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Research Article

Blood Pressure Factors on Proteinuria in Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background: Diabetes mellitus (DM), one of the metabolic degenerative diseases, requires significant resources to treat complications. Microvascular complications are diabetic nephropathy which is characterized by proteinuria. Blood pressure monitoring is part of self-management to avoid complications. **Purposes**: This study aims to determine the relationship between blood pressure and proteinuria in patients with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta. **Methods**: This study used a cross-sectional study analysis by collecting secondary data on patients diagnosed with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta for the period Juli-October 2021. **Results**: A total of 51 patients were sampled in this study; 34 (66.7%) were female and 17 other patients (33.3%) were male. Most cases with an age range of 45-64 years, namely 38 patients (74.5%). On examination of blood pressure with the highest frequency, 27 patients (52.9%) had normal blood pressure; on examination of proteinuria, found proteinuria +1 in 25 patients (49%), proteinuria +2 in 3 patients (5.9%), and proteinuria negative as many as 23 patients (45,1%). From the results of the Gamma correlation obtained a value (p= 0.022) (r = 0.441). **Conclusion**: Based on the results of this study, in patients with type 2 diabetes mellitus, the highest age range was 45-64 years, with more cases found in women, normal blood pressure, and +1 proteinuria levels. A significant relationship exists between blood pressure and proteinuria in type 2 diabetes mellitus patients at the Matraman District Health Center, East Jakarta.

Keywords: blood pressure, type 2 diabetes melitus, proteinuria

INTRODUCTION

Like many other countries, Indonesia faces high economic, social, and health challenges related to metabolic, degenerative, and infectious diseases. Diabetes is caused by elevated blood sugar levels or metabolic disorders characterized by high blood sugar. Hyperglycemia is caused by pancreatic beta cell dysfunction, resulting in decreased insulin secretion. Insulin is a hormone that regulates blood sugar levels to remain stable in the body Indonesia, like many other countries, is currently facing high economic, social, and health challenges related to metabolic degenerative diseases and infectious diseases. Diabetes is caused by elevated blood sugar levels or metabolic disorders characterized by high blood sugar. Hyperglycemia is caused by pancreatic beta cell dysfunction, resulting in decreased insulin secretion. Insulin is a hormone that regulates blood sugar levels to remain stable in the body (1). Diabetes mellitus (DM), one of the metabolic degenerative diseases, requires significant resources to treat macrovascular and microvascular complications caused by this disease. Diabetes mellitus

(DM), one of the metabolic degenerative diseases, requires significant resources in the treatment of macrovascular and microvascular complications caused by this disease (2).

According to Soelistijo Soebagijo Adi (2019), the prevalence of diabetes in the population, aged 15 years and over reached 5.7%, especially in urban areas (3). According to WHO in 2014, 8.5% of adults aged 18 years and over had diabetes. In 2019, diabetes was the direct cause of 1.5 million deaths. According to WHO in 2014, 8.5% of adults aged 18 years and over had diabetes. In 2019, diabetes was the direct cause of 1.5 million deaths. According to the results of the Basic Health Research (4) conducted in 2018, the prevalence of diabetes in Indonesia is 2% based on medical diagnosis at the age ≥15 years. This is an increase compared to the 1.5% prevalence of diabetes at the age ≥15 due to Riskesdas 2013. In contrast to most diabetes based on blood glucose test results, Riskesdas stated that in 2013, the prevalence of diabetes based on blood glucose test results was 6.9%, which increased to 8.5% in 2018. This figure shows that only about 25% of people with diabetes know they have diabetes conducted in 2018, the prevalence of diabetes in Indonesia is 2% based on medical diagnosis at the age ≥15 years. This is an increase compared to the 1.5% prevalence of diabetes at the age ≥15 as a result of Riskesdas 2013. In contrast to the prevalence of diabetes based on blood glucose test results, Riskesdas stated that in 2013 the prevalence of diabetes based on blood glucose test results was 6.9%, which increased to 8,5% in 2018. This figure shows that only about 25% of diabetics know that they have diabetes.

