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Impact of Single vs Combination Anti-Hyperglycemic Drug Therapy on HbA1c Levels: A Cross-Sectional Study

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Article Info	Abstract
	Diabetes Mellitus (DM) is a long-term medical condition characterized by increased blood glucose levels caused by abnormalities in the insulin metabolism process. Various types of antihyperglycemic drugs are available, both as single and combination therapy. Recent research shows that single or combination therapy can impact glycemic control differently, especially when looking at changes in HbA1C levels. This research is descriptive-analytical with a cross-sectional design using medical record data from Type 2 DM patients in the 2022-2023 period. Data was analyzed using SPSS. In this study, there was a significant relation between single and combination anti-hyperglycemic drug therapy. Bivariate analysis showed that both single and combination therapy were associated with a reduction in HbA1C levels, with a p-value of 0.019. There is a correlation between HbA1C levels and single and combination therapy in type 2 DM patients at the Prolanis Clinic.

INTRODUCTION

Diabetes Mellitus (DM) is a long-term medical condition characterized by increased blood glucose levels caused by abnormalities in the insulin metabolism process[1]. Diabetes management involves a variety of approaches, including lifestyle changes, patient education, and medication administration.[2] One crucial indicator to measure in diabetes management is the Hemoglobin A1C (HbA1C) level, which reflects the average blood glucose level over the past few months.[3]

In uncomplicated Diabetes Mellitus patients, antihyperglycemic drug therapy is the focus to achieve good glycemic control. There are various types of antihyperglycemic drugs available, both as single and combination therapy.[4] Recent research shows that the use of single or combination therapy can have different impacts on glycemic control, especially when looking at changes in HbA1C levels.[5]

Prolanis Clinic, as a health service center that focuses on diabetes management, plays an important role in developing antihyperglycemic drug therapy plans for non-complicated DM patients.[6] Therefore, it is important to evaluate the effectiveness of single and combination therapy in achieving glycemic control targets in patients.[7] In this study, the aim was to evaluate the relationship between the use of single and

combination antihyperglycemic drug therapy and HbA1C levels in non-complicated DM patients at the Prolanis Clinic. It is hoped that the data obtained from this study can provide a deeper understanding of diabetes therapy management and become the basis for improving therapy strategies carried out in clinics as primary health services.[8]

This study will carry out retrospective data analysis, with the aim of determining the relationship between single and combination anti-hyperglycemic drug therapy on HbA1C levels in DM patients. The results of this study are expected to provide practical guidance for selecting optimal antihyperglycemic drug therapy in non-complicated DM patients in the Prolanis clinic environment. In Semarang there has not been much research regarding single and combination drug therapy in primary care, so this research is necessary.

METHODS

This study is descriptive-analytic research. The approach used in this research is cross-sectional. The research focuses on the use of anti-hyperglycemic drug therapy.

The subjects of this research are patients with type 2 diabetes mellitus (DM) who visited the Prolanis Clinic in August 2023. The inclusion criteria include type 2 DM patients who consume oral hyperglycemia medications and undergo Prolanis HbA1C laboratory examinations every six months. HbA1c is considered controlled if <7% and uncontrolled if >7%. The exclusion criteria are type 2 DM patients who use insulin or have a history of complications. The research subjects total 75 individuals. The sampling technique used in this research is purposive sampling.

The research data were analyzed using correlation analysis to determine the relationship between the dosage of anti-hyperglycemic drug therapy and patients' HbA1C levels. This study also analyzes the difference in HbA1C values between the two dosage therapies (single and combination doses). Data analysis was performed using SPSS version 26.

The researchers explained the purpose of the study to the subjects before data collection. Subjects who were willing to participate were asked to sign an informed consent form. The researchers did not include the respondents' identities in the report or publications. This research was conducted after obtaining ethical approval from the ethics committee.

RESULT

This research was carried out at the Prolanis Clinic Semarang. A total of 110 medical records of type 2 DM patients were obtained. From the medical record data that met the inclusion criteria, only 75 patient medical records were used as research samples.

Univariate analysis showed the largest number of samples was female, 40 patients (53.3%) with a majority age group distribution of 61-70 years, 28 patients (37.3%) and the second largest number of patients in the 71-80 age group, namely 16 patients (21.3%) and the age group of at least 30-40 years amounted to 3 patients (4%). Of the 75 patient samples, 38 patients (50.7%) took single oral anti-hyperglycemic drugs, while 37 patients (49.3%) took combination anti-hyperglycemic drugs. In this study, the majority of patients had controlled Hba1c levels, 49 patients (65.3%) while 26 patients had uncontrolled Hba1c levels (34.7%).

Statistical analysis will be carried out using the chi-square test with a 95% confidence level to determine whether there is a relationship between HbA1C levels and the type of therapy given to Type 2 DM patients at the Prolanis Clinic, either alone or in combination.

