Enfermería Clínica 31 (2021) S130–S134

Enfermería Clínica

www.elsevier.es/enfermeriaclinica

The relationship between painful diabetic peripheral neuropathy and functional status of older people in Kuantan, Pahang☆

Aniawanis Makhtar, Sharifah Munirah Syed Elias*, Athirah Azizi

Kulliyyah of Nursing, International Islamic University Malaysia, Pahang, Kuantan, Malaysia

Received 15 September 2020; accepted 21 September 2020

KEYWORDS
Pain;
Painful diabetic peripheral neuropathy;
Functional status;
Older people

Abstract This study aimed to determine the relationship between painful diabetic peripheral neuropathy and functional status among older people in Kuantan, Pahang. A cross-sectional study was performed by using an interviewer-administered questionnaire among 300 participants recruited from selective Primary Health Centres and endocrine clinics, Hospital Tengku Ampuan Afzan in Kuantan, Pahang. The data were analyzed by using SPSS version 22. The findings indicated that most participants reported neuropathic pain experience. The severity of pain was found to be significantly related to patients who had been diagnosed over 10 years ago, Indians patients and those who were treating their diabetes with insulin alone. No significant relationship was found between pain severity and functional status. The severity of pain and the associated factors suggest the need for a multidisciplinary approach to provide effective treatment to patients with painful diabetic peripheral neuropathy.

Introduction

Diabetic peripheral neuropathy (DPN) is the most common complication of diabetes mellitus (DM).[1,2] DPN is associated with significant morbidity and mortality, and it is a very common cause of non-traumatic amputations and hospital admissions, as well as increased health-related costs.[1,2] The prevalence of DPN in DM varies widely from 9.6 to 88.7% globally.[3–7] In Malaysia, peripheral neuropathy (PN) has previously been found in adult and older patients with DM, which are about 50% and 51%, respectively.[8,9]

Pain can develop as a symptom of DPN.[10] The prevalence of painful diabetic peripheral neuropathy (PDPN) ranges from 10% to 20% of patients with DM, and in those with DPN, it ranges from 40% to 50%.[1] The prevalence of PDPN in a cohort of Malaysian diabetic outpatients is found to be lower than 5.4% of the population.[11] Patients with PDPN describe their pain as sharp, throbbing, aching, or burning; as being stabbed by tiny knives or bitten by hundreds of

☆ Peer-review under responsibility of the scientific committee of the 4th International Conference for Global Health (ICGH) in conjunction with the 7th Asian International Conference in Humanized Health Care (AIC-HHC). Full-text and the content of it is under responsibility of authors of the article.

* Corresponding author.
E-mail address: shmunirah@iium.edu.my (S.M. Syed Elias).

https://doi.org/10.1016/j.enfcli.2020.12.007
1130-8621/

spiders or fire ants on their lower legs and feet; and as keeping them awake all night long.[1,2] PDPN was common among older people and commonly associated with impairment in health-related quality of life, functional impairment, and activities of daily living (ADL).[12]

To the researcher's best knowledge, there are no data available on PDPN among older people in Malaysia. Thus, this study aimed to determine the relationship between PDPN and functional status among older people in Kuantan, Pahang.

Method

This study employed a cross-sectional design, and it was conducted at selective Primary Health Centres and endocrine clinics, Hospital Tengku Ampuan Afzan (HTAA) in Kuantan, Pahang.

Patients were eligible for inclusion in the study if they were aged 60 years old and above, diagnosed with Type 1 and Type 2 Diabetic Mellitus, and willing to take part in the study. Additionally, neuropathic pain was also assessed using the interview section of the Douleur Neuropathy 4 (DN4).[13] Patients with neuropathic pain (DN4 $\geq$4) were included. Patients were excluded if they also had other conditions that could lead to pain in the feet and/or damage to the peripheral nervous system and if they were not able to understand English or Malay language. The sample size was calculated using Raosoft.[14] So, the total sample size was 323 respondents.

