Article in press 2025 - https://genius.inspira.or.id/index.php/gj

GENIUS JOURNAL
general nursing science journal
e-ISSN: 2723-7729
Vol. 00 No. 00 PP. 00 E-ISSN 2723-7729

Factors Associated with Neuropathy Incidence based on 10 g Monofilament Examination in Type 2 Diabetes Mellitus Patients

Ratna Dewi[1], Kgs. M. Faizal[1], Hermain[1]
[1]*Department of Nursing, Institut Citra Internasional, Bangka Belitung, Indonesia*

Correspondence author: Ratna Dewi
Email: ratnadeww1106@gmail.com
Address: Pal 2 Mentok, Bangka Barat. 082281028188
DOI:
This work is licensed under a Creative Commons Attribution 4.0 International License

ABSTRACT

Introduction: Diabetic neuropathy is damage caused by excessive blood sugar levels. Neuropathy can be defined by certain signs or specific symptoms that are usually experienced by people with diabetes. Neuropathy causes nerve disorders resulting in pain or numbness, especially in the extremities.
Objective: This study aims to determine the factors associated with the occurrence of neuropathy through 10 gr monofilament examination in Type 2 diabetes patients at Sejiran Setason Hospital, West Bangka in 2024.
Method: This research design uses a cross-sectional approach to determine the relationship between the variables studied at a certain time. The population of this study was patients with type 2 diabetes mellitus at Sejiran Setason Hospital West Bangka from January to December in 2024. The number of research samples was 166 people. The collected data were then analyzed univariately and bivariately using the chi-square test at 95% dk (α=0.05).
Result: The results of this study prove that there is a relationship between age (p-value = 0.013, POR = 3.820), duration of suffering (p-value = 0.006, POR = 3.290), and physical activity (p-value = 0.000, POR = 5.413) with the incidence of neuropathy at Sejiran Setason Regional Hospital, West Bangka in 2024. The most dominant factor in relation to the incidence of neuropathy is physical activity (POR = 5.413).
Conclusion: The recommendation from this study is that Type 2 DM patients need to do physical activity for at least 30 minutes a day, 3-5 times a week, recognize and monitor body changes regularly and carry out routine screening examinations for diabetes mellitus risk factors to detect diabetes mellitus risk factors early.

Keywords: diabetes melitus, monofilament, neuropathy

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Introduction

According to the World Health Organization (WHO), diabetes mellitus is a chronic metabolic disorder with multiple etiologies characterized by high blood sugar levels accompanied by impaired carbohydrate, lipid, and protein metabolism resulting from insulin deficiency. An estimated 463 million people aged 20-79 worldwide suffered from diabetes, equivalent to 9.3% of the total population in 2019. Based on age, the prevalence of diabetes in people aged 65-79 was estimated at 19.9% in 2019 and is predicted to increase to 20.4% in 2030 and 20.5% in 2045. The prevalence of diabetes in 2019 was 9% for women and 9.6% for men. This figure is predicted to increase to 578.4 million in 2030 and 700.2 million in 2045 (IDF, 2019).

Diabetes mellitus (DM) is one of the leading causes of death worldwide. According to the International Diabetes Federation (IDF), in 2021, there were 537 million adults with diabetes worldwide, and this number is expected to increase to 634 million by 2030 and 783 million by 2045. As many as 43% of deaths caused by high blood glucose levels occur in people under 70 years of age. In 2014, the majority of diabetes mellitus cases worldwide occurred in people over 18 years of age, accounting for 8.50% (Hossain et al., 2024). The increasing number of diabetes mellitus sufferers has resulted in an increased prevalence of long-term complications. According to data from the Foundation for Peripheral Neuropathy, an estimated 60-70% of people with diabetes worldwide suffer from diabetic neuropathy (The Foundation for Peripheral Neuropathy, 2019). Research on diabetic neuropathy has also been conducted in several countries in Southeast Asia and the Asia Pacific. Research conducted in 2014-2015 estimated the prevalence of diabetic neuropathy in Hong Kong, Taiwan, and Thailand at around 12-18%, while in Malaysia and the Philippines, the prevalence was estimated at 29% and 33%, respectively (Amelia & Sofiani, 2020). Diabetic neuropathy is a microvascular complication of type 2 diabetes mellitus and is defined as the manifestation of peripheral nerve dysfunction in people with diabetes after excluding other causes. However, studies in Yemen and Ghana reported prevalences of diabetic neuropathy of 56.2% and 50.7%, respectively. These studies reported a higher prevalence of diabetic neuropathy, at 75%. Approximately 60%-70% of patients experiencing neuropathy symptoms are found to be long-standing DM sufferers (Restu, 2022).

