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# The Relationship Of The Duration Of Type 2 Diabetes Mellitus With Peripheral Neuropathy

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ABSTRACT

Patients with diabetes mellitus ≥ 5 years of age can cause diabetic peripheral neuropathy, which is a symmetrical peripheral nerve disorder characterized by sensory, motor and autonomic disorders that affect the outer leg nerves. The purpose of this study was to determine the correlation between duration of suffering from diabetes mellitus and the occurrence of peripheral neuropathy. This type of research is analytic with a cross sectional design, a sample of 52 respondents who are in the working area of Puskesmas Tiban Baru Batam City, using purposive sampling with MNSI (Michigan Neuropathy Screening Instrument) questionnaire. The results of this study found that most people with diabetes mellitus ≥ 5 years were 31 respondents (59.6%), most of them had peripheral neuropathy as many as 31 respondents (59.6%) and almost all patients with diabetes mellitus ≥ 5 years had peripheral neuropathy as many as 24 respondents (77.4%). From the results of the chi suare statistical test p value = 0.001 (0.05), Ha is accepted, this indicates that there is a significant relationship between the duration of suffering from diabetes mellitus and the occurrence of peripheral neuropathy. People with diabetes mellitus are obliged to maintain a pattern of daily life such as physical activity, diet, and regularity in taking medication to reduce the risk of peripheral neuropathy.

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## 1. Introduction

Diabetes Mellitus is a degenerative disease and one of the non-communicable diseases with the number of patients increasing every year (Prihatin, 2019). Based on the (International Diabetes Federation, 2019) stated that in 2019 there were 463 million cases and it is estimated to increase to 700 million cases in 2045. The Diabetes Epidemic in Indonesia still shows an increasing trend (Riskesdas, 2018). Indonesia is ranked 7th in the world with the number of people with Diabetes Mellitus aged 20-79 years with a total of 10.7 million people with Diabetes Mellitus (Perkeni, 2019). This figure is predicted to continue to increase and reach 16.6 million in 2045 (International Diabetes Federation, 2019). diabetes mellitus was recorded at 1.3% in 2013 and increased by 0.4% in 2018 with a percentage of 1.7% (8060 people) of all people with diabetes mellitus in Indonesia (Kemenkes RI, 2019).

Diabetes mellitus in 20 public health centers in the city of Batam is a non-communicable disease which ranks second from non-communicable diseases with a percentage of 21.99%. Data from 20 health centers obtained 23623 cases of diabetes mellitus, the highest diabetes mellitus was at the Tiban Baru Public Health Center by occupying the first position as many as 3290 people with diabetes mellitus and for the second position in the Sekupang Health Center as many as 3009 people with diabetes mellitus (Dinas Kesehatan Kota Batam, 2021). The prevalence of Diabetes Mellitus (DM) which continues to increase in recent years has an impact on the increasing number of people with diabetes mellitus who experience chronic complications. These chronic complications include neuropathy, nephropathy, retinopathy, heart disease, stroke and so on. The main chronic complication is neuropathy with a prevalence of 60% worldwide (PERKENI, 2019). The incidence of neuropathy in Indonesia is quite high, namely 43% of the 16,800 cases proven to be at risk of developing this, the prevalence of neuropathy will increase to 50% of patients with neuropathy. Patients with long-term Diabetes Mellitus around 60-70% experience symptoms of diabetic neuropathy. Diabetic neuropathy is initially characterized by loss of the ability to feel vibrations in the form of glove and stockings like from distal to proximal. The condition of diabetes mellitus is influenced by the presence of hyperglycemia for several years and persistent diabetes mellitus patients with diabetes mellitus duration of more than 5 years will increase the risk of diabetic neuropathy pain by 4-5 times compared to duration of diabetes mellitus less than 5 years (Jack, M & Wright, 2013). The duration of suffering from diabetes mellitus with an average of 8

years is 97.5% in patients with type 2 diabetes mellitus causing several complications, including diabetic neuropathy 67.2%, diabetic retinopathy 42%, diabetic nephropathy 7.3%, microvascular complications 16% and macrovascular 27.6% (Lestari, 2015). Peripheral neuropathy is a complex problem that is the reason people with diabetes mellitus undergo treatment. Treatment for diabetic peripheral neuropathy is aimed at obtaining optimal glycemic control (Kaku et al., 2015).

The management of Diabetes Mellitus consists of the first pharmacological therapy, which includes the administration of oral anti-diabetic drugs and insulin injection. The two non-pharmacological therapies include lifestyle changes by adjusting diet, increasing physical activity, and educating various problems related to diabetes mellitus which are carried out continuously. Based on the above background, researchers are interested in conducting research related to the relationship between duration of suffering from Diabetes Mellitus and the occurrence of peripheral neuropathy.

