International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 08 Issue 12 December 2025
DOI: 10.47191/ijcsrr/V8-i12-71, Impact Factor: 8.048
IJCSRR @ 2025
www.ijcsrr.org

Factors Associated with Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly in The Coastal Community of Konawe Islands

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ABSTRACT
Background: Diabetes mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia. Long-term, uncontrolled hyperglycemia can trigger macrovascular complications, including coronary heart disease, stroke, and peripheral vascular disease, significantly increasing morbidity and mortality.
Objective: This study aimed to analyze factors associated with chronic macrovascular complications of type 2 diabetes mellitus in elderly people in coastal communities in the Konawe Islands Regency.
Methods: This study was quantitative with a cross-sectional approach. The study population was all 256 elderly people with type 2 DM in the period January–September 2025. A sample of 160 respondents was selected using simple random sampling and met the inclusion criteria. Independent variables included duration of diabetes, obesity, blood sugar control, dyslipidemia, hypertension, and physical activity. Data analysis was performed using the Spearman rank test and logistic regression.
Results: Factors significantly associated with macrovascular complications were duration of diabetes mellitus (p=0.00), obesity (p=0.032), dyslipidemia (p=0.000), hypertension (p=0.001), and physical activity (p=0.045). Meanwhile, blood sugar control showed no significant association (p=0.114). The R-square value of 0.500 indicates that half of the variation in complication incidence can be explained by the studied variables.
Conclusion: Duration of diabetes mellitus, obesity, dyslipidemia, hypertension, and physical activity are associated with the occurrence of macrovascular complications in elderly with type 2 diabetes mellitus. Efforts to prevent and control these risk factors need to be increased to reduce the burden of complications in the elderly population in coastal areas.

KEYWORD: Chronic Macrovascular, Metabolic disease, Type 2 Diabetes Mellitus.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disease with various causes, characterized by elevated blood glucose levels accompanied by impaired carbohydrate, lipid, and protein metabolism due to impaired insulin function[1]. This disease has become a global health problem, with its prevalence increasing annually. Diabetes was also the direct cause of 1.6 million deaths in 2021, nearly half of which occurred before the age of 70, and contributed to 530,000 deaths from kidney disease and approximately 11% of total cardiovascular deaths [2]. The global burden of diabetes is expected to continue to increase significantly. The International Diabetes Federation [3] projects the number of people with diabetes worldwide to increase from 588.7 million in 2024 to 852.5 million in 2050, a 45% increase, with Southeast Asia accounting for 73% (from 106.9 million to 184.5 million cases).

Based on the results of the 2023 Indonesian Health Survey (SKI), the prevalence of diabetes mellitus in the population aged ≥15 years reached 2.2%, an increase compared to 2018 data which showed a prevalence of 2.0%. The highest rate was found in the 65-74 age group, at 6.7%. The increase in prevalence occurred in almost all provinces, including Southeast Sulawesi with a prevalence rate of 1.6%. Type 2 diabetes mellitus was the most common type, at 40.7%, with the highest proportion by age group being in the elderly at 52.5%. This condition illustrates the increasing burden of disease, especially in the elderly group who are a population vulnerable to chronic complications of diabetes [4]. In Konawe Kepulauan Regency, the number of cases of Diabetes Mellitus (DM)

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showed a significant increase. In 2023, 713 cases were recorded, increasing to 965 cases in 2024. Of these, 298 were elderly, out of a total of 4,065 elderly in the region. As of the third quarter of 2025, 265 elderly were still suffering from the disease.

Type 2 diabetes mellitus is the most common type of diabetes, accounting for over 90% of all diabetes cases. The main risk factors include advanced age, obesity, low physical activity, urbanization, and unhealthy diet [5]. The majority of people with type 2 diabetes mellitus are aged ≥45 years, with the risk increasing with age [6].

Uncontrolled chronic hyperglycemia can trigger macrovascular complications such as coronary heart disease, stroke, and peripheral vascular disease, which significantly increase morbidity and mortality [7]. Atherosclerotic Cardiovascular Disease (ACD), which includes Coronary Heart Disease (CHD), Cerebrovascular Disease, and Peripheral Artery Disease due to atherosclerosis, is a major macrovascular complication that is the main cause of morbidity and mortality in people with diabetes. This disease not only reduces quality of life but also causes a large economic burden, with estimated expenditures reaching approximately 37.3 billion US dollars per year for the treatment of vascular complications, thus demonstrating the urgency of optimal prevention and management of cardiometabolic risk factors [8].

Various studies have shown that macrovascular and microvascular complications remain a dominant problem in people with diabetes. A study at a national referral center in Yemen noted that 62.6% of patients experienced complications, with a prevalence of CHD of 16.7% [9]. Similar findings were reported at Pertamina Hospital in Bandar Lampung, where the distribution of complications varied by age and gender, with foot ulcers being the most common, especially in women [10]. Various studies have also confirmed that poor glycemic control, elevated HbA1c, and uncontrolled blood sugar levels significantly increase the risk of complications. Conditions such as obesity, abnormal waist circumference, and poor blood sugar management further worsen the risk profile of diabetes patients [11].