Based on epidemiological data, 8% of people with diabetes already have diabetic neuropathy when diagnosed, and 25% only discover it 25 years after the diagnosis. The incidence of neuropathy in people with diabetes exceeds 50%. The prevalence of diabetic peripheral neuropathy worldwide reaches 66%. The prevalence of diabetic peripheral neuropathy in type 2 diabetes is 50.8%, while in type 1 diabetes it is 25.6%. The prevalence of diabetic peripheral neuropathy is higher in women, at 26.4%, and in men, at 20.0%. The 45-65 age group has the highest prevalence of neuropathy. The number of people with diabetes mellitus who suffer from peripheral neuropathy complications is higher than those who do not (Mulyasari, 2023). The prevalence of diabetic neuropathy in Indonesia is quite high.

According to one study, approximately 54% of people with diabetes mellitus in Indonesia experience diabetic neuropathy. Furthermore, other studies report that the prevalence of diabetic peripheral neuropathy in Indonesia reaches 58%, a figure similar to other Southeast Asian countries such as Malaysia (54.3%) and the Philippines (58%). This data shows that more than half of diabetes mellitus sufferers in Indonesia experience neuropathy complications, which can affect quality of life and increase the risk of further complications (Erianti, 2023).

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

According to data from the Institute for Health Metrics and Evaluation, diabetes was the third leading cause of death in Indonesia in 2019, with approximately 57.42 deaths per 100,000 people. Data from the International Diabetes Federation (IDF) found that the number of diabetes sufferers in Indonesia in 2021 has increased rapidly over the past ten years. This number is projected to reach 28.57 million by 2045, a 47% increase compared to 19.47 million in 2021. Based on the 2008 Basic Health Research (Riskesdas) report, the prevalence of diabetes mellitus in Indonesia was 31.9%. A cross-sectional study of 1,785 individuals with type 2 diabetes mellitus found a prevalence of diabetic neuropathy of 63.5%. A retrospective study conducted in Surabaya assessed the medical records of 302 patients with type 2 diabetes mellitus and found a prevalence of diabetic neuropathy of 58.6%. Based on the 2013 Basic Health Research (Riskesdas) report, the prevalence of DM in Indonesia based on diagnosis or symptoms was 2.1%, higher than in 2007 (1.1%). Based on 2018 Riskesdas data, the prevalence of diabetes mellitus based on doctor's diagnosis in the age group ≥15 years was 2%, with the 55-64 age group being the highest at 6.3%. According to the Indonesian Health Survey, the prevalence of diabetes in the population of all ages based on doctor's diagnosis was 1.7%. Meanwhile, the prevalence of diabetes in the population aged 15 years and older, based on doctor's diagnosis, is 2.2%, and based on blood sugar tests, it is 11.7% (SKI, 2023).

DM is a chronic and complex disease, requiring long-term treatment and complex risk reduction strategies (Istianah & Hapipah, 2019). If blood glucose levels are elevated and uncontrolled, a person is considered to have diabetes mellitus. DM is a metabolic disorder characterized by elevated blood glucose levels due to defects in insulin secretion, insulin action, or both (Putri, 2023). DM is a degenerative disease that can lead to neuropathy. DM can damage all organs of the body and can lead to various complaints or complications, such as chronic damage to the eyes, kidneys, blood vessels, and others. DM is chronic, and its prevalence and severity continue to increase over time, from early stages (those at risk) to advanced stages (those with complications). DM is a non-communicable and lifelong disease where this condition requires continuous and consistent treatment so that it can be the main prevention of neuropathy (Adi, 2019).

This is further supported by a preliminary survey conducted by researchers at Sejiran Setason Regional Hospital, West Bangka Regency. Data showed that the number of DM patients in 2022 was 221, in 2023 it was 229, and in 2024, as of December 2024, it was 235. The data obtained indicates an increase in cases of diabetes mellitus at Sejiran Setason Regional Hospital, West Bangka Regency (Medical Records of Sejiran Setason Regional Hospital, West Bangka Regency). In the preliminary survey, conducted on December 23rd and 24th, 2024, at the Internal Medicine Clinic, Inpatient Unit, and ICU of Sejiran Setason Regional Hospital, researchers performed a 10g monofilament test on 10 patients with type 2 diabetes. The test revealed that 5 of the 10 patients (50%) were diagnosed with neuropathy or nerve damage. Based on the problems that arise above and also the increase in cases with DM every year from the above hospitals, the researcher is interested in conducting research on "Factors Related to the Incidence of Neuropathy Through 10g Monofilament Examination in Type 2 DM Patients at Sejiran Setason Regional Hospital, West Bangka Regency in 2024".

