

# The Profile of Blood Sugar Level of Type 2 Diabetes Mellitus and Hyperlipidemia Patients Who Consume Oral Anti-Diabetic Drugs and Simvastatin in Some Community Health Centers in Makassar City

Rosliah<sup>1\*</sup>, Elly Wahyudi<sup>2</sup>, Hasyim Kasim<sup>3</sup>

<sup>1</sup>Clinical Pharmacy Study Program Hasanuddin University

<sup>2,3</sup> Pharmacy Faculty Hasanuddin University

**Abstract:** Metformin and glimepiride are oral anti-diabetic drugs used by diabetes mellitus patients, which aims to lower blood sugar levels, while simvastatin is an anti-hyperlipidemia drug with indications of lowering lipid levels in the blood. This study aims to determine the fasting blood sugar level during the use of a combination of oral anti-diabetic drugs and simvastatin drug for type 2 diabetes mellitus and hyperlipidemia patients in some Community Health Centers in Makassar City. This research is a descriptive non-experimental study with a treatment of data in a population of all type 2 diabetes mellitus and hyperlipidemia patients who consume oral anti-diabetic drugs and simvastatin. Data collection was conducted for a month, namely from January to February 2020, using medical record data and laboratory results of fasting blood sugar test. The research subjects consisted of 3 groups, namely metformin users (n = 39), glimepiride users (n = 13), and a combination of metformin and glimepiride users (n = 28). Changes in fasting blood sugar levels between metformin group, glimepiride group, and a combination of metformin and glimepiride group showed that during 3-month use of a combination of metformin and glimepiride, it was shown significant results (P = 0.017). This indicates that the use of a combination of metformin and glimepiride drugs is better at lowering the patients' blood sugar level than those of a single therapy of either metformin or glimepiride. The tests were conducted to compare each group of drugs through observations in each month, and the results showed no significant difference. Thus, it can be concluded that there is no difference in any group of treatment.

**Keywords:** Diabetes Mellitus, Glimepiride, Hyperlipidemia, Metformin, Simvastatin

## I. INTRODUCTION

According to a survey conducted by WHO (World Health Organization), Indonesia is in the fourth position with the largest number of Diabetes Mellitus patients in the world after India, China, and the United States. Its prevalence is 8.6% of the total population. In 1995, the number of Diabetes Mellitus patient was the largest among all diseases caused by endocrine disorders, which was estimated up to 4.5 million people, both hospitalized and outpatient (Department of Health of the Republic of Indonesia, 2005).

Diabetes Mellitus is a disease caused by an effect of insulin secretion, insulin action, or both. Diabetes Mellitus leads to long-term health problems, including dysfunction and failure of various organs like the heart, nervous system, eyes, kidneys, and blood vessels (American Diabetes Association, 2013).

The main cause of death in Diabetes Mellitus patients is the onset of cardiovascular disease. Many risk factors of cardiovascular disease in Diabetes Mellitus patients, namely hypertension, obesity, hyperlipidemia, microalbuminuria, coagulation disorders, stroke, and myocardial infarction (Soegondo S, 2008).

Hyperlipidemia means there is excessive accumulation of one or more main lipids in plasma as a manifestation of metabolic disorders or lipid transport. In clinical expression, hyperlipidemia is referred to as hypercholesterolemia, hypertriglyceridemia, or a combination of both. Secondary hyperlipidemia is caused by increased blood lipid levels due to certain disease, such as Diabetes Mellitus (Arif, et al, 2000).

One of the supporting successes of type 2 Diabetes Mellitus and Hyperlipidemia therapy is by choosing the right drug, while the failure of therapy can be caused by Drug Related Problems. Drug Related Problems (DRPs) are problems that may occur while a patient is receiving a therapy, namely indication without drugs that leads to drug interaction, and the failure of patients to receive therapy due to various factors (Andriani et al, 2019).

During observations in several studies, there are different combinations of prescription for diabetes and hyperlipidemia treatments due to differences in the patients' medical condition and their level of adherence. In terms of the use of drug combination, it is essential to pay attention to the effects of mixing different drugs and its interaction (Gunawan, 2007).

There is a research on the use of statin class drugs increasing fasting blood sugar level in type 2 Diabetes Mellitus patients. In that research, it is found that the fasting blood sugar levels of type 2 Diabetes Mellitus and hyperlipidemia patients

decrease after oral anti-diabetic drugs administration. However, their fasting blood sugar levels increase after they are given statin drugs (Bharti 2015, Yeni Farida, 2016).

