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RESEARCH **Open Access**

The Effect of Visual Media Education in the Management Therapy on the Level of Knowledge of Patients Diabetes Mellitus with Comorbid

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Abstract

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both and is often accompanied by increased blood pressure. One of the drug-related problems that are frequently encountered is patient non-compliance in taking drugs. This can occur due to a lack of knowledge about managing pharmacological and non-pharmacological therapies, making therapeutic outcomes difficult. This study aims to determine the effect of visual media education on managing pharmacological and non-pharmacological treatment on the level of knowledge of type 2 DM patients with comorbid hypertension. This type of research is quasi-experimental, with pretest and posttest designs without a control group design. The research sample is the age group that has the age of 18-68 years, as many as 123 people using Purposive Sampling. The results showed that the level of knowledge before being given education was in a good category (4.81%), sufficient (42.29%), and less (52.90%). After being given education visual media, there was an increase in knowledge results for the good (74.25%), sufficient (18.14%) and poor (7.61%) categories. The results of the Wilcoxon test analysis obtained a p-value (0.000) < (0.005), which means that there is an effect of visual media education on the level of knowledge of type 2 DM patients with comorbid hypertension. Through the results of this study, it is hoped that pharmacists can provide ongoing educational counselling to chronic disease patients receiving polypharmacy to prevent drug-related problems.

Keywords: Education, Diabetes Mellitus, Hypertension, Knowledge.

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1. INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both. Hyperglycemia is one of the typical signs of DM, in the form of an increase in blood glucose levels that exceed normal limits and is often accompanied by an increase in blood pressure (hypertension). In 2017, about 462 million people were diagnosed with type 2 diabetes, with an estimated 6.28% of the world's population (4.4% of those aged 15-49 years, 15% of those aged 50-69, and 22% of those aged 50-69). >70 years old) (Khan et al., 2020). Based on East Java Health Profile data, the prevalence of hypertension in East Java reached 13.47% (about 935,736 population), with the proportion of men 13.78% (547,823 residents) and women 13.25% (387,913 residents).

The increasing prevalence of DM cases with hypertension has influential risk factors such as obesity, stress, unhealthy lifestyles, diet and unhealthy eating patterns. This unhealthy diet and lifestyle can lead to acute and chronic patient complications. If it is not handled properly and to prevent complications, it is necessary to have therapy management (Trento et al., 2020). The pharmacological treatment used for DM patients with hypertension, antihypertensives are Angiotensin-converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARBs), which have long been considered the cornerstone of anti-hypertensive treatment in diabetic patients. Previous studies have demonstrated that both renin-angiotensin-aldosterone system (RAAS) blockers, ACEI and ARB, are associated with preventing new-onset DM in hypertensive patients (Grossman & Grossman, 2017). ARBs or ACEIs are recommended for hypertension with diabetes, heart disease and stroke. ARBs or ACEIs in DM can reduce progression to DM nephropathy or chronic kidney disease because they have a vasodilating effect on the efferent arteriole of the kidney, thereby providing a renoprotective effect (Utami et al., 2020).

According to research (Devarajan et al., 2017), the most commonly used Oral Antidiabetic (OAD) are metformin (biguanide group) and glimepiride (sulphonylurea group). In DM patients, the use of the combination glimepiride/metformin showed a significant decrease in glycemic parameters. The use of metformin single OAD is a first-line therapy for DM patients, which is effective and safe, inexpensive, and can reduce the risk of cardiovascular events and mortality rates (American Diabetes Association, 2019). Non-pharmacological therapy in DM patients with hypertension can be managed by monitoring blood sugar, adjusting diet and weight, regular exercise, adherence to hypoglycemic drugs, and routine blood sugar control (Oyekale, 2019). Blood sugar control is also balanced with blood pressure control, which can be done by maintaining a lifestyle modification by regulating the diet DASH (The Dietary Approach to Stop Hypertension) is a diet pattern by adjusting the consumption of fruits, vegetables, low-fat dairy products, efforts to reduce salt and red meat intake (Siervo et al., 2015). Therefore, it is very important to balance pharmacological therapy and lifestyle modification, one of which is by adjusting the DASH diet.

