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Evaluation of Rationality in Prescribing Metformin (Biguanide Group) at Dr. Mohammad Hoesin General Hospital Palembang

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ABSTRACT

Backgrounds. It is very important to evaluate and assess the rationality of the use of antidiabetic drugs, especially the biguanide (metformin) group to maintain the quality and quality of diabetes mellitus drug administration so that the target of diabetes mellitus control can be optimized. This study aims to evaluate the rationality of prescribing metformin oral antidiabetic at Dr. Mohammad Hoesin General Hospital Palembang. **Methods:** The research design is a descriptive study using secondary data from medical records in the medical records section of Dr. Moh Hoesin Hospital Palembang. The object of research is all medical records of patients with type 2 diabetes mellitus who used metformin at RSMH Palembang in the period July 1st, 2019-July 31st, 2020, with complete medical record data and without serious comorbidities. The rationality for using metformin that was assessed in this study was the frequency of use, drug dose, route of administration, duration of administration, and drug interactions. The frequency of drug use is assessed by how many times the drug is taken in one day. **Results:** The most age group of patients who received a prescription for metformin were 51-60 years old and 61-70 years old with a total of 17 patients (35.4%). The majority of patients were female as much as 60.4%. Drug interactions with metformin are still quite common, although the majority are synergistic and potentiating interactions. There are still 2 cases or 4.2 percent who experience antagonistic interactions. **Conclusion:** The rationality for using metformin in patients with type 2 diabetes mellitus is based on the criteria for the right dose (100%), the right frequency of drug administration (100%), the right time for giving the drug (100%), the right way of giving the drug (100%), and the right drug interaction. (95.8%).

1. Introduction

Indonesia is ranked the fourth largest of all those with diabetes mellitus, which is 8.6% of the total population, while the top rankings are India, China, and the United States (WHO, 2018). WHO predicts that there will be an increase in the number of people with diabetes mellitus in Indonesia, which was 8.4 million people in 2000, increasing to 21.3 million in 2030. The International Diabetes Foundation (IDF) estimates that there will be an increase in the number of people suffering from Diabetes Mellitus in 2009 from 7 million and will increase in 2030 to reach 12 million people. This information, it shows that there will be a 2-3 times increase in the population experiencing Diabetes Mellitus in 2030.[1] Management of Diabetes Mellitus

generally consists of four indicators, namely education, nutritional therapy, exercise, and pharmacological intervention. Pharmacological therapy is given to patients who do not respond or respond at least during a carbohydrate diet, exercise is recommended to change a healthy lifestyle for three months to maintain blood glucose levels to remain above 200 mg/dL and HbA1c above 6.5 %.[2-4]

Pharmacological interventions include oral and injectable antidiabetic drugs. Oral drugs include the biguanide group, sulfunilureas. Oral antidiabetic drugs are the drugs that are used more often. The first choice of drug in this patient is metformin. To achieve effective therapy, the rational administration of oral antidiabetic drugs, namely the right dose, the right patient diagnosis, the right choice and administration of drugs, and there are no contraindications, needs good attention. It is very important to evaluate and assess the rationality of the use of antidiabetic drugs, especially the biguanide (metformin) group to maintain the quality and quality of diabetes mellitus drug administration so that the target of diabetes mellitus control can be optimized.

2. Methods

The research design is a descriptive study using secondary data from medical records in the medical records section of Dr. Moh Hoesin Hospital Palembang. The object of the study was all medical records of patients with type 2 diabetes mellitus who used metformin at RSMH Palembang in the period July 1st, 2019-July 31st, 2020, with complete medical record data and without serious comorbidities. The rationality for using metformin that was assessed in this study was the frequency of use, drug dose, route of administration, duration of administration, and drug interactions. The frequency of drug use is assessed by how many times the drug is taken in one day. The dose of metformin used is 500 mg or 850 mg. The method of administration of the drug is the method of consumption of the drug metformin and the duration of drug administration is the duration of administration of the drug written on the prescription. Drug interactions are reactions that arise between two or more drugs in the same use, in the form of synergism, namely the administration of one drug can strengthen the effects of other drugs, antagonists, namely the administration of one drug can reduce the effects of other drugs and potentiation, namely the administration of one drug can strengthen the effect of another drug by increasing the concentration of that other drug by the body.

The data used is secondary data through medical records obtained from the Medical Record Installation Section of RSMH Palembang. In data collection, the researcher does not take data directly, but by parties who are not researchers. The data collected in this study will be processed using the SPSS descriptive statistical method based on the number of cases recorded in the medical records of patients with diabetes mellitus according to the variables studied. The research results will be analyzed and presented in tabular form and will be explained in narrative form. The type of statistical analysis that will be used in this research is a univariate analysis which aims to describe the characteristics of each variable being studied.

3. Results

Table 1 shows the number of patients with type 2 DM with Metformin, the youngest age suffering from type 2 DM is 42 years, while the oldest age is 77 years. Where these results were obtained the average age group is 51-60 years old and 61-70 years old with a total of 17 patients (35.4%). The majority of patients were female as much as 60.4%. The majority of patients received 3-4 drugs per prescription.

Table 1. Baseline characteristic

Variable	Number of Cases (n)	Percentage (%)
Age		
40-50 years old	12	25.0
51-60 years old	17	35.4
61-70 years old	17	35.4
71-80 years old	2	4.2
Gender		
Male	19	39.6
Female	29	60.4
Number of Drugs Per Prescription		
1	8	16.7
2	9	18.8
3	13	27.1
4	10	20.8
5	8	16.7

Table 2 shows that drug interactions with metformin are still quite often encountered, although the majority are synergistic and potentiating interactions. There are still 2 cases or 4.2 percent who experience antagonistic interactions.

