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Analysis Of The Use Of Oral Antidiabetic Drugs In Type II Diabetes Mellitus Patients At X Hospital Semarang City

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ABSTRACT

Diabetes mellitus is a long-term condition marked by high blood sugar levels. It stems from metabolic endocrine disorders that may result from reduced insulin secretion, reduced insulin sensitivity, or both. Management of type II DM often includes antidiabetic treatment, which may consist of one medication or a combination. This research aims to describe patient characteristics, outline medication usage, report rates of Glucose Ad Random (GAR) reduction, and assess the efficacy of single versus combination antidiabetic drugs in type 2 DM patients admitted to X Hospital in Semarang City. The study uses an analytical observational approach with retrospective data collection and purposive sampling. Findings showed that 52.13% were women and 42.02% were aged 56-65 years (late elderly group). Also, 70.21% had Type II DM with complications, and 57.45% had hospital stays of 1-4 days. The most used single antidiabetic accounted for 53.19% of cases. Paired Sample T-Test results for both single and combination antidiabetics showed $p < 0.05$, indicating both therapies effectively reduce GAR. Single antidiabetic therapy yielded a 22.46% reduction, while the combination led to a 45.36% decrease. The T-Test results further showed the combination was more effective, with an average GAR reduction of 111.2386 mg/dL. Hospitals are expected to continue using combination oral antidiabetics as per the hospital formulary to maintain blood sugar control. Diabetes Mellitus patients should monitor blood sugar routinely, take medications regularly, and follow a recommended diet, healthy lifestyle, and regular exercise. This helps prevent complications. Future researchers are encouraged to examine the relationship between laboratory data and other factors such as BMI, diet, and stress.

Keywords: Antidiabetics, Blood Glucose. Diabetes Mellitus, Effectiveness.

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INTRODUCTION

The definition of diabetes mellitus according to the World Health Organization (WHO) is a metabolic endocrine system disorder caused by decreased insulin secretion, insulin productivity, or both [(1)]. Diabetes mellitus is the leading cause of death because this disease causes many complications in sufferers [(2)].

In Indonesia itself, in 2018, the prevalence of diabetes mellitus was reported to have increased to 10.9 % [3]. The prevalence of diabetes mellitus reported by the Central Java Health Profile was (13.67%) in 2020, (11%) in 2021 and (15.6%) in 2022.

The selection of Antidiabetic drugs for therapy in Type II DM patients is a determining factor in the success of diabetes treatment. Administration of oral antidiabetic pharmacotherapy by providing single drug Antidiabetic therapy or by using a combination of 2 different drug classes [4].

Based on the description explained, the researcher feels the need to conduct the latest research, to be able to determine the difference in effectiveness in the use of single and combination oral antidiabetic drugs in Type II diabetes mellitus patients at the X Hospital, Semarang City.

METHOD

The study was conducted using an analytical observational design method with retrospective data collection. The sampling technique was carried out using a non-probability sampling method, using a purposive sampling technique according to the inclusion and exclusion criteria. The subjects in this study were 188 type II diabetes mellitus patients who were hospitalized at the X Hospital in Semarang City.

The inclusion criteria studied were type II diabetes mellitus patients, patients with single or combination oral antidiabetic therapy, non - BPJS patients, patients with inpatient medical record data for the period January - March 2024, patients who had random blood glucose lab data, and patients aged ≥ 17 years. The exclusion criteria in this study were incomplete or deceased patient medical record data, diabetes mellitus patients who did not experience a decrease in random blood glucose levels during therapy, pregnant patients, and type II diabetes mellitus patients who used insulin.

RESULTS AND DISCUSSIONS

The results were obtained from medical record data of 188 Type 2 diabetes mellitus patients who met the inclusion and exclusion criteria at Hospital X Semarang City in the period January - March 2024.

Table 1. Characteristics of Type II Diabetes Mellitus Patients Based on Gender, Age, Diagnosis, Complications, Length of Hospitalization, Use of Medication.