Objective

The general objective of this study is to determine the factors associated with the occurrence of neuropathy through 10g monofilament examination in Type 2 DM patients at Sejiran Setason Regional Hospital, West Bangka Regency in 2024.

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Method

This study design used a cross-sectional approach to determine the relationship between the variables studied over a specific time period. The study population was patients with type 2 diabetes mellitus at Sejiran Setason Regional General Hospital, West Bangka, from January to December 2024. The study sample size was 166 people. The study was conducted from April 18 to May 22, 2025, at the Internal Medicine Clinic, Inpatient Unit, and ICU of Sejiran Setason Regional General Hospital, West Bangka Regency. The data collection process is to conduct identity data collection on the research subjects, the researcher first introduces himself and informs the respondents about the intent and purpose of the research and the benefits that will be obtained by the respondents, provides an explanation to prospective respondents and if they are willing to become respondents, they are invited to sign an informed consent, provides guidance regarding the activities carried out related to the research on the topics during the research, asks the respondents for permission to document the initial activities that have been carried out, asks respondents to fill out the questionnaire that has been prepared by the researcher, then the data is collected and analyzed. The collected data are then analyzed univariately and bivariately using the chi-square test at a 95% confidence level (α = 0.05).

Result

Table 1. The Relationship Between Age and Neuropathy Incidence at Sejiran Setason Regional General Hospital, West Bangka Regency, 2024

Age	Neuropathy Incidence						*p-value*	*POR (95% CI)*
	Neuropathy		No Neuropathy		Total			
	n	%	n	%	n	%		
Elderly	84	67.2	41	32.8	125	100	0.013	3820 (1.860-7.860)
Adults	18	43.9	23	56.1	41	100		

Table above shows that 84 (67.2%) patients with Type 2 DM experienced neuropathy in the elderly, more than in adults. Meanwhile, 23 (56.1%) patients with Type 2 DM did not experience neuropathy in adults.

Data analysis using the Chi-Square test yielded a p-value of 0.013, indicating a relationship between age and the incidence of neuropathy in Type 2 DM patients at Sejiran Setason Regional Hospital, West Bangka Regency, in 2024. Further analysis yielded a Prevalence Odds Ratio (POR) of 3,820 (95% CI = 1,860-7,860), indicating a 3,820-fold greater risk of neuropathy among elderly Type 2 DM patients compared to adult Type 2 DM patients.

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Table 2. The Relationship Between Duration of Suffering and Neuropathy Incidence at Sejiran Setason Regional General Hospital, West Bangka in 2024

Duration Suffering	Neuropathy Incidence						*p-value*	*POR (95% CI)*
	Neuropathy		No Neuropathy		Total			
	n	%	n	%	n	%		
Old	87	67.4	42	32.6	129	100	0.006	3290 (1.550-6.990)
New	22	59.5	15	40.5	37	100		

Table above shows that 87 (67.4%) more Type 2 DM patients experienced neuropathy in the long-term category than in the new category. Meanwhile, more Type 2 DM patients did not experience neuropathy in the new category. 15 people (40.5%).

Data analysis using the Chi-Square test yielded a p-value of 0.006, indicating a correlation between duration of disease and neuropathy in Type 2 DM patients at Sejiran Setason Regional Hospital, West Bangka in 2024. Further analysis yielded a Prevalence Odds Ratio (POR) of 3,290 (95% CI = 1,550-6,990), indicating that Type 2 DM patients with long-standing symptoms were 3,290 times more likely to experience neuropathy than Type 2 DM patients with new symptoms.