Other risk factors contributing to the development of chronic complications include duration of diabetes, physical activity level, and stability of blood pressure and lipid profiles. Patients with a disease duration of more than five years have a higher risk of complications, including PAD [12]. Low physical activity has also been shown to be strongly correlated with an increased incidence of complications, with all patients with low physical activity experiencing complications. Furthermore, blood pressure variability and lipid fluctuations contribute to vascular damage, increasing the risk of cardiovascular complications and albuminuria. Hypertension, especially when accompanied by arterial stiffness, further exacerbates macrovascular risks in people with diabetes, making control of these factors key to preventing long-term complications [13],[14].

In Konawe Kepulauan Regency, the number of diabetes mellitus (DM) cases has shown a significant increase. In 2023, 713 cases were recorded, increasing to 965 cases in 2024. Of these, 298 were elderly, out of a total of 4,065 elderly in the region. As of the third quarter of 2025, 265 elderly were still suffering from this disease.

Based on the background, this study aims to determine the association between obesity, blood sugar control, and hypertension with the incidence of chronic macrovascular complications of type 2 diabetes in the elderly. A comprehensive understanding of the factors contributing to the development of complications can provide an important foundation for developing more effective interventions in the prevention and management of diabetes mellitus and its complications.

METHODS

This study used a quantitative cross-sectional design. The population was 265 elderly people aged ≥60 years diagnosed with Type 2 Diabetes mellitus (DM) registered in the Elderly Programmer database at the Konawe Islands Regency Health Office in the third quarter of 2025. The sampling technique used was simple random sampling. A sample of 160 elderly people was selected using the Slovin formula based on inclusion and exclusion criteria. Data analysis used the Spearman rank test and logistic regression. This study has been declared ethically sound, as evidenced by the issuance of an ethics approval letter from the Indonesian Public Health Experts Association (IAKMI) of Southeast Sulawesi, No. 253/KEPK-IAKMI/VIII/2025. Furthermore, this study has also obtained an implementation permit from the Konawe Islands Health Office, No. 500.10.3.1/639/2025.

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RESEARCH RESULTS

Respondent Characteristics

Table 1. Distribution of Characteristics of Research Respondents

Respondent Characteristics	Frequency (n)	Percentage (%)
Age		
Young Elderly ≥60-74 years	140	87,5
Older Elderly >74 years	20	12,5
Gender		
Male	38	23,75
Female	122	76,25
Education Level		
Elementary School	110	68,75
Middle School	21	13,1
High School	26	16,25
University	3	1,9
Total	160	100

Based on the results of a study of 160 elderly people with type 2 diabetes mellitus in the coastal community of Konawe Islands, it was found that the majority of respondents were young elderly aged ≥60-74 years (140 people) (87.5%), while older elderly aged 74 and above numbered 20 (12.5%). These findings indicate that type 2 diabetes sufferers in the coastal community are predominantly elderly in their early years, who remain at high risk of developing chronic macrovascular complications. This is related to the aging process, which naturally decreases metabolic function and increases susceptibility to the development of atherosclerosis.

In terms of gender, the majority of respondents were women (122 people) (76.25%), while 38 were men (23.75%). The predominance of women in this study may reflect the high prevalence of type 2 diabetes in elderly women, who are physiologically more susceptible to hormonal and metabolic changes that can accelerate the degenerative process, including chronic macrovascular complications such as heart disease and stroke.

Regarding education, the majority of respondents (110 respondents (68.75%) had an elementary school education, indicating that the majority of the population in this study had a primary education. Twenty-one respondents (13.1%) had a junior high school education, and 26 respondents (16.25%) had a high school education, indicating that the proportion of respondents with secondary education was smaller than that with primary education. Only three respondents (1.9%) had a college education, indicating that higher education was relatively rare in this study population. Overall, the number of respondents was 160 (100%).

Overall, the characteristics of the respondents in this study were predominantly young elderly, female, and elementary school educated, reflecting a population group at high risk for chronic macrovascular complications due to type 2 diabetes.

Table 2. Frequency Distribution of Chronic Macrovascular Complications of DM, Duration of DM Suffering, Obesity, Blood Sugar Control, Dyslipidemia, Hypertension and Physical Activity

Variable	Frequency (n)	Percentage (%)
Chronic Macrovascular Complications		
No Complications	36	22,5
Complications Present	124	77,5
Duration of Suffering		
< 5 years	94	58,75
≥ 5 years	66	41,25

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Obesity		
Non-Obesity	122	70
Obesity	48	30
Blood sugar control		
Controlled	36	22,5
Uncontrolled	124	77,5
Dyslipidemia		
Normal	107	66,9
Abnormal	53	33,1
Hypertension		
Not Hypertensive	87	54,4
Hypertension	73	45,6
Physical Activity		
Good	63	39,4
Not good	97	60,6
Total	160	100

Based on the characteristics of the respondents, most participants did not experience chronic macrovascular complications (77.5%), while 22.5% had experienced complications. The majority of respondents had suffered from diabetes mellitus for <5 years (58.75%), and 41.25% had suffered from it for ≥5 years. The proportion of non-obese respondents was higher (70%) than obese respondents (30%). Most respondents had uncontrolled blood sugar control (77.5%). In addition, abnormal dyslipidemia was found in 33.1% of respondents. A history of hypertension was found in 45.6% of respondents, while 54.4% were not hypertensive. In terms of physical activity, the majority of respondents were in the poor category (60.6%). The total number of respondents in this study was 160 people.

