

EFFECTIVENESS OF DIABETES MELLITUS THERAPY

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ABSTRACT

Diabetes mellitus is called the silent killer because this disease can affect all organs of the body and cause various kinds of complaints. Evaluation of the rationality of oral antidiabetic drugs on the effectiveness of therapy for patients with type II diabetes mellitus, RSUD Dr. Moewardi Surakarta concluded that ADO (biguanide + sulfonylurea) combination therapy is a therapy that is often used in patients and is effective in reducing blood glucose levels within 3 months of treatment. The aim of this study is to know the effectiveness of type II diabetes mellitus treatment therapy, both single treatment (oral or insulin) and combination (oral + oral or oral + insulin) which can reduce blood glucose levels in patients in the outpatient installation of RSUD Dr. Moewardi Surakarta in 2023. This research is non-experimental with retrospective data collection looking at patient medical record data. The sample size was calculated using the Slovin formula so that 88 respondents were obtained. Profile of treatment therapy used in type II diabetes mellitus patients undergoing outpatient treatment at RSUD Dr. Moewardi Surakarta has the most combination therapy of long-acting insulin + rapid-acting insulin with a percentage of 36.4%, then the second most is premixed analog insulin monotherapy with a percentage of 10.2%. The results of the paired sample T-test can be stated that from the 1st to the 2nd month there was a significant decrease in blood sugar levels as well as in the 1st to 3rd month, this indicates that antidiabetic drugs, both oral and injectable, are effective for lower blood sugar levels.

Keywords: antidiabetic; diabetes mellitus type 2; effectiveness; RSUD Dr. Moewardi

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia and abnormalities in carbohydrate, fat, and protein metabolism. It results from defects in insulin secretion, insulin sensitivity, or both. Impaired fasting glucose is defined as FPG of 100 to 125 mg/dL (5.6 to 6.9 mmol/L) (Barbara G et al., 2009). Diabetes mellitus is called the silent killer because this disease can affect all organs of the body and cause various kinds of complaints. Diseases that will be caused include eye vision problems, cataracts, heart disease, kidney disease, sexual impotence, wounds that are difficult to heal and rot, lung infections, blood vessel disorders, stroke and others (Fatimah, 2015). Around 537 million adults (20-79 years) live with diabetes and it is predicted that by 2030 this will increase to 643 million people. Diabetes is responsible for 6.7 million deaths in 2021 or 1 every 5 seconds (IDF, 2021). The percentage of people with type 1 diabetes mellitus is around 5-10%, type 2 diabetes mellitus is around 90% and rare diabetes such as gestational diabetes mellitus or other types of diabetes is around 1-2% (Barbara G et al., 2009)

Pharmacological treatment of diabetes mellitus is divided into two parts, namely oral antihyperglycemic and injectable (insulin). Oral antihyperglycemic drugs are divided into 5, namely insulin secretion enhancers (sulfonylureas and glinides), insulin sensitivity enhancers (biguanides and thiazolidinediones), α -glucosidase inhibitors, dipeptidyl peptidase-4 (DPP-4)

enzyme inhibitors and sodium glucose co-transporter enzyme inhibitors-2 (SGLT-2). Non-pharmacological diabetes mellitus treatment therapy is divided into two parts, namely: food regulation and physical exercise (Perkeni, 2021). Evaluation of the rationality of oral antidiabetic drugs on the effectiveness of therapy for patients with type II diabetes mellitus, RSUD Dr. Moewardi Surakarta concluded that ADO (biguanide + sulfonilurea) combination therapy is a therapy that is often used in patients and is effective in reducing blood glucose levels within 3 months of treatment. Based on the description above, it can be seen that the prevalence of diabetes mellitus continues to increase, so research is interesting regarding the effectiveness and profile of type 2 diabetes mellitus drug use at Dr. Moewardi Surakarta which can reduce fasting blood glucose levels.