## 2. Methods

The type of research used is an analytic study with a cross sectional design where the researcher will measure the research variables at the same time, namely the relationship between the length of suffering from diabetes mellitus and the occurrence of peripheral neuropathy in the work area of the Tiban Baru Health Center, Batam City in 2020. The population in this study were people with diabetes mellitus who had diabetes mellitus. are in the Work Area of the Tiban Baru Health Center in Batam City and the sample from the study is people with diabetes mellitus who meet the inclusion criteria, namely the elderly who are > 40 years old, live in the Work Area of the Tiban Baru Health Center, can communicate actively and not with cognitive impairment. The sampling technique is non-probability sampling with purposive sampling technique, namely the sampling is not based on strata, random or regional but on a specific purpose as many as 52 people. The instruments used in this study were the demographic data questionnaire and the Michigan Neuropathy Screening Instrument Questionnaire modified by (Aghniya, 2017) consisting of 15 items. Bivariate analysis was carried out on variables that were suspected to be related or correlated (Notoatmodjo & Soekidjo, 2018). The test used in this research data analysis is Chi Square with a category measurement scale (Dahlan, 2018). The author uses the Chi Square test in analyzing research data. The data collection technique was by filling out a questionnaire and previously people with diabetes mellitus signed an informed consent stating that they were willing to become research respondents.

## 3. Result and Analysis

Based on the results of the study, the majority of respondents who suffered from type 2 Diabetes Mellitus with a duration of 5 years were 59.6% (31 respondents). The results of this study are the same as the research conducted by (Mildawati et al., 2019), where the majority of respondents suffer from Diabetes Mellitus with a duration of 5 years as many as 35 respondents (42.2%). The results of this study are the same with (Aghniya, 2017) that the majority of respondents suffered from type 2 diabetes mellitus with duration of 5 years as many as 46 respondents (46% ). The duration of suffering from type 2 diabetes mellitus is the onset or onset of hyperglycemia that occurs due to insulin secretion disorders. Patients with diabetes mellitus with diabetes mellitus duration of more than 5 years will increase the risk of diabetic neuropathy by 4-5 times compared to duration of diabetes mellitus less than 5 years (Jack, M & Wright, 2013). Researchers concluded that the longer the patient with diabetes mellitus, the more peripheral neuropathy will occur, and the better the lifestyle of the diabetic patient, the less the risk of peripheral neuropathy.

TABLE 1
FREQUENCY DISTRIBUTION BASED ON THE DURATION WITH TYPE 2 DIABETES MELLITUS

| Duration of Type 2 Diabetes Mellitus | Frequency | Percentage |
|---|---|---|
| < 5 years old | 21 | 40.4 |
| ≥ 5 years old | 31 | 59.6 |

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| | | |
|---|---|---|
| **Total** | 52 | 100 |

Based on the results of the study, the majority of respondents experienced peripheral neuropathy 59.6% as many as 31 respondents. The results of this study are the same as the research conducted by (Mildawati et al., 2019) the majority of respondents experiencing peripheral neuropathy 53% as many as 44 respondents. Sensory peripheral neuropathy is caused by damage to the axons (axonal degeneration), damage to the myelin sheath (demyelination), or a combination of both that occurs in sensory nerves. Disorders of this sensory nerve cause the patient to experience a decrease in the sensation of touch, pain, or temperature changes or conversely feel excessive pain sensations on stimuli that normally do not trigger pain /alodynia (International Diabetes Federation, 2019). The researcher concluded that most of the respondents experienced peripheral neuropathy because most of the respondents had long suffered from diabetes mellitus, more than 5 years, would increase the risk of diabetic neuropathy by 4-5 times compared to having diabetes mellitus for less than 5 years.

TABLE 2
FREQUENCY DISTRIBUTION BASED ON THE OCCURENCE OF PERIFERRAL NEUROPATY IN DIABETES MELLITUS PATIENTS

| Peripheral Neuropathy | Frequency | Percentage |
|---|---|---|
| **Occur** | 31 | 59.6 |
| **Not Occur** | 21 | 40.4 |
| **Total** | 52 | 100 |

Based on the results of research conducted in the work area of the Tiban Baru Health Center, Batam City, some respondents with diabetes for 5 years experienced peripheral neuropathy as many as 24 respondents (77.4%). The results of this study using the Chi-Square statistical test obtained a P-value of 0.001 <0.05. This means that there is a significant relationship between duration of suffering from diabetes mellitus and the occurrence of peripheral neuropathy in respondents in the work area of the Tiban Baru Health Center in Batam City 2020. The results of this study are the same as research conducted by (Mildawati et al., 2019), the results showed that there was a relationship between duration of diabetes and the incidence of diabetic peripheral neuropathy (p value 0.001 = 0.05).