Table 3. Relationship between Duration of Diabetes and Chronic Macrovascular Complications

Duration of Suffering	**Chronic Macrovascular Complications**				**Total**		**r value**	**Significance value**
	No Complications		Complications Present					
	n	%	n	%	n	%		
< 5 years	88	93,6	6	6,4	94	100	**0,461**	**0,000**
≥ 5 years	36	54,5	30	45,5	66	100		
Total	124	77,5	36	22,5	160	100		

The results showed a significant association between the duration of diabetes mellitus and the incidence of chronic macrovascular complications. Elderly individuals with diabetes mellitus duration less than 5 years were largely free of complications (93.6%), while in elderly individuals with diabetes mellitus duration greater than 5 years, the proportion of complications increased to 45.5%. The correlation value of r = 0.461 indicates a positive association with moderate strength, meaning the longer a person has diabetes, the higher the risk of macrovascular complications.

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Table 4. Relationship between Obesity and Chronic Macrovascular Complications

Obesity	Chronic Macrovascular Complications				Total		r value	Significance value
	No Complications		Complications Present					
	n	%	n	%	n	%		
Not Obese	92	82,1	20	17,9	112	100	**0,170**	**0,032**
Obesity	32	66,7	16	33,3	48	100		
Total	124	77,5	36	22,5	160	100		

The results of the study showed that obesity was significantly associated with the incidence of chronic macrovascular complications in diabetic patients. The proportion of complications in the obese group reached 33.3%, almost twice as high as in the non-obese group (17.9%). Although the correlation value obtained was relatively weak (r = 0.170), the direction of the relationship still indicated that obesity increased the risk of macrovascular complications. A significance value of p = 0.032 confirmed that this relationship was statistically significant.

Table 5. Relationship between Blood Sugar Control and Chronic Macrovascular Complications

Blood Sugar Control	Chronic Macrovascular Complications				Total		r value	Significance value
	No Complications		Complications Present					
	n	%	n	%	n	%		
Controlled	33	86,8	5	13,2	36	100		
Uncontrolled	91	74,6	31	25,4	124	100	**0,125**	**0,116**
Total	124	77,5	36	22,5	160	100		

The results of this study indicate that descriptively there is a difference in the proportion of macrovascular complications between patients with controlled and uncontrolled blood sugar control, where complications are more common in the uncontrolled group (25.4%) compared to the controlled group (13.2%). However, the results of statistical tests show a very weak correlation (r = 0.0125) and not significant (p = 0.116), so there is no significant relationship between blood sugar control and the incidence of chronic macrovascular complications in this study. These findings indicate that other factors such as the duration of DM, obesity, dyslipidemia, hypertension, and physical activity may have a more dominant role in the emergence of macrovascular complications in respondents.

Table 6. Relationship between Dyslipidemia and Chronic Macrovascular Complications

Dyslipidemia	Chronic Macrovascular Complications				Total		r value	Significance value
	No Complications		Complications Present					
	n	%	n	%	n	%		
Normal	97	90,7	10	9,3	107	100		
Abnormal	27	50,9	26	49,1	53	100	**0,448**	**<0,001**
Total	124	77,5	36	22,5	160	100		

The results of this study indicate that dyslipidemia has a strong and significant relationship with the incidence of chronic macrovascular complications in patients with diabetes mellitus. The proportion of complications in the group with abnormal

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dyslipidemia reached 49.1%, significantly higher than the group with a normal lipid profile, which was only 9.3%. The correlation value of r = 0.448 indicates a positive relationship with moderate to strong strength, indicating that the worse the lipid profile, the greater the risk of macrovascular complications. The very strong statistical significance of p = <0.001 confirms that dyslipidemia is one of the important factors contributing to the occurrence of vascular complications in patients with diabetes.

Table 7. Relationship between Hypertension and Chronic Macrovascular Complications

Hypertension	Chronic Macrovascular Complications				Total		r value	Significance value
	No Complications		Complications Present					
	n	%	n	%	n	%		
No Hypertension	76	87,4	11	12,6	87	100	**0,258**	**0,001**
Hypertension	48	65,8	25	34,2	73	100		
Total	124	77,5	36	22,5	160	100		

The results of this study indicate that hypertension has a significant relationship with the incidence of chronic macrovascular complications in diabetic patients. Patients with hypertension have a significantly higher proportion of complications (34.2%) compared to patients without hypertension (12.6%). The correlation value of r = 0.258 indicates a positive relationship with weak to moderate strength, indicating that the presence of hypertension increases the risk of macrovascular complications. The high statistical significance of p = 0.001 confirms that this relationship is statistically significant and not a coincidence. Thus, hypertension is an important factor that needs to be considered in preventing macrovascular complications in diabetes mellitus.