A questionnaire consisting of three sections. Section one comprised questions on demographic and clinical characteristics, including age, race, religion, level of education, marital status, duration of DM, and type of DM treatment. Section two consisted of the short form of the McGill Pain Questionnaire 2 (SF-MPQ-2), developed to measure both neuropathic pain and non-neuropathic pain, consists of 22 different descriptors of pain, and each item is rated based on a 0–10 scale, with 0 equals to no pain, and 10 equals to the worst pain ever during the past week. SF-MPQ-2 comprises of 4 parts, including Continuous (throbbing pain, cramping pain, gnawing pain, aching pain, heavy pain, tender), Intermittent (shooting pain, stabbing pain, sharp pain, splitting pain, electric-shock pain, piercing), Neuropathic (hot-burning pain, cold-freezing pain, pain caused by light touch, itching, tingling or ''pins and needles'', numbness), and Affective (tiring-exhausting, sickening, fearful, punishing-cruel) subscales. The scoring procedure for the subscale score was calculated by taking the mean of the item ratings included in the scale, while the total score was calculated using all SF-MPQ-2 items.[15] Section three contained the Katz Index of Independence in Activities of Daily Living (Katz ADL). The participants were asked to rate each of the six ADL on a three-point Likert scale, whereby 2 = Independence, 1 = Partially dependence and 0 = Dependence.[16] The validated Malay version of SF-MPQ-2 and Katz ADL questionnaire were used in this study. The internal reliability tests for the Malay version of the SF-MPQ-2 and the Katz ADL revealed Cronbach's alpha coefficients of 0.73 and 0.70, respectively.

The Statistical Package for the Social Sciences (SPSS) Version 22 was used to analyze the data. Descriptive statistics were used for the analysis of demographic and clinical characteristics. Statistical analysis conducted includes Mann–Whitney *U*, Kruskal–Wallis, and Spearman's rank correlation test. A *p*-value of less than 0.05 was considered the statistical significance.

This study was approved by the International Islamic University of Malaysia Research Ethics Committee (IREC-471) and the Medical Research Ethics Committee (MREC), Ministry of Health Malaysia (Ref: NMRR-18-40-39600). Informed written consent was obtained from the participants. Permission to use the questionnaires was obtained from the authors.

Results

The response rate was 92.8%, and the majority of those who responded were aged between 60 and 69 years old (65.7%), male (52%), Malays (74.3%), married (96.7%) and had secondary as the highest educational degree (37%). Regarding clinical characteristics, the majority of the participants had been having DM for six to ten years (37%) and were prescribed oral hypoglycemic agents (OHA) (64.4%). The demographic and clinical characteristics are shown in Table 1.

Table 1 Demographic and clinical characteristics of the patients.

Variables	Frequency (*N*)	Percentage (%)
Age		
60–69	197	65.7
70–79	90	30.0
80–89	13	4.3
Gender		
Male	156	52.0
Female	144	48.0
Race		
Malay	223	74.3
Chinese	53	17.7
Indian	24	8.0
Marital status		
Married	290	96.7
Widowed	10	3.3
Educational level		
None	53	17.7
Primary level	107	35.7
Secondary level	111	37.0
Tertiary level	29	9.7
Duration of diabetes mellitus		
1–5 years	102	34.0
6–10 years	111	37.0
More than 10 years	87	29.0
Types of treatment		
OHA	191	63.6
Insulin therapy	43	14.3
Both OHA and Insulin therapy	66	22.0

Table 2 Self- reported pain intensity of the patients.

Variables	Median	Interquartile range (IQR)
Continuous	21	10
Intermittent	18	16
Neuropathic	31	8
Affective	9	2
Total score	80	25

Table 2 summarizes the self-reported pain intensity. The values of continuous pain, intermittent pain, neuropathic pain, affective descriptors, and total pain scores in the SF-MPQ-2 were 21 (11), 20 (17), 32 (8), 9 (2) and 80 (25), respectively. As can be seen in the table, the majority of the participants reported neuropathic pain.