TABLE 3
FREQUENCY DISTRIBUTION BASED ON THE RELATIONSHIP OF THE DURATION TYPE 2 DIABETES MELLITUS WITH THE OCCUPATION OF PERIPHERAL NEUROPATHY

| Duration of type 2 Diabetes Mellitus | Pheriferral Neuropathy | | | | Total | | P *Value* |
|---|---|---|---|---|---|---|---|
| | Not Occur | | Occur | | | | |
| | N | % | N | % | N | % | |
| < 5 years old | 14 | 66.7 | 7 | 33.3 | 21 | 100 | **0,001** |
| ≥ 5 years old | 7 | 22.6 | 24 | 77.4 | 31 | 100 | |
| Total | 21 | 40.4 | 31 | 59.6 | 52 | 100 | |

The duration of suffering from diabetes mellitus along with the risk of complications, in the sense that the longer you suffer from diabetes mellitus, the higher the incidence of complications experienced by the patient. In the long term it can occur because sugar levels in the blood increase continuously so that complex substances consisting of sugar in the walls of blood vessels can cause

thickening in blood vessels which results in reduced blood flow resulting in damage to the walls of capillaries which are directly related to nerves and other internal structures that can cause neuropathy (Yulita, R.F; WaluyoA; Azzam, 2019). This does not rule out the possibility that someone who has type 2 diabetes mellitus with a duration of < 5 years can experience peripheral neuropathy, the same as the results obtained by the researchers as many as 7 respondents (33.3%) with a duration of diabetes mellitus < 5 years with the occurrence of type 2 diabetes mellitus peripheral neuropathy.

This can happen because it can be influenced by several factors, including uncontrolled eating patterns that will cause persistent hyperglycemia which results in increased activation of the polyol pathway or alternative pathways of glucose metabolism, treatment regimens that are not carried out properly, which is the same as the research conducted by  stated that of the 9 respondents who were not compliant with treatment, 8 of them experienced neuropathy, and could be affected by a lack of physical activity that could lead to a buildup of glucose in the body (Rahmawati & Hargono, 2018). The results of this study are the same as the research conducted by (Mildawati et al., 2019) that showed the results of patients with type 2 diabetes mellitus with a duration of diabetes mellitus < 5 years with the occurrence of peripheral neuropathy as many as 11 respondents (33.3%). This may be due to low glycemic control and dyslipidemia which can increase the occurrence of diabetic neuropathy or in patients who have symptoms of complications before being diagnosed with diabetes mellitus (Jaiswal et al., 2017).

Patients with diabetes mellitus with regular blood glycemic control can detect early in the opportunity to reduce the risk and prevent complications effectively (Perkeni, 2019), just as researchers got results in patients with diabetes mellitus with a duration of 5 years without experiencing peripheral neuropathy as many as 7 respondents. (22.6%), and the results of this study are the same with (Suyanto & Susanto, 2016) with the results that 31 respondents (93.9%) in patients with diabetes mellitus with a duration of 5 years did not experience peripheral neuropathy, because some respondents were obedient in controlling blood sugar with regular medication, diet and regular physical activity. Based on the results of the study, it can be concluded that the duration of suffering from diabetes mellitus 5 years will result in the risk of peripheral neuropathy, this can occur due to uncontrolled blood glucose levels, therefore people with diabetes mellitus are strived to be able to prevent increasing blood sugar levels with regularity in taking drugs, eating patterns according to the diet of people with diabetes mellitus, and regular activity patterns.

## 4. **Discussion**

Based on the results of the study, most of the respondents who suffered from type 2 diabetes mellitus with a duration of 5 years 59.6% were 31 respondents. The duration of suffering from type 2 diabetes mellitus is the onset or onset of hyperglycemia that occurs due to insulin secretion disorders. Patients with diabetes mellitus with diabetes mellitus duration of more than 5 years will increase the risk of diabetic neuropathy by 4-5 times compared to duration of diabetes mellitus less than 5 years in diabetic patients. mellitus, it will lead to peripheral neuropathy, and the better the lifestyle of patients with diabetes mellitus, the less the risk of peripheral neuropathy (Jack, M & Wright, 2013). The risk for suffering from glucose intolerance increases with age. The Indonesian Endocrinology Association (Soelistijo et al., 2015) recommends conducting a DM examination in patients >45 years of age because diabetes generally occurs at >45 years of age. The results of this study are the same as the research conducted (Mildawati et al., 2019) it was found that the majority of respondents suffered of type 2 Diabetes Mellitus with a duration of 5 years as many as 35 respondents (42.2%).