Table 3. The Relationship Between Physical Activity and Neuropathy Incidence at Sejiran Setason Regional Hospital, West Bangka Regency, 2024

Physical Activity	Neuropathy Incidence						*p-value*	*POR (95%)*
	Neuropathy		No Neuropathy		Total			
	n	%	n	%	n	%		
Insufficient	93	68.9	42	31.1	135	100	0.000	5.413 (2.298-12.751)
Sufficient	9	29.0	22	71.0	31	100		

Based on Table above, 93 (68.9%) patients with Type 2 DM experienced neuropathy in the insufficient physical activity category, more than those with sufficient physical activity. Meanwhile, 22 (71%) patients with Type 2 DM did not experience neuropathy in the sufficient physical activity category.

Data analysis using the Chi-Square test yielded a p-value of 0.000, indicating a relationship between physical activity and neuropathy in Type 2 DM patients at Sejiran Setason Regional General Hospital, West Bangka Regency, in 2024. were 5,413 times more likely to experience neuropathy than Type 2 DM patients with sufficient physical activity.

Discussion

Based on the research results, researchers assume that age is a significant determinant factor in the occurrence of peripheral neuropathy in patients with type 2 diabetes mellitus. As age increases, the body's physiological functions and metabolic systems decline, including the peripheral nervous system which becomes more susceptible to damage. The aging process causes decreased blood vessel elasticity, reduced blood flow to peripheral tissues,

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

and increased oxidative stress, all of which can worsen nerve conditions, especially in individuals with chronic hyperglycemia such as type 2 diabetes. In this study, the relationship between age and the occurrence of neuropathy is strengthened based on research data that 67.2% of neuropathy occurs in the elderly age group while in adults only 43.9%, conversely in Type 2 diabetes who do not experience neuropathy more often in the adult age group reaching 56.1%. This strengthens the belief that the influence of age, namely the elderly, is higher than adults on the occurrence of neuropathy. Therefore, researchers see the need for routine screening in the adult age group for early detection of risk factors for type 2 diabetes.

Researchers assume that there is a significant relationship between the duration of type 2 diabetes mellitus and the incidence of neuropathy. This assumption is based on the pathophysiological understanding that long-term chronic hyperglycemia can cause microvascular damage and the accumulation of toxic substances in nerve tissue, such as sorbitol, which then triggers oxidative stress and structural and functional damage to peripheral nerves. The longer a person has diabetes, the greater the likelihood of impaired sensory nerve impulse conduction leading to neuropathy. Researchers also assume that peripheral neuropathy in type 2 DM patients can be detected accurately and objectively using a 10-gram monofilament test, which serves as a standard screening tool to evaluate decreased sensation in the feet. In this study, the relationship between duration of disease and the incidence of neuropathy is strengthened by research data that 67.4% of neuropathy occurs in type 2 DM patients with a long-standing category, while in type 2 DM patients with a new category, the figure is only 59.5%. Conversely, in type 2 DM patients who do not experience neuropathy, the incidence is more common in type 2 DM patients with a new category, reaching 40.5%. This reinforces the belief that the duration of illness, specifically the duration of illness in the old category, is greater than the duration of illness in the new category, on the incidence of neuropathy. Therefore, researchers see the need to recognize and regularly monitor body changes in Type 2 DM patients.

Peneliti berasumsi bahwa aktivitas fisik memiliki hubungan yang signifikan dengan kejadian neuropati perifer pada pasien diabetes melitus tipe 2. Asumsi ini didasarkan pada pemahaman bahwa aktivitas fisik yang teratur dapat meningkatkan sensitivitas insulin, memperbaiki aliran darah perifer, dan mengurangi kadar glukosa darah, sehingga mampu mencegah kerusakan saraf akibat hiperglikemia kronis. Sebaliknya, kurangnya aktivitas fisik diasumsikan dapat memperburuk kontrol glukosa, meningkatkan resistensi insulin, serta mempercepat terjadinya komplikasi diabetes, termasuk neuropati. Peneliti mengasumsikan bahwa individu dengan tingkat aktivitas fisik rendah memiliki risiko lebih tinggi mengalami gangguan sensorik yang dapat terdeteksi melalui pemeriksaan monofilament 10 gr. Pemeriksaan ini digunakan untuk menilai integritas fungsi sensorik perifer pada kaki, yang merupakan lokasi umum terjadinya neuropati diabetik. Oleh karena itu, aktivitas fisik dipandang sebagai salah satu faktor yang berhubungan kejadian neuropati, dan pengukurannya menjadi penting dalam menganalisis faktor-faktor risiko yang berkontribusi terhadap perkembangan komplikasi pada pasien DM tipe 2. Dalam penelitian ini hubungan antara aktivitas fisik dengan kejadian neuropati diperkuat berdasarkan data penelitian bahwa 68,9% neuropati terjadi pada penderita DM Tipe 2 dengan aktivitas fisik kategori kurang sedangkan pada penderita DM Tipe 2 dengan aktivitas fisik kategori cukup hanya 29%, sebaliknya pada DM Tipe 2 yang tidak mengalami neuropati lebih banyak terjadi pada penderita DM Tipe 2 dengan aktivitas fisik kategori cukup 71%. Hal tersebut memperkuat keyakinan bahwa pengaruh aktivitas fisik yaitu penderita DM Tipe 2 dengan aktivitas fisik kategori kurang lebih tinggi dibandingkan penderita DM Tipe 2 dengan aktivitas fisik kategori