Table 1
Respondent Characteristics

Indicators	n	%
Gender		
Male	35	46,6
Female	40	53,3
Age		
30 - 40	3	4
41 - 50	10	13,3
51 - 60	18	24
61 - 70	28	37,3
71 - 80	16	21,3
Therapy		
Single	38	50,7
Combination	37	49,3
HbA1c Level		
Controlled	49	65,3
Uncontrolled	26	34,7

Bivariate analysis showed that the distribution of two groups of pharmacological therapy, namely combination drugs and single drugs, on HbA1C levels was as follows: 25 patients who used combination drugs had controlled HbA1C and 8 patients had uncontrolled HbA1C. Among Type 2 DM patients who used single therapy, 20 people had controlled HbA1C and 18 people had uncontrolled HbA1C. Bivariate analysis showed that both single and combination therapy were associated with a reduction in HbA1C levels, with a *p value* of 0.019.

The resulting HbA1C value was then calculated as an average of 6.61% for single therapy and 7.09 for combination therapy, with a minimum HbA1C value for single therapy of 3.50% and a maximum value of 9.50%. While the minimum hba1c value with combination therapy is 4.50% and the maximum is 10.00%

Numerical data analysis was also carried out using the T test, and there was no statistically significant relationship between the administration of single therapy and the combination with a p value of 0.142.

Table 2
The Correlation between HbA1C Levels and the Use of Single and Combination Therapy

Variable	HbA1C Level						p-value
	Controlled		Uncontrolled		Total		
	n	%	n	%	n	%	
Therapy							
Combination	29	59,18	8	30,76	37	100	0,019*
Single	20	40,81	18	69,23	38	100	

*p value <0,05

Table 3
The difference between HbA1C levels and Use of Single and Combination Therapy

Indicators	Minimum	Mean	Maximum	Std. Deviation	P value
Single Therapy	3,50	6,61	9,50	1,36	0,1427
Combination Therapy	4,50	7,09	10,00	1,44	

DISCUSSION

Our study aims to determine the relationship between single and combination anti-hyperglycemic drug therapy on hba1c levels in non-complicated DM patients at the Prolanis clinic. There were differences in the distribution of the two pharmacological therapy groups, namely the use of single and combination drugs, on HbA1C levels. 25 patients receiving the combination drug had controlled HbA1C, while 8 patients did not. In Type 2 DM patients who received monotherapy, 20 people had controlled HbA1C, while 18 people did not. There is a significant relationship between HbA1C levels and the type of pharmacological therapy given to type 2 DM patients without complications at the Prolanis Clinic

Semarang, according to the results of the chi-square statistical test, with a p value of 0.019. The results showed that uncomplicated DM patients at the Prolanis Semarang clinic reduced HbA1C significantly with combination therapy75. However, after we analyzed further numerical data using T test, and there was no statistically significant relationship between the administration of single therapy and the combination with a p value of 0.142.

When using single therapy, the research results showed that the majority of respondents still had high HbA1c levels.[9] These findings are in line with research which states that metformin is effective as a first-line antihyperglycemia drug to reduce HbA1c levels, followed by sulfonyurea as a second drug that can be considered. However, some sources state that if there is no improvement in glycemic control after four weeks of using metformin, it is recommended to consider using a combination of drugs with evaluation of HbA1c levels. Metformin/glimepiride combination therapy at doses of 500mg/1mg and 500mg/2mg is known as a frequently used therapy and has a good effect in lowering blood sugar levels.[10]

Drug combination therapy offers a number of clear benefits over monotherapy. First, several medications have the ability to operate on several targets at once, working together to control diabetes by different processes and pathways, which could help patients achieve improved blood glucose control and make up for the drawbacks of single-drug therapy.[11] Second, mixing different medications allows for a reduction in the dosage of each one, which lessens the likelihood of harmful side effects and medication-related reactions. This increases long-term treatment compliance and helps patients tolerate the medication better. [12]

Through a variety of mechanisms, combination therapy may be able to successfully control blood sugar levels, reducing the problems associated with hyperglycemia.[13]

Last but not least, by carefully combining different medicine combinations based on the particular symptoms, needs, and features of the patient, combination therapy delivers more customized treatment programs and ultimately improves patients' general health status.[14]

Many variables can indirectly influence glycemic control, including the type of therapy given to respondents.[15] Several factors that play a role are the variables age, gender, diet, daily physical activity, history of other diseases, smoking history, history of duration of diagnosis of DM and compliance with anti-hyperglycemia medication consumption. Each of these factors can have a different effect on each respondent.[3] For example, research conducted by Safitri 2021 stated that the duration of the DM illness and age could also influence changes in Hba1c levels in non-complicated type 2 DM respondents.[4] Research also stated that the results of the analysis of physical activity and the occurrence of type 2 DM in the elderly found that respondents with less physical activity would experience an increased risk of type 2 DM by 7.4%.[16] Therefore, preventive and promotive efforts are needed to detect DM risk factors early and provide public health education about DM. Elderly patients and patients with symptoms and signs of DM should have their blood glucose levels checked regularly at health facilities. As well as curative efforts, it explains the importance of DM treatment which must be routine and controlled.[13]

CONCLUSION

There is a categorical relationship between HbA1C levels and single and combination therapy in type 2 DM patients at the Prolanis Clinic. However, after further explanation with numeric data, there was no significant difference in the HBA1c

values between patients who received single and combination therapy. The hope is that the findings of this research can strengthen previous research and become a basis for further research.

ACKNOWLEDGMENT

The researcher would like to say thank you to all the participated as research respondents

CONFLICT OF INTEREST

Neither of the authors has any conflicts of interest that would bias the findings presented here.

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