Gender	**n**	**Percentage (%)**
Male	90	47.87
Female	98	52.13
Total	188	100
Age (years)	**n**	**Percentage (%)**
26-35	1	0.53
36-45	20	10.64
46-55	52	27.66
56-65	79	42.02
>65	36	19.15
Total	188	100.00
Diagnose	**n**	**Percentage (%)**
DM Tipe II without complications	56	29.79
DM Tipe II with complications	132	70.21
Total	188	100
Complications	**n**	**Percentage (%)**
Hypertension	107	81.06
Retinopathy	6	4.55

Nephropathy	2	1.52
Hypertension + Neuropathy	7	5.30
Hypertension + Retinopathy	6	4.55
Hypertension + Nephopathy	2	1.52
Hypertension + Neuropathy + Retinopathy	2	1.52
Total	132	100

Long Treatment (days)	Single		Combination	
	n	Percentage (%)	n	Percentage (%)
1-4	50	50	58	65.91
5-7	31	31	18	20.45
8-10	19	19	12	13.64
Total	100	100	88	100

Therapi	n	Percentage (%)
Single	100	53.19
Combination	88	46.81
Total	188	100

Source: Primary Data

Table 2. Normality Test, Paired Sample T-Test, and GAR Reduction of Single and Combination Antidiabetics

Terapi	Sig		n
Single	0.62		100
Combination	0.124		88
GAR	**Mean**	**Sig**	**n**
Single			
*beginning of hospitalization	174.21	0.00	100
*end of hospitalization	135.08		100
Combination			
* beginning of hospitalization	245.25	0.00	88
* end of hospitalization	134.0114		88
Decrease in GAR	**Mean**	**Sig**	**n**
Single	39.13	0.00	100
Combination	111.2386		88

Source: Primary Data

Based on Table 1 it shows that Type 2 diabetes mellitus patients are mostly female, namely 98 patients (52.13%), while men are 90 patients (47.87%).

This shows that gender is a risk factor for developing diabetes mellitus. This is in line with research conducted by Ninia in 2023 [5] which stated that the risk of developing Type II diabetes mellitus in women is higher, where women have a higher percentage of 71.4%. Female patients have monthly cycles (premenstrual syndrome) and postmenopause which cause the distribution of fat in the body to accumulate more easily which is a result of the hormonal process [6]. This risks increasing glucose levels because it is related to decreased insulin sensitivity. The risk of Type II diabetes mellitus in men is also high because not only gender is a causal factor but there are still many factors that cause the disease.

The youngest patient in the early adult category was 27 years old, and the oldest in the elderly category was 80 years old. Patients were dominated by the late elderly category aged 56-65 years, which was 79 patients (42.02%). The results of this study are in line with Lestari's 2024 study which stated the same thing

that most type II diabetes mellitus patients were patients aged 56-65 years at 43.92%. At the age of 50 and over, atrophy occurs in the beta cells of the pancreas which causes insufficient insulin secretion [7]. As we age, fat accumulates in the body and is stored in the abdomen, forming central obesity, which results in insulin resistance and contributes to type II Diabetes [5]. Based on this statement, it can be ascertained that age is one of the factors causing type II Diabetes..

Type II diabetes mellitus patients with complications, as many as 132 patients (70.21%). The results of this study are in line with Ninia's 2023 study, most patients were Type II diabetes mellitus patients with complications of 90%. The risk of complications that occur is related to the duration of suffering from Type II Diabetes and HbA1C levels> 7.0%. So that modifications to a healthy lifestyle need to be done so that the risk of complications in Type II diabetes mellitus sufferers can be reduced [8].

The highest percentage of complications is hypertension, which is 81.06%. In a study conducted by Fortuna in 2023, hypertension was the most common complication in patients with diabetes mellitus, which was 41%. Factors Affecting Complications in Patients with diabetes mellitus at Dr. Moewardi Hospital. Pharmacon: Indonesian Pharmacy Journal, 20: 27 – 35. This is in line with the theory that blood glucose has various impacts on the occurrence of hypertension, such as toxic effects that affect endothelial cells in blood vessels, which leads to increased vasoconstriction and the risk of atherosclerosis [5].

The number of cases of type II diabetes mellitus with the second largest complication is hypertension and neuropathy as many as 7 patients (5.3%). Uncontrolled blood sugar levels will cause chronic hyperglycemia and cause microangiopathy that underlies the onset of diabetic neuropathy. Hypertension causes microvascular damage, insulin resistance or hyperinsulinemia, metabolic system disorders, and increased sympathetic nerve activity so that hypertension can be linked to the occurrence of diabetic neuropathy [9].

