JURNAL PENELITIAN SEKOLAH TINGGI ILMU KESEHATAN NAHDLATUL ULAMA TUBAN
https://ejournal.iiknutuban.ac.id/index.php/jp
E-ISSN: 2686-4959
P-ISSN: 2338-5898
VOL. 7 NO.1 June. Page 54-59

RELATIONSHIP BETWEEN DURATION OF TYPE 2 DIABETES MELLITUS AND BLOOD PRESSURE IN PATIENTS AT THE PERSADIA TULUNGAGUNG CLINIC

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Article Info:
Submitted: June 13, 2025
Accepted: June 18, 2025
Published: June 18, 2025

Handling Editor:
June 18, 2025

Keywords:
Blood Pressure;
Diabetes Mellitus;
Period; Type 2.

ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a chronic condition characterized by the body's inability to use insulin effectively. Prolonged duration of T2DM and poor glycemic control may lead to various complications, including macroangiopathy—damage to large blood vessels—which can affect blood pressure. This study aimed to investigate the relationship between the duration of type 2 diabetes mellitus (T2DM) and blood pressure levels in patients with type 2 diabetes. Methods: This study employed an analytical design with a cross-sectional approach, involving 30 respondents selected through purposive sampling. The study was conducted from June 15 to 22, 2019. Data collection involved the use of validated questionnaires and medical records, as well as direct blood pressure measurements. The Spearman Rho correlation test was used with a 95% confidence level. Results: Among the 13 respondents with a longer duration of T2DM, all (100%) had high blood pressure. The Spearman Rho test yielded a p-value of 0.000, which is less than the significance level of 0.05, indicating a statistically significant relationship. The correlation coefficient was 0.797, suggesting a strong positive correlation between the duration of diabetes and blood pressure. Conclusion: There is a significant relationship between the duration of type 2 diabetes mellitus and blood pressure levels in patients at the Indonesian Diabetes Association (PERSADIA) Clinic in Tulungagung.

1. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease characterized by persistent hyperglycemia resulting from impaired insulin secretion, insulin resistance, or a combination of both (American Diabetes Association [ADA], 2017). Prolonged elevation of blood glucose levels can cause vascular damage and increase the risk of both microvascular and macrovascular complications (Setiadi, 2007).

One of the most frequently observed macrovascular complications among individuals with diabetes is hypertension. Chronic hyperglycemia contributes to endothelial dysfunction through the formation of Advanced Glycation End Products (AGEs), which initiate oxidative stress and vascular inflammation. These processes lead to arterial stiffness and atherosclerosis, consequently elevating blood pressure (Tandra, 2009). Epidemiological data support this association, with the ADA (2017) reporting that approximately two-thirds of patients with diabetes also suffer from hypertension. Cheung et al. (2012) further emphasize that hyperglycemia is often accompanied by blood pressure abnormalities and constitutes a key component of metabolic syndrome.

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Additionally, Conen et al. (2007) identified high blood pressure as both a complication and a potential contributing factor to the onset of diabetes (Price, 2006).

The prevalence of diabetes in Indonesia has shown a significant upward trend. The World Health Organization (WHO, 2016) estimated that the number of diabetes cases would rise from 8.4 million in 2000 to 21.3 million in 2030. In East Java, Riskesdas (2013) reported a diabetes population of nearly 29 million. At the local level, data from the Tulungagung District Health Office show an increase in DM cases from 2,293 in 2015 to 3,159 in 2016, representing a 37.7% growth. As of November 2018, the Indonesian Diabetes Association (PERSADIA) branch in Tulungagung had recorded 125 active members diagnosed with type 2 diabetes mellitus.

Although the association between diabetes and hypertension has been widely studied, limited research has addressed the correlation between the duration of diabetes and blood pressure levels, particularly in localized populations such as those in Tulungagung. Given the rising prevalence and burden of DM-related complications, this study aims to analyze the relationship between the duration of diabetes mellitus and blood pressure among patients with type 2 diabetes mellitus at the Indonesian Diabetes Association (PERSADIA) Clinic in Tulungagung.