Based on the research mentioned above which discusses about the effects of statin drugs on Diabetes Mellitus treatment, we plan to examine the same issues further in Makassar City since there has not been such research conducted in that city. We would also like to discuss about the fasting blood sugar levels of type 2 Diabetes Mellitus patients who receive oral anti-diabetic and simvastatin drug administration.

## II. RESEARCH METHOD

This research was a descriptive non-experimental study (Arafah & Hasyim, 2020) applying retrospective data collection on a total population of type 2 Diabetes Mellitus and hyperlipidemia patients who consumed oral anti-diabetic drugs and simvastatin drugs in several Community Health Centers in Makassar City. The population was all patients who underwent Diabetes Mellitus and hyperlipidemia therapy in several Community Health Centers in Makassar City from May 2019 to December 2019. The samples of this research were all type 2 Diabetes Mellitus and hyperlipidemia patients who consumed simvastatin and oral anti-diabetic drugs in several Community Health Centers in Makassar City from May 2019 to December 2019. The number of sample was 80 patients.

Data were collected after receiving an approval from the Head of the Community Health Center, the Head of Administration, Medical Record staff, and the Head of Internal Diseases Department. In this case, each Community Health Center had different policy. The samples, 80 patients, were selected retrospectively from May 2019 to December 2019, and then collected in the medical record department of 6 (six) Community Health Centers (CHCs) in Makassar City, namely Mamajang CHC, Barabara CHC, Kassi-Kassi CHC, Batua CHC, Tamalanrea CHC, and Sudiang CHC.

Observations were conducted, and the data were recorded directly into the table provided for further analysis on 80 type 2 Diabetes mellitus and hyperlipidemia who consumed simvastatin. The patients were divided into three groups, namely 39 patients who consumed metformin, 13 patients who consumed glimepiride, and 28 patients who consumed both metformin and glimepiride. There were some data observed and analyzed by the researcher. The first one is the demographic data of 80 patients, such as sex, age, BMI, and duration of suffering from Diabetes Mellitus. The second one is changes in fasting blood sugar level of those three groups of patients, which were observed for 3 months. The third one is the percentage of reduction in fasting blood sugar level in the first, the second, and the third month of treatments using metformin, glimepiride, and a combination of metformin and glimepiride.

## III. RESULTS AND DISCUSSION

Data used in this research are collected from the medical records of patients suffering from both type 2 Diabetes

Mellitus and hyperlipidemia who consume oral anti-diabetic therapy and simvastatin drugs from May 2019 to December 2019 in 6 (six) Community Health Centers in Makassar City (mention the name of the Community Health Centers). This research is conducted for a month, namely from 17 January to 17 February 2020. After that, the researchers selected Diabetes Mellitus and hyperlipidemia patients who meet the inclusion criteria. The data show that not all Diabetes Mellitus and hyperlipidemia patients consume oral drugs, and thus the researchers eliminate some patients and exclude some of them from the samples of this research. (*Mention the number of patients in each group*).

This research is a descriptive non-experimental study, where the data are collected retrospectively. This research aims to examine the effectiveness of oral anti-diabetic drugs, simvastatin drugs, and a combination of both to lower the fasting blood sugar level in Diabetes Mellitus and hyperlipidemia patients.

This research is carried out based on the workflow of research method. The data collected include demographic data (sex, age, BMI, duration of Diabetes Mellitus) and the clinical condition based on the laboratory test (fasting blood sugar level). The demographic data of the research subjects are described in the following table, completed by explanation.

Based on the research conducted, the distribution of sex, age, Body Mass Index (BMI), and duration of Diabetes Mellitus can be seen in table 1.

Table 1. Characteristics of Diabetes Mellitus patients based on sex, age, Body Mass Index (BMI), and duration of Diabetes Mellitus.

