



Research Paper

## Identification of Drug-Related Problems among Patients with Type 2 Diabetes Mellitus at an Internal Medicine Outpatient Clinic in a Public Hospital in Padang, Indonesia

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**ABSTRACT:** Type 2 diabetes mellitus (T2DM) is a chronic disease that requires long-term pharmacological treatment to achieve optimal glycemic control and reduce the risk of complications. Inappropriate medication use may lead to Drug-Related Problems (DRPs), which are events or circumstances associated with drug therapy that have the potential to interfere with the achievement of desired therapeutic outcomes. Therefore, the identification of DRPs in patients with T2DM is essential to improve patient safety. This study aimed to evaluate the patterns of antidiabetic drug use and identify the occurrence of DRPs among patients with T2DM. This was an observational study conducted retrospectively using patients' medical records. A cross-sectional design was employed, and data were collected from March to September 2021. Samples were selected using a purposive sampling technique, resulting in 152 patients who met the inclusion criteria. The results showed that the patterns of antidiabetic drug use consisted of monotherapy (34.86%), combination therapy with two antidiabetic agents (58.56%), and combination therapy with three antidiabetic agents (6.58%). DRPs were identified in 31 patients (20.39%), while 121 patients (79.61%) experienced no DRPs. The identified DRP categories included drug therapy without indication in 7 cases (21.88%), inappropriate drug selection in 20 cases (62.50%), and subtherapeutic dosage in 5 cases (15.63%). Statistical analysis using the Chi-square test revealed no significant association between patient characteristics or antidiabetic drug utilization patterns and the occurrence of DRPs ( $p > 0.05$ ).

**KEYWORDS:** Type 2 diabetes mellitus, Drug-Related Problems (DRPs), antidiabetic drugs, medication utilization, patient safety

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### I. INTRODUCTION

Diabetes mellitus (DM) is one of the non-communicable diseases (NCDs) that has become a major global health concern due to the continuously increasing number of cases each year. This disease is characterized by hyperglycemia resulting from impaired insulin secretion, insulin action, or a combination of both. The consistently rising prevalence of diabetes over the past few decades indicates that this disease remains a significant challenge for healthcare systems worldwide [1][2].

Indonesia is among the countries with a high number of diabetes cases. According to a report from the Indonesian Ministry of Health in 2020, Indonesia ranked first in Southeast Asia in terms of the number of diabetes mellitus cases [3]. Data from the International Diabetes Federation (IDF) in 2019 also showed that the prevalence of diabetes increases with age. Among individuals aged 20–79 years, the prevalence of diabetes reached 9.3%, affecting approximately 463 million people worldwide, while in the 65–79 years age group, the prevalence increased to 19.9% [4].

The 2018 Basic Health Research (Riskesdas) reported an increase in the prevalence of diabetes mellitus among individuals aged  $\geq 15$  years in Indonesia, rising from 1.5% in 2013 to 2.0% in 2018. A similar trend was observed in West Sumatra Province, where the prevalence increased from 1.3% to 1.6% during the same period. Based on the 2018 West Sumatra Riskesdas data, Pariaman City had the highest prevalence of diabetes at 3.17%, while Padang City ranked fifth among all regencies and cities in West Sumatra with a

prevalence of 2.47%. In addition, the 2020 Padang City Health Profile reported 9,471 diabetes mellitus cases distributed across 11 districts [5] [6].

According to the American Diabetes Association (ADA), diabetes mellitus is a chronic disease that requires long-term management through continuous medical therapy, lifestyle modification, and patient education to prevent both acute and chronic complications [2]. In general, diabetes mellitus is classified into type 1 diabetes mellitus and type 2 diabetes mellitus. Type 1 diabetes mellitus occurs due to the destruction of pancreatic beta cells leading to absolute insulin deficiency, whereas type 2 diabetes mellitus is mainly caused by insulin resistance accompanied by impaired insulin secretion. The management of type 2 diabetes mellitus initially involves non-pharmacological approaches, including dietary regulation, increased physical activity, and lifestyle modification. If these interventions fail to achieve adequate glycemic control, pharmacological therapy becomes the next treatment option. Pharmacological management may involve single oral antidiabetic therapy or a combination of antidiabetic agents depending on the patient's clinical condition [7][8].