The hypothesis of this study is as follows: H1: There is a significant relationship between the duration of diabetes mellitus and blood pressure among patients with type 2 diabetes mellitus at the Indonesian Diabetes Association (PERSADIA) Clinic in Tulungagung. H0: There is no significant relationship between the duration of diabetes mellitus and blood pressure among patients with type 2 diabetes mellitus at the Indonesian Diabetes Association (PERSADIA) Clinic in Tulungagung. This research has been approved by the Ethics Committee of STIKES Hutama Abdi Husada Tulungagung, with Ethical Clearance Number: 57/K-STIKes HAH/EC/VII/2019.

2. METHOD

This study employed a correlational analytical design using a cross-sectional approach, which aims to identify the relationship between dependent and independent variables measured at a single point in time (Setiadi, 2007). The design was used to determine the relationship between the duration of diabetes mellitus and blood pressure among patients with type 2 diabetes mellitus at the Indonesian Diabetes Association (PERSADIA) Clinic in Tulungagung.

The population of this study consisted of 125 patients diagnosed with type 2 diabetes mellitus who sought treatment at the PERSADIA Clinic in Tulungagung. A total of 30 respondents were selected as the sample, based on predetermined inclusion and exclusion criteria.

The sampling technique used in this study was non-probability sampling, specifically purposive sampling, in which samples are selected from the population according to the specific objectives or problems being studied. This method ensures that the selected sample represents characteristics that are already known within the population (Nursalam, 2008).

The instruments used in this study included a structured (closed-ended) questionnaire to assess the duration of diabetes mellitus and a sphygmomanometer to measure the respondents' blood pressure. The questionnaire was developed by the researcher and subsequently validated through expert judgment involving two internal medicine specialists and one public health expert to assess its content validity. The reliability of the questionnaire was

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tested through a pilot study involving 10 respondents who were not part of the main study sample, resulting in a Cronbach's alpha value of 0.82, indicating a high level of internal consistency.

Data collection involved both primary and secondary data. Primary data were obtained through the questionnaire and direct blood pressure measurements from respondents who met the study criteria. Secondary data were collected from the patients' medical records, used to validate the self-reported duration of diabetes mellitus.

The data were analyzed using the Spearman Rho correlation test to determine the relationship between the duration of diabetes mellitus and blood pressure. Statistical analysis was conducted using SPSS version 16.0 for Windows, with a significance level of 95% ($\alpha = 0.05$). If the resulting p-value < 0.05, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted, indicating a significant relationship between the duration of diabetes mellitus and blood pressure. Conversely, if $p \geq 0.05$, H_0 was accepted, indicating no significant relationship between the two variables.

3. RESULTS AND DISCUSSION

The results of this study are presented through univariate and bivariate analyses.

Table 1. Demographic Characteristics of Respondents

Characteristics	n	%
Age (Years)		
≤55	15	47%
56-64	12	40%
≥	4	13%
Gender		
Male	11	37%
Female	19	63%

Univariate analysis indicates that out of 30 respondents, 19 were female (63%) and 11 were male (37%). The majority of respondents were aged ≤55 years (47%), followed by 56–64 years (40%), and ≥65 years (13%).

Table 2. Respondent Characteristics by Duration of Diabetes Mellitus

Duration of Diabetes Mellitus	n	%
Short (1-5 tahun)	10	33,3%
Medium (6-10 tahun)	7	23,3%
Long (>10 tahun)	13	43,3%
N	30	100%

Duration of Diabetes Mellitus: 13 respondents (43.3%) had diabetes for more than 10 years, 7 respondents (23.3%) for 6–10 years, and 10 respondents (33.3%) for 1–5 years. And 19 respondents (63.3%) had high blood pressure (>140/>90 mmHg), and 11 respondents (36.7%) had normal blood pressure (90–140/60–90 mmHg). As shown in Tables 1 and 2.

Table 2. Respondent Characteristics by Blood Pressure

Tekanan Darah	n	%
Normal (90-140/60-90 mmHg)	11	36,7%
High (>140/>90 mmHg)	19	63,3%
N	30	100%

Bivariate Analysis indicates that the correlation between the duration of diabetes mellitus and blood pressure was analyzed using Spearman's Rho test. The analysis yielded a p-value of 0.000 and a correlation coefficient Rho (ρ) of 0.797, indicating a strong positive correlation.

Since the p-value was less than the significance level ($\alpha = 0.05$), the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_1) was accepted. This means that there is a significant

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relationship between the duration of diabetes mellitus and blood pressure among patients with type 2 diabetes mellitus at the PERSADIA Clinic in Tulungagung.

