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Long Relationship of Suffering with the Incidence of Diabetic Neuropathy in Diabetes Mellitus Patients at the South Bulango Health Center, Bone Bolango Regency

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ABSTRACT

Diabetes mellitus is a chronic disease characterized by an increase in blood glucose levels in the long term due to insulin disorders and is a growing public health problem. Prolonged hyperglycemia can lead to a variety of complications, including diabetic neuropathy, through peripheral nerve damage and microcirculatory disorders. Therefore, the length of suffering from diabetes mellitus needs to be studied as a factor that plays a role in the occurrence of diabetic neuropathy to support prevention and early detection efforts. This study aims to determine the relationship between the length of time suffering from diabetes mellitus and the incidence of diabetic neuropathy in patients who are treated at the South Bulango Health Center. The study used a quantitative approach with a cross sectional design and involved 116 respondents who were selected through proportional stratified sampling techniques. The research instrument used was the Diabetic Neuropathy Symptom Score (DNS) questionnaire. The results showed that respondents had diabetes mellitus for a long time <5 years, as many as 48 respondents (41.4%) had diabetic neuropathy and 37 respondents (31.8%) did not experience diabetic neuropathy. Meanwhile, in respondents with diabetes mellitus for a long time ≥5 years, most of them had diabetic neuropathy, namely 27 respondents (23.2%), and only 4 respondents (3.4%) did not experience diabetic neuropathy. The results of the statistical test using the chi-square test obtained a p-value of 0.002 (<0.05), which shows that there is a significant relationship between the length of suffering from diabetes mellitus and the incidence of diabetic neuropathy in patients with diabetes mellitus at the South Bulango Health Center.

INTRODUCTION

Diabetes mellitus is a series of metabolic disorders that are chronic, characterized and identified by an increase in blood glucose levels (hypergilchemia). Diabetes mellitus occurs because the body is unable to produce enough insulin or cannot effectively use the insulin produced, which leads to an increase in blood glucose levels (Anggit, 2024).

Patients with diabetes mellitus with prolonged hyperglycemia condition trigger various pathophysiological mechanisms, such as oxidative stress, activation of polyol pathways, formation of *advanced glycation end products* (AGEs), and microcirculation disorders. This process causes progressive damage to small blood vessels (microangiopathy) as well as disorders of peripheral nerve metabolism. The accumulation of this damage over the long term leads to a reduced supply of oxygen and nutrients to the nerve tissue, thus increasing the risk of neurological complications in diabetic patients.

One of the most common chronic complications that arises from such nerve damage is diabetic neuropathy. This complication is characterized by impaired sensory, motor, and autonomic functions that usually develop slowly over a period of time a person suffers from diabetes. Common clinical manifestations include tingling, burning, pain, and numbness in the extremities, which significantly decreases the patient's quality of life (Al-ruwais *et al*., 2024). Diabetic neuropathy has a serious clinical impact because it can decrease functional ability, limit daily activities, and increase the risk of diabetic foot ulcers, chronic infections, and lower extremity amputations.

Chronic hyperglycemia that lasts for a long period of time is known to be the main risk factor for the onset of diabetic neuropathy. As a person develops diabetes, the accumulation of nerve damage due to oxidative stress, microcirculatory disorders, and accumulation *Advanced Glycation and Products* (AGEs) are getting heavier, increasing the likelihood of neuropathic symptoms. Research by (Recitation *et al*., 2024) reports that the average time to develop diabetic neuropathy is 5 years, with a mean survival time of 7 years. Thus, suffering from diabetes mellitus for a long time is one of the factors that is suspected to play an important role in the occurrence of diabetic neuropathy.

Several previous studies have shown a link between the length of time you have diabetes and the incidence of diabetic neuropathy. Research conducted by (Ibrahim *et al*., 2022) revealed that factors related to the incidence of diabetic neuropathy were long suffering from diabetes mellitus, history of contraceptive use and glycemic control. Similar findings were also made in Eltrikanawati (2021) That said, diabetic peripheral neuropathy is at high risk of occurring in people with type 2 diabetes who have had diabetes mellitus for >5 years. In addition, the research (Bawono, 2021) showed that there was no significant relationship between the length of time of suffering from type 2 diabetes mellitus and the incidence of diabetic neuropathy at the Polyclinic

The difference in the results of the study shows that there is a research gap that needs to be studied further, especially related to the influence of long-term suffering from diabetes mellitus on the incidence of diabetic neuropathy in the context of primary health services. In addition, the results of observations of initial interviews with several diabetes mellitus patients at the South Bulango Health Center showed that there was a variation in the incidence of diabetic neuropathy based on the length of time the patient suffered from diabetes mellitus. Of the three patients who had been suffering from diabetes for more than five years, two of them complained of pain, tingling and cramping in both legs. Meanwhile, of the two patients who were only diagnosed less than five years old, one patient also experienced pain and cramps in the legs.