Table 8. Relationship between Physical Activity and Chronic Microvascular Complications

Physical Activity	Chronic Macrovascular Complications				Total		r value	Significance value
	No Complications		Complications Present					
	n	%	n	%	n	%		
Good	54	85,7	9	14,3	63	100	**0,159**	**0,045**
Not Good	70	72,2	29	27,8	96	100		
Total	124	77,5	36	22,5	160	100		

The results of this study indicate that physical activity has a significant relationship with the incidence of chronic macrovascular complications in patients with diabetes mellitus. Patients with poor physical activity had a higher proportion of complications (27.8%) compared to patients with good physical activity (14.3%). The correlation value of r = 0.159 indicates a positive relationship with weak strength, but still indicates that low physical activity contributes to an increased risk of vascular complications. The statistical significance of p = 0.045 confirms that activity is a factor significantly associated with the incidence of macrovascular complications, although its influence is not as strong as other variables such as dyslipidemia or hypertension.

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Multivariate Analysis

Table 9. Simultaneous Relationship of Independent Variables to the Dependent Variable

Variable	B	S.E.	wald	Df	Sig.	Exp.B
Long-Term Suffering	2.303	.558	17.042	1	<,001	10.007
Obesity	.536	.526	1.040	1	.308	1.710
Dyslipidemia	1.996	.499	15.996	1	<,001	7.362
Hypertension	.929	.507	3.362	1	.067	2.533
Physical Activity	.293	.563	.271	1	.603	1.340
Constant	-10.408	1.793	33.680		<,001	.000
R Square=0.500						

Table 9 shows that the variables of duration of diabetes and dyslipidemia significantly influence the occurrence of complications, each with a p-value < 0.001. Patients who have had diabetes for a long time have a chance of experiencing complications approximately 10 times greater, while patients with dyslipidemia have a risk approximately 7.3 times higher than those without dyslipidemia. Meanwhile, obesity, hypertension, and physical activity did not show a significant effect on the occurrence of complications (p > 0.05). The R Square value of 0.500 indicates that the model is able to explain approximately 50% of the variation in the occurrence of complications based on the variables studied.

DISCUSSION

The Relationship Between Duration of Diabetes and Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly

The duration of diabetes mellitus reflects how long a person has had since the disease was first diagnosed. The duration of diabetes is associated with an increased risk of various complications. In addition to the duration of the disease, the severity of the diabetes is also an important factor in triggering complications. In general, the longer a person lives with diabetes mellitus, the higher the likelihood of developing various complications [15].

The Spearman Rank test revealed a significant association between duration of diabetes mellitus and the incidence of chronic macrovascular complications. Elderly individuals with diabetes mellitus duration less than 5 years were largely free of complications (93.6%), while in elderly individuals with diabetes duration greater than 5 years, the proportion of complications increased to 45.5%. A correlation value of r = 0.461 indicates a moderately strong positive association, meaning the longer a person has diabetes, the higher the risk of macrovascular complications.

Complication-based staging assesses the severity of diabetes based on the presence and extent of target organ damage associated with chronic hyperglycemia. This stage generally increases with the duration of diabetes, increasing the risk of complications such as ASCVD, heart failure, CKD, retinopathy, and neuropathy [16].

The results of this study are in line with research conducted by [11], which stated that patients with a duration of suffering from DM for ≥ 5 years have a 5.68 times higher risk of experiencing complications compared to patients whose disease duration is <5 years (OR = 5.68). Similar findings were also reported by [12] that respondents who have suffered from diabetes for ≥ 5 years have a 2.3 times greater risk of experiencing complications compared to those who have only suffered from it for <5 years. Research conducted by [17] shows that patients with a history of the disease for ≥ 5 years are more at risk of experiencing complications than patients with a duration of suffering from DM <5 years.

The duration of diabetes mellitus (DM) is closely related to the degenerative processes caused by chronic hyperglycemia. Long-term exposure to high blood glucose can damage the walls of the capillaries that supply blood to various body tissues. This condition disrupts microcirculation and triggers endothelial dysfunction, which is the starting point for the development of macrovascular complications. Furthermore, within 5–10 years after diagnosis, the risk of complications tends to increase sharply due to a decline in pancreatic beta cell function and a reduced ability of the body to produce insulin optimally. As a result, glycemic control worsens and accelerates the process of atherosclerosis.

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The Relationship Between Obesity and Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly

The results of this study indicate that obesity is significantly associated with the incidence of chronic macrovascular complications in diabetes patients. The proportion of complications in the obese group reached 33.3%, almost twice as high as in the non-obese group (17.9%). Although the correlation value obtained was relatively weak (r = 0.170), the direction of the relationship still indicates that obesity increases the risk of macrovascular complications. A significance value of p = 0.032 confirms this relationship is statistically significant.

