

Study Of Antidiabetic Use In Diabetes Mellitus Patients With Hypertension Comorbidity at Gunungpati Public Health Center, Semarang

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Abstract

Diabetes Mellitus (DM) is a long-term metabolic condition resulting from damage to the pancreas, which impairs its ability to produce adequate insulin for the body's needs. The cases of Diabetes mellitus at Gunung Pati health center that have received services according to procedures amounted to 1,247 people. Increased blood glucose levels (hyperglycemia) cause intravascular fluid resistance, resulting in increased body fluid volume and causing increased peripheral artery resistance. Patients diabetes mellitus with comorbid hypertensive requiring continuous glucose monitoring is very important and medication adherence can maximize the effectiveness of pharmacotherapy. A retrospective review in the form of medical record data for the period January – April 2025 at the Gunungpati Health Center based on inclusion and exclusion criteria for 50 patients. Analysis of the data used for the paired t-test. The results of of the Paired T-test, it was shown a significant change ($p < 0.05$) on blood glucose levels before and after use anti diabetic drug with single antidiabetic therapy ($p < 0.001$), combination of 2 types of drugs ($p < 0.001$) means that the use of oral antidiabetic therapy is effective in lowering blood sugar levels.

Keywords: treatment effectiveness, Blood Sugar Levels, Diabetes Mellitus

1. INTRODUCTION

Diabetes Mellitus (DM) is a degenerative disease characterized by an increase in blood glucose levels beyond normal limits, with clinical symptoms such as polyuria, polydipsia, and polyphagia (Helmi et al., 2022). DM is also defined as a chronic metabolic disorder due to damage to the pancreas, which makes the organ unable to produce sufficient amounts of insulin for the body's needs, so glucose accumulates in the blood (PERKENI, 2021).

The prevalence of diabetes based on medical diagnosis has increased compared to Riskesdas 2018 data, namely from 1.5% in 2018 to 1.7% in 2023 for all age groups, and from 2.0% to 2.2% in the age group ≥ 15 years. The International Diabetes Federation (IDF) estimates that the number and prevalence of diabetics aged 20-79 years in Indonesia will continue to increase over time (Ministry of Health, 2023). Therefore, the proper management of the use of antidiabetic drugs is very necessary as an important treatment strategy, with the aim of delaying the development of complications or inhibiting the progression of existing complications. In addition to the high incidence of this disease, DM is known as a condition with a low cure rate

and is often accompanied by other diseases, such as hypertension. Hypertension is a condition in which systolic and diastolic blood pressure rises above normal values. A person is declared hypertensive if their blood pressure exceeds 140/90 mmHg (PERHI, 2021).

The study on the use of oral antidiabetics with comorbid hypertension is done as one of the efforts to improve the quality of life of DM patients with comorbid hypertension. This has been implicitly written in the Qur'an surah Al-Hasyr verse 18 as follows:

تَعْمَلُونَ بِمَا خَبِيرُ اللَّهِ إِنَّ اللَّهَ وَاتَّقُوا ۖ لَعَدِ قَدَمَتْ مَا نَفْسٌ وَلْتَنْتَظِرُ اللَّهُ اتَّقُوا الَّذِينَ أُيُّهَا يَا

Meaning: *O you who have believed, fear Allah and pay attention to what you have done for tomorrow; and fear Allah, for Allah is Aware of what you do.*

Through the passage of the verse which means 'pay attention to what he has done for tomorrow' shows that Allah wants us to study and evaluate everything that is done, and to find out the right steps.

Research on the use of antidiabetic drugs in patients with diabetes mellitus and comorbid hypertension at community health centers is still limited, which has prompted the researcher to conduct this study. This study aims to investigate the treatment patterns and provide an overview of therapy in patients with Diabetes Mellitus comorbid with Hypertension at Gunungpati community health centers.

2. METHOD

Research Plan

The study on the use of oral antidiabetics with comorbid hypertension that will be carried out in this study is an evaluation to determine the success of therapy in the outpatient installation of the Gunungpati Health Center based on laboratory results or examinations before and after the administration of oral antidiabetic therapy with comorbid hypertension which was carried out in January – April 2025.