The ability of people with type 2 diabetes mellitus to manage and prevent complications with self-management. Self-management includes monitoring blood sugar levels and blood pressure, adopting a healthy lifestyle, and preventing obesity. The ability of people with type 2 diabetes mellitus to manage and prevent complications with self-management. Self-management includes monitoring blood sugar levels, monitoring blood pressure, adopting a healthy lifestyle, and preventing obesity (5). People with diabetes who cannot maintain adequate glycemic control (especially test results that do not reach the recommended target of less than 7% for HbA1c) are prone to neuropathy, retinopathy, nephropathy, cardiovascular disease, cerebrovascular disease, and premature death. Diabetics who cannot maintain adequate glycemic control (especially test results that do not reach the recommended target of less than 7% for HbA1c) are prone to neuropathy, retinopathy, nephropathy, cardiovascular disease, cerebrovascular disease, and premature death (6).

The problem that type 2 diabetes patients will face is complications in the form of macrovascular and microvascular. One of the microvascular complications is diabetic nephropathy, which is characterized by proteinuria. Another cause of kidney disease is hypertension. According to the problem that will be faced by type 2 diabetes patients is complications in the form of macrovascular and microvascular. One of the microvascular complications is diabetic nephropathy which is characterized by proteinuria. Another cause of kidney disease is hypertension. According to (7) hypertension increases glomerular damage and glomerular filtration rate. Increased glomerular filtration rate can increase glomerular vascular permeability, allowing the protein to escape during filtration. Protein leakage is a sign of nephrosclerosis. Insulin resistance in type 2 diabetics can cause hyperglycemia by reducing insulin secretion by the beta cells of the pancreas. Long-term hyperglycemia can increase to the point of damage, leading to renal failure by increasing the glomerular filtration rate and

renal dilatation. The presence of protein or albumin in the urine (>300 mg/day or >200 mcg/minute) is an indication of irreversible chronic kidney failure hypertension increases glomerular damage and glomerular filtration rate. Increased glomerular filtration rate can increase glomerular vascular permeability, allowing the protein to escape during filtration. Protein leakage is a sign of nephrosclerosis. Insulin resistance in type 2 diabetics can cause hyperglycemia by reducing insulin secretion by the beta cells of the pancreas. Long-term hyperglycemia can increase to the point of damage leading to renal failure by increasing the glomerular filtration rate and renal dilatation. The presence of protein or albumin in the urine (>300 mg/day or >200 mcg/minute) is an indication of irreversible chronic kidney failure (8).

The most straightforward test to determine kidney function is to test for proteinuria. Until now, urine protein tests have effectively detected impaired renal function and can be used as a promising biomarker for chronic kidney disease. The simplest test to determine kidney function is to test for proteinuria. Until now, urine protein test is very effective in detecting impaired renal function and can be used as a good biomarker for chronic kidney disease (9). Generally, every healthy person excretes about 150 mg of protein in the urine each day. More than 150 mg per day is called proteinuria, and normal protein levels measured in urine are <10 mg/dL^3 (10).

Based on this description, the researcher wanted to know the characteristics of people with type 2 diabetes according to age, gender, blood pressure, and proteinuria, as well as whether or not there was a relationship between blood pressure and proteinuria in patients with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta Based on this description, the researcher wanted to know the characteristics of people with type 2 diabetes according to age, gender, blood pressure, and proteinuria, as well as whether or not there was a relationship between blood pressure and proteinuria in patients with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta.

METHODS

This study used analytic research with a cross-sectional design at the Matraman District Health Center, East Jakarta, from June to October 2021. The population in this study were all patients with type 2 diabetes mellitus. The Total Sampling technique is that the sample taken is the entire medical record of type 2 diabetes mellitus that meets the researcher's inclusion criteria. Inclusion Criteria include patients diagnosed with type 2 diabetes mellitus with the results of blood pressure measurements and the effects of laboratory examinations of urine protein levels on a dipstick at the Matraman District Health Center, East Jakarta, from June to October 2021. Exclusion criteria were patients with increased urinary protein in patients with urinary tract infections and Patients who still need complete blood pressure records.

The research data will be analyzed in univariate and bivariate. In this case, proteinuria and the independent variable, namely blood pressure in patients with type 2 diabetes mellitus using the gamma correlation test. If the results of statistical tests with p-value <0.05 are obtained, then H0 is rejected, meaning there is a significant difference between the independent and dependent variables. If the results of statistical tests with p-value <0.05 are obtained, then H0 is rejected, meaning there is a significant difference between the independent and dependent

variables. Data was analyzed using the Statistical Package for Social Science (SPSS) program. This research has passed ethical review number 237/PE/KE/FKK-UMJ/X/2021.