Other complications that occurred were retinopathy in 6 patients (4.55%) and hypertension and retinopathy in 6 patients (4.55%). This is in line with research conducted by Raflin in 2023 showing that blood glucose control is a risk factor for diabetic retinopathy [10]. Hypertension is an inducer of oxidative stress and inflammation, which are causal factors for the development of diabetic retinopathy [11].

In complications of nephropathy disease, as many as 2 patients (1.52%), hypertension and nephropathy as many as 2 patients (1.52%), hypertension, neuropathy and retinopathy as many as 2 patients (1.52%). The many complications that arise are caused by Type II diabetes mellitus usually appear without being known, which causes treatment to only be carried out after years later when the disease has developed and complications have arisen [12].

A total of 50 patients (50%) who used single therapy and 58 patients (65.91%) who used combination therapy were treated for 1-4 days. The difference in the length of hospitalization depends on the achievement of the target of reducing blood glucose levels, and whether or not the patient's condition improves is also another factor in the length of hospitalization [13].

Most therapy is single therapy, which is 100 patients (53.19%). While those using combination therapy are 88 patients (46.81%). Metformin as the first line because of its good antidiabetic effectiveness, lower risk

of hypoglycemia, high availability and low cost. This biguanide class drug has a main working mechanism of increasing insulin sensitivity and reducing liver glucose production [8].

Combination therapy is dominated by 2 combinations of oral antidiabetics, namely 70 patients. The combination of biguanide and sulfonylurea is the most widely used combination, namely 50 patients. This combination reduces the side effects of sulfonylureas, such as the risk of hypoglycemia and weight gain, increasing the effectiveness of therapy [14]. The use of other combination therapies is a combination of 3 antidiabetic oral in 17 patients, and a combination of 4 antidiabetic oral in 1 patient. The advantage of combination antidiabetics compared to single antidiabetics is that combination antidiabetics have different mechanisms so that they can target various pathophysiological aspects of diabetes, combination therapy also has a synergistic effect so that the combined effect of the combination of antidiabetics is greater than the effect of each drug if taken separately.

Based on Table 2, which shows the results of the normality test, the data were normally distributed, with a significant number of blood sugar levels at the beginning and end of hospitalization for each therapy ($p > 0.05$). The results of the Paired Sample T-Test for blood sugar levels at the beginning and end of hospitalization for the use of single and combination therapies each obtained results ($p <0.05$) so that the use of single and combination antidiabetic drugs effectively reduced blood sugar levels at the time.

The results of the Independent Sample T-Test showed a decrease in Glucose Ad Random (GAR) in single combination antidiabetic therapy ($p <0.05$). So, that combination antidiabetic drugs are more effective in significantly reducing GAR with an average decrease of 111.2386 mg/dL. This is in line with Udayani's at 2016 study which stated that the use of combination antidiabetic drugs is more effective than single with a decrease in blood sugar levels of 70 mg/dL [15]. From these data, it can be concluded that combination antidiabetic therapy is a rational choice compared to single therapy for the treatment of Type II diabetes mellitus with uncontrolled blood glucose levels. The use of combination antidiabetic drugs can be given when certain conditions occur when the target blood sugar level is not achieved or is not controlled with single therapy [8].

CONCLUSION

Percentage of characteristics of patients who were hospitalized at Hospital X Semarang City for the period January - March 2024 with a total of 188 patients, more dominantly suffered by female patients, aged 56 - 65 years, diagnosed with Type II diabetes mellitus with complications and length of hospitalization for 1 - 4 days. The most widely used antidiabetic drug is the use of single antidiabetic. Single and combination oral antidiabetic drugs are effective in lowering random blood sugar levels. In single oral antidiabetic drugs, the decrease in GAR was 22.46% and combination antidiabetic drugs decreased GAR by 45.36%. The effectiveness of single and combination antidiabetic drugs has a significant difference, so that combination antidiabetic therapy is more effective in significantly lowering random blood glucose with an average decrease of 111.24 mg / dL.

Hospitals are expected to maintain the use of combination oral antidiabetics according to the hospital formulary so that patients' blood sugar levels remain under control, Diabetes Mellitus patients are expected to

check their blood sugar levels routinely, consume antidiabetic drugs regularly, so that blood sugar levels can be controlled and follow a diet according to recommendations, a healthy lifestyle, regular exercise so that the emergence of other complications can be prevented and further researchers are expected to be able to see the relationship between laboratory examination data and other factors that can influence such as BMI (Body Mass Index), diet patterns, stress, etc.

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