Characteristics of Patients	Therapy		
	Metformin (N=39)	Glimepiride (N=13)	Metformin + Glimepiride (N=28)
1. Sex			
Male	11 (28.2 %)	3 (23.1 %)	9 (32.1 %)
Female	28 (71.8 %)	10 (76.9 %)	19 (67.9 %)
Total	39 (100 %)	13 (100 %)	28 (100 %)
2. Age			
23 - 37 years	1 (2.6 %)		
38 - 52 years	1 (2.6 %)	3 (23.1 %)	5 (17.9 %)
53 - 67 years	31 (79.5 %)	10 (76.9 %)	17 (60.7 %)
68 - 82 years	6 (15.4 %)		6 (21.4 %)
Total	39 (100 %)	13 (100 %)	28 (100 %)
3. BMI			
< 18.5	1 (2.6 %)		
18.5 – 22.9	7 (17.9 %)	2 (15.4 %)	6 (21.4 %)
23.0 – 24.9	12 (30.8 %)	3 (23.1 %)	10 (35.7 %)
25.0 – 29.9	18 (46.2 %)	8 (61.5 %)	11 (39.3 %)
≥ 30.0	1 (2.6 %)		1 (3.6 %)
Total	39 (100 %)	13 (100 %)	28 (100 %)
4. Duration of Diabetes Mellitus			
≤ 1 year	13 (33.3 %)	2 (15.4 %)	1 (3.6 %)

2 – 5 years	22 (56.4 %)	10 (76.9 %)	26 (92.9 %)
6 – 10 years	4 (10.3 %)	1 (7.7 %)	1 (3.6 %)
Total	39 (100 %)	13 (100 %)	28 (100 %)

Source: Primary Data (2020)

Based on sex, the number of patients who consume metformin is 39 patients, consisting of 11 male patients (28.2%) and 28 female patients (71.8%). The number of patients who consumed glimepiride is 13, consisting of 3 male patients (23.1%) and 10 female patients (76.9%). There are 28 patients consuming a combination of metformin and glimepiride, consisting of 9 male patients (32.1%) and 19 female patients (67.9%).

Based on age, the number of patients aged 23-37 years who consume metformin is 1 patient (2.6%), while the number of patients aged 38-52 years who consume metformin is 1 patient (2.6%), the number of patients who consume glimepiride is 3 patients (23.1%), and the number of patients who consume a combination of metformin and glimepiride is 5 patients (17.9%). The number of patients aged 53-67 years who consume metformin is 31 patients (79.5%), the number of patients who consume glimepiride is 10 patients (76.9%), and the number of patients who consume a combination of metformin and glimepiride is 17 patients (60.7%). The number of patients aged 68-82 years who consume metformin is 6 patients (15.4%), and the number of patients who consume metformin and glimepiride is 6 patients (21.4%).

Characteristics based on age are non-modifiable risk factors for Diabetes Mellitus and hyperlipidemia. In this research, the number of patients aged 23-37 years who consume metformin is 1 patient (2.6%), while the number of patients aged 38-52 years who consume metformin is 1 patient (2.6%), the number of patients who consume glimepiride is 3 patients (23.1%), and the number of patients who consume a combination of metformin and glimepiride is 5 patients (17.9%). The number of patients aged 53-67 years who consume metformin is 31 patients (79.5%), the number of patients who consume glimepiride is 10 patients (76.9%), and the number of patients who consume a combination of metformin and glimepiride is 17 patients (60.7%). The number of patient aged 68-82 years who consume metformin is 6 patients (15.4%), and the

number of patients who consume metformin and glimepiride is 6 patients (21.4%). The total number of patients who use metformin is 39 patients, the number of patient who uses glimepiride is 13 patients, and the number of patients who use both metformin and glimepiride is 28 patients.

Based on the characteristic of Body Mass Index (BMI), accompanied by therapy with anti-diabetic mellitus and hyperlipidemia on Diabetes Mellitus and hyperlipidemia patients, as shown in the table above, Diabetes Mellitus and hyperlipidemia are potentially suffered by patients with BMI of 25 to 29.9, namely 37.

Based on the characteristic of the duration of Diabetes Mellitus, the number of patients suffering from Diabetes Mellitus for less than 1 year is 16 patients, those who suffer from DM for about 2-5 years are 58 patients, and those who suffer from DM for about 6-10 years are 6 patients.

*Please explain what Diabetes Mellitus and hyperlipidemia, and provide more explanation about the drugs used.*

Table 2.Changes in fasting blood sugar levels between metformin, glimepiride, and the combination of metformin and glimepiride groups

Blood Sugar Level	Metformin	Glimepiride	Metformin + Glimepiride
	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)
The first month	193.36 (71.88)	202.23 (87.64)	238.5 (81.5)
The second month	179.15 (58)	198.23 (74.92)	210.18 (53.11)
The third month	188.1 (51.15)	179.54 (70.89)	194.71 (57.84)
<i>P value</i>	0.363	0.345	0.017*

Source: Primary Data (2020)

Table 2 shows changes in fasting blood sugar levels between metformin, glimepiride, and the combination of metformin and glimepiride groups. The use of combination of metformin and glimepiride in 3 months shows significant difference with p value of 0.017. It indicates that therapy using the combination of both drugs is better to lower blood sugar level compared to therapy using a single drug, either metformin or glimepiride.