Table 3 shows the distribution of frequency and percentage of the functional status of the participants. The functional status of the majority of the participants in this study was ''independence'' for all the ADL assessed (bathing, dressing, transferring, toileting, continence, and feeding).

Table 4 shows an association between demographic and clinical characteristics by pain severity. There was an association between race, duration of diabetes mellitus and types of treatment. Based on the post hoc tests, participants who had been diagnosed over 10 years ago and were undergoing treatment of insulin therapy showed significantly higher SF-MPQ2 scores (<0.001), respectively. A significantly higher SF-MPQ2 score was also reported among Indian patients (<0.001).

Discussion

This study aimed to determine the relationship between PDPN and functional status among older people in Kuantan, Pahang. The result showed that many patients had the experience of neuropathic pain than other types of pain. Therefore, the most frequently reported PDPN symptoms in the present study included hot-burning pain, cold-freezing pain, pain caused by light touch, itching, tingling or ''pins and needles'' and numbness. This study revealed the same findings with previous studies.[16–18]

It is not surprising that the majority of the patients in the current study did not present problems with functional statuses in ADL. This suggests that older people with PDPN could carry out each self-care activity independently. The current study was conducted in an urban setting, and the majority of the patients were from the age range of between 60 and 69 years (young-old age), which means that 65.7% of them were in the productive age group. This may be the reason why older people with PDPN were found to be independent in performing ADLs.

The study found an association between race and pain among older people in Malaysia. The result showed that patients of the Indian race experienced neuropathic

Table 3 Self- reported functional status of the patients.

Variables	Partially independence		Independence	
	Frequency (*N*)	Percentage (%)	Frequency (*N*)	Percentage (%)
Eating	0	0	300	100
Dressing	1	0.3	299	99.7
Bathing	8	2.7	292	97.3
Transferring	63	21.0	237	79.0
Toileting	74	24.7	226	75.3
Incontinence	38	12.7	262	87.3

Table 4 Association between demographic and clinical characteristic by pain severity.

Variables	Median	Interquartile range (IQR)	(X^2)*	*p*-Value
Race			24.88	<0.001
Malay	3.55	1		
Chinese	3.32	1		
Indian	4.07	1		
Duration of diabetes mellitus			24.75	<0.001
1–5 years	3.20	1		
6–10 years	3.59	1		
More than 10 years	3.86	1		
Type of medication			27.04	<0.001
OHA	3.36	1		
Insulin therapy	3.96	1		
Both OHA and Insulin therapy	3.77	1		

Note: X^2 = Kruskal–Wallis test.

pain.[11,17] The possible explanation for this result is genetic factors and cultural backgrounds determining neuropathic pain perception among the Indian population.

The finding from this study shows that there was an association between the duration of DM and pain. Most of the previous studies found that the more increased the duration of DM, the higher the prevalence for developing PDPN. This study shows a finding similar to the previous studies as the results indicated that the participants who had been diagnosed with DM for more than 10 years ago were more likely to experience greater neuropathic pain.[17]

The results of this study show that the types of DM treatment in which the patients were prescribed insulin therapy can be a significant indicator of the severity of pain. There was a possibility that insulin therapy was prescribed because of poor metabolic control, a situation in which the patient had a high fasting plasma sugar and glycated haemoglobin (HbA1c). In Malaysia, patients are prescribed insulin after they have been on a maximum number of oral hypoglycaemia and have failed to achieve the glycaemic target.[8] This could suggest that the patients in the current study had not been successful in controlling their sugar level and so they required insulin therapy. Previous studies have shown that bigger fluctuations in glycaemic levels are associated with a greater intensity of neuropathic pain.[10] However, the findings of the current study were inconsistent with a previous study.[17]

The majority of research into PDPN and quality of living confirmed that the impact on the physical aspects of a patient's daily life was significant.[19,20] Nevertheless, in this current study, PDPN was found as not having any association with functional status. The possible explanation might be that the majority of the patients were still in the productive age group, and as a result, they were able to manage ADLs and live independently without any assistance from another person.