In addition, education can also be given, which is one of the four pillars of DM management, which also affects the patient's success in carrying out metabolic control. Education using visual media is a means of conveying messages or information to patients, combined with depiction media that can only be read by the sense of sight. It is hoped that visual aids can help improve people's understanding and memory regarding drug use. Providing education is one of the efforts that can be used to increase the knowledge and skills of DM patients with hypertension. This is also supported by research (Wahyuni et al., 2019) that increased knowledge of hypertension prevention was obtained by respondents after receiving intervention through video media. Previous research (Sidrotullah et al., 2022) used a questionnaire measuring knowledge and adherence to medication in diabetes mellitus patients which resulted in a relationship between the level of knowledge and adherence to medication

in patients with type 2 diabetes mellitus. It is important to increase patient understanding through the use of visual educational media, one of which is by providing explanatory brochures or leaflets medication with pictures. Therefore, it is important to provide appropriate information and education both pharmacologically and non-pharmacologically related to the management of diabetes mellitus with hypertension in the hope of increasing attitudes about patient care, controlling the disease they suffer and preventing complications in Type 2 DM with comorbid hypertension.

2. RESEARCH METHOD

This research has been done through research testing and is declared ethically worthy. The research design used a one-month quasi-experimental pre-post test with a purposive sampling method and obtained 123 outpatients at Clinic "X" Lamongan City. The research was conducted in February-March 2021 using primary data. The inclusion criteria of the research sample: outpatients with a diagnosis of type 2 diabetes mellitus with hypertension with age > 17 years; Willing to be a respondent in the study by signing the consent form. Exclusion Criteria: Patients who cannot communicate well. (this condition is believed to make them incapacitated). The variables of this study consisted of independent variables, sociodemography, and dependent variables: knowledge of pharmacological and non-pharmacological therapy. Data collection is done by filling out a questionnaire before receiving visual media education (Pretest), after which the patient will receive visual education in the form of a short educational video related to the management of pharmacological and non-pharmacological therapy in type 2 DM patients with hypertension (three times the respondents are given the intervention) After that, the questionnaire will be filled again (Posttest). The research instrument that will be used is a closed questionnaire consisting of 20 questions (10 questions for pharmacological therapy and ten questions for non-pharmacological therapy) tested for validity and reliability on 30 respondents from the research sample. If the calculated r-value> r-table value with = 5%, the questions in the questionnaire are declared valid. The value of the r-table for 30 respondents is 0.312. The results demonstrate that each item of pharmacological and non-pharmacological therapy management has an r value greater than the r-table, which is 0.4. Hence, the question item is declared valid and can be employed for research

Data analysis was carried out statistically and descriptively. Descriptive analysis was conducted to see the level of pharmacological and non-pharmacological knowledge. The results of the descriptive calculations will be put into categories: 76-100% good category, 56-70% sufficient category, and 56% poor category (Sugiyono, 2017). Statistical analysis was carried out to see the effect of visual media education in managing pharmacological and non-pharmacological therapy on the level of knowledge of Type 2 DM patients with comorbid hypertension. Hypothesis testing was carried out using the Wilcoxon Sign Rank Test using the IBM SPSS Statistics 26 application. This research has an ethics certificate issued by the University of Muhammadiyah Lamongan with No 226/EC/KEPK-S2/02/2021.

3. RESULTS AND DISCUSSION

In this study, 123 respondents met the inclusion criteria. Data on the characteristics of the respondents are presented in Table 1. Based on the data on the characteristics of the respondents, it is known that 34.15% of respondents are in the late elderly age, namely 56-65 years, who also have a Body Mass Index (BMI) in the overweight category 44.72% A total of 60.98% respondents are women and 46.34% of respondents come from basic education. Most of the respondents work as farmers 45.53%.