RESULTS

The univariate analysis describes the frequency distribution of cases of type 2 diabetes mellitus with blood pressure and proteinuria which includes age, sex, blood pressure, and proteinuria.

Table 1. Case Distribution of Type 2 Diabetes Mellitus Patients at the Matraman District Health Center, East Jakarta

Category Type 2 DM Patients	Frequency	Percentage (%)
Gender		
Male	17	33.3
Women	34	66.7
Age		
15 – 24 years	1	2
25 – 34 years	2	3.9
35 – 44 years	6	11.8
45 – 54 years	22	43.1
55 – 64 years	16	31.4
65 - 74 years	2	3.9
75+ years	2	3.9
Blood Pressure		
Normal	27	52.9
Prehypertension	7	13.7
Hypertension grade 1	10	19.6
Hypertension grade 2	7	13.7
Proteinuria		
Negative	23	45.1
+1	25	49
+2	3	5.9

Based on data from 51 cases of type 2 diabetes mellitus, there were 27 normal patients' blood pressure (52.9%), 10 grade 1 hypertension (19.6%), and seven prehypertension and grade 2 hypertension, respectively—people (13.7%). Of the 51 cases of type 2 diabetes mellitus, 23 patients (45.1%) were found with negative proteinuria, 25 (49%) with positive proteinuria 1, and 3 with positive proteinuria 2 (5.9%).

Based on data obtained through the medical records of patients with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta, for June - October 2021, a sample of 51 patients who met the inclusion criteria was obtained. After the univariate analysis was performed, the data was reprocessed, and bivariate analysis was performed using SPSS to determine whether or not there was a significant relationship between the dependent variable, in this case, proteinuria, and the independent variable, namely blood pressure in patients with type 2 diabetes mellitus using the gamma correlation test. If the results of statistical tests with p-value <0.05 are obtained, then H0 is rejected, meaning there is a significant difference between the independent and dependent variables.

The samples of this study were grouped based on blood pressure and proteinuria levels. The proteinuria category was grouped into negative proteinuria, positive 1, and positive two

according to the availability of medical record data. Meanwhile, blood pressure is grouped by Normal, Prehypertension, Hypertension Grade 1, and Hypertension Grade 2.Based on data obtained from 51 cases of type 2 diabetes mellitus, there was 27 normal patients' blood pressure (52.9%), 10 grade 1 hypertension (19.6%), and 7 prehypertension and grade 2 hypertension respectively. people (13,7%). Of the 51 cases of type 2 diabetes mellitus, 23 patients (45.1%) were found with negative proteinuria, 25 (49%) with positive proteinuria 1, and 3 with positive proteinuria 2 (5.9%).

Based on data obtained through the medical records of patients with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta for the period June - October 2021, a sample of 51 patients who met the inclusion criteria was obtained. After the univariate analysis was performed, the data was reprocessed and bivariate analysis was performed using SPSS to determine whether or not there was a significant relationship between the dependent variable, in this case, proteinuria, and the independent variable, namely blood pressure in patients with type 2 diabetes mellitus using the gamma correlation test. If the results of statistical tests with p-value <0.05 are obtained, then H0 is rejected, meaning that there is a significant difference between the independent and dependent variables.

The samples of this study were grouped based on blood pressure and proteinuria levels. The proteinuria category was grouped into negative proteinuria, positive 1, and positive 2 according to the availability of medical record data. Meanwhile, blood pressure is grouped by Normal, Prehypertension, Hypertension Grade 1, and Hypertension Grade 2.

Table 2. Gamma Correlation Analysis Results

Blood Pressure	Proteinuria			Correlation coefficient (r)	p-value
	Negative	+1	+2		
Normal	17 (62.9)	9 (33.3)	1 (3.7)	0.441	0.022
Prehypertension	1 (14.2)	6 (85.7)	0		
Hypertension grade 1	2 (20)	6 (60)	2 (20)		
Hypertension grade 2	3 (42.8)	4 (57.1)	0		
Total	23	25	3		

With the Gamma correlation analysis results, a p-value of 0.022 was obtained, indicating that the relationship between blood pressure and proteinuria in patients with diabetes mellitus 2 had a significant correlation. The correlation value (r) of 0.441 indicates a positive correlation with moderate correlation strength. ((Weak relationship r = 0.2-0.39) moderate (r = 0.4-0.59) strong (r = 0.6-0.79)).With the results of the Gamma correlation analysis, a p-value of 0.022 was obtained which indicated that the relationship between blood pressure and proteinuria in patients with diabetes mellitus 2 had a significant correlation. The correlation value (r) of 0.441 indicates a positive correlation with moderate correlation strength. ((weak relationship r = 0.2-0.39) moderate (r = 0.4-0.59) strong (r = 0.6-0.79)).