Based on this description, this study is focused on re-examining the relationship between the duration of diabetes mellitus and the incidence of diabetic neuropathy, as an effort to strengthen prevention, early detection, and control strategies for complications at the primary health service level.

RESEARCH METHODS

This research has been carried out in the working area of the South Bulango Health Center on December 1 - December 10, 2025. The type of quantitative research uses *a cross-sectional* research design. The sampling technique in this study uses *probability sampling* with a sample of 116 respondents which will then be taken proportionally *stratified sampling* or samples taken proportionally from each strata according to the distribution in the population, and selected based on the attendance dating during Prolanis activities. This research instrument used medical records to see how long they have been suffering from diabetes mellitus and a *Diabetic Neuropathy Symptom Score* (DNS) questionnaire to detect symptoms of diabetic neuropathy.

RESEARCH RESULTS

Respondent Characteristics

Table 1. Characteristics of Respondents by Age Category

Age Category	Frequency (n)	Percentage (%)
Early Adulthood	1	0.9%
Late Adult	20	17.2%
Early Elderly	37	51.9%
Late Elderly	38	32.8%
Manula	20	17.2%
Total	116	100%

Source : Primary Data 2025

Based on the table above, it was found that the distribution of respondents based on age categories was Most respondents had the age category of the late elderly (56-65 years) as many as 38 respondents (32.8%) and a small part of the early adult category (26-35 years) as many as 1 respondent (0.9%).

Table 2. Characteristics of Respondents Based on Village Categories

Address/Village	Frequency (n)	Percentage (%)
South Ayula	13	11.2%
Ayula Tilango	16	13.8%
Ayula Timur	5	4.3%
Ayula North	13	11.2%
Western Tooth	21	18.1%

Southern Tooth	3	2.6%
North Tooth	3	2.6%
Squirt	17	14.7%
Prosperous	14	12.1%
Tinelo Ayula	11	9.5%
Total	116	100%

Source : Primary Data 2025

Based on the table above, it was found that the distribution of respondents based on address/village was Most of the respondents came from West Huntu village as many as 21 respondents (18.1%).

Table 3. Characteristics of Respondents by Gender Category

Gender	Frequency (n)	Percentage (%)
Male	31	26.7%
Women	85	73.3%
Total	116	100%

Source : Primary Data 2025

Based on the table above, it was found that the distribution of respondents by gender was 85 respondents (73.3.9%) and a small number of respondents were male as many as 31 respondents (26.7%).

Table 4. Characteristics of Respondents by Job Category

Jobs	Frequency (n)	Percentage (%)
None	15	12.9%
Village officials	3	2.6%
ASN	1	0.9%
Teacher	1	0.9%
IRT	74	63.8%
Health Cadre	2	1.7%
Village head	2	1.7%
Merchant	1	0.9%
Retirees	2	1.7%
Farmer	7	6.0%
Private	8	6.9%
Total	116	100%

Source : Primary Data 2025

Based on the table above, it was found that the distribution of respondents based on work Most of the respondents worked as IRTs as many as 74 respondents (63.8%).

Table 5. Characteristics of Respondents Based on Family Disease History Category

Family History of Illness	Frequency (n)	Percentage (%)
DM	59	50.9%
DM, Hypertension	1	0.9%
Hypertension	1	0.9%
None	55	47.4%
Total	116	100%

Source : Primary Data 2025

Based on the table above, it was found that the distribution of respondents based on family disease history, namely most respondents had a family history of DM disease as many as 59 respondents (50.9%).

Univariate Analysis

Table 6. Long Suffering from Diabetes Mellitus in Patients at South Bulango Health Center

Long Suffering from DM	Frequency (n)	Percentage (%)
<5 years old	85	73.3%
≥5 years	31	26.7%
Total	116	100%

Source : *Primary Data 2025*

Based on the table above, it was found that for a long time suffering from diabetes mellitus in patients at the South Bulango Health Center, most of the respondents suffered from DM <5 years, 85 respondents (73.3%) and a small number of ≥5 years , as many as 31 respondents (26.7%).