METHOD

This research is a non-experimental study in which data collection was carried out retrospectively, namely by looking at the patient's medical record data. The sampling technique was purposive sampling who met the inclusion criteria, namely outpatient type 2 diabetes mellitus patients, aged 20-79 years and patients undergoing routine treatment for 3 consecutive months in the period 2023, while the exclusion criteria were pregnant women, age < 20 years or > 79 years, medical record data is incomplete or missing and the patient dies. Based on the inclusion and exclusion criteria, there are 88 respondents who joined this research. The results obtained were analyzed using Paired Sample T-test. This research has received ethical permission and was approved by the research ethics committee with number 1.160/VI/HREC/2023.

RESULTS AND DISCUSSION

Patient characteristics are used to determine the diversity of patients based on gender, age and diagnosis. Regarding the characteristics of respondents based on gender, the majority of people with type 2 diabetes mellitus were male namely 46 people (52.3%). Characteristics based on age, the largest number of sufferers were in the age range 40-59 years amounting to 44 patients (50%). The highest diagnosis of type 2 diabetes mellitus was accompanied by complications in 86 patients (96.6%). Table 1 presents the characteristic of the respondents.

Table 1.
Characteristic of the respondents (88)

Characteristic	Category	f	%
Gender	Male	46	52.3
	Female	42	47.7
Age	20-39 years old	5	5.7
	40-59 years old	44	50
	60-79 years old	39	44.3
Diagnosis	DM2 without complication	2	3.4
	DM2 with complication	86	96.6

Therapeutic profile of drug use in type 2 diabetes mellitus patients undergoing outpatient treatment at RSUD Dr. Moewardi Surakarta, the highest use of monotherapy is premixed analog insulin (novomix[®]) with a percentage of 10.2% (9 patients). Insulin therapy in DM patients can prevent endothelial damage, suppress inflammatory reactions, and reduce cell apoptosis. Premixed insulin therapy contains basal and prandial components so it can meet basal and prandial needs in one injection. This is in line with (Hongdiyanto et al., 2014) who found that insulin use tended to be greater with a percentage of 75%. While the most combination therapy is long acting insulin +

rapid acting insulin (lantus[®] + novorapid[®]) with a percentage of 36.4 % (32 patients). Combination therapy of basal and prandial insulin can be given if blood glucose levels throughout the day are not controlled even though basal insulin has been given. This is in line with (Gamayanti et al., 2018) which obtained the highest percentage of insulin combination, namely long acting insulin + rapid acting insulin with a percentage of 33.75%. Table 2 presents the drug use profile.

Table 2.
Drug use profile

Type of drug	f	%
Monotherapy		
Alpha Glucosidase Inhibitors	1	1.1
DPP-4 inhibitor	5	5.7
Biguanides	4	4.5
Premixed Analog Insulin	9	10.2
2 combinations		
Alpha Glucosidase Inhibitor + DPP-4 Inhibitor	3	3.4
Alpha Glucosidase Inhibitor + Sulfonylurea	2	2.3
DPP-4 Inhibitor + Sulfonylurea	3	3.4
DPP-4 inhibitor + Biguanide	7	8
Biguanide + Sulfonylurea	1	1.1
Long Acting Insulin + DPP-4 Inhibitor	2	2.3
Long Acting Insulin + Rapid Acting Insulin	32	36.4
Premixed Analog Insulin + Alpha Glucosidase Inhibitor	2	2.3
Premixed Analog Insulin + Long Acting Insulin	6	6.8
Premixed Analog Insulin + Rapid Acting Insulin	2	2.3
3 combinations		
DPP-4 Inhibitor + Alpha Glucosidase Inhibitor + Long Acting Insulin	1	1.1
Biguanide + Alpha Glucosidase Inhibitor + DPP-4 Inhibitor	3	3.4
Biguanide + Sulfonylurea + DPP-4 Inhibitor	1	1.1
Biguanide + DPP-4 Inhibitor + Long Acting Insulin	1	1.1
Biguanide + Rapid Acting Insulin + Long Acting Insulin	1	1.1
Alpha Glucosidase Inhibitor + Rapid Acting Insulin + Long Acting Insulin	1	1.1
Alpha Glucosidase Inhibitor + Thiazolidinedione + Sulfonylurea	1	1.1

