INDONESIAN PHARMACOPEIA JOURNAL

IPJ Vol. 1 No. 1

RESEARCH ARTICLE OPEN ACCESS

DESCRIPTION OF BLOOD SUGAR LEVELS OF DM PATIENTS WITH ORAL HYPOGLYCEMIC DRUG ADMINISTRATION AT ONE OF THE JEMBER HOSPITALS

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Submitted: 21 September 2023 Accepted: 11 Januari 2023 Published: 20 Januari 2023

ABSTRACT

Background: Diabetes Mellitus (DM) is a chronic disease caused by impaired metabolism of fat, carbohydrates and proteins, characterized by high blood sugar levels that exceed normal limits. The incidence of DM will increase every year, the increasing incidence of DM can be caused by risk factors, such as obesity, physical activity and age. This study aims to determine the use of metformin and glimepiride along with a picture of blood sugar levels of diabetes mellitus patients before and after administering single metformin and glimepiride drugs at one of the hospitals in Jember. **Methods:** This study includes non-experimental research, namely obervasional with analytical descriptive research design with cross sectional methods. Samples were taken using a total sampling technique that met the inclusion criteria of 32 outpatients. Penelitian ini dilakukan di ruang rekam medis di salah satu Rumah Sakit di Jember pada bulan Juni-Juli 2023. Data were taken using observation sheets and recapitulation sheets. **Research Results:** The use of metformin and glimepiride drugs in type 2 DM patients in one of the hospitals in Jember is metformin as much as 15.6% while glimepiride is 84.4%. The data showed the difference in the average blood sugar levels of patients before using metformin which was 233.2 mg / dl and after using metformin which was 168.4 mg / dl and the difference in the average blood sugar levels of patients before using glimepiride was 246.7 mg / dl and after using glimepiride was 181.5 mg / dl. **Conclusion:** The use of metformin and glimepiride alone drugs in patients with type 2 diabetes showed that almost all patients used a single glimepiride drug which was 84.4%. Single metformin and glimepiride drugs were also able to lower blood sugar levels of type 2 diabetes patients in one of the medical record rooms of the outpatient hospital installation in Jember.

Keywords: Diabetes mellitus, Metformin, Glimepiride, Blood sugar levels

BACKGROUND

Diabetes Mellitus (DM) is a chronic disease caused by disorders of fat, carbohydrate and protein metabolism, characterized by high blood sugar levels that exceed normal limits, and allows complications in small and large blood vessels (Defirson & Lailan Azizah, 2021). One type of DM that is often found is type 2 DM, type 2 DM is a type of DM where the pancreas is still able to produce insulin, but the quality of insulin produced is not good and cannot function properly as a key to enter glucose into cells. As a result, the concentration of glucose in the blood increases (Defirson & Lailan Azizah, 2021).

Based on data from the International Diabetes Federation (2021), the prevalence of DM in the world in adults (aged 20-79 years) reaches 537 million people. This number is expected to continue to rise to 783 million people by 2045. The death rate from DM reached 6.7 million in 2021, or one person dies from DM every 5 seconds. The prevalence of DM in developing countries such as Indonesia is increasing faster than developed countries. In 2021, the number of DM sufferers in Indonesia reached 19.5 million and is expected to increase to 28.6 million in 2045 or an increase of 47%, and of this number there are around 14.3 million undiagnosed. In the last 10 years, DM deaths in Indonesia have increased by 58% or a total of 236 thousand deaths (Herli & Irfan, 2022). Data from the East Java Health Office (2018) states that the total number of DM sufferers is 450 thousand people or 2.0%. According to data from the Jember Health Office (2019), the total number of DM sufferers in Jember Regency amounted to 12,000 people with DM, the number increased from the previous year (Amin dkk., 2022). At the time of the preliminary study at one of the hospitals in Jember, DM patients who sought treatment in 2022 in January-October amounted to around 4,315 patients.

Based on the high incidence rate and the importance of proper treatment of DM and the complications it causes, the therapy given must be done appropriately. Management of DM begins with applying a healthy lifestyle (medical nutrition and physical activity) along with pharmacological interventions with oral anti-hyperglycemia drugs and injections. Pharmacological intervention of oral drug therapy is given to patients who fail to follow a low-carbohydrate diet for at least three months with recommended physical activity, where after efforts to change a healthy lifestyle, blood glucose levels remain or are unstable. While the use of insulin therapy or injections can be given to patients who fail with the use of a combination of Oral Hypoglycemic Drugs (OHO) (Panamuan & Utari, 2021). From the results of a preliminary study at one hospital in Jember, type 2 DM patients with outpatient treatment used more biguanid antidiabetic drugs and sulfonylureas. The biguanid group that is often used is metformin, while the sulfonylurea group that is often used is glimepiride.