Obesity, particularly visceral adiposity, plays a key role in triggering chronic inflammation that increases the risk of metabolic and cardiovascular disorders. Visceral adiposity tissue produces various pro-inflammatory adipokines such as leptin, resistin, IL-6, and MCP-1, which attract macrophages to the adipose tissue and trigger systemic inflammation. This condition causes oxidative stress, endothelial dysfunction, abnormal lipid metabolism, hypercoagulability, and insulin resistance. This mechanism explains why obesity contributes to the development of atherosclerosis and increases the risk of cardiovascular complications [18]. Thus, the results of this study align with the basic theory that obesity accelerates the progression of large blood vessel damage in patients with type 2 diabetes.

The results of this study align with the findings of various previous studies showing that obesity is a significant factor in increasing the risk of complications in patients with diabetes mellitus. [19] reported that obese individuals with diabetes had a 3.9 times greater risk of developing complications than those without obesity. These findings are supported by [20], which confirmed that weight gain not only worsens metabolic control but also increases the risk of death, heart failure, and micro- and macrovascular complications. Another study by [21] also indicated that nutritional status is a dominant factor contributing to the development of chronic complications in patients with diabetes. This evidence is consistent with the findings of this study, which show that obesity plays a significant role in increasing the susceptibility of diabetic patients to various chronic complications.

Overall, this research emphasizes the importance of weight control efforts as part of a strategy to prevent chronic complications of type 2 diabetes mellitus.

The Relationship between Blood Sugar Control and Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly

The results of this study indicate a descriptive difference in the proportion of macrovascular complications between patients with controlled and uncontrolled blood sugar control. Complications were more common in the uncontrolled group (25.4%) compared to the controlled group (13.2%). However, statistical tests showed a very weak correlation (r = 0.0125) and an insignificant (p = 0.116), indicating no significant relationship between blood sugar control and the incidence of chronic macrovascular complications in this study. These findings indicate that other factors such as duration of diabetes, obesity, dyslipidemia, hypertension, and physical activity may play a more dominant role in the development of macrovascular complications in respondents.

Theoretically, poor blood sugar control is a major factor contributing to the development of macrovascular complications, such as coronary heart disease, stroke, and peripheral artery disease. Chronic hyperglycemia causes protein glycation, endothelial dysfunction, oxidative stress, and systemic inflammation, which accelerate the process of atherosclerosis. This mechanism has been explained in the American Diabetes Association (ADA) and various literature which confirms that long-term glycemic control is a protective factor against cardiovascular disease [22].

This finding in the study is in line with several previous studies, such as research by [13] which found that patients with regular blood sugar checks were not proven to have a relationship with complications in diabetes patients. This study is in line with [23] that there is no relationship between regular blood sugar checks and the presence of diabetes complications, although most respondents carry out routine checks every month, but this is not significantly meaningful in relation to controlled blood glucose. GDS is not related to macrovascular complications in the elderly because this examination does not reflect chronic blood sugar exposure that causes atherosclerosis, is very fluctuating, is influenced by many other factors in the elderly, and is not as sharp as HbA1c in predicting vascular damage.

However, this study disagrees with research conducted by [16], which explains that poor glycemic control accelerates the transition from early stages to more severe complications through the accumulation of vascular and nerve damage due to prolonged exposure to hyperglycemia. Conversely, optimal blood glucose control can slow stage progression, reduce the risk of irreversible complications, and improve long-term clinical outcomes.

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Critically, the results of this study indicate that assessing the risk of chronic macrovascular complications is not sufficient using the GDS alone; therefore, it is crucial to use indicators of long-term glycemic control such as HbA1c. Furthermore, macrovascular complications are multifactorial, influenced by factors such as hypertension, dyslipidemia, obesity, duration of diabetes, and lifestyle. These factors likely contribute more to the development of complications than GDS control alone. This may explain why this study did not find a significant association.

The Relationship between Dyslipidemia and Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly

The results of this study indicate that dyslipidemia has a strong and significant relationship with the incidence of chronic macrovascular complications in patients with diabetes mellitus. The proportion of complications in the group with abnormal dyslipidemia reached 49.1%, significantly higher than the group with a normal lipid profile, which was only 9.3%. The correlation value of r = 0.448 indicates a positive relationship with moderate to strong strength, indicating that a worse lipid profile increases the risk of macrovascular complications. The very strong statistical significance of p = < 0.001 confirms that dyslipidemia is a significant factor contributing to the development of vascular complications in patients with diabetes.