Table 3.Percentage of reduction in fasting blood sugar level in the first month of treatment using metformin, glimepiride, and the combination of metformin and glimepiride

Therapy	Therapy	Mean Difference	Std.	Sig.	Confidence interval 95 %	
			Error		Lower Bound	Upper Bound
Metformin	Glimepiride	-8.87179	24.96288	0.933	-68.5296	50.7860
	Metformin and Glimepiride	-45.14103	19.30737	0.057	-91.2830	1.0009
Glimepiride	Metformin	8.87179	24.96288	0.933	-50.7860	68.5296
	Metformin and Glimepiride	-36.26923	26.16003	0.353	-98.7881	26.2496
Metformin and Glimepiride	Metformin	45.14103	19.30737	0.057	-1.0009	91.2830
	Glimepiride	36.26923	26.16003	0.353	-26.2496	98.7881

Source: Primary Data (2020)

Table 3 shows the percentage of reduction in fasting blood sugar level in the first month of treatment using metformin, glimepiride, and the combination of metformin and glimepiride.

Table 4. Percentage of reduction in fasting blood sugar level in the second month of treatment using metformin, glimepiride, and the combination of metformin and glimepiride

Therapy	Therapy	Mean Difference	Std.	Sig.	Confidence interval 95 %	
			Error		Lower Bound	Upper Bound
Metformin	Glimepiride	-19.07692	19.01166	0.577	-64.5122	26.3583
	Metformin and Glimepiride	-31.02473	14.70444	0.094	-66.1663	4.1169
Glimepiride	Metformin	19.07692	19.01166	0.577	-26.3583	64.5122
	Metformin and Glimepiride	-11.94780	19.92341	0.821	-59.5620	35.6664
Metformin and Glimepiride	Metformin	31.02473	14.70444	0.094	-4.1169	66.1663
	Glimepiride	11.94780	19.92341	0.821	-35.6664	59.5620

Source: Primary Data (2020)

Table 4 shows the percentage of reduction in fasting blood sugar level in the second month of treatment using metformin, glimepiride, and the combination of metformin and glimepiride.

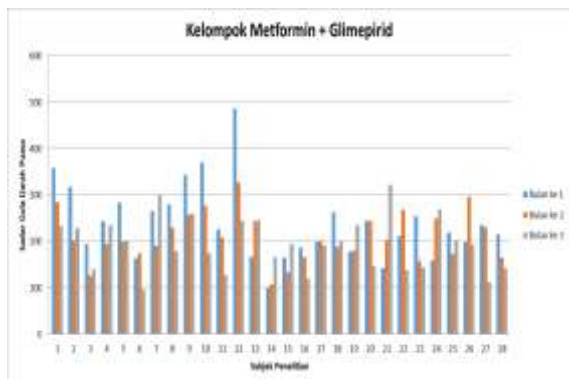
Table 5. Percentage of reduction in fasting blood sugar level in the third month of treatment using metformin, glimepiride, and the combination of metformin and glimepiride

Therapy	Therapy	Mean Difference	Std.	Sig.	Confidence interval 95 %	
			Error		Lower Bound	Upper Bound
Metformin	Glimepiride	8.56410	18.25051	0.886	-35.0521	52.1803
	Metformin and Glimepiride	-6.61172	14.11573	0.886	-40.3464	27.1229
Glimepiride	Metformin	-8.56410	18.25051	0.886	-52.1803	35.0521
	Metformin and Glimepiride	-15.17582	19.12575	0.708	-60.8837	30.5321
Metformin and Glimepiride	Metformin	6.61172	14.11573	0.886	-27.1229	40.3464
	Glimepiride	15.17582	19.12575	0.708	-30.5321	60.8837