MATERIALS AND METHODS

The design of this study includes observational research with analytical descriptive research design with cross sectional method. Samples were taken using a total sampling

technique that met the inclusion criteria of 32 patients. This research was conducted in the medical record room of one of the hospitals in Jember in June-July 2023. Data were taken using observation sheets and recapitulation sheets.

RESULTS AND DISCUSSION

The characteristics of the study based on age in table 1 concerning the frequency distribution of respondent characteristics based on the age of type 2 DM patients at Citra Husada Hospital Jember in 2022 show that the age of respondents who have the most type 2 diabetes mellitus is respondents aged >61 years, which is 65.6% (21 respondents). The prevalence of type 2 diabetes increases with age. The large number of patients with type 2 diabetes at the age of over 50 years, because in someone over 50 years old with a low glucose diet setting will experience shrinkage of pancreatic beta cells. The remaining pancreatic beta cells normally remain active, but insulin secretion is reduced. Age exceeding 50 years usually experiences a rapid decline in physiological function, resulting in insulin secretion deficiency due to disorders in pancreatic beta cells and insulin resistance (Irfan & Israfil, 2020).

Table 1 Frequency distribution of respondents' characteristics based on the age of type 2 DM patients at Citra Husada Hospital Jember in 2022

No.	Age	Frequency	Percentage (%)
1.	45-60 th	11	34,4 %
2.	>61 th	21	65,6 %
	Sum	32	100 %

Source : Medical Record of RS Citra Husada

Table 2 Frequency distribution of respondent characteristics based on the sex of type 2 DM patients at Citra Husada Hospital Jember in 2022

No.	Jenis Kelamin	Frequency	Percentage (%)
1.	Woman	17	53 %
2.	Man	15	47 %
	Sum	32	100 %

Source : Medical Record of RS Citra Husada

The characteristics of the study based on sex in table 2 concerning the frequency distribution of respondent characteristics based on the sex of type 2 DM patients at Citra Husada Hospital Jember in 2022 show that female respondents suffer more from type 2 diabetes mellitus than men, namely 53% (17 respondents). The results of this study are the same as the results of research from Nyoman et al in 2022. Women experience more type 2 diabetes mellitus because women have a higher percentage of body fat compared to men so that women increase weight faster and blood sugar levels increase. Men are also at high risk of developing type 2 diabetes mellitus if the lifestyle is unhealthy, because gender is actually not a risk factor for developing type 2 diabetes mellitus (Irfan & Israfil, 2020).

Table 3 Frequency distribution of patient characteristics based on comorbidities of type 2 DM patients at Citra Husada Hospital Jember in 2022

No.	Comorbidities	Frequency	Percentage (%)
1.	Responders with comorbidities	12	38 %
2.	Rsponden without comorbidities	20	62 %
	Sum	32	100 %

Source : Medical Record of RS Citra Husada

The characteristics of the study based on comorbidities in table 3 concerning the frequency distribution of patient characteristics based on comorbidities of type 2 DM patients at Citra Husada Hospital Jember in 2022 showed that respondents who experienced complications or comorbidities were 38% (12 respondents). Complications or comorbidities are caused by poorly handled glucose levels.. Complications usually occur over a long period of time up to 10 years of diagnosis. This is a delay in establishing the diagnosis of DM because the symptoms and signs of DM are not felt by the patient before complications occur. If the respondent is not compliant in the treatment applied, complications will easily occur due to chronic hypoglycemia that is not controlled (Kuna dkk., 2022).

Table 4 Frequency distribution of metformin and glimepiride drugs for type 2 DM patients at Citra Husada Hospital Jember in 2022

No.	Types of drugs	Frequency	Percentage (%)
1.	Metformin	5	15,6 %
2.	Glimepiride	27	84,4 %
	Sum	32	100%

Source : Medical Record of RS Citra Husada

The results showed that the use of drugs in type 2 DM patients in one of the outpatient hospital installations in Jember can be seen in table 4. Based on table 4, regarding the frequency distribution of metformin and glimepiride drugs in type 2 DM patients at Citra Husada Hospital Jember in 2022, respondents with the percentage of drug use almost entirely using glimepiride drugs were 27 respondents (84.4%) and a small percentage of respondents using metformin drugs, namely 5 respondents (15.6%).