Atherosclerosis is a fundamental process in the development of cardiovascular disease triggered by an abnormal lipid profile. Elevated LDL and apoB play a key role in initiating the accumulation of lipoproteins in the arterial wall, which then undergo oxidation and form foam cells through phagocytosis by macrophages. This process triggers inflammation, oxidative stress, and smooth muscle cell proliferation, ultimately forming atherosclerotic plaques. Plaque instability can lead to rupture and thrombus formation, leading to ischemic events such as heart attacks and strokes. Conversely, HDL has a protective effect through cholesterol efflux and inhibition of inflammation. This mechanism explains why dyslipidemia, particularly high levels of atherogenic lipoproteins, significantly contributes to macrovascular complications, as found in this study [24].

The results of this study are also consistent with previous studies showing that dyslipidemia is a major risk factor for cardiovascular disease in diabetic patients. One study reported that variability or fluctuation in HDL, LDL, and triglyceride levels over time has been shown to increase the risk of cardiovascular complications and albuminuria, as unstable lipid changes accelerate endothelial dysfunction and vascular inflammation [20]. Dyslipidemia was found to be higher in the group with CHD and DM. This indicates that DM patients with abnormal cholesterol levels are at higher risk of CHD, suggesting a relationship between dyslipidemia and CHD events in type 2 DM patients [25].

Overall, these findings emphasize the importance of comprehensive dyslipidemia screening and management in diabetic patients to prevent the progression of macrovascular disease.

The Relationship between Hypertension and Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly

The results of this study indicate that hypertension is significantly associated with the incidence of chronic macrovascular complications in diabetic patients. Patients with hypertension had a significantly higher proportion of complications (34.2%) compared to patients without hypertension (12.6%). A correlation value of r = 0.258 indicates a positive association with weak to moderate strength, indicating that the presence of hypertension increases the risk of macrovascular complications. The high statistical significance of p = 0.001 confirms that this association is statistically significant and not a coincidence. Thus, hypertension is an important factor that needs to be considered in preventing macrovascular complications in diabetes mellitus.

Hypertension and type 2 diabetes are two conditions that frequently coexist and exacerbate each other. The prevalence of hypertension in diabetic patients is nearly twice as high as in individuals without diabetes, while hypertensive patients are also more susceptible to insulin resistance and ultimately develop diabetes. This association is caused by similar pathophysiological mechanisms, including endothelial dysfunction, vascular inflammation, arterial remodeling, atherosclerosis, lipid metabolism disorders, and obesity. The combination of these factors creates a vascular environment that is more susceptible to structural and functional damage. In diabetic patients, hypertension is a major factor accelerating the progression of cardiovascular disease, which is a major cause of morbidity and mortality. The overlap between cardiovascular complications in diabetes and hypertension at both the microvascular and macrovascular levels confirms that hypertension is not only a comorbidity but also a significant contributor to the development of more severe chronic complications. These findings reinforce the importance of blood pressure control as a key step in preventing the progression of vascular damage in patients with type 2 diabetes [26].

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The findings of this study are consistent with previous studies showing that hypertension is a strong determinant of the incidence of vascular complications. Research by [27] showed that high blood pressure was a significant factor in this study, which increased the risk of complications by 22.5-fold. Hypertension often occurs alongside type 2 diabetes and exacerbates complications such as heart disease and stroke. The similarity of these results suggests that the patterns found in this study are not isolated but are within a strong body of scientific evidence. Other findings also indicate that individuals with hypertension tend to experience insulin resistance, thus being at greater risk of developing diabetes compared to normotensive individuals. In diabetic patients, cardiovascular disease is a major cause of morbidity and mortality, and this condition is further exacerbated by hypertension [28].

Overall, these study results strengthen the evidence that hypertension is a significant risk factor for chronic macrovascular complications. These findings also emphasize the importance of optimal blood pressure control as a priority in preventing macrovascular complications in high-risk populations.

The Relationship between Physical Activity and Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly

The results of this study indicate that physical activity is significantly associated with the incidence of chronic macrovascular complications in patients with diabetes mellitus. Patients with poor physical activity had a higher proportion of complications (27.8%) compared to patients with good physical activity (14.3%). The correlation value of $r = 0.159$ indicates a positive association with weak strength, but still indicates that low physical activity contributes to an increased risk of vascular complications. The statistical significance of $p = 0.045$ confirms that activity is a factor significantly associated with the incidence of macrovascular complications, although its influence is not as strong as other variables such as dyslipidemia or hypertension.

When compared with previous studies, this pattern of findings aligns with those of [25], who stated that physical activity contributes to increased motivation to adopt a healthy lifestyle (effect size 0.52), encourages healthy behaviors (effect size 0.57), and improves self-perception of health (effect size 0.41). In patients with diabetes mellitus, this intervention has been shown to improve health behaviors such as weight control, glucose regulation, and exercise consistency. Conversely, lack of physical activity can worsen diabetes, and uncontrolled diabetes can increase the risk of coronary heart disease progression and death. These findings are also supported by [29], who confirmed that low physical activity is a legitimate risk factor considered a predictor of cardiovascular outcomes and mortality. Furthermore, research conducted by [30] demonstrated a prospective relationship between physical activity levels and the incidence of major diabetes-related complications in individuals diagnosed with diabetes. There is moderately certain evidence that physical activity is associated with a reduced relative risk of coronary heart disease (CHD), and CHD mortality.