The findings in this study are subject to at least four limitations. First, selection bias is a common limitation of cross-sectional studies as probability sampling is seldom used. Second, the use of self-report measures of PDPN and functional status and self-reported data may have introduced a social desirability bias, which could have led to the over- or under-reporting of PDPN and functional status. Third, the sample of this study was recruited in Kuantan, Pahang only, which could not possibly be generalized to all older patients with PDPN in Malaysia. Lastly, the cross-sectional design of this study did not permit the exploration of causal relationships between PDPN and the associations with each of the contributing factors. Future longitudinal single cohort studies and investigations on such potential causal relationships, which include the control of other contributory variables such as other pain and medical comorbidities and disabilities caused by PN are necessary to understand the burden of PDPN.

Conclusion

The results of this study clearly suggest that PDPN is associated with race, duration of DM, and types of treatment. Most participants with PDNP reported the severity of the pain to be neuropathic pain. The severity of pain and the associated factors suggest the need for a multidisciplinary approach to provide effective treatment to older patients with PDPN.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

The authors would like to express our gratitude to the older adults who agreed to participate in this study.

References

1. Kaur S, Pandhi P, Dutta P. Painful diabetic neuropathy: an update. Ann Neurosci. 2011;18:168–75, http://dx.doi.org/10.5214/ans.0972-7531.1118409.
2. Yoo M, Sharma N, Pasnoor M, Kluding PM. Painful diabetic peripheral neuropathy: presentations, mechanisms, and exercise therapy. J Diabetes Metab. 2013, http://dx.doi.org/10.4172/2155-6156.S10-005. S10:005.
3. Jember G, Melsew Y, Fisseha B, Sany K, Gelaw AY, Janakiraman B. Peripheral sensory neuropathy and associated factors among adult diabetes mellitus patients in Bahr Dar, Ethiopia. J Diabetes Metab Disord. 2017;16:16, http://dx.doi.org/10.1186/s40200-017-0295-5.
4. Al Washali AY, Azuhairi AA, Hejar AR, Amani YW. Prevalence and associated risk factors of diabetic peripheral neuropathy among diabetic patients in national center of diabetes in Yemen. Int J Public Health Clin Sci. 2014;1:141–50.
5. Kisozi T, Mutebi E, Kisekka M, Lhatoo S, Sajatovic M, Kaddumukasa M, et al. Prevalence, severity and factors associated with peripheral neuropathy among newly diagnosed diabetic patients attending Mulago hospital: a cross-sectional study. Afr Health Sci. 2017;17:463–73, http://dx.doi.org/10.4314/ahs.v17i2.21.
6. Jacovides A, Bogoshi M, Distiller LA, Mahgoub EY, Omar MK, Tarek IA, et al. An epidemiological study to assess the prevalence of diabetic peripheral neuropathic pain among adults with diabetes attending private and institutional outpatient clinics in South Africa. J Int Med Res. 2014;42:1018–28, http://dx.doi.org/10.1177/0300060514525759.
7. Kostev K, Jockwig A, Hallwachs A, Rathmann W. Prevalence and risk factors of neuropathy in newly diagnosed type 2 diabetes in primary care practices: a retrospective database analysis in Germany and UK. Prim Care Diabetes. 2014;8:250–5, http://dx.doi.org/10.1016/j.pcd.2014.01.011.
8. Azidah AK, Hasniza H, Zunaina E. Prevalence of falls and its associated factors among elderly diabetes in a Tertiary Center, Malaysia. Curr Gerontol Geriatr Res. 2012;2012:539073, http://dx.doi.org/10.1155/2012/539073.
9. Abougalambou SSI, Abougalambou AS. Explorative study on diabetes neuropathy among type II diabetic patients in Universiti Sains Malaysia Hospital. Diabetes Metab Syndr. 2012;6:167–72, http://dx.doi.org/10.1016/j.dsx.2012.09.002.
10. Rajan RS, de Gray L, George E. Painful diabetic neuropathy. Contin Educ Anaesth Crit Care Pain. