RELATIONSHIP BETWEEN BLOOD PRESSURE AND URINE PROTEINS IN TYPE 2 DIABETES MELITUS PATIENTS IN KEDUNGMUNDU HEALTH CENTER

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Abstract

Hyperglycemia trigger complication in type 2 Diabetes Mellitus patients such as diabetic nephropathy which cause of end-stage kidney failure. Monitoring of blood glucose and blood pressure are part of self-management to prevent complications of diabetes. This study aim to determine the characteristics of type 2 DM prolanis patients at the Kedungmundu Health Center based on age, sex, duration of suffering, blood pressure, and blood glucose. In addition, the relationship of blood pressure and urine protein is also analyzed in this study. This research use observational analytic design with cross-sectional approaching. The dependent and independent variables of this study are protein urine and blood pressure. Forty-six of DM patients are choosen as research's object using purposive sampling technique. The data was analyzed using chi-square. The results show that ratio between female and male type 2 diabetes patients are 71.7% to 28.3%. In addition, about 63% of the patients are suffering type 2 diabetes less than 5 years. The results inform us that 50% of type 2 diabetes patients are 56-65 years old, about 52.2% of them have hypertension, and 84.8% hyperglycemia. There is a significant relationship between blood pressure and urine protein with a p-value of 0.038 (p-value $\leq$ 0.05).

Keywords: *urine protein; diabetes mellitus; blood pressure*

1. Introduction

Kedungmundu Health Center is one of the First Level Health Service Units in the City of Semarang that implements the Prolanis Program. Prolanis is a health service system that involves participants, Health Facilities, and Health BPJS to maintain the quality of life of patients to be optimal (Raraswati, Heryaman, & Soetedjo, 2018). Some prolanis patients at Kedungmundu Health Center in Semarang City suffer from chronic diseases, one of the Diabetes Mellitus (DM).

Diabetes occurs due to metabolic disorders characterized by increased blood glucose levels or hyperglycemia. Hyperglycemia occurs due to pancreatic beta-cell dysfunction so that insulin secretion is reduced. Insulin is a hormone that functions to regulate blood sugar levels to remain stable in the body(Fatimah, 2015) (Juhartini, 2017).

Prolonged hyperglycemia of DM patients due to self-management to poor and complications, one of which is diabetic nephropathy. Diabetes and hipertension were responsible for more than 50% of cases of end-stage renal disease (ESRD) (Nasri & Rafieian-kopaei, 2015). The ability of each DM type 2 patient to manage and prevent complications is called Self-management. Self-management includes monitoring blood glucose levels, blood pressure, adopting healthy lifestyles, preventing obesity, and preventing prolonged emotional states (Sihombing, Sumber, & Kesehatan, 2017).

The proportion of DM patients with high hypertension is 51.8% consisting of 45.8% men and 55.4% women of the total number of DM people that is 5253. Risk factors for

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hypertension in DM people include age $\geq$ 45 years increased by 2.63 times, DM people who are obese increased by 1.57 times, and those with hypercholesterolemia increased by 1.68 times (Sihombing, Sumber, & Kesehatan, 2017).

According to (Satria, Decroli, & Afriwardi, 2018)(Rivandi et al., 2015) hypertension resulted in glomerular damage and increased Glomerular Filtration Rate (LFG). Increasing LFG can increase glomerular vascular permeability so that the protein escapes during filtration. The escape of protein is a sign of nephrosclerosis.

According to (Satria et a., 2018) (Rivandi et al., 2015) insulin resistance of type 2 DM patients can reduce pancreatic beta-cell insulin secretion and cause hyperglycemia. Hyperglycemia in a long period of time can increase LFG and kidney expansion in the direction of damage resulting in kidney failure. The presence of urine protein or urinary albumin whose levels (>300 mg/day or >200 µg/min) indicate chronic irreversible kidney failure. Based on the description, the researcher wants to know the characteristics of type 2 DM patients based on age, sex, duration of illness, blood pressure, and blood glucose and whether there is a relationship between blood pressure and urine protein in type 2 DM patients at the Kedungmundu Health Center.

2. Method

Observational (non-experimental) research, with a cross-sectional approach. The number of sample was calculated using an average estimation formula in accordance to 10% of the relative precision and a degree of confidence of 95%, so we get a sample of 41, but researchers use 46 respondents as research samples. The research sample was Prolanis DM type 2 patients at the Kedungmundu Health Center who examined the Kedungmundu Health Center in September 2019. The sample was a DM type 2 patient, based on the doctor's diagnosis in medical records suffering from type 2 DM, not yet having complications of kidney disease and malignancy.

Quantitative blood pressure measurement using a mercury sphygmomanometer (Accoson, Dekamet, United Kingdom) and a stethoscope. The measurement is done twice and the blood pressure data is the average value of the two measurements. Blood pressure data are categorized by (Directorate of P2PTM Ministry of Health, 2018) namely: Normal (less <120/80

mmHg), Prehypertension (120-139/80-89 mmHg), Hypertension 1 (140-159/90-99 mmHg), Hypertension 2 ($\geq$160/ $\geq$100 mmHg) The Measurement of urine protein is semi-quantitative because it is categorized, namely: (negative), (positive 1), (positive 2), (positive 3), and (positive 4). The reagent uses urine dipstick by dipping method. The principle of examination is the bromophenol indicator blue can detect albumin protein because it is very sensitive (Surya et al., 2018).

Specimens using morning urine, the middle portion of type 2 DM patients in Kedungmundu Public Health Center in Semarang City. and blood pressure was treated statistically with a computer program using the chi-square test because the data were in the form of categories, meaningful results were obtained (p <0.05).

3. Result and Discussion

Based on table 1 the highest number of respondents with type 2 diabetes mellitus in Kedungmundu Health Center 56-65 years old is 23 people (50%) and at least 36-45 years old is 3 people (6.5%). According to (Sihombing, Sumber, & Kesehatan, 2017) based on 2013 Riskesdas data that DM will increase at the age of $\geq$ 45 years. The same results in the study of (Saputri, Nugraha, Pratama, & Holidah, 2016) that the age range of the most type 2 DM patients occurred at the age of 50-69 namely 160 people (78.2%). Increased age or age of more than 40 years will occur in the body of generative processes one of which is a decrease in the work of beta-pancreatic cells, in secreting insulin resulting in glucose intolerance and hyperglycemia. Hyperglycemia occurs because the body is unable to respond to insulin or is resistant to insulin so that the body's peripheral cells cannot absorb glucose resulting in glucose in the blood vessels (Fatimah, 2015).

Table 1. Age Distribution of Respondents

Age	Frequency (Person)	Percentage (%)
36 - 45 years	3	6.5
46 - 55 years	7	15.2
56 - 65 years	23	50.0
66 - 85 years	13	28.3
Total	46	100

Based on table 2 the number of respondents DM patients type 2 at the Kedungmundu Health Center most women

were 33 people (71.7%) compared to men, 13 people (28.3%). The highest number of DM patients is female, namely, 3287 people (62.6%) compared to 1966 men (37.4%)(Sihombing, Sumber, & Kesehatan, 2017). According to (Saputri et al., 2016) DM sufferers are more dominant women than men because generally, women's activities are smaller than men so that glucose uptake is less, making it vulnerable to obesity and hyperglycemia. The results of (Azitha, Aprilia & Ilhami, 2018) differ explained that physical activity is not related to blood glucose levels.

Table 2. Gender Distribution of Respondents

Gender	Frequency (Person)	Percentage (%)
Female	33	71.7
Male	13	28.3
Total	46	100.0

Table 3 Based on the number of respondents diabetic patients type 2 at the Kedungmundu Health Center the most is suffering from type 2 DM for 0-5 years, namely 29 people (63.0%) and the second-highest is 11 people (23.9%) who suffer from type 2 DM for 6-10 years. The number of respondents prolanis patients who suffer from type 2 diabetes for 11-20 years is 8 people (13%) of the total number of respondents.

According to (Lathifah, 2017) Diabetic nephropathy is one of the complications of DM due to changes in renal morphology and function, which occur after 2-5 years of diagnosis of DM. Diabetic nephropathy is characterized by albuminuria, because glomerular hypoperfusion and hyperfiltration favor the leakage of albumin from the glomerular. Damage to the kidney organs will reduce the function of the kidneys as an excretory organ which results in protein escaping during filtration and being urine. The presence of urine protein or microalbuminuria as a screening for chronic kidney disease (Miranda-díaz, Pazarín-villaseñor, Yanowsky-escatell, Andrade-sierra, & Changes, 2016).

Table 3. Distribution of Illness Duration in Respondents

Duration of illness (Year)	Frequency (Person)	Percentage (%)
0-5	29	63.0
6-10	11	23.9
11-15	2	4.3
16-20	4	8.7
Total	46	100.0

Based on table 4 the number of respondents types 2 DM patients at the Health Center Kedungmundu with hypertension as many as 24 people (52.2%) consisting of hypertension 1 and hypertension 2 each as many as 12 people (26.1%). Most respondents of type 2 DM patients at the Kedungmundu Health Center are over 45 years old, 43 people (93.5%) ,and those aged 35-45 years are 3 people (6.5%). The results of this study are in line with Riskesdas 2013 data that DM people with hypertension are 51.8% and those aged 45 years or more have the potential to experience hypertension 2.6 times, more than those aged less than 45 years (Sihombing et al., 2017b). According to (Rapina & Saftarina, 2017) increasing age or getting older, the risk of hypertension is increasing. This is due to reduced arterial elasticity and stiffness in the artery walls due to elastic lamellar calcification.

Based on table 4 the normal distribution of blood pressure of respondents as many as 10 people (21.7%), those with hypertension as many as 24 people (52.2%), and those with prehypertension as many as 12 people (26.1%). Respondents who have normal blood pressure <130/80 mmHg, based on interviews due to several things including diligently monitoring blood pressure every month, regularly consult a doctor. Respondents also adopted a healthy lifestyle such as regular exercises such as walking, running, elderly exercise, reducing the consumption of foods with high salt content and fat. Regular exercise for 30-60 minute/ day, at least 3 days/week can prevent hypertension (Rapina & Saftarina, 2017). Blood pressure monitoring is very important for patients with type 2 DM to prevent complications including kidney failure (Saputri et al., 2016); (Rapina & Saftarina, 2017).

Table 4. Distribution of Blood Pressure in Respondents

Blood Pressure	Frequency (Person)	Percentage (%)
Normal	10	21.7
Prehypertension	12	26.1
Hypertension 1	12	26.1
Hypertension 2	12	26.1
Total	46	100

According to (Saputri et al., 2016) (Satria et al.,2018), monitoring fasting blood glucose (GDP) can prevent the progression of diabetic nephropathy. Based on table 5 the number of respondents DM patients type 2 at the Kedungmundu Health Center those whose fasting blood glucose was normal (<126 mg/ dl) were 7 people (15.2%) and those who increased ($\geqslant$ 126 mg/dl) were 39 people (84.8%). The results of the study are compared with the research of (Azitha et al., 2018) namely the normal GDP of more patients is 36 people (30%) and the increase is less that is 84 people (70%) of the total number of respondents. Chronic hyperglycemia in patients with type 2 DM results in damage to small blood vessels (microvascular), glomerular lesions in the kidney triggering diabetic nephropathy, proteinuria and ending with end-stage renal disease or ESRD (Satria et al., 2018).

Table 5. Distribution of Blood Glucose In Respondents

Fasting Blood Glucose	Frequency (Person)	Percentage (%)
Normal	7	15.2
Increased	39	84.8
Total	46	100

Based on the Cross-tabulation table, the highest urine protein (+3) results were 8 people (17.4%) when compared with urine protein that are (+1) and (+2), as many as 6 people (13%). These results are under the research of (Surya, 2018) that the results of the examination of urine protein are the most (+3) in patients with chronic kidney disease in RSUP Dr. M. Djamil Padang in 2015-2017. The results of previous studies stated that the results of the most positive urine protein tests in patients with type 2 DM who are hypertensive and hypertensive are risk factors for diabetic nephropathy (Yulianti, 2014).

Table 6. Crosstabulation Blood Pressure and Urine protein

Blood Pressure	Urine protein				
	negative	positive 1	positive 2	positive 3	Total
Normal	7	0	2	1	10
	70.%	0%	20%	10%	100%
Pre hypertension	11	0	1	0	12
	91.7%	0%	8.3%	0%	100%
Hypertension 1	5	2	1	4	12
	41.7%	16.7%	8.3%	33.3%	100%
Hypertension 2	3	4	2	3	12
	25.0%	33.3%	16.7%	25%	100%
Total	26	6	6	8	46
	56.5%	13.%	13%	17.4%	100%

Based on the *Chi-Square* table there is a relationship between blood pressure and urine protein with p=0.038 (p<0.05). According to (Surya et al., 2018) the presence of protein in urine indicates that there is glomerular and tubular kidney damage, one of the triggers is hypertension. This is because hypertension triggers glomerular capillary damage and causes kidney failure.

Table 7. Relationship between Blood Pressure and Urine protein

Statistical Analysis	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17 754[a]	9	0.038
Likelihood ratio	21 348	9	0.011
Linear-by-Linear Association	4742	1	0.029
N of Valid Cases	46		

Urine protein is a strong predictor of chronic kidney disease. An increase in the amount of urine protein indicates decreased kidney function. Protein can escape in the urine due to increased permeability, damage to the glomerular barrier and decrease in tubular protein re-absorption.

4. Conclusion and Suggestion

High blood pressure is significantly increase the urine protein in type 2 diabetes patients at the Kedungmundu Public Health Center, Semarang City and vice versa. Furthermore, study about hypertension and hyperglycemic management in type 2 DM

patients are needed to minimize the incidence of ESRD. In addition, the type 2 diabetes patients have to monitor blood pressure urine protein and blood glucose regularly as well as implement a healthy lifestyle.

5. Acknowledgments

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