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

cukup terhadap kejadian neuropati. Maka peneliti melihat perlunya melakukan aktivitas fisik minimal 30 menit sehari, 3-5x seminggu pada kelompok pasien DM Tipe 2.

Conclusion

The results of the study indicate that there is a significant relationship between age and the incidence of neuropathy in type 2 diabetes patients as assessed using the 10g monofilament test at Sejiran Setason Regional Hospital, West Bangka Regency in 2024. In addition, a significant relationship was also found between the duration of the disease and the incidence of neuropathy in these patients. Furthermore, physical activity was shown to be significantly associated with the incidence of neuropathy. Among the three variables examined, the most dominant factor related to the incidence of neuropathy was physical activity, with a POR value of 5.413. This finding suggests that patients with low levels of physical activity have a substantially higher risk of developing neuropathy compared to those who engage in adequate physical activity.

References

1. Adi, S. (2019) 'Pengelolaan Dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia', *PB Perkeni*, p. 133.
2. Adiputra, I.M.S. *et al.* (2021) *Metodologi Penelitian Kesehatan*. Edited by R. Watrianthos and J. Simarmata. Denpasar: Yayasan Kita Menulis.
3. Aditiya, M. *et al.* (2024) 'Puskesmas Maesan', 8(8), pp. 67–75.
4. Adli, F.K. (2021) 'Diabetes Melitus Gestasional : Diagnosis dan Faktor Risiko', *Jurnal Medika Hutama*, 03(01), pp. 1545–1551.
5. Amelia, K.R. and Sofiani, Y. (2020) 'Self-Monitoring of Blood Glucose dalam Mencegah Neropati pada Ektremitas Bawah Pasien Diabetes Melitus Tipe II', *Indonesian Journal of Nursing Sciences and Practice*, pp. 58–72.
6. Amelia, R., Wahyuni, A.S. and Yunanda, Y. (2019) 'Neuropati Diabetik pada Penderita Diabetes Melitus Tipe 2 di Puskesmas Amplas Kota Medan', *Joulnal of Medical Sciences*, 7(20), pp. 3400–3403.
7. Arini Rahmawati (2019) 'Pengaruh Keteraturan Berobat dan Aktivitas Fisik Terhadap Kejadian Neuropati Diabetik Tipe 2 Influence the Regularity of Treatment and Physical Activity Againts the Occurance of type 2 Diabetic Neuropathies Departemen Epidemiologi Fakulta', *Jurnal Wiyata*, pp. 80–87.
8. Asep and Santoso at all (2021) 'Hubungan aktivitas fisik dengan kejadian neuropati diabetik pada penderita diabetes mellitus Tipe 2', *Holistik Jurnal Kesehatan*, 15(2), pp. 176–186. Available at: https://doi.org/10.33024/hjk.v15i2.3624.
9. Badan Kebijakan Pembangunan Kesehatan, Kementerian Kesehatan RI. (2023). Survei Kesehatan Indonesia (SKI) 2023
10. Badan Penelitian Dan Pengembangan Kesehatan Republik Indonesia (2008) 'Laporan Riskesdas 2008 Nasional.pdf', *Lembaga Penerbit Balitbangkes.*
11. Badan Penelitian Dan Pengembangan Kesehatan Republik Indonesia (2013) 'Laporan Riskesdas 2013 Nasional.pdf', *Lembaga Penerbit Balitbangkes.*
12. Badan Penelitian Dan Pengembangan Kesehatan Republik Indonesia (2018) 'Laporan Riskesdas 2018 Nasional.pdf', *Lembaga Penerbit Balitbangkes*, p. hal 156.
13. Darmawan, A.A.K. (2015) 'Faktor Faktor yang Mempengaruhi Perilaku Kunjungan Masyarakat Terhadap Pemanfaatan Pelayanan Posyandu di Desa Pemecutan Kelod Kecamatan Denpasar Barat', *Jurnal Dunia Kesehatan*, 5, pp. 29–39.