DISCUSSION

Based on the results of research conducted at the Matraman District Health Center, East Jakarta, from medical records of patients with diabetes mellitus for the period June – October 2021, 51 samples were obtained that met the researcher's inclusion criteria.

In this study, the results of data analysis based on gender showed that the majority of type 2 diabetes mellitus patients were 34 women (66.7%), while 17 were men (33.3%). These results following research Based on the results of research conducted at the Matraman District Health Center, East Jakarta from medical records of patients with diabetes mellitus for the period June – October 2021, 51 samples were obtained that met the researcher's inclusion criteria.

In this study, the results of data analysis based on gender showed that the majority of type 2 diabetes mellitus patients were 34 women (66.7%), while 17 were men (33.3%). These results are in accordance with research (5) that the highest number of DM sufferers is women, namely 3287 people (62.6%) compared to 1966 men (37.4%). According to Saputri et al., 2016 DM sufferers are more dominant in women than men because women's activities are generally smaller than men's, so they take less glucose. Hence, they are prone to obesity and hyperglycemia that the highest number of DM sufferers is women, namely 3287 people (62.6%) compared to 1966 men (37.4%). According to Saputri et al., 2016 DM sufferers are more dominant in women than men because in general women's activities are smaller than men so they take less glucose so they are prone to obesity and hyperglycemia (11). Different research results explain that physical activity is unrelated to blood glucose levels Different research results explain that physical activity is not related to blood glucose levels (12).

In this study, it was found that most cases of type 2 diabetes mellitus occurred in the age range of 45-54 years, as many as 22 people (43.1%); this research is in line with the Ministry of Health of the Republic of Indonesia 2020 based on Riskesdas 2018 data that DM will increase with increasing age from 45 years. In this study, it was found that most cases of type 2 diabetes mellitus occurred in the age range of 45-54 years as many as 22 people (43.1%) where this research is in line with the Ministry of Health of the Republic of Indonesia 2020 based on Riskesdas 2018 data that DM will increase with increasing age from 45 years (4). The same results in the study Saputri that the age range of type 2 DM is the most common in patients aged 50-69, namely 160 people (78.2%) The same results in the study Saputri that the age range of type 2 DM is the most common in patients aged 50-69, namely 160 people (78.2%) (11). Increasing age or increasing age from 40 years will occur in the body of generative processes, one of which is a decrease in the work of pancreatic beta cells, in secreting insulin, which causes glucose intolerance and hyperglycemia. Hyperglycemia occurs because the body cannot respond to insulin or is resistant to insulin, so the body's peripheral cells cannot absorb glucose so that glucose in the blood vessels. Increasing age or increasing age from 40 years will occur in the body of generative processes, one of which is a decrease in the work of pancreatic beta cells, in secreting insulin which causes glucose intolerance and hyperglycemia. Hyperglycemia occurs because the body cannot respond to insulin or is resistant to insulin so that the body's peripheral cells cannot absorb glucose so that glucose in the blood vessels (1).

This study also analyzed the distribution of cases of type 2 diabetes mellitus based on blood pressure. Patients with type 2 diabetes mellitus at the Matraman District Health Center, East Jakarta, were the most with an age range of 45-54 years, with as many as 22 people (43.1%). This study's results align with the 2013 and 2018 Riskesdas data, where DM patients with hypertension aged 45 years or older have the potential to experience hypertension 2.6 times more than those aged less than 45 years. This study also analyzed the distribution of cases of type 2 diabetes mellitus based on blood pressure. Patients with type 2 diabetes mellitus at

the Matraman District Health Center, East Jakarta, were the most with an age range of 45-54 years as many as 22 people (43.1%). The results of this study are in line with the 2013 and 2018 Riskesdas data where DM patients with hypertension aged 45 years or more have the potential to experience hypertension 2.6 times, more than those aged less than 45 years (5).