Research Subject

The sample from this study consisted of all patients diabetic patient with hypertension with the inclusion criteria of patient demographic data (age ≥ 18 years and gender) who received antidiabetic and antihypertensive therapy during the period of January-April 2025. and the exclusion criteria of incomplete medical records.

Data Analysis

Data analysis was carried out in a descriptive manner and the results were presented in the form of a table. The tabulated data included demographic characteristics and drug use profiles. The data obtained from medical records were processed with the Microsoft Exel application and then analyzed using the SPSS Software statistical *paired t-test* to determine the effectiveness of the use of oral antidiabetic drugs on the results of pre and post blood sugar tests .

3. RESULTS AND DISCUSSION

Demographic characteristics of patients

The results obtained after the implementation of the research at the Medical Record installation of the Gunung Pati Semarang Health Center using a retrospective method identified 50 patients suffering from Diabetes Mellitus type II comorbid Hypertension in the period from January to April 2025 which were included in the inclusion criteria, the following results were obtained:

Characteristics of respondents based on Gender and Age

In Table 1, it can be seen that the most gender as patients with hypertensive DM is 74% (n=37) while men are 26% (n=13) and the highest age range is the elderly group at the age of 45-64 years with a total of 62% (n=31) while in the productive age group of >65 years it is 38% (n=19). This is in accordance with previous research conducted at the Mrebet health center where the most patients with comorbid hypertension Diabetes Mellitus were women as many as 42 patients (76.4%) (Melani et al., 2023).

Table.1 Patient characteristics by gender and age.

Patient Characteristics	Sum	Percentage (%)
Gender		
Man	13	26%
Woman	37	74%
Total	50	100%
Age (years)		
18-44	0	0%
45-64	31	62%
>65	19	38%
Total	50	100%

Primary data sources (2025)

Women experience pathophysiological conditions due to monthly cycle syndrome, which makes them more susceptible to obesity and body fat accumulation. Women's Body Mass Index (BMI) is generally higher, so the risk of developing type 2 diabetes mellitus (DM) is greater than that of men. Premenstrual syndrome and postmenopausal hormonal changes are known to affect body fat distribution, which facilitates fat accumulation and increases the risk of type 2 DM in women (Rahmawaty et al., 2023). Meanwhile, in men, increased blood glucose can be caused by higher stress levels. Stress manifestations are often triggered by increased stress hormones such as adrenaline and cortisol, which release glucose stored in the blood, resulting in elevated blood glucose levels (Megawati et al., 2020)

Research at the Tanjung Rejo Health Center shows that age is related to the incidence of DM accompanied by comorbidities. Theoretically, these risk factors cannot be changed because as we age, the body's metabolism slows down, organ function decreases, so blood sugar levels and blood pressure rise, which often leads to impaired glucose tolerance and hypertension in old age (Nasution et al., 2021). The World Health Organization (WHO) also states that after the age of 40, fasting blood glucose levels increase by 1-2% per year, and can rise by 5.6-13% within 2 hours of eating. Therefore, age is a major factor in the prevalence of DM and impaired glucose tolerance (Fanani et al., 2022). The 2023 Basic Health Research Report shows that in the productive age group (18-59 years) and the elderly (60 years and above), the percentage of type 2 DM is 52.1% in the productive group and 48.9% in the elderly group, while type 1 DM reaches 15.5% in the productive group and 17.8% in the elderly group (Ministry of Health, 2023). Not only based on the report, the Endocrinology Association also stated that the age of over 45 years is one of the triggering factors for DM. This is because as age increases, the function of pancreatic beta cells will decline and produce less insulin. In addition, aging reduces physical activity, which leads to abnormalities in glucose metabolism in the body and a decrease in the number of insulin receptors. Therefore, oral antidiabetic therapy is needed to control blood sugar. This can be seen in Table 2.

Drug Use Profile

The results of the analysis identified five treatment regimens in 50 patients, with the majority of patients receiving triple or double therapy. The most dominant regimens involving a combination of standard Metformin, Glimepiride, Amlodipine, and candesartan are found in the following Table 2.