Table 7. Incidence of Diabetic Neuropathy in Diabetes Mellitus Patients at South Bulango Health Center

Incidence of Diabetic Neuropathy	Frequency (n)	Percentage (%)
Occurs	75	64.7%
Not happening	41	35.3%
Total	116	100%

Source : *Primary Data 2025*

Based on the table above, the incidence of diabetic neuropathy in patients with diabetes mellitus at the South Bulango Health Center was 75 respondents (64.7%) and a small number of respondents were not 41 respondents (35.3%).

Bivariate Analysis

Table 8. The Relationship Between Length of Suffering and the Incidence of Diabetic Neuropathy in Patients with Diabetes Mellitus at the South Bulango Health Center

Long suffering from DM	Incidence of Diabetic Neuropathic				Total		*P-value*
	Occurs		Not happening				
	n	%	n	%	n	%	0.002
<5 years old	48	41.4	37	31.8	85	73.2	
≥5 years	27	23.2	4	3.4	31	26.7	
Total	75	64.6	41	35.2	27	100	

Source : *Primary Data 2025*

Based on the results of the study in table 4.8, respondents with a long period of DM <5 years with the incidence of diabetic neuropathic disease as many as 48 respondents (41.4%) and a long period of DM <5 years with the absence of diabetic neuropathic as many as 37 respondents (31.8%), then also obtained a long period of DM suffering from DM ≥5 years with the occurrence of diabetic neuropathy as many as 27 respondents (23.2%) and a long time suffering from DM ≥5 years with the absence of diabetic neuropathy as many as 4 respondents (3.4%) The results of the statistical test using *the chi-square* test obtained a *p-value* (0.002) < 0.05, meaning that there is a relationship between the length of suffering and the incidence of diabetic neuropathy in patients with diabetes mellitus at the South Bulango Health Center.

DISCUSSION

Long Suffering from Diabetes Mellitus Patients at South Bulango Health Center

Based on the results of the study in Table 4.6 on the length of suffering from diabetes mellitus, it is known that most of the respondents at the South Bulango Health Center suffered from diabetes mellitus for <5 years, namely 85 respondents (73.3%). Meanwhile, respondents who suffered from diabetes mellitus for ≥5 years amounted to 31 respondents (26.7%). These results show that the majority of patients with diabetes mellitus are in the early to intermediate phase of the disease and are dominated by patients with a relatively short duration of suffering.

These findings suggest that the length of suffering from diabetes mellitus can vary based on the demographic characteristics of the patient, specifically age. According to research by Kumar et al, (2024) shows that the average age of patients is higher in the group with diabetes mellitus for less than one year, which is about 60 years, compared to patients with a long period of one to five years who are at the age of 52 to 53 years. The study also showed significant differences between sex, comorbidities, and socioeconomic status with long-term diabetes mellitus, suggesting that the duration of the disease is influenced by various individual characteristics.

Long suffering from diabetes mellitus with high blood sugar levels affects the walls of blood vessels so that it causes the walls of the blood vessels to thicken and have an impact on blood pressure. This process will slowly damage blood capillaries and nerve fibers. The longer a person suffers from diabetes mellitus, the higher the risk of worsening nerve cell damage. Chronic hyperglycemia in the early stages of type 2 diabetes mellitus can trigger changes in the biochemical homeostasis of cells that will affect small nerve fibers, and along with the increase in duration the disease will be followed by large nerve fibers and are associated with a decrease in the speed of nerve transmission (Sri Rahmi et al., 2022).

The large number of respondents with diabetes mellitus for less than 5 years in this study can be attributed to the increase in early detection and screening efforts for diabetes mellitus in primary health services. Non-communicable disease control programs such as the PTM Posbindu and routine blood sugar checks at health centers help people find out their health conditions early. In addition, increasing public awareness of the symptoms of diabetes mellitus also plays a role in accelerating the diagnosis of the disease.

Although most respondents had less than 5 years of diabetes mellitus, this condition could not be interpreted as a low risk of complications. In the early phase of the disease, patients often do not feel severe symptoms so that the management of diabetes mellitus is not optimal. Non-adherence in medication, diet, and physical activity can cause blood sugar levels to get out of control in the first place, increasing the risk of chronic complications.