Several previous studies have shown that Drug-Related Problems (DRPs) are still frequently encountered among patients with type 2 diabetes mellitus. A study conducted by Rokiban (2020) at the Gedong Air Inpatient Public Health Center in Bandar Lampung reported that most patients were aged 56–65 years, with DRP categories including drug use without indication and untreated indications [9]. Another study by Tampa'i (2021) at Tuminting Public Health Center also identified several DRP categories, including indications without drug therapy, drug use without indication, inappropriate drug selection, subtherapeutic dosage, and excessive dosage [10].

Drug-Related Problems (DRPs) are defined as events or circumstances related to drug therapy that potentially or actually interfere with the achievement of therapeutic goals. The presence of DRPs may reduce treatment effectiveness, increase the risk of adverse effects, and negatively affect patients quality of life. Therefore, the identification and management of DRPs are essential components of clinical pharmacy practice. Pharmacists play an important role in detecting, preventing, and resolving various medication-related [11][12].

## **II. RESEARCH METHODS**

This study was a descriptive observational study with a retrospective cross-sectional design using patients' medical records. The study was conducted at the Internal Medicine Outpatient Clinic of a government hospital in Padang during the period of March–September 2021.

The study population consisted of all outpatients diagnosed with type 2 diabetes mellitus who received treatment at the Internal Medicine Outpatient Clinic during the study period. Samples were selected using a purposive sampling technique based on predetermined inclusion and exclusion criteria.

The inclusion criteria were medical records of outpatients receiving oral antidiabetic therapy, patients with a primary diagnosis of type 2 diabetes mellitus with or without complications, and medical records containing complete patient characteristic data, including age and gender. The exclusion criteria included patients receiving insulin therapy and medical records that were incomplete, illegible, or unavailable.

Data collection was carried out through a review of medical records of patients with type 2 diabetes mellitus. The collected data included patient characteristics, disease diagnosis, complications, and patterns of antidiabetic therapy.

The study parameters analyzed were the occurrence of Drug-Related Problems (DRPs) based on Cipolle's classification, including untreated indications, drug therapy without indication, inappropriate drug selection, subtherapeutic dosage, and excessive dosage.

Data were analyzed descriptively and analytically using Microsoft Excel 2010 and SPSS version 26.0. Univariate analysis was performed to describe the distribution of patient characteristics, patterns of antidiabetic drug use, and the occurrence of DRPs in the form of frequencies and percentages. Bivariate analysis was conducted using the Chi-square test to determine the association between patient characteristics and patterns of antidiabetic drug use with the occurrence of DRPs. A p-value <0.05 was considered statistically significant

This study received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Andalas University, with ethical clearance number 519/UN.16.2/KEP-FK/2021.

## **III. RESULTS AND DISCUSSION**

The characteristics of patients with type 2 diabetes mellitus in this study included age, gender, and the number of comorbid complications. The distribution of patient characteristics is presented in Table 1.

**Table 1. Characteristics of Patients with Type 2 Diabetes Mellitus (n=152)**

| Characteristics                | Number of patients | (%)   |
|--------------------------------|--------------------|-------|
| <b>Age (years)</b>             |                    |       |
| 36–45                          | 11                 | 7.24  |
| 46–55                          | 44                 | 28.95 |
| 56–65                          | 53                 | 34.87 |
| >65                            | 44                 | 28.95 |
| <b>Gender</b>                  |                    |       |
| Male                           | 59                 | 38.82 |
| Female                         | 93                 | 61.18 |
| <b>Number of complications</b> |                    |       |
| No complications               | 5                  | 3.29  |
| <3 complications               | 84                 | 55.26 |
| ≥3 complications               | 63                 | 41.45 |

