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Article

Analysis of Outpatient Type 2 Diabetes Mellitus Treatment Patterns: A Four-Criteria Framework at Sanjiwani Hospital, Gianyar

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ABSTRACT

Background: Diabetes mellitus is a chronic condition with high blood sugar levels caused by insufficient insulin production. Improper prescribing can lead to ineffective treatment, increased health risks, and resource wastage.

Objective: This study aims to assess compliance with four essential criteria for rational drug use in treating Type 2 Diabetes Mellitus (DM2) patients at Sanjiwani Hospital in Gianyar. By examining these areas, the study seeks to identify opportunities for improving DM2 treatment and ensuring that practices align with established standards to enhance patient outcomes and safety.

Methods: A cross-sectional survey was conducted from May to June 2024, analyzing purposively collected prescriptions. A total of 113 prescriptions were reviewed to assess prescribing practices.

Results: The study evaluated prescribing accuracy based on four criteria: drug selection, dosage, indication, and timing. Results showed 100% accuracy in drug selection and indication, 76.1% accuracy in dosage, and 78.8% accuracy in timing.

Conclusion: These findings suggest that medication practices at Sanjiwani Hospital for DM2 patients are generally satisfactory. However, pharmacists should play an active role in providing pharmaceutical information and counseling to achieve the best clinical outcomes. This includes ensuring correct dosage and timing to improve overall treatment effectiveness and patient safety.

Keywords: Diabetes Mellitus, Rational Drug Use, Prescription Practices

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INTRODUCTION

Diabetes mellitus (DM) is a major global health issue characterized by chronic hyperglycemia due to disruptions in insulin synthesis, secretion, or action. As a metabolic disease, it involves elevated blood sugar levels caused by impaired insulin function, which is crucial for maintaining homeostasis (PERKENI, 2021). To mitigate the public health impact of DM, comprehensive management strategies are necessary, including lifestyle modifications and vigilant monitoring, in addition to medication, to prevent complications and improve patient outcomes. Diabetes mellitus involves both modifiable and non-modifiable risk factors. Permanent risks include race, ethnicity, age, gender, family history, low birth weight, and high birth weight. Modifiable risk factors comprise prediabetes, excess body weight, obesity, inactivity, high blood pressure, dyslipidemia, poor diet, and smoking (Rosita et al.,

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2022). Addressing DM requires a holistic approach that emphasizes non-communicable disease prevention through healthy lifestyle choices from an early age (Suryanti, 2021).

In Southeast Asia, Indonesia has a high diabetes prevalence rate of 11.3%, ranking it third in the region, with over 10.7 million cases. This places Indonesia seventh globally in terms of diabetes burden, highlighting the urgent need for effective management strategies. Irrational drug use can lead to adverse reactions and inadequate treatment, underscoring the importance of quality pharmaceutical services (Aisyah & Qarriy, 2023). Rational medication use is essential to optimize therapeutic outcomes and minimize side effects, involving proper drug selection, dosage, delivery, and timing (Suryanita, 2020).

Pharmaceutical services now emphasize patient-centered care to enhance quality of life through effective medication use (Destiyani et al., 2022). Research indicates low self-awareness and compliance among DM2 patients, highlighting the need for rational drug prescribing to align treatments with clinical needs (Triastawan et al., 2024; Saptayuda & Yuniarsih, 2023). Rational drug use is critical in ensuring effective treatment, benefiting both health and productivity (Bardoczi & Aubert, 2024). Prescription evaluation ensures appropriate treatment, correct dosage, and cost-effectiveness. The rationality of drug use can be assessed through prescription patterns, which reflect potential issues such as polypharmacy, improper drug selection, and deviation from clinical guidelines (Padhi et al., 2020; PERKENI, 2021). This study aims to evaluate the appropriate use of medications in diabetes management in healthcare settings, focusing on drug choice, dosage, and delivery methods, and their adherence to clinical recommendations.

METHODS

Study Design and Setting

A cross-sectional study was conducted at Sanjiwani Hospital in Gianyar. This observational research method assesses variables at a specific point in time, enabling the evaluation of current prescribing practices for outpatients with diabetes mellitus.

Sample Selection

The study utilized secondary data from 113 patient prescriptions, purposefully selected to meet inclusion and exclusion criteria. The focus was on prescriptions for outpatients with Type 2 Diabetes Mellitus (DM2) from May to June 2024. Inclusion criteria encompassed prescriptions for antidiabetic drugs with complete information on drug selection, dosage, timing, and indication. Excluded were prescriptions for patients with Type 1 diabetes, gestational diabetes, or other non-diabetic conditions, as well as those written for inpatients or containing missing or illegible information. Additionally, pediatric and pregnant patients were not included to ensure alignment with DM2 treatment guidelines.