Meanwhile, respondents with diabetes mellitus for a long time ≥5 years even though the number is smaller still need special attention. A longer duration of the disease indicates the length of the body's exposure to chronic hyperglycemia. This condition can lead to gradual damage to small blood vessels and peripheral nerves, increasing the risk of

microvascular complications, including diabetic neuropathy.

Thus, the results of this study confirm that the length of suffering from diabetes mellitus is an important aspect that must be considered in the management of diabetes mellitus patients at the South Bulango Health Center. Patients with a disease duration of less than 5 years still need optimal blood sugar control to prevent early complications, while patients with a duration of more than 5 years need more intensive monitoring.

Incidence of Diabetic Neuropathy in Diabetes Mellitus Patients at South Bulango Health Center

Based on the results of the study in table 4.7 related to the incidence of diabetic neuropathy, it is known that most of the respondents with diabetes mellitus at the South Bulango Health Center experienced diabetic neuropathy, namely 75 respondents (64.7%), while a small percentage of respondents did not experience diabetic neuropathy, namely 41 respondents (35.3%). These results show that diabetic neuropathy is a fairly dominant complication experienced by diabetes mellitus patients in the working area of the South Bulango Health Center.

The results of this study were obtained by 75 respondents experiencing diabetic neuropathy, which was supported by the results of filling in the Diabetic Neuropathy Symptom (DNS) instrument where the average respondent showed subjective complaints in the form of feet and/or toes feeling punctured. This condition can be explained through the pathophysiological theory of chronic hyperglycemia, where high blood glucose levels lead to the activation of polyol pathways, increased oxidative stress, and the formation of advanced glycation end products (AGEs). These processes contribute to the deterioration of peripheral nerve structure and function, including the occurrence of demyelination and impaired transmission of nerve impulses. As a result, patients experience various symptoms of neuropathy such as tingling, pain, and decreased sensitivity in the lower extremities (Lin et al., 2023).

In addition to metabolic factors, a number of studies have also identified various other determinants that also affect the occurrence of diabetic neuropathy, such as old age and high HbA1c levels. Older individuals have a higher tendency to develop peripheral neuropathy due to degenerative processes in the nervous system and decreased microcirculatory function. As we age, the flexibility of blood vessels will decrease, so that it can affect the vascularization of body organs. In addition, high HbA1c levels reflect poor glycemic control in the long term, which ultimately increases the risk of nerve damage (Putri & Waluyo, 2020).

Meanwhile, the absence of diabetic neuropathy in 41 respondents can be explained through the theory of protective factors in patients with diabetes mellitus. Some patients may have better glycemic control that may suppress the incidence of diabetic neuropathy. This is in line with research by Sartika & Rambu (2025) who said that blood glucose level control is important in the management and control of diabetes. Good metabolic control can reduce nerve exposure to hyperglycemia, thereby slowing down or preventing nerve damage from occurring.

The difference in the number of respondents who experienced and did not experience diabetic neuropathy in this study showed that the incidence of diabetic neuropathy was not only influenced by the presence of diabetes mellitus itself, but also by metabolic, vascular, age, and individual responses to the disease. These findings explain the importance of prevention and control of risk factors for diabetic neuropathy early to reduce the incidence of complications in patients with diabetes mellitus.

Long Relationship of Suffering with the Incidence of Diabetic Neuropathy in Diabetes Mellitus Patients at the South Bulango Health Center

Based on the results of the study in table 4.8, it was found that 48 respondents (41.4%) had long-term diabetes mellitus who had diabetes mellitus <<5 years who did not experience diabetic neuropathy. Meanwhile, in the group of respondents with diabetes mellitus for a long time ≥5 years, most of them had diabetic neuropathy, which was 27 respondents (23.2%), and only a small number did not experience diabetic neuropathy, namely 4 respondents (3.4%). These results show that there is a difference in the incidence of diabetic neuropathy based on the length of time you have had diabetes mellitus.

In the group of respondents with diabetes mellitus for less than 5 years, a total of 48 respondents (41.4%) were found to have diabetic neuropathy, suggesting that this complication can occur even in the early phases of the disease course. Diabetic neuropathy is a progressive complication that depends not only on the intensity of hyperglycemia exposure and the long duration of diabetes, but is also influenced by other characteristics such as gender and genetic factors.