Insulin has a mechanism of action, namely regulating blood glucose levels in the liver, muscle and adipose. The main role of insulin is uptake, utilization and storing nutrients in cells. The anabolic effect of insulin is to stimulate, utilize and store glucose, amino acids and fatty acids intracellularly. The effect of insulin catabolism is to inhibit the breakdown of glycogen, fat and protein. Side effects that may occur when using insulin are hypoglycemia, weight gain and lipodystrophy (Gunawan, 2016). Novomix[®] contains a combination of insulin protamine aspart 70% (long-acting insulin) and aspart 30% (fast-acting insulin) which is injected subcutaneously once or twice daily before meals. Novorapid[®] is a rapid acting insulin containing insulin aspart and Lantus[®] is a long acting insulin containing insulin glargine. Rapid acting insulin is injected 5-10 minutes before eating with the aim of controlling blood glucose after eating, while long acting insulin is injected once at night before bed with the aim of controlling fasting blood glucose levels. Combination therapy is recommended rather than increasing the dose of one type of hypoglycemia drug which can increase the risk of toxicity and side effects. Two or more hypoglycemia drugs with different mechanisms of action when used together can provide better benefits in controlling blood glucose levels (Perkeni, 2021). The combination of Novorapid[®] + Lantus[®] insulin is needed for patients with blood sugar levels ≥ 200 mg/dL, although in its use oral antidiabetics can still be given but

earlier use of insulin can provide better clinical results, especially related to the problem of glucotoxicity (Maisu, 2018).

Table 3.
Fasting Blood Sugar Lever

Keterangan	Fasting blood glucose level (GDP)		
	Month 1	Month 2	Month 3
Controlled	18 (20,5%)	16 (18,2%)	28 (31,8%)
Not Controlled	70 (79,5%)	71 (80,7)	60 (68,2%)
No Checking	-	1 (1,1%)	-

Based on the laboratory results of patients with type II diabetes mellitus at RSUD Dr. Moewardi can see that the reference value for fasting blood sugar levels is 70-110 mg/dl while blood sugar levels 2 hours post prandial are 80-140 mg/dl, so it can be seen in table 11 that most of the fasting blood sugar levels and The patient's 2 hour postprandial blood pressure was not controlled during 3 months of treatment. GDP and GD2PP levels can fluctuate 24 hours from day to day in DM patients so that blood sugar levels cannot describe the true state of blood sugar and it is difficult to determine objective control of blood sugar levels because these two tests are very influenced by short-term lifestyle. patient (such as food, drink and physical activity) before carrying out the examination as well as patient compliance with taking medication. An examination that can be used to monitor the control of blood sugar levels objectively is the HbA1c examination (Charisma, 2017). Examination of HbA1c levels can provide a clinical picture of blood sugar levels in 3 months. This is in line with research (Rukminingsih & Nova, 2021) which stated that 50.88% of patients had GDP levels ≥ 126 mg/dl and GD2PP ≥ 200 mg/dl or abnormal blood sugar levels.

Table 3.
Results of paired sample T-test analysis of GDP before and after therapy

	Mean	t _{hitung}	p-Value	Sig	Information
GDP 1 – GDP 2	17,413	2,565	0,012	p<0,05	Significant
GDP 1 – GDP 3	16,943	2,203	0,030	p<0,05	Significant

Tabel 3 show the results of paired sample T-test analysis of GDP before and after therapy. The results of the paired sample T-test for the difference in fasting blood sugar levels in the 1st month (GDP 1) and fasting blood sugar levels in the 2nd month (GDP 2) obtained a p-Value of $0.012 < 0.05$, which means there is a difference between the levels GDP 1 (mean = 164,574) and GDP 2 (mean = 147,160). b) Results of the paired sample T-test for the difference in fasting blood sugar levels in the 1st month (GDP 1) and fasting blood sugar levels in the 3rd month (GDP 3) which obtained a p-Value of $0.030 < 0.05$, which means there is a difference between levels of GDP 1 (mean = 163,556) and GDP 3 (mean = 146,613).

CONCLUSION

There was a significant reduction in blood glucose levels after being given diabetes mellitus treatment therapy, either oral or injectable and either alone or in combination. The profile of drug use that is widely used in type 2 diabetes mellitus sufferers is insulin use.

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