Based on Table 1, the majority of patients were in the 56–65 years age group, accounting for 53 patients (34.87%). This finding indicates that type 2 diabetes mellitus was more commonly observed among older adults. The increased prevalence of diabetes in the elderly is associated with physiological decline, particularly decreased insulin sensitivity and impaired pancreatic beta-cell function, resulting in reduced insulin secretion [13]. In addition, aging is associated with alterations in glucose metabolism, increased insulin resistance, and decreased physical activity, all of which contribute to a higher risk of developing type 2 diabetes mellitus [14]. The findings of this study are consistent with the study conducted by Rokiban (2020), which reported that the highest prevalence of type 2 diabetes mellitus occurred in the 56–65 years age group [9]. The 2018 Indonesian Basic Health Research (*Riskesdas*) also demonstrated that the prevalence of diabetes increases with age [5].

Based on gender distribution, female patients were more predominant than male patients, accounting for 61.18% of the study population. The higher prevalence of type 2 diabetes mellitus among females may be associated with hormonal factors and changes in body fat composition. Alterations in estrogen levels, particularly during menopause, may increase insulin resistance and promote fat accumulation, thereby increasing the risk of impaired glucose metabolism. [15][16]

These findings are in agreement with studies conducted by Hongdiyanto (2014) and Rokiban (2020), which reported a higher prevalence of type 2 diabetes mellitus among females compared to males. In addition to hormonal factors, females also tend to have a higher body mass index, which contributes to increased insulin resistance [9][17].

Most patients had fewer than three complications, accounting for 84 patients (55.26%), while 63 patients (41.45%) had three or more complications. The high prevalence of complications among patients with type 2 diabetes mellitus indicates that many patients had experienced prolonged disease progression and required more complex therapeutic management. This condition may increase the risk of *polypharmacy* and Drug-Related Problems (DRPs) [18]. The greater the number of complications experienced by patients, the higher the likelihood of receiving multiple medications, which may increase the risk of drug interactions, inappropriate therapy, and adverse drug reactions [19].

The distribution of antidiabetic drug therapy patterns is presented in Table 2.

**Table 2. Patterns of Antidiabetic Drug Use (n=152)**

| Therapy Pattern              | Number of patients | (%)   |
|------------------------------|--------------------|-------|
| Monotherapy                  | 53                 | 34.86 |
| Two-drug combination therapy | 89                 | 58.56 |

| Therapy Pattern                | Number of patients | (%)  |
|--------------------------------|--------------------|------|
| Three-drug combination therapy | 10                 | 6.58 |

As shown in Table 2, two-drug combination therapy was the most frequently prescribed treatment regimen, accounting for 58.56% of patients. The predominance of combination therapy indicates that monotherapy alone was insufficient to achieve optimal glycemic control in most patients, thereby necessitating therapy intensification. According to the Indonesian Society of Endocrinology (*PERKENI*) and the *American Diabetes Association* (ADA), combination therapy is recommended when glycemic targets are not achieved after approximately three months of monotherapy. Combination therapy aims to produce synergistic effects through different mechanisms of action. The use of combination antidiabetic agents may improve glycemic control more effectively than monotherapy while minimizing the need for higher doses of a single drug, thereby reducing the risk of adverse effects [8][20].

Metformin was the most commonly prescribed antidiabetic agent in this study. This finding is consistent with *PERKENI* and ADA guidelines, which recommend metformin as the first-line therapy for type 2 diabetes mellitus in the absence of contraindications. Metformin acts by reducing hepatic glucose production and improving insulin sensitivity in peripheral tissues. In addition, metformin has a relatively low risk of hypoglycemia and is considered safe for long-term use [1][8].

Sulfonylureas, particularly glimepiride, were also commonly prescribed in combination therapy. Glimepiride stimulates insulin secretion from pancreatic beta cells and is frequently combined with metformin because the two drugs have complementary mechanisms of action. The combination of metformin and glimepiride was the most commonly used regimen in this study due to its effectiveness in achieving glycemic control [8][20].

The distribution of DRPs among patients with type 2 diabetes mellitus is presented in Table 3.