The obesity factor is closely related to the incidence of insulin resistance and fat distribution, which can cause risk factors for metabolic syndrome and cardiovascular disease (CVD). Impaired insulin work and insulin secretion contribute to the risk of hyperglycemia, hyperlipidemia, hypertension and obesity, which leads to the metabolic syndrome. Men are more susceptible to metabolic syndrome than premenopausal women; However, protection in women is reduced significantly when estrogen levels decrease. Consistent with these findings, when compared with premenopausal women, postmenopausal women and men of the same age have the same risk of developing insulin resistance (De Paoli et al., 2021). Women are more at risk of diabetes mellitus 2,777 times greater than men. In addition, factors from the hormone estrogen affect HDL levels to be low and LDL to be high, leading to high blood pressure (Kusumawaty et al., 2016).

The age characteristic is dominated by the late elderly (56-65 years) (34.15%). As you age, your blood pressure will also increase. The majority of hypertensive patients occur at the age of over 40 years. In conditions of hypertension, the arterial walls will experience thickening caused by the buildup of collagen in the muscle layer, causing the blood vessels to narrow and become stiff so that in the end the elasticity of the blood vessels decreases. Other studies also show that age 50 will be 5.2 times more at risk of suffering from DM than the age group <50 years (Tsalissavrina et al., 2018).

At the education level, most of the respondents had an elementary school education (46.34%). A person's education level determines the knowledge, attitudes and behavior. The lower a person's level of education, the less information obtained in this case will lead to unhealthy behavior and lifestyle for hypertensive patients such as a lack of understanding of the dangers and prevention of hypertension and DM (Restuning, 2015). The last characteristic based on Body Mass Index (BMI) is that the majority of DM patients with hypertension were in the overweight category (44.72%). BMI is related to systolic blood pressure. Being overweight increases the risk of cardiovascular disease because the greater the body mass, the more blood is needed to supply oxygen and food to the body's tissues. So that the volume of blood circulating through the blood vessels increases and puts high blood pressure on the arterial walls, resulting in increased blood pressure. Patients who are overweight or obese tend to ignore their ideal body weight and diet. As a result, the potential for diabetes is much higher (Adnan et al., 2013).

Table 1. Characteristics of Respondents at Clinic "X" Lamongan period February-March 2021.

Variable	Total (n=123)	Percentage (%)
Age (years old)		
17-25	7	5.69
26-35	20	16.26
36-45	34	27.64
46-55	20	16.26
56-65	42	34.15
Sex		
Male	48	39.02
Female	75	60.98
Education		
No Education	57	46.34
Primary school	24	19.51
Junior high school	17	13.82
Senior high school	25	20.33
Occupation		
Farmer	56	45.53

Housewife	34	27.64
Entrepreneur	33	26.83
Body Mass Index (BMI)		
Underweight (<18,5 kg/m^2)	31	25.20
Normal (18,5-22,9 kg/m^2)	37	30.08
Overweight (> 23 kg/m^2)	55	44.72

Based on the research results on the level of knowledge of pharmacological therapy in DM patients with hypertension, several indicators of questions were asked (Table 2). In the indicator, The accuracy of the type of drug consumed with indications, the pretest results show the sufficient category, and after being given education using visual media, it is in a good category. This study's most commonly prescribed oral antidiabetic drugs were metformin and glimepiride. Likewise, in research (Moon et al., 2017), oral antidiabetic therapy metformin monotherapy or a combination of metformin and sulfonylureas are the most commonly prescribed antidiabetic options. While the antihypertensives were amlodipine and captopril. This is like in a study (Utami & Octavia, 2022), hypertensive patients with comorbid DM were most dominantly using amlodipine for antihypertensives, and glimepiride for antidiabetics. Research from (Fares et al., 2016) also stated that based on randomized controlled trials amlodipine is considered effective and has high efficacy so that it can be the first line of prevention and reduction of cardiovascular events. Antidiabetic Glimpiride has less hypoglycemic side effects than glibenclamide, so amlodipine was chosen because it has no effect on insulin sensitivity. The provision of drug information education related to general indications for antidiabetic and antihypertensive has been informed in advance from the doctor conducting the examination. Knowledge related to the names of drugs consumed by patients is an important and underlying factor for providing therapy from clinicians (doctors), for example, requiring drug replacement due to drug-related problems that may occur (Kurnia et al., 2020).