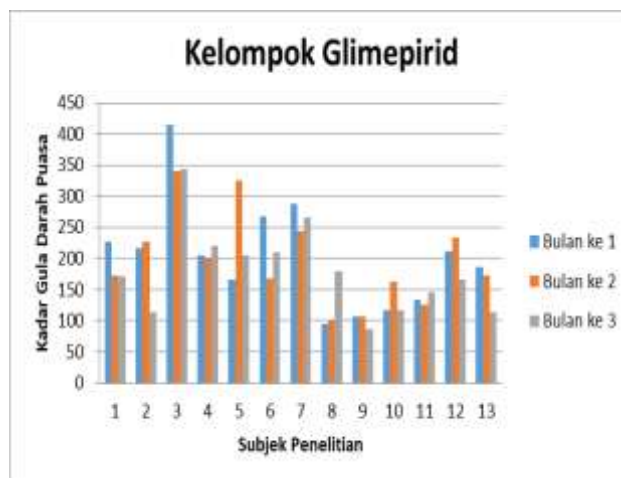
Source: Primary Data (2020)

Table 5 shows the percentage of reduction in fasting blood sugar level in the third month of treatment using metformin, glimepiride, and the combination of metformin and glimepiride.

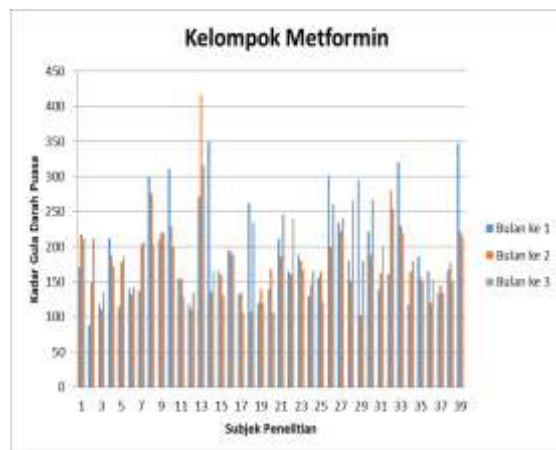
Graph 1. Metformin and Glimepiride Group



Graph 2 Glimepiride Group



Graph 3 Metformin Group



#### IV. CONCLUSION

Based on the results of this research, it is shown that the combination of glimepiride and metformin is better in lowering cholesterol level and fasting blood sugar level. Changes in fasting blood sugar level between metformin group, glimepiride group, and the combination of metformin and glimepiride group in three months show that the treatment using the combination of metformin and glimepiride results in significant difference with p value of 0.017. It indicates that the combination of metformin and glimepiride is better in

lowering fasting blood sugar level compared to a single use of either metformin or glimepiride.

It is recommended that further research on several kinds of anti-diabetic drugs be conducted for the purpose of patients' recovery, especially Diabetes Mellitus patients.

#### REFERENCES

- [1] American diabetes association. (2013). Executive Summary: Standard of Medical Care in Diabetes.
- [2] Andriani, R., Karsana, AA.R. Satyaweni, IGA. (2019). Pengaruh Pemberian Asuhan Kefarmasian Terhadap Kejadian Permasalahan Terkait Obat Pasien Geriatri Rawat Inap di RSUP Sanglah Denpasar. *Pharmaceutical Journal Of Indonesia*, 4(2): 79 – 83
- [3] Arafah, Burhanuddin, Hasyim, Muhammad. Covid-19 Mythology And Netizens Parrhesia Ideological Effects Of Coronavirus Myths On Social Media Users. (2020). *Palarch's Journal of Archaeology of Egypt/Egyptology* 17(4), 1398-1409.
- [4] Arif, Mansjoer, dkk. (2000) *Kapita Selekta Kedokteran*. Edisi ke-3. FKUI, Jakarta, Medica Aesculpalus.
- [5] Bharti chogtu, Rahul Magazine, and KL Bairy. (2015). Statin use and risk of diabetes mellitus, *Word J Diabetes*, 6 (2): 352-357.
- [6] Departeman Kesehatan. (2005). *Pharmaseutical care untuk penyakit diabetes mellitus*. Jakarta.
- [7] Farida, Yeni & Putri, Claudia. (2016). Efek simvastatin terhadap kenaikan gula darah pasien diabetes mellitus tipe 2. *Journal of Pharmaceutical Science and Clinical Research*, 01, 58-65.
- [8] Gunawan., Sulistia G., (2007). *Farmakologi dan Terapi* Edisi V., Departemen Farmakologi dan Terapeuti, EGC, Jakarta. Guyton Hall.
- [9] Soegondo S. (2008). *Diabetes, The Silent Killer*, at <http://www.medicastore.com>.