**Table 3. Distribution of Drug-Related Problems (DRPs) (n=152)**

| DRPs Occurrence  | Number of cases | (%)   |
|------------------|-----------------|-------|
| Experienced DRPs | 31              | 20.39 |
| No DRPs          | 121             | 79.61 |

Based on Table 3, DRPs were identified in 31 patients (20.39%), whereas 121 patients (79.61%) did not experience DRPs. Although most patients did not experience DRPs, the findings indicate that medication-related problems remain common among patients with type 2 diabetes mellitus. The occurrence of DRPs may be influenced by therapy complexity, comorbid conditions, multiple drug use, and the need for individualized therapeutic adjustments.

The categories of DRPs based on Cipolle's classification are presented in Table 4.

**Table 4. Categories of Drug-Related Problems (DRPs) (n=152)**

| DRPs Category                   | Number of Cases | (%)   |
|---------------------------------|-----------------|-------|
| Drug therapy without indication | 7               | 21.88 |
| Inappropriate drug selection    | 20              | 62.50 |
| Subtherapeutic dosage           | 5               | 15.63 |

As shown in Table 4, the most common DRP category was inappropriate drug selection, accounting for 20 cases (62.50%). The high prevalence of this category indicates that antidiabetic therapy was not always prescribed appropriately according to the patients clinical conditions. Several cases involved patients with impaired renal function who continued to receive metformin therapy. Since metformin is eliminated primarily through the kidneys, inappropriate use in patients with renal impairment may increase the risk of lactic acidosis. [8][11]

In addition, several patients with uncontrolled blood glucose levels were still treated with monotherapy. According to PERKENI and ADA recommendations, patients with elevated HbA1c levels or uncontrolled glycemic status should receive combination therapy to achieve optimal glycemic control. Therefore, monotherapy in such conditions was considered less effective and categorized as inappropriate drug selection [8][20].

Drug therapy without indication was identified in seven cases (21.88%). This condition occurred in patients who continued to receive combination antidiabetic therapy despite having achieved glycemic targets. The use of unnecessary medications may increase the risk of adverse effects, drug interactions, and reduced patient adherence due to an increased pill burden. Subtherapeutic dosage was identified in five cases (15.63%), primarily involving metformin prescribed at doses lower than the recommended therapeutic dose. Inadequate dosing may result in suboptimal glycemic control and reduced therapeutic effectiveness. [1][8][11]

The findings of this study are consistent with previous studies conducted by Tampa'i (2021) which also reported inappropriate drug selection as the most common DRP category among patients with type 2 diabetes mellitus. These findings emphasize the importance of regular medication review and therapeutic monitoring to ensure appropriate drug selection, dosing, and treatment regimens according to patients' clinical conditions [10].

#### **Association Between Patient Characteristics, Antidiabetic Therapy, and DRPs**

Bivariate analysis using the Chi-square test demonstrated no statistically significant association between age, gender, number of complications, or patterns of antidiabetic therapy and the occurrence of DRPs ( $p > 0.05$ ).

The absence of significant associations suggests that DRPs are not solely influenced by demographic characteristics or therapy patterns. Other factors, such as patients' clinical conditions, medication adherence, therapeutic monitoring, renal function, duration of diabetes, and clinical considerations by healthcare professionals, may also contribute to the occurrence of DRPs [11].

Although no statistically significant associations were identified, the identification of DRPs remains essential as part of clinical pharmacy services. Routine evaluation and monitoring of DRPs may improve therapeutic outcomes, prevent adverse drug events, and enhance patient safety in the management of type 2 diabetes mellitus.

#### **IV. CONCLUSION**

The majority of patients with type 2 diabetes mellitus in this study were aged 56–65 years, female, and had fewer than three comorbid complications. The most commonly used antidiabetic therapy was a two-drug combination regimen. Drug-Related Problems (DRPs) were identified in 20.39% of patients, with inappropriate drug selection being the most frequent category. Statistical analysis showed no significant association between patient characteristics or antidiabetic therapy patterns and the occurrence of DRPs ( $p > 0.05$ ).

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