Table 4. A Cross-Tabulation Between Duration of Diabetes Mellitus and Blood Pressure

Duration of Diabetes		Blood Pressure		
		Normal	Tinggi	Total
Short	n	9	1	10
	%	90	10	100
Medium	n	2	5	7
	%	28,6	71,4	100
Long	n	0	13	13
	%	0	100	100

A cross-tabulation further revealed that all respondents with a diabetes duration of more than 10 years (n = 13) had high blood pressure (100%), whereas only 1 out of 10 respondents with a duration of 1–5 years had high blood pressure (10%).

The findings of this study indicate a strong and statistically significant positive correlation between the duration of diabetes mellitus and blood pressure. This suggests that patients who have had diabetes for a longer period are more likely to develop hypertension. The correlation coefficient of 0.797 demonstrates a high degree of association.

These results are consistent with previous studies. According to the American Diabetes Association (2017), approximately two-thirds of individuals with diabetes also suffer from high blood pressure. Cheung et al. (2012) highlighted that hyperglycemia is often accompanied by elevated blood pressure due to its contribution to metabolic syndrome (Smeltzer, 2008). The pathophysiological mechanism underlying this relationship involves vascular endothelial damage caused by chronic hyperglycemia, which leads to the formation of AGEs (Advanced Glycation End Products), triggering inflammation and atherosclerosis (Tandra, 2009).

Hypertension is commonly observed in patients with type 2 diabetes mellitus due to shared risk factors such as obesity, insulin resistance, and chronic inflammation. In a cross-sectional study conducted in Jordan, the prevalence of hypertension among diabetic patients was found to be remarkably high, highlighting the need for integrated management strategies." *(Al-Hourani Z, et al. Ther Adv Endocrinol Metab. 2020).*

The pathogenesis of hypertension in diabetes involves complex mechanisms including endothelial dysfunction, increased oxidative stress, and activation of the renin-angiotensin-aldosterone system (RAAS), all of which contribute to vascular stiffness and elevated blood pressure." *(Jia G, Sowers JR. Hypertension. 2021).*

Longer duration of diabetes was associated with a higher incidence of hypertension and cardiovascular events. This supports the hypothesis that chronic hyperglycemia has cumulative effects on vascular health over time." *(Zeng X, et al. J Transl Med. 2021*). In a study conducted in Ethiopia, more than half of the diabetic patients were hypertensive. Factors such as age, duration of diabetes, BMI, and poor glycemic control were significantly associated with elevated blood pressure." *(Akalu Y, Belsti Y. Diabetes Metab Syndr Obes. 2020*). The coexistence of hypertension and diabetes necessitates early screening and continuous monitoring to prevent complications. Integrated care models are recommended to improve health outcomes in patients with long-standing diabetes."*(Bani Salameh A, et al. Ann Med Surg. 2021).*

This study contributes to the growing body of evidence that long-term diabetes management is critical not only for blood

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glucose control but also for the prevention of cardiovascular complications such as hypertension.

However, several limitations should be acknowledged. First, the sample size was relatively small (n = 30), which may limit the generalizability of the findings. Second, the use of purposive sampling introduces the possibility of selection bias, as the sample may not fully represent the broader population of diabetic patients. Third, the study was conducted in a single clinic, which may limit the external validity.

Future studies with larger, randomized samples and longitudinal designs are recommended to explore causality and better understand the progression of hypertension among patients with diabetes.

4. CONCLUSION

This study found a significant and strong positive correlation between the duration of diabetes mellitus and blood pressure in patients with type 2 diabetes mellitus at the Indonesian Diabetes Association (PERSADIA) Clinic in Tulungagung. Patients who had diabetes for a longer period were more likely to experience high blood pressure.

These findings highlight the practical importance of regular blood pressure monitoring and lifestyle modifications for individuals with type 2 diabetes, particularly those with a longer disease duration. Interventions such as a balanced diet, regular physical activity, weight management, medication adherence, and routine check-ups should be emphasized in diabetes care programs to prevent or manage hypertension.

Future research is recommended to explore the biological mechanisms underlying the relationship between diabetes duration and the development of hypertension. In addition, larger-scale and multi-center studies are needed to validate these findings and provide broader generalizability.

5. ACKNOWLEDGMENTS

The authors would like to express their gratitude to STIKES Hutama Abdi Husada Tulungagung for funding this research and to all respondents who generously contributed to this study.

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