The purpose of using oral antidiabetic and antihypertensive drugs consumed by patients should be accompanied by an understanding the rules for taking drugs and the frequency of using the right drugs. Most patients belong to the category of good knowledge after being given education regarding the frequency of administration of metformin and captopril drugs, but they still do not know the exact frequency of glimepiride administration. Likewise, with the accuracy of the rules for taking amlodipine and glibenclamide. Based on (James, et al, 2014) not all antihypertensive drugs can be taken right after eating there is a class of antihypertensive drugs that should be taken before eating or on an empty stomach, namely the ACE inhibitor group, the drug used is captopril. Captopril belongs to the Acei group and has a bioavailability of 60-75% so it is absorbed quickly on an empty stomach. Food can reduce drug bioavailability by about 24-30% (Ko et al., 2019). In the CCB group consumed after meals in this case, amlodipine has a bioavailability of 60-65% amlodipine absorption is not affected by food intake (Kang et al., 2018). Amlodipine has a maximum concentration in the body of 6-12 hours and t1/2 is longer than 30-50 hours, so amlodipine is taken only once a day (Kang et al., 2018). For nifedipine, in contrast to amlodipine, peak blood levels are reached within 20 minutes and have an elimination half-life (t1/2) of 4 hours, so it is given three times a day. Captopril has a half-life (t1/2) of 2-3 hours, so it can be given 2-3 times a day (Ilic et al., 2015). Knowledge related to the rules of use and the frequency of administration is very important because it can be a cause of non-fulfillment of drug-related needs (Drug Related Needs), namely the effectiveness of a drug and related to the availability of drugs in the blood (drug levels are too low, and it could also be that drug levels are too high and pass through the blood). minimum limit of toxic concentrations (so that it can harm the patient) which can indirectly cause problems related to treatment. Drug-related problems need to be a concern because they can affect variations in

patient responses to the expected therapeutic outcomes. In the Study (Utami, Octavia, & Fandinata, 2020) there were 11 patients who showed various negative responses such as an increase in blood pressure after being observed for 3 months of therapy, some of them had co-morbidities with DM. This is influenced by the inaccuracy in choosing a single therapy given to patients who have comorbidities, causing variations in negative responses which can also be seen from the increase in blood pressure produced for three months.

In the indicators related to the potential side effects of metformin, it is still in the category of sufficient level of knowledge (*posttest*), then captopril and nifedipine are in the good category. The side effect of metformin can cause gastrointestinal disturbances, and a potential side effect of captopril is dry cough on captopril administration there is an inhibition of the conversion of angiotensin I to angiotensin II which can cause bradykinin degradation and is also inhibited so that bradykinin levels in the blood increase. An increase in bradykinin can stimulate chemoreceptors in the airways which causes itching, a cough reflex will occur (Yılmaz, 2019). The potential side effect of nifedipine and amlodipine is orthostatic hypotension (a decrease in blood pressure when a person stands where a decrease in systolic blood pressure of at least 20 mmHg or a decrease in dastolic pressure of at least 10 mmHg within three minutes of standing) which can be overcome by taking it sitting upright for 5 minutes and not immediately with a standing position because it can cause dizziness or fainting. The potential side effect of antihypertensives of the Ca Channel Blocker class, it is also necessary to pay attention to the risk of other drug problems such as drug interactions that can occur with the use of NSAIDs, patients are known to sometimes also take NSAIDs when the body feels sick. Therefore, knowledge of information on the risk of interaction of antihypertensive drugs with NSAIDs is also important to be educated (Utami, Octavia, & Fandinata, 2020).