The results obtained stated that as many as 27 people (52.9%) were patients with normal blood pressure, while those suffering from hypertension were 17 people (33.3%) and those with prehypertension were seven people (13.7%). Medical record data shows patients with normal blood pressure <130/80 mmHg due to several things, including diligently monitoring blood pressure every month and regularly consulting a doctor. Blood pressure monitoring is essential for type 2 DM patients to prevent complications, including kidney failureThe results obtained stated that as many as 27 people (52.9%) were patients with normal blood pressure, while those suffering from hypertension were 17 people (33.3%), and those with prehypertension 7 people (13.7%). Patients who have normal blood pressure <130/80 mmHg, based on medical record data due to several things including diligently monitoring blood pressure every month, and regularly consulting a doctor. Blood pressure monitoring is very important for type 2 DM patients to prevent complications including kidney failure (11).

According to fasting blood glucose (GDP) monitoring can prevent the development of diabetic nephropathy. According to, fasting blood glucose (GDP) monitoring can prevent the development of diabetic nephropathy (11). Based on cross-tabulation, it was found that most patients with positive proteinuria 1 were 25 (49%), negative proteinuria was 23 (45.1%), and positive proteinuria 2 was 3 (5.9%). This study's results differ from the research in which the study found that most urine protein examination results were positive 3 in patients with chronic kidney disease at Dr. RSUP. M. Djamil Padang in 2015-2017Based on cross-tabulation, it was found that most patients with positive proteinuria 1 were 25 (49%), negative proteinuria was 23 (45.1%), and positive proteinuria 2 was 3 (5.9%). The results of this study are different from the research in which the results of the study found that most urine protein examination results were positive 3 in patients with chronic kidney disease at Dr. RSUP. M. Djamil Padang in 2015-2017 (9). The results of previous studies stated that urine protein test results were most positive in type 2 DM patients whose hypertension and hypertension were factors in the occurrence of diabetic nephropathy The results of previous studies stated that urine protein test results were most positive in type 2 DM patients whose hypertension and hypertension were factors in the occurrence of diabetic nephropathy (13).

The results of the bivariate analysis in this study using the Gamma statistic test obtained a p-value of 0.022, which indicates that the correlation between blood pressure and proteinuria in patients with type 2 diabetes mellitus shows a positive correlation with the strength of the correlation (r) being (0.441). According to Surya 2018, proteinuria indicates damage to the glomerulus and kidney tubules, one of the triggers for hypertension. This is because hypertension triggers glomerular capillary damage and causes kidney failure. The results of the bivariate analysis in this study using the Gamma statistic test obtained a p-value of 0.022 which indicates that the correlation between blood pressure and proteinuria in patients with type 2 diabetes mellitus shows a positive correlation with the strength of the correlation (r) being (0.441). According to Surya 2018 the presence of proteinuria indicates damage to the

glomerulus and kidney tubules, one of the triggers for hypertension. This is because hypertension triggers glomerular capillary damage and causes kidney failure (9).

Proteinuria is a strong predictor of chronic kidney disease (14). An increase in the amount of proteinuria indicates a decrease in kidney function. The presence of diabetic kidney disease significantly elevates the risk for morbidity and mortality. An increase in the amount of proteinuria indicates a decrease in kidney function. The presence of diabetic kidney disease significantly elevates the risk for morbidity and mortality (15). Protein can be excreted in the urine due to increased permeability, damage to the glomerular barrier, and decreased tubular protein reabsorption. With varying degrees of success, numerous metabolic pathways for diabetic kidney disease have been investigated, including mitochondrial function, reactive oxygen species, NADPH oxidase (NOX), transcription factors (NF-B and Nrf2), advanced glycation, protein kinase C (PKC), aldose reductase, JAK-STAT, autophagy, apoptosis-signaling kinase 1 (ASK1), fibrosisProtein can be excreted in the urine due to increased permeability, damage to the glomerular barrier, and decreased tubular protein reabsorption. With varying degrees of success, numerous metabolic pathways for diabetic kidney disease have been investigated, including mitochondrial function, reactive oxygen species, NADPH oxidase (NOX), transcription factors (NF-B and Nrf2), advanced glycation, protein kinase C (PKC), aldose reductase, JAK-STAT, autophagy, apoptosis-signaling kinase 1 (ASK1), fibrosis (16). In another study, Albuminuria and renal insufficiency were present in many type 2 diabetes mellitus patients with hypertension, and the length of diabetes mellitus was a significant independent factor related to Albuminuria and renal insufficiency rather than the duration of hypertension Other study, Albuminuria and renal insufficiency were present in a considerable number of type 2 diabetes mellitus patients with hypertension, and the length of diabetes mellitus was a significant independent factor related with albuminuria and renal insufficiency rather than the duration of hypertension (17).