The Most Influential Variables for Chronic Macrovascular Complications of Type 2 Diabetes in the Elderly

Multivariate analysis showed that duration of diabetes and dyslipidemia were significant determinants of the incidence of chronic macrovascular complications in patients with diabetes mellitus, with p-values <0.001 for both variables. Longer disease duration was shown to substantially increase the risk of complications, as indicated by an Exp(B) value of 10.007. This finding indicates that patients with a longer history of diabetes have approximately a 10-fold greater chance of developing complications. Pathophysiologically, this condition is consistent with the progressive mechanism of chronic hyperglycemia that causes vascular damage, oxidative stress, and endothelial dysfunction, which cumulatively contribute to the development of macrovascular complications.

Dyslipidemia was also identified as a significant factor with an Exp(B) value of 7.362, indicating that patients with an abnormal lipid profile have approximately a 7.3-fold higher risk of developing complications compared to patients without dyslipidemia. These results align with various empirical evidence showing that lipid imbalance, particularly increased LDL and decreased HDL, accelerates the process of atherosclerosis through plaque buildup and narrowing of the vascular lumen, thereby increasing susceptibility to coronary heart disease, stroke, and other vascular complications.

In contrast, obesity, hypertension, and physical activity did not show a significant association with the incidence of complications in this regression model ($p > 0.05$). The insignificance of these three variables could be due to various factors, including heterogeneity in respondent characteristics, the effectiveness of risk factor management through routine therapy, or the possibility of unmeasured confounding factors. Furthermore, the impact of these three variables on macrovascular complications may be indirect or require a different analytical approach to more comprehensively understand their influence.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 08 Issue 12 December 2025
DOI: 10.47191/ijcsrr/V8-i12-71, Impact Factor: 8.048
IJCSRR @ 2025
www.ijcsrr.org

An R-square value of 0.500 indicates that the model is able to explain approximately 50% of the variation in the incidence of complications based on the variables analyzed. Therefore, there are still approximately 50% of other factors outside the model that could potentially influence the occurrence of complications, such as long-term glycemic control, therapy adherence, smoking history, diet, and genetic factors. This underscores the need for further research with a broader range of variables to obtain a more comprehensive picture of the determinants of macrovascular complications in diabetes patients.

Overall, these findings underscore the importance of monitoring disease duration and controlling dyslipidemia as part of a comprehensive strategy for preventing macrovascular complications. Targeted and sustained interventions aimed at these factors are expected to reduce the burden of complications experienced by diabetes patients.\

CONCLUSIONS AND SUGGESTIONS

Based on research conducted in the coastal communities of the Konawe Islands in 2025, the following conclusions can be drawn:
There is a relationship between duration, obesity, blood sugar control, dyslipidemia, hypertension, physical activity with chronic macrovascular complications of type 2 diabetes mellitus in the elderly

REFERENCES

1. Kemenkes. Pengendalian Kadar Gula Pasien Diabetes Melitus melalui Farmakoterapi. Direktorat jendral Kesehatan Lanjutan. 2023.
2. WHO. Diabetes. world health organitation. 2024.
3. IDF. Diabetes Atlas 11th Edition. Diabetes Atlas 11th Edition. 2025. 1–399 p.
4. SKI. Survei Kesehatan Indonesia, Dalam Angka Dalam Angka. 2023.
5. IDF. About diabetes, Facts & figures. International Diabetes Federation. 2024.
6. Rohmatulloh VR, Pardjianto B, Kinasih LS. Hubungan Usia Dan Jenis Kelamin Terhadap AngkaKejadian Penderita Diabetes Melitus Tipe 2 Di RSUD Karsa Husada Kota Batu. J Kesehat Masy. 2024;8(1):2528–43.
7. Mezil, Sabreen A BA abed. Complication of Diabetes Mellitus Complication of Diabetes Mellitus. Ann Rom Soc Cell Biol. 2021;25(3)(3):1546–56.
8. ADA. Cardiovascular disease and risk management: Standards of medical care in diabetes- 2020. Diabetes Care. 2020;43(June):S111–34.
9. Alrubaiee GG. Prevalence of chronic diabetic complications and associated risk factors among follow-up diabetic patients: estimates from a referral national diabetes center in Yemen. BMC Endocr Disord. 2025;25(1).
10. Megawati SW, Utami R, Jundiah RS. Senam Kaki Diabetes pada Penderita Diabetes Melitus Tipe 2 untuk Meningkatkan Nilai Ankle Brachial Indexs. J Nurs Care. 2020;3(2).
11. Wahyuni Andi Nur Afifah et al. Faktor risiko komplikasi kronik pada pasien DM tipe 2 di RSUP Dr. Wahidin sudirohusodo Kota Makassar. J Kesehat Komunitas. 2025;11(2):317–26.
12. Purwandari CAA, Wirjatmadi B, Mahmudiono T. Faktor Risiko Terjadinya Komplikasi Kronis Diabetes Melitus Tipe 2 pada Pra Lansia. Amerta Nutr. 2022;6(3):262–71.
13. Utary A, Mahmud nur ulmy, Septiyanti. View of Faktor Yang Berhubungan Dengan Komplikasi Diabetes Melitus Di Rumah Sakit Dr. Tadjuddin Chalid.pdf. makassar: pusat kajian dan pengelola jurnal fakultas kesehatan masyarakat UMI; 2023. p. vol. 4 no.5.
14. Wu Z, Yu S, Zhang H, Guo Z, Zheng Y, Xu Z, et al. Combined evaluation of arterial stiffness, glycemic control and hypertension for macrovascular complications in type 2 diabetes. Cardiovasc Diabetol. 2022;21(1):1–11.
15. Kriswiastiny R, Yoeby K, Hadiarto R, Prasetia T. hubungan lama menderita diabetes melitus dan kadar gula darah dengan kadar kreatinin pasien diabetes melitus tipe 2. Medula. 2022;12(3).
16. Bae JH, Choe HJ, Yang YS, Seo MH, Choi JH, Kim G, et al. Defining Severe Diabetes Mellitus : A Consensus Framework for Grading and Staging Diabetes Based on Pathophysiology and Defining Severe Diabetes Mellitus : A Consensus Framework for Grading and Staging Diabetes Based on Pathophysiology and Complications. 2025;1141–54.
17. Fortuna TA, Karuniawati H, Purnamasari D, Purlinda DE. Faktor-Faktor yang Mempengaruhi Komplikasi pada Pasien Diabetes Mellitus di RSUD Dr. Moewardi Factor Affecting Complications in Diabetes Mellitus Patients in RSUD Dr. Moewardi. J Farm Indones. 2023;20(1):1–9.

International Journal of Current Science Research and Review
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IJCSRR @ 2025
www.ijcsrr.org

18. Henning RJ. Obesity and obesity-induced inflammatory disease contribute to atherosclerosis : a review of the pathophysiology and treatment of obesity. 2021;11(4):504–29.
19. Ilman PA. Faktor risiko kejadian komplikasi diabetes melitus tipe 2 di rumah sakit umum daerah kota makassar. 2023;
20. Ceriello A, Prattichizzo F. Variability of risk factors and diabetes complications. Cardiovasc Diabetol. 2021;20(1):1–11.
21. Yusnita, Djafar MHA, Tuharea R. Risk of Complication Symptoms of Diabetes Mellitus Tipe II in the UPTD Diabetes Center Ternate City. Media Publ Promosi Kesehat Indones. 2021;4(1):60–73.
22. ADA. 2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(January):S27–49.
23. Febriani DH, Studi P, Program K, Tiga D, Tinggi S, Kesehatan I, et al. LAMA MENDERITA DENGAN KOMPLIKASI DIABETES MELITUS TIPE 2 DI RUMAH SAKIT PANTI RAPIH. 2025;11(1):7–11.
24. MacRae F Linton, et al M. The Role of Lipids and Lipoproteins in Atherosclerosis. Natl Libr Med. 2019;
25. Pakaya N, Keperawatan J, Olahraga F, Kesehatan D, Gorontalo UN. Jambura Nursing Journal. 2022;4(1):57–67.
26. Petrie JR, Guzik TJ, Touyz RM. Diabetes , Hypertension , and Cardiovascular Disease : Clinical Insights and Vascular Mechanisms. Can J Cardiol. 2018;34(5):575–84.
27. Rany N, Harnani Y, Abidin AR. Diabetes Mellitus Tipe 2 Risk factors associated with complications of Type 2 Diabetes Mellitus. 2024;10(September):534–45.
28. Lin B, Coleman RL, Bragg F, Maddaloni E, Holman RR, Adler AI. Younger-onset compared with later-onset type 2 diabetes : an analysis of the UK Prospective Diabetes Study (UKPDS) with up to 30 years of follow-up (UKPDS 92). LANCET Diabetes Endocrinol. 2024;12(12):904–14.
29. Sattar N, Ph D, Eliasson B, Ph D, Svensson AM, Ph D, et al. Risk Factors, Mortality, and Cardiovascular Outcomes in Patients with Type 2 Diabetes. 2018;
30. Rietz M, Lehr A, Mino E, Lang A, Szczerba E, Schiemann T, et al. Physical Activity and Risk of Major Diabetes-Related Complications in Individuals With Diabetes : A Systematic Review and Meta- Analysis of Observational Studies. 2022;45(December):3101–11.

Cite this Article: Hamzah, N., Asriati, Mubarak (2025). Factors Associated with Chronic Macrovascular Complications of Type 2 Diabetes Mellitus in the Elderly in The Coastal Community of Konawe Islands. International Journal of Current Science Research and Review, 8(12), pp. 6617-6628. DOI: https://doi.org/10.47191/ijcsrr/V8-i12-71