Table 2. Pretest and Posttest Results Related to Pharmacological Therapy at the Lamongan "X" Clinic for the period February-March 2021.

Question indicator	**Pretest (n=123)**			**Posttest (n=123)**		
	F	**%**	**Category**	**F**	**%**	**Category**
The accuracy of the type of drug consumed with indications	81	65.85	Enough	113	91.87	Good
Accuracy of use of Metformin drug use rules	60	48.78	Less	95	77.23	Good
Accuracy in the use of the rules for using the drug Amlodipine	65	52.84	Less	93	75.61	Enough
The accuracy of using the rules for using the drug Glibenclamide	63	51.22	Less	93	75.61	Enough
The Accuracy of the Frequency of Metformin Use	66	53.66	Less	96	78.05	Good
The Accuracy of the Frequency of Using Captopril	62	50.41	Less	95	77.24	Good
The Accuracy of the Frequency of Use of Glimepiride Drugs	63	51.22	Less	93	75.61	Enough
Potential Metformin Side EffectsPotential Nifedipin	51	41.46	Less	90	73.17	Enough
Side Effects Potential Captopril	55	44.71	Less	94	76.42	Good

Side Effects	63	51.22	Less	99	80.49	Good

The level of knowledge of non-pharmacological therapy (Table 3), most of the patients had a good level of knowledge after being given education. Preventing DM and Hypertension requires lifestyle adjustments, regular physical activity, proper dietary planning such as the DASH (Dietary Approach to Stop Hypertension) diet in hypertensive patients, regular exercise, adherence to hypoglycemic medication, and blood sugar checks. can help optimize the therapeutic outcome to be achieved. Knowledge of controlling the patient's glycemic level is influenced by patient compliance with dietary recommendations including the type and amount of food consumed, whereas if the patient's level of knowledge is low, it is one of the obstacles to achieving treatment goals and will also result in the patient requiring examination or treatment that is not actually needed (Muhammed et al., 2021). Compliance with taking medication can also be improved by storing medication using the pillbox method, making it easier for patients to consume medication more effectively and efficiently (Utami, et al., 2022)(Utami, Octavia, & Fandinata., 2020).

Some patients are still unfamiliar with the term DASH diet for hypertension, but after being given education, many have understood that it is very important to control diet. In addition, the types of vegetables, fruit, and sugar and salt restrictions up to the appropriate dose are still poorly understood. Foods that are recommended for hypertension patients are vegetables. Vegetables contain vitamins and minerals that are beneficial for health, one of which is controlling blood pressure such as celery vegetables contain potassium compounds and can reduce blood pressure by + 7.67 mmHg, knowledge related to food can provide the positive effect is not only in the form of energy but also helps control blood pressure (Siervo et al., 2015). High salt intake can increase the mass of the left ventricle resulting in pressure on the arteries so that blood pressure increases. To lower systolic and diastolic blood pressure, it can be done with a daily salt diet by limiting gram intake to no more than 5 grams per day. Limiting salt consumption to < 6 grams per day can lower blood pressure by 2-8 mmHg.

Restrictions on the consumption of marine fish also need to be considered for blood pressure control, if you consume seafood > 4 pieces a week and do it every day it will be difficult to control blood pressure. Knowledge related to the dose of fish consumption will help patients estimate the amount of fish consumed so that there is no increase in blood pressure. Likewise, with the dietary dose for blood sugar control and preventing obesity, the recommended diet composition for diabetics is carbohydrates of 45-65% of the total/total calories needed every day, and the recommended protein of 10-20% of total calories, and for fat, 20-25% of total calories are needed, and ±25 grams of fiber is fiber that has nutritional value (Oyekale, 2019)

Obesity is one of the risk factors for hypertension and DM which will inhibit the uptake of sugar (glucose) by muscle tissue so that high blood sugar levels if it lasts for a long time cause hypertension. Knowledge related to the number of calories can provide information for patients to avoid high-calorie foods such as red meat. Providing pharmacological and non-pharmacological education will have many benefits, especially in patients who have a high risk of cardiovascular disease (DM, HT, and obesity) as in this study. This is also supported by research (Wahyuni et al., 2019) that there is a significant difference in effectiveness between videos and slide presentations in improving attitudes towards preventing hypertension.