Sensory peripheral neuropathy is caused by damage to the axons (axonal degeneration), damage to the myelin sheath (demyelination), or a combination of both that occurs in sensory nerves. Disorders of this sensory nerve cause the patient to experience a decrease in the sensation of touch, pain, or changes in temperature or vice versa to feel excessive pain sensations on stimuli that do not normally trigger pain. The process of neuropathy is usually progressive. High blood sugar levels for a long time cause the accumulation of sorbitol which increases the activity of the polyol pathway and results in changes in nerve tissue. These changes have an impact on signal transduction disturbances in the nerves that cause type 2 Diabetes Mellitus sufferers to experience decreased sensitivity in the feet (Ardiyati, 2014).

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The results of this study are the same as the research conducted by (Mildawati et al., 2019) with the majority of respondents experiencing peripheral neuropathy 53% as many as 44 respondents. Based on the results of the study showed that from 52 respondents there were respondents with diabetes duration 5 years experiencing peripheral neuropathy as many as 24 respondents (77.4%). The results of the Chi-Square analysis obtained a P-value of 0.001 <0.05. This means that there is a significant relationship between the duration of suffering from diabetes mellitus with the occurrence of peripheral neuropathy in respondents in the work area of the Tiban Baru Health Center Batam City 2020. There is a significant relationship between the duration of suffering from diabetes mellitus and the occurrence of peripheral neuropathy at the Tiban Baru Health Center Batam City in 2020. with the results of the chi square test p value of 0.001 <0.05.

The results of this study are the same as research conducted by which showed that there was a relationship between duration of suffering from diabetes mellitus and the incidence of diabetic peripheral neuropathy (p value 0.001 = 0.05). However, in another study, it was found that there were differences in the duration of suffering from diabetes mellitus, it was stated that there were 60 diabetes mellitus patients who were divided into groups of DM duration <5 years, 5-10 years, and > 10 years. fold in each group (Ilmi, M.Z ; Abdurrahman ; Abiyoga, 2020). The duration of suffering from diabetes mellitus is in line with the risk of complications, in the sense that the longer you suffer from diabetes mellitus, the higher the incidence of complications experienced by the patient. In the long term it can occur because sugar levels in the blood increase continuously so that complex substances consisting of sugar in the walls of blood vessels can cause thickening in blood vessels which results in reduced blood flow resulting in damage to the walls of capillaries which are directly related to nerves. and other internal structures that can cause neuropathy (Yulita, R.F; WaluyoA; Azzam, 2019).

This does not rule out the possibility that a person with diabetes mellitus < 5 years may experience peripheral neuropathy, similar to the results obtained by the researchers as many as 7 respondents (33.3%) with a duration of diabetes mellitus < 5 years with the occurrence of peripheral neuropathy. This is the same as the research conducted by (Mildawati et al., 2019) which showed the results of patients with diabetes mellitus with a duration of suffering from diabetes mellitus < 5 years with the occurrence of peripheral neuropathy as many as 11 respondents (33.3%). This may be due to low glucose control and dyslipidemia which can increase the occurrence of diabetic neuropathy or in patients who have symptoms of complications before being diagnosed with diabetes mellitus (Jaiswal et al., 2017). controlled will cause persistent hyperglycemia which results in increased activation of the polyol pathway or alternative pathways of glucose metabolism, treatment regimens that are not carried out properly, which is the same as the results of the study which stated that of 9 respondents who did not comply with treatment, 8 of them had diabetic neuropathy, and can be affected due to a lack of physical activity that can create a buildup of glucose in the body (Rahmawati & Hargono, 2018). Patients with diabetes mellitus with regular blood glucose control can detect early in the opportunity to reduce the risk and prevent complications effectively (Rachman, A ; Dwipayana, 2020), just as researchers get results in patients with diabetes mellitus with a duration of 5 years without experiencing peripheral neuropathy. as many as 7 respondents (22.6%), and the results of this study are the same as research (Suyanto & Susanto, 2016) with the results of 31 respondents (93.9%) in patients with diabetes mellitus with a duration of 5 years did not experience peripheral neuropathy, because some respondents are obedient in controlling blood sugar by regularly taking medication, eating patterns and regular physical activity. Diabetic peripheral neuropathy is at high risk for those with type 2 diabetes who have had diabetes mellitus for >5 years. Based on this, it is highly recommended for people with diabetes mellitus to have regular health control and education to prevent further complications.

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