Research from Elliott et al, (2024), women have a higher tendency to experience painful diabetic neuropathy than men, even though the duration of the disease is the same. Which means that gender factors may modify the risk of neuropathy through certain biological or hormonal mechanisms. Furthermore, according to Feldman et al, (2019), who say that certain genetic polymorphisms are associated with susceptibility to diabetic neuropathy. The medical history of families with diabetes mellitus may reflect a genetic predisposition that accelerates nerve damage to prolonged hyperglycemia exposure

In addition, in the group of respondents with diabetes mellitus for less than 5 years, it was also found that 37 respondents did not experience diabetic neuropathy, which shows that the duration of the disease alone does not always determine the appearance of neuropathic complications. This is due to good glycemic cotrols and healthy lifestyle factors such as regular physical activity and a balanced diet, which play a strong role as protective factors against the development of diabetic neuropathy, as these contribute to better metabolic stability and vascular function (Yang et al., 2025).

Furthermore, the results of this study also show that the group of respondents who have suffered from diabetes mellitus for more than 5 years, as many as 27 respondents have diabetic neuropathy. This is more caused by disease processes or metabolic changes in the body. Where in theory hyperglycemia that lasts for a long time can trigger endothelial dysfunction. This condition interferes with the ability of blood vessels to vasodilate, especially in the nervous system, due to decreased production of nitric oxide by endothelial cells. Disruptions in the vasodilation process can cause blood flow to the distal part of the body to be disrupted, causing ischemia. This ischemia can then lead to hypoxia, especially in areas of the body such as the extremities (Mawaddah, 2024).

Although prolonged suffering is generally associated with a higher risk of neuropathy, in this study there were four respondents with a long period of ≥5 years who did not experience diabetic neuropathy. Based on the results of a brief interview with some of the respondents, it was said that every day they always do light exercise (walking for 30 minutes) in the morning, and also take medication regularly.

Research by Rahman et al (2025), shows that patient adherence in taking medications and carrying out a healthy lifestyle such as physical activity, is closely related to the control of blood sugar levels. Patients who are not disciplined in undergoing treatment tend to have difficulty keeping blood sugar levels within normal limits, which will ultimately worsen the risk of complications such as neuropathy.

Thus, the results show that although diabetic neuropathy has been found in patients with a long period of suffering <5 years, the proportion of occurrence is higher in patients with diabetes mellitus for a long time ≥5 years, which indicates that the risk of neuropathy tends to increase as the duration of the disease increases. These findings confirm the importance of optimal control of diabetes mellitus from the beginning of diagnosis, as patients with a duration of <5 years remain at risk of developing neuropathy if disease management is insufficient, while patients with a duration of ≥5 years require more intensive monitoring and prevention of complications of diabetic neuropathy.

CONCLUSION

Based on the results of research conducted on DM patients at the South Bulango Health Center, it can be concluded that:

1. The length of suffering in patients with diabetes mellitus at the South Bulango Health Center was less than 5 years as many as 85 respondents (73.3%), and those who suffered from diabetes mellitus for ≥5 years were 31 respondents (26.7%).
2. The incidence of diabetic neuropathy in patients with diabetes mellitus at the South Bulango Health Center is relatively high, where most respondents experience diabetic neuropathy as many as 75 respondents (64.7%), while respondents who do not experience diabetic neuropathy are 41 respondents (35.3%).
3. There was a significant relationship between the length of suffering from diabetes mellitus and the incidence of diabetic neuropathy in patients with diabetes mellitus at the South Bulango Health Center with a p-value of 0.002 (<0.05).

ADVICE

1. For Diabetes Mellitus Patients: Patients with diabetes mellitus are expected to increase adherence to treatment, maintain a healthy diet, do regular physical activity, and conduct regular health checkups. Awareness to recognize the early symptoms of diabetic neuropathy and get checked early also needs to be improved.
2. For the South Bulango Health Center: The health center is expected to improve the control and monitoring of patients with diabetes mellitus from the beginning of diagnosis through routine neuropathy screening, education on medication adherence and a healthy lifestyle, and optimization of chronic disease service programs, in order to prevent and reduce the risk of diabetic neuropathy in patients with a long period of less than or more than 5 years.
3. For Educational Institutions: The results of this research are material for learning development, especially in medical, surgical and community nursing courses. The results of this study can be used as a reference to strengthen students' understanding of risk factors and complications of diabetes mellitus.
4. For Future Researchers: Researchers are further advised to develop this study by adding other variables related to the incidence of diabetic neuropathy, such as glycemic control and lifestyle, as well as using a more detailed long-term grouping of people with diabetes mellitus and an assessment of the severity of diabetic neuropathy in order to obtain more comprehensive study results.

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