Table.2 Drug Use Profiles

Medicine	Sum	Percentage (%)
Antidiabetics		
metformin+glimepirid	29	58%
Glimepirid	20	40%
metformin	1	2%
Total	50	100%
Antihypertensive		
amlodipine	39	78%
amlodipine + candesartan	11	22%
Total	50	100%

Based on table 2, it is shown that of the 50 patients who received the most dominant regimen, the combination of metformin + Glimepirid with a total of 58% (N=29). This is in line with a study conducted in one of the private hospitals in Denpasar-Bali where the most use of combination of antidiabetics is metformin and glimepirid with a percentage of 43.32% (N=52) of the total sample population of 120. The single antidiabetic use was glimepirid with a total of 40% (N=20) and metformin 2% (N=1). This is different from the research conducted at the Mrebet health center where the use of single antidiabetics was 12.7% and glimepiride 9% of the total sample size of 55(Melani et al., 2023).

Based on table 2, it was found that comorbid diabetic patients received the most single antihypertensive therapy used was amlodipine with a percentage of 78% (N=39) and the combination therapy given was amlodipine and candesartan 22% (N=11). This is in accordance with the management of diabetes mellitus with comorbid hypertension where the hypertension drugs used are ACE Inhibitors, Angiotensin Receptor Blockers (ARBs), calcium antagonists, low-dose betablocker receptor blockers and low-dose diuretics.(PERKENI, 2021)

Effectiveness of therapy on the results of blood sugar and blood pressure tests

Effectiveness is the success of antidiabetics in achieving target blood sugar levels. The target blood sugar is random blood glucose (RBG) ≤ 200 mg/dL(PERKENI, 2021). Based on the results of the *paired sample t-test*, which is one of the testing methods used to assess the effectiveness of treatment, there was a difference in the average before and after treatment. Obtained in the following Table 3.

Table.3 Comparison of Average Clinical Examination Results

Category	Examination		Std Mean	P Value P<0.05
	Pre-test	Post Test		
GDS 2 medicine (n=29)	234.97	198.0	36.86	0.001
GDS 1 medicine (n=21)	134.75	116.65	18.10	0.001

Based on table 3, the results of the statistical test show that the results of the analysis show that there is a significant decrease in the average Blood Sugar At Time (GDS), In this case, combination oral antidiabetics used are the sulfonylurea and biguanid groups, The range of differences in random blood glucose levels before and after oral antidiabetic administration was 36.86 from 187.84 mg/dL in the Pre-test to 170.18 mg/dL in the Post Test. In the administration of a single therapy antidiabetic drug, the average before was 134.75 and after was 116.65 with a difference 18.10. The p-value obtained was <0.001. The statistical test (Paired T-test) yielded a P Value <0.05 so it was concluded that there was a significant difference in GDS levels before and after the antidiabetic therapy intervention.

The use of obstetric therapy can be seen in table 2 where the most dominant regimen involves a combination of standard Metformin, Glimepiride, Amlodipine, and candesartan. This is in accordance with the ADA.2020 the use of hypertension drugs must include a class of drugs that are proven to reduce cardiovascular incidence in diabetic patients, in this case the drugs given are ACE inhibitors, Angiotensin receptor blockers (ARBs), diuretics or dihydropyridine calcium channel blockers (CCB) where multi-drug therapy is generally needed to achieve blood (Johnson et al., 2020)pressure targets. Apart from the effectiveness of treatment, blood sugar levels reduction is also inseparable from pharmacological services in the form of education and monitoring to increase compliance in routine medicine. It has been successful in encouraging changes in the behavior of the elderly towards a healthy lifestyle, including adherence to regular medication and recommendations for a healthy lifestyle. (Agustina et al., 2025)

4. CONCLUSION

From the research that has been conducted, it can be concluded that the use of combination antidiabetics, seen from the range of difference in pre- and post-treatment reduction of 36.86, is greater than the administration of single antidiabetics, which is 18.10. Thus, the average pre- and post-treatment results from the Paired T-test showed a significant change, $p=0.001$ ($p<0.05$), in blood glucose levels before and after administration of OAD with single antidiabetic therapy ($p<0.001$), and combination therapy with 2 types of drugs ($p<0.001$).

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