level is critical for diabetes management in Indonesia, where the prevalence of diabetes continues to rise. Strengthening adherence to national guidelines, enhancing physician training, and integrating clinical pharmacists into primary care teams could help optimize therapy. Moreover, this study underscores the importance of continuous monitoring and evaluation of prescribing practices to ensure that patients receive evidence-based treatment tailored to their clinical needs.

4. CONCLUSION

This retrospective study at Lonrong Health Center, Bone Regency, demonstrated that the rationality of oral antidiabetic drug (OAD) use was generally high, with 100% accuracy in dosage, indication, and timing of administration. However, drug selection accuracy was lower (82%), with inappropriate monotherapy prescribed in patients presenting with elevated blood glucose levels who required combination therapy. The findings highlight the strengths of prescribing practices at the primary care level, particularly adherence to dosing and indication guidelines, while also identifying a critical gap in drug selection that may compromise glycemic control. This study is novel in providing community-level evidence from a primary health care facility in Bone Regency, complementing hospital-based studies and offering insights into real-world prescribing patterns in resource-limited settings. Practical implications include the need for continuous training of primary care physicians, stricter adherence to national guidelines (PERKENI 2021), and the integration of clinical pharmacists into health center teams to support rational prescribing. Future research should expand to multiple health centers, employ larger samples, and explore the underlying causes of inappropriate drug selection, thereby strengthening diabetes management strategies at the primary care level.

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