Data collection

Data was collected using a structured checklist form specifically designed to evaluate the appropriateness of prescribing practices for DM2 outpatients. This checklist comprised two main sections. The first section gathered data on respondent characteristics, including age, gender, education level, comorbidities,

types of medications prescribed by the doctor, and the quantity of drugs given. The second section focused on assessing prescription accuracy based on four specific criteria: drug selection, dosage, timing, and indication accuracy. For drug selection, the pharmacist verified whether the appropriate class of medication, such as oral hypoglycemics or insulin, was chosen based on the patient's condition. Dosage accuracy involved checking that the prescribed dose fell within the recommended therapeutic range. Timing was assessed to ensure the prescribed schedule optimized the medication's pharmacokinetics and pharmacodynamics for controlling blood glucose levels. Lastly, indication accuracy confirmed that the medication was clinically justified for the condition being treated. Each criterion was compared with the Diabetes Mellitus treatment guidelines (PERKENI, 2021) to ensure comprehensive evaluation and verification of prescriptions.

Data Analysis

Descriptive statistics were performed using Microsoft Excel. The analysis involved summarizing patient demographics, types of drugs prescribed, and the number of drugs per prescription using frequencies and percentages. The accuracy of prescribing was evaluated based on the four criteria, with proportions of correct prescriptions calculated for each category. Results were presented in percentages, highlighting compliance levels against DM treatment standards (PERKENI, 2021). The primary objective was to describe current practices, without performing inferential statistical tests, to provide a detailed overview of prescribing appropriateness at Sanjiwani Hospital.

Ethical Considerations

Ethical approval was obtained from the Sanjiwani Hospital Health Research Ethics Committee, with research permission granted under No. 62/PEPK/V/2024, issued on May 16th, 2024.

RESULTS

Table 1. Data Characteristics (n=113)

Characteristics	n	%
Age group (years)		
15-25	1	0.9
26-35	2	1.8
36-45	3	2.7
46-55	14	12.4
56-65	57	**50.4**
66-75	19	16.8
>75	17	15.0
Gender		
Male	66	**58.4**
Female	47	41.6
Types of Drugs Prescribed		
Glimepiride	98	**60.5**
Metformin	58	35.8
Glibenclamide	4	2.5
Januvia (Sitagliptin)	2	1.2
Diagnose		
DM only	68	**60.2**

Characteristics	n	%
DM with comorbidities	45	39.8
Single and Combination Drug Use		
Monotherapy	64	**56.6**
Combination therapy	49	43.4

Table 1 presents the demographic and treatment characteristics of the DM2 patient population studied. The majority of patients (50.4%) were aged 56 to 65 years, and 58.4% (n=66) were male. Moreover, 60.2% of patients had a diagnosis of DM2 without any additional medical conditions. Regarding medication, Glimepiride was the most commonly prescribed drug, used by 60.5% of patients. Additionally, 56.6% of patients received monotherapy for DM2.

These findings illustrate a typical demographic profile of DM2 patients at Sanjiwani Hospital in Gianyar and provide insights into common treatment approaches. The high number of patients aged 56-65 aligns with the established link between aging and DM2 prevalence. The predominance of male patients and the frequent use of Glimepiride reflect current prescribing practices, underscoring the need for ongoing monitoring to ensure optimal treatment outcomes.

Table 2. The Four-Criteria Approach for Appropriate Treatment (n=113)

Criteria	n	%
Drug Selection		
Appropriate	113	100
Inappropriate	0	0
Dosage		
Appropriate	86	76.1
Inappropriate	27	**23.9**
Indication		
Appropriate	113	100
Inappropriate	0	0
Time Interval		
Appropriate	89	78.8
Inappropriate	24	**21.2**

The data shows that all drug selections were made correctly, with 100% (n=113) accuracy. However, the analysis of dosages revealed that 76.1% (n=86) were correct, while 23.9% (n=27) were incorrect. All drug indications were accurate, maintaining a 100% correct rate. Regarding adherence to prescribed time intervals, 78.8% (n=89) of prescriptions were correct, while 21.2% (n=24) were not. These findings highlight the importance of continuous oversight in dosage and timing practices to improve treatment efficacy and patient safety.