Glimepiride is included in the sulfonylurea group, based on PERKENI (2021), this class of drugs has the main effect of increasing insulin secretion by pancreatic beta cells. The mechanism of action of glimepiride binds to beta cell sulfonylurea receptor 1 (SUR1) and stimulates insulin secretion via intracellular calcium transport. This can lead to hypoglycemia and weight gain with glimepiride. Sulfonylurea drugs usually cause a weight gain of about 2 kg. The use of 50% of the maximum dose of sulfonylurea drugs has been able to control blood glucose optimally, so use that exceeds the dose should be avoided. In terms of effectiveness, metformin is equivalent to sulfonylureas, and lowers HbA1C by up to 1.5%. Unexpected effects when prolonged hypoglycemia occurs so that it is at risk of

life-threatening. The mechanism of action of metformin is not through increased insulin and increased insulin sensitivity with increased peripheral glucose absorption. In addition, in vitro and in vivo studies describe the effects of metformin on plasma membrane fluidity, receptor transporter and plasticity, mitochondrial respiratory chain inhibition, increased phosphorylation of insulin-stimulated receptors and tyrosine kinase activity, and stimulation of translocation of insulin-regulated glucose transporters responsible for the uptake of insulin-regulated glucose into fat and muscle cells (GLUT4). The effectiveness of these two oral hypoglycemic drugs is reflected not only in the decrease in blood sugar levels, but also in their mechanism of action (Defirson & Lailan Azizah, 2021).

Based on PERKENI (2021), this study is appropriate, in this study it shows that almost all respondents use glimepiride and a small number use metformin. PERKENI states that metformin is the first-line pharmacological treatment option in most cases of type 2 DM patients. However, respondents who had received monotherapy within three months could not reach the target, so began two-drug combination therapy consisting of metformin plus other drugs that have different mechanisms of action. The content uses two combinations of drugs recommended by PERKENI, namely metformin and glimepiride, the combination using the two drugs will be able to achieve treatment goals through unequal mechanism pathways that mutually benefit the effects of each drug. The use of this combination drug is in accordance with that recommended by PERKENI, namely metformin and glimepiride. If for some reason, metformin cannot be given, for example due to allergies, or gastrointestinal side effects that cannot be tolerated by respondents, then another drug is chosen that suits the respondent's situation, namely glimepiride. But in this study researchers were not able to see the history of previous medical records, so only a single drug glimepiride was seen. Based on the characteristics of complications in this study, almost all respondents who used glimepiride drugs were accompanied by complications or comorbidities. While glimepiride has the advantage of reducing microvascular complications (Panamuan & Utari, 2021).

Table 5 Frequency distribution of patient characteristics based on drug dose in type 2 DM patients at Citra Husada Hospital Jember in 2022

No.	Drug dosage	Frequency	Percentage (%)
1.	Metformin 850 mg	2	6,3%
2.	Metformin 500 mg	3	9,4%
3.	Glimepiride 1 mg	1	3,1%
4.	Glimepiride 2 mg	8	25%
5.	Glimepiride 3 mg	9	28,1%
6	Glimepiride 4 mg	9	28,1%
	Sum	32	100%

Source : Medical Record of RS Citra Husada

The characteristics of the study based on drug doses in table 5 showed that respondents who received a prescription for 500 mg metformin drugs compared to 850 doses of metformin. This is because the patient's blood sugar levels can still be stabilized

with the use of a dose of 500 mg. However, the higher the dose used, the risk of side effects. Side effects of metformin can be minimized or avoided by the use of metformin drugs taken after meals and starting with a low dose of 500 mg a day, then increased gradually after 2-3 weeks with the addition of 500 mg or 850 mg per two weeks until blood sugar control is achieved (Malihah & Emelia, 2020). The study also showed that respondents prescribed the most doses were 3 mg and 4 mg, compared to the other two doses, these doses can lower fasting blood glucose, post-prandial blood glycose and blood glucose-related hemoglobin (AIC) (Kurniawaty & Yanita, 2016).