Blood pressure should be checked at every clinical visit to avoid microvascular alterations and kept at or below 140/90 mm Hg. Albuminuria may be reduced by angiotensin-converting enzyme inhibitors and angiotensin receptor blockers, which stop Diabetic Kidney Disease (DKD) from progressing To avoid microvascular alterations, blood pressure should be checked at every clinical visit and kept at or below 140/90 mm Hg. Albuminuria may be reduced by angiotensin-converting enzyme inhibitors and angiotensin receptor blockers, which stop Diabetic Kidney Disease (DKD) from progressing (18).

The nonglycemic effects of incretin-based diabetes therapy (glucagon-like peptide-1 receptor agonists and dipeptidyl peptidase four inhibitors) as well as sodium-glucose cotransporter-2 inhibitors within the kidney in individuals with type 2 diabetes can provide renal protection. The nonglycemic effects of incretin-based diabetes therapy (glucagon-like peptide-1 receptor agonists and dipeptidyl peptidase 4 inhibitors) as well as sodium-glucose cotransporter-2 inhibitors within the kidney in individuals with type 2 diabetes can provide renal protection (19). SGLT2 inhibitors are common anti-diabetic medications. Recent clinical trials have shown that these medications reduce the risk of renal function impairment and heart failure in type 2 diabetic patients by enhancing glycemic control, lowering blood pressure, and reducing body weight. Hemodynamic activities and metabolic actions are the two main divisions of potential Sodium-glucose co-transporter (SGLT2) inhibitor renoprotective

mechanisms SGLT2 inhibitors are common anti-diabetic medications. Recent clinical trials have shown that these medications reduce the risk of renal function impairment and heart failure in type 2 diabetic patients by enhancing glycemic control, lowering blood pressure, and reducing body weight. Hemodynamic activities and metabolic actions are the two main divisions of potential Sodium-glucose co-transporter (SGLT2) inhibitor renoprotective mechanisms (20).

The presence of proteinuria is a well-known risk factor for the development of kidney disease and cardiovascular morbidity and mortality, and reduced urinary protein excretion rates are associated with a slower decline in kidney function and a reduced risk of cardiovascular events. Elevated blood pressure has a significant role in the development of proteinuria in patients with diabetic or non-diabetic kidney disease, and all recent guidelines recommend a target blood pressure of less than 130/80 mm Hg in patients with proteinuria to achieve maximum renal and cardiovascular protection. The presence of proteinuria is a well-known risk factor for the development of kidney disease and cardiovascular morbidity and mortality, and reduced urinary protein excretion rates are associated with a slower decline in kidney function and a reduced risk of cardiovascular events. Elevated blood pressure has a major role in the development of proteinuria in patients with diabetic or non-diabetic kidney disease, and all recent guidelines recommend a target blood pressure of less than 130/80 mm Hg in patients with proteinuria to achieve maximum renal and cardiovascular protection (21). Failure to properly diagnose and treat albuminuria contributes to type 2 diabetes morbidity and death. The onset of the renin-angiotensin-aldosterone system (RAAS) treatment was determined by micro/macroalbuminuria, elevated blood pressure, the frequency of cardiovascular events, and antihypertensive medication Failure to properly diagnose and treat albuminuria contributes to type 2 diabetes morbidity and death. The onset of renin-angiotensin-aldosteron system (RAAS) treatment was determined by the presence of micro/macroalbuminuria, elevated blood pressure, the frequency of cardiovascular events, and the use of antihypertensive medication (22).

CONCLUSION

Based on the results of this study, in patients with type 2 diabetes mellitus, the highest age range was 45-64 years, with more cases found in women, normal blood pressure, and +1 proteinuria levels. A significant relationship exists between blood pressure and proteinuria in type 2 diabetes mellitus patients at the Matraman District Health Center, East Jakarta, from June to October 2021Based on the results of this study, in patients with type 2 diabetes mellitus, the highest age range was 45-64 years with more cases found in women, normal blood pressure, and +1 proteinuria levels. There is a significant relationship between blood pressure and proteinuria in type 2 diabetes mellitus patients at the Matraman District Health Center, East Jakarta for the period June - October 2021.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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