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

Article in press 2025 - https://genius.inspira.or.id/index.php/gj

14. Faiqotunnuriyah dan Widya Hary Cahyati (2021) 'Faktor Yang Berhubungan Dengan Kejadian Neuropati Diabetik Pada Penderita Diabetes Melitus Tipe 2', p. 6.
15. Feldman, E. L., Callaghan, B. C., Pop-Busui. (2019). Diabetic neuropathy. *Nature Reviews Disease Primers, 5*(1), 1–18. https://doi.org/10.1038/s41572-019-0092-1
16. Fish, B. (2020) 'Analisis struktur sebaran indikator terkait kesehatan lansia', 2507(February), pp. 1–9.
17. Masturoh, I. and Anggita, N. (2018) *Metodologi Penelitian Kesehatan*. Jakarta.
18. Muntasir, E., Handayani, R.N. and Wahyuningrum, E. (2023) 'Analisis Faktor Yang Mempengaruhi Kejadian Neuropati Diabetik Pada Pasien Diabetes Melitus Tipe 2', *Jurnal Kesehatan*, 12(00007), pp. 1–19.
19. Nurjannah, N., Saputra, B. and Erianti, S. (2023) 'Gambaran derajat keparahan neuropati perifer pada pasien diabetes melitus tipe 2', *Jurnal Prima Medika Sains*, 5(1), pp. 16–20. Available at: https://doi.org.v5i1.3562.
20. Nursalam (2020) *Metodologi Penelitian Ilmu Keperawatan*. 5th edn. Edited by P.P. Lestari. Jakarta: Salemba Medika.
21. Pankewycz, O.G. *et al.* (2023) 'Quality of Life', *Transplantation of the Pancreas: Second Edition*, pp. 1039–1052. Available at: https://doi.org/10.1007/97-4_74.
22. Putri, G.C.A. (2023) 'Deteksi Dini Kejadian Neuropati Pada Pasien Dm Dengan Menggunakan Metode Iptt Di Rsup Haji Adam Malik Medan', *STIKes Santa Elisabeth Medan*, pp. 38–39.
23. Vorvick, L. J. (2019). Diabetes—Complications. *MedlinePlus Medical Encyclopedia*. Retrieved from https://medlineplus.gov/ency/article/000313
24. Wahid, A. (2019) 'Hubungan Usia, Jenis Kelamin dan Lama Menderita Diabetes dengan Kejadian Neuropati Perifer Diabateik', *Caring Nursing Journal*, 3(2), pp. 31–37.
25. Wahyudi, M. (2024) 'Penerapan Diabetes Self Management Education untuk Pemenuhan Kebutuhan Aktualisasi Diri pada Pasien Diabetes Melitus di wilayah Kerja Puskesmas Gamping Yogyakarta 2024'.
26. Wahyuningrum, D. *(2023).* Analisis faktor yang mempengaruhi kejadian neuropati diabetik pada pasien diabetes melitus tipe 2.
27. Wanjaya, I.K.O. *et al.* (2020) 'Aktivitas Fisik Dengan Diabetik Neuropati Perifer Pada Pasien Dm Tipe 2', *Jurnal Gema Keperawatan*, 13(1), pp. 1–9.
28. Washia, W. (2020) 'Hubungan Lama Menderita Diabetes Dengan Pengetahuan Pencegahan Ulkus Diabetik Di Pussmas Ciputat', *Jurnal Universitas Syarif Hidayatullah*,pp.1–74.Availableat: https://repository.uinjkt.ac.id
29. Widianti, E., & Sari, K. (2022). Faktor yang Memengaruhi Neuropati Diabetik pada Pasien Diabetes Melitus Tipe 2 di RSUD dr. Soekardjo Kota Tasikmalaya. Medika Kartika: Jurnal Kedokteran dan Kesehatan, 4(2), 102-110.
30. Yulianti, R (2022) 'Hubungan Aktivitas Fisik Terhadap Tingkat VO2MAKS di Lembaga Kesejahteraan Sosial Yayasan Batara Hati Mulia Kabupaten Gowa 2022'.

Article in press 2025 - https://genius.inspira.or.id/index.php/gj