Table 6 Blood Sugar Levels Before and After Using Metformin and Glimepiride in 2022

No.	Types of drugs	Average Before	Average After	Average Change
1.	Metformin	233,2	168,4	64,8
2.	Glimepiride	246,7	186,1	60,6

Source : Medical Record of RS Citra Husada

The results showed that the decrease in blood sugar levels before and after the use of metformin drugs in type 2 DM patients in one of the outpatient hospital installations in Jember can be seen in table 6. Based on table 6, about Blood Sugar Levels Before and After Using Metformin and Glimepiride in 2022 metformin drugs can lower blood sugar levels, the table shows the results of differences in patients' average blood sugar levels before using metformin is 233.2 mg / dl, while the patient's blood sugar levels after using metformin are 168.4 mg / dl and the average results of changes in patients' blood sugar levels are 64.8 mg / dl.

Metformin is theoretically an alternative for overweight patients, but in this study the patient's weight-related information was not listed on the medical record sheet. Metformin is widely used as an alternative because of many things such as tolerability, affordable price, effectiveness of hemoglobin A1c (HbA1C) reduction, its ability not to cause hypoglycemia and can be combined with other oral antidiabetic drugs to treat type 2 DM. But sometimes metformin as a single therapy is not enough so it is usually combined with DM drugs from other groups, such as sulfonylurea group combinations (Kurniawaty & Yanita, 2016).

Table 6 shows about Blood Sugar Levels Before and After Using Metformin and Glimepiride in 2022 in the table shows that glimepiride is also able to lower blood sugar levels in type 2 DM patients in one of the outpatient Home installations in Jember. The table shows the results of the difference in the average blood sugar levels of patients before using glimepiride which is 246.7 mg / dl, while the patient's blood sugar levels after using glimepiride are 186.1 mg / dl and the average results of changes in patient blood sugar levels are 60.6 mg / dl.

Glimepiride is a third-generation sulfonylurea with a longer duration of action and faster onset. Unlike other sulfonylureas, glimepiride can reduce cardiovascular complications and regulate insulin levels secreted with blood sugar levels, especially in postprandial conditions, so that the incidence of glimepiride hypoglycemia is lower than other sulfonylurea drugs (Kurniawaty & Yanita, 2016).

Based on the results of research on reducing blood sugar levels of patients before and after using metformin and glimepiride single drugs used in type 2 DM patients in one of the outpatient installations of hospitals in Jember indicated that the use of metformin and glimepiride both affect the blood glucose of patients with type 2 DM. The blood sugar levels seen in this study were Current Blood Sugar (GDS) values before and after taking single metformin and glimepiride drugs. However, in this study there were a small number of respondents who experienced an increase in blood sugar levels on average after using metformin drugs 27 mg / dl and after using glimepiride with an average increase of 34.2 mg / dl. Increased blood sugar levels can be influenced by many things, one of which is the non-compliance of respondents in treatment which causes uncontrolled blood sugar levels. Adherence to taking medication is one of several efforts to control DM. When patients take medication according to the rules and a balanced diet, it is expected to reduce blood sugar levels. Changing the rules of taking medication that does not follow the doctor's instructions will eventually reduce the effectiveness of the drug and fail to control blood sugar levels (Defirson & Lailan Azizah, 2021).

This research is not much different from the research conducted by Defirson & Lailan Azizah in 2021 at one of the Jambi city hospitals. Where from the results obtained in the study showed that the effectiveness of metformin and glimepiride its ability to lower blood sugar levels of type 2 DM patients is not much different.

CONCLUSION

The use of metformin and glimepiride single drugs in type 2 diabetes mellitus patients in one of the outpatient installations of hospitals in Jember showed that almost all respondents used a single glimepiride drug which was 27 respondents (84.4%) and a small number of respondents used a single metformin drug which was 5 respondents (15.6%). While blood sugar levels before and after using metformin and glimepiride drugs alone in type 2 diabetes mellitus patients in one of the outpatient installations of hospitals in Jember showed that metformin and glimepiride were able to reduce blood sugar levels in accordance with the inclusion criteria of the study with the average blood glucose levels before using metformin which was 233.2 mg / dl and after using metformin which was 168.4 mg / dl, While the average blood glucose level before using glimepiride was 246.7 mg / dl and after using glimepiride was 186.1 mg / dl.

ACKNOWLEDGMENTS

Thank you to my parents, who gave me all their love, love, time, encouragement, expenses, and prayers. Thank you to all mothers, lecturers of the Bachelor of Pharmacy Study Program, University dr. Soebandi who has provided a lot of knowledge and experience so far, and thank you beloved alma mater Universitas dr. Soebandi, as the first foothold in studying pharmacy. Thank you also to myself who has struggled and tried to complete all stages of the lecture to completion.

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