DISCUSSION

The study observed a high prevalence of diabetes mellitus (DM) in older age groups, with 50.4% of patients aged between 56 and 65. This finding aligns with existing literature indicating that Type 2 Diabetes Mellitus (DM2) becomes more common with age due to physiological changes such as reduced insulin secretion and increased insulin resistance (Fajar and Kamaruddin, 2020). The American Diabetes Association notes that individuals over 45 are at higher risk, with peak prevalence between 55 and 64 years. The study included 66 male participants, making up 58.4% of the total, which is similar to findings from St. Elisabeth Hospital in Semarang, where 50.88% of DM2 patients were male (Rukminingsih, 2021). Factors like reduced physical activity contribute to higher DM2 rates in males, as lower activity levels lead to increased BMI and insulin resistance. This highlights the importance of physical exercise in reducing DM2 risk and calls for targeted lifestyle interventions (Rietz et al., 2022).

In terms of medication, the most commonly used antidiabetic drugs were Glimepiride (44.5%), Metformin (26.4%), and Glibenclamide (1.8%). Glimepiride enhances insulin secretion, and when combined with Metformin, significantly improves glycemic control (Rashidi et al., 2020). This combination also benefits lipid profiles, lowering cardiovascular risk (Xie et al., 2023). The study found that 60.2% of DM2 patients had no other medical conditions, whereas 39.8% had comorbidities, with hypertension being the most common. Poorly managed diabetes can exacerbate hypertension and dyslipidemia, increasing cardiovascular risk (Pinakesty & Azizah, 2020). Addressing these comorbidities is crucial for comprehensive diabetes management.

At Sanjiwani Hospital, drug selection for DM2 patients fully adhered to the 2021 PERKENI Guidelines, achieving 100% compliance. Metformin was commonly prescribed as monotherapy, reflecting adherence to rational medication use standards (Singh et al., 2021). This consistency indicates a strong commitment to effective diabetes management. The study found that 83.3% of prescribed dosages met the 2021 PERKENI guidelines; however, 17.7% were incorrect, with some having potential for overdose. Errors in dosage, such as incorrect Glimepiride and Metformin prescriptions, highlight the need for improved dosing accuracy and patient safety (Tananda et al., 2023). Furthermore, all prescriptions met the 2021 PERKENI guidelines for indication, achieving 100% compliance and reinforcing strong adherence to clinical standards across healthcare settings (Dwi Agung Jaka Perdana & Nofita, 2021). The study also revealed 85.2% compliance with recommended time intervals for medication administration, although 14.8% of prescriptions deviated from the guidelines, reflecting the need for improved medication management practices to ensure effective treatment (Tananda et al., 2023).

The study has several limitations primarily related to its methodology. Conducted at a single healthcare facility, Sanjiwani Hospital, the findings may not be generalizable to other settings or populations, as prescribing practices can vary significantly across different hospitals and regions. Additionally, the reliance on secondary data from patient prescriptions limits the understanding of the clinical context and patient experiences, as the study did not include direct assessments of

patient adherence or the rationale behind prescribing decisions. Moreover, the cross-sectional design provides only a snapshot of practices at a specific time rather than insights into long-term trends or the sustainability of observed behaviors. While the study identified that 17.7% of dosages were incorrect, it did not explore the reasons behind these discrepancies, which limits the ability to develop targeted interventions for improvement. Lastly, the absence of an evaluation of actual patient adherence to prescriptions or the clinical outcomes resulting from potential dosing inaccuracies or timing deviations suggests a need for further research to bridge these gaps in understanding diabetes management effectiveness.

Future research should focus on longitudinal analyses of prescribing trends, patient-centered outcomes, and the effectiveness of intervention-based programs. Expanding research to include diverse settings and chronic conditions, as well as conducting cost-effectiveness analyses, can further improve DM2 management and patient outcomes.

CONCLUSION

The study assessed the proper use of drugs in treating diabetes mellitus. It found that drug selection and indications were managed appropriately. However, there were accuracy rates of 76.1% for medication dosage and 78.8% for timing adherence, indicating areas needing improvement. The study's limitations include being limited to a specific healthcare setting, its inability to examine reasons behind inappropriate dosages and timing, and its lack of evaluating patient adherence or the implications of errors on results. To enhance the generalizability of findings, healthcare professionals should receive better training, monitoring systems should ensure accurate dosage and timing, research should examine the causes of errors and their impact on patient outcomes, and the study should include a broader variety of settings and populations. These actions are critical for improving patient care in treating diabetes and optimizing drug management.

CONFLICT OF INTEREST

Author(s) stated that there is no conflict of interest.

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