Table 2. Distribution of respondents based on drug Interactions

Drug Interactions	Number of Cases (n)	Percentage (%)
Synergistic Interactions	17	35.4
Potentializing Interactions	29	60.4
Antagonist Interactions	2	4.2

Table 3. Distribution of synergistic drug Interactions

Synergistic interactions	Number of cases (n)	Percentage (%)
Metformin + Glimepiride	9	18.8
Metformin + Glucobay	12	4.2
Metformin + Gliclazid	3	6.2
Metformin + Glibenclamid	3	6.2

Table 4. Distribution of potentiating drug Interactions

Potentiating interactions	Number of cases (n))	Percentage (%)
Metformin + Aspilet	2	4,2
Metformin + Amlodipine	10	20,8
Metformin + Captopril	6	12,5
Metformin + Ranitidine	5	10,4
Metformin + Furosemide	4	8,3
Metformin + Valsartan	2	4,2

Table 5. Distribution of antagonistic drug Interactions

Antagonist interactions	Number of cases (n)	Percentage (%)
Metformin + Spironolactone	1	2.1
Metformin + Methylprednisolone	1	2.1

Table 6 shows that the patients with the right dose set amounted to 47 patients with a percentage of 97.9%, exact frequency of delivery There were 48 patients with a percentage of 100% of drugs, 48 people (100%) on the right time to administer the drugs, 48 people on the right way of administering drugs (100%), 17 patients with the right drug interactions with a percentage of 35.4%, and the right drug interactions. potentiating drug interactions 29 patients with a percentage of 60.4%.

Table 6. The rationality for using Metformin

Variable	Appropriate			
	Yes	(%)	No	(%)
Dosage	47	97.9	1	2.1
Frequency of administration	48	100	0	0
Duration of administration	48	100	0	0
Method of administration	48	100	0	0
Synergistic interactions	17	35.4	0	0
Potentiating Interaction	29	60.4	0	0
Antagonist Interaction	0	0	2	4.2

4. Discussion

Glimepiride is a third-generation sulfonylurea drug with a longer duration of action and a faster onset of action. The use of a mixture of other antidiabetic drugs creates a synergistic relationship, where the activities of each drug reinforce each other to achieve the same goal, to lower glucose more. Glimepiride stimulates beta cells to secrete insulin, while metformin reduces hepatic glucose production, decreasing intestinal glucose absorption, and increase insulin sensitivity by increasing peripheral glucose uptake and utilization. Glimepiride can reduce cardiovascular complications and convert insulin released into glucose levels, especially in the postprandial state, with the aim that glimepiride is less hypoglycemic than glibenclamide. With the profile they have, the combination of Metformin and Glimepirid is more feasible and safe.[5-7] Metformin given concurrently with Glucobay can decrease metformin AUC levels. The alpha-glucosidase inhibitor Glucobay decreases the bioavailability of Metformin and reduces the normal peak plasma centralization of Metformin, but the chances of achieving that top fixation are unchanged. Patients should be informed of the need to monitor blood glucose levels regularly and be aware of indications for hypoglycemia.[8-10]

The most widely administered drugs and have potentiating interactions are antihypertensive drugs. Metformin given together with calcium channel blocker drugs such as amlodipine can reduce the effects of metformin and has a moderate level of pharmacodynamic interaction.[11,12] Metformin given concurrently with Ranitidine can increase plasma concentrations by slowing the renal tubular excretion of metformin.[13-15] Metformin given concurrently with captopril may increase the risk of hypoglycemia. Moreover, the simultaneous use of captopril will cause blood glucose levels to increase by 2.2 mmol/L after 24 hours and increase to 2.9 mmol/L after 48 hours. For this situation, the use of the drug Captopril can be replaced with Valsartan class ARB (angiotensin receptor blocker), because Valsartan can lower blood pressure through the main enemy of the renin-angiotensin-aldosterone framework. Likewise,

Valsartan can also reduce the release of albumin in the serum, if the excess albumin lost from the blood shows high blood glucose levels for a long time, so Valsartan can be overcome by slowing albumin secretion.[16-18] Metformin given together with furosemide will increase metformin levels in the blood, causing hypoglycemia, while metformin can reduce furosemide levels. Furosemide and metformin are secreted in the tubular portion of the kidney so that they can interact with each other in the tubular system, resulting in increased metformin levels. Furosemide can increase the plasma metformin concentration by 22% and metformin can reduce the peak concentration and elimination half-life of furosemide by 31% and 32%, respectively.[19]

Spironolactone is a diuretic drug. Metformin given concurrently with Spironolactone will induce renal impairment and dehydration which can increase the risk of lactic acidosis in patients concurrently using Metformin. Methylprednisolone is a corticosteroid class, Metformin which is given together with Methylprednisolone can inhibit glucose levels resulting in hyperglycemia, glucose intolerance, changes in glucose levels with new-onset, and exacerbation of diabetes mellitus.[20]

5. Conclusion

The rationality for the use of Metformin in Patients with Type 2 Diabetes Mellitus is based on the criteria for the right dose (100%), the right frequency of administration (100%), the right time for giving the drug (100%), the right way of giving the drug (100%), and the right way. drug interactions (95.8%).

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