Table 3. Pretest and Posttest Results Related to Non-Pharmacological Therapy at the Lamongan "X" Clinic for the period February-March 2021.

Question indicator	Pretest (n=123)			Posttest (n=123		
	F	%	Category	F	%	Category
Disease prevention concept	77	62.60	Enough	107	86.99	Good
Patient lifestyle management concept	82	66.67	Enough	105	85.36	Good
The concept of setting the patient's diet	57	46.34	Less	109	88.62	Good
Types of food that can be consumed	59	47.97	Less	112	91.06	Good
Amount of food content	58	47.15	Less	89	72.36	Enough
Solutions to Overcome Dietary Disobedience	65	52.85	Less	105	85.36	Good
The right way to control blood sugar	71	57.72	Enough	103	83.74	Good
How to prevent the risk of complications	56	45.53	Less	107	86.99	Good
How to improve medication adherence	65	52.85	Less	109	88.62	Good
Frequency of consumption of fish and vegetables	69	56.10	Enough	108	87.80	Good
Total number of calories on the DASH Diet pole	64	52.03	Less	91	73.98	Enough

Table 4. Overall Knowledge of Respondents Before and After Education at the Lamongan "X" Clinic in 2021.

Knowledge	Pretest		Posttest	
	Frequency (Patient)	Percentage (%)	Frequency (Patient)	Percentage (%)
Good	6	4.88	91	73.98
Enough	52	42.28	32	26.02
Less	65	52.84	0	0
Total	123	100.00	123	100.00

The study's results (Table 4) showed that most of the patients (73.98%) had good knowledge after being educated. Statistical data with Willcoxon also showed a significant difference ($\alpha = 0.000 < 0.005$) after being given an intervention in the form of visual education on the level of knowledge of pharmacological therapy and non-pharmacological treatment in DM and hypertension patients (Table 5).

Table 5. Willcoxon Test Result

Test Result	Mean Rank	z	p
Pretest-Posttest	62.00	-9.652	0.000

Previous research (Sidrotullah et al., 2022) was in the scope of providing questionnaires measuring the level of knowledge, but there was no intervention in the form of direct face-to-face education using visual media. In this study, educational information was provided using visual media with the type of educational delivery in the form of pharmacological and non-pharmacological therapy management included in a brochure equipped with pictures of the

DASH diet settings for patients. The visual media used is very useful in increasing patient knowledge, as in research (Dalal et al., 2014) which explains that there is a significant difference in the results of stable glycemic control without any risk of hypoglycemia in diabetes patients who received counselling and education compared to the control group. Apart from that, research by Chrvala et al. (2016) confirmed that education on drug use accompanied by dietary regulation and regular exercise would be more effective in controlling glycemic HbA1C than education on drug use alone. Based on this explanation, the important role of pharmacist intervention is really needed by the community to significantly influence medication adherence and glycemic control in diabetes mellitus patients (Shareef & Fernandes, 2016).

This research has limitations in conducting research, namely limitations when carrying out educational interventions. It cannot provide maximum comprehensive understanding because some patients sometimes require brief explanations, affecting knowledge assessment.

4. CONCLUSION

Education about pharmacological and non-pharmacological management using visual media in DM patients with hypertension has a positive impact by increasing the level of patient knowledge. On non-pharmacological and pharmacological therapy indicators, patients who previously had a lack of or sufficient knowledge on the results of the pretest experienced an increase in knowledge on posttest results to be good after being given education. Education from a health worker has always been an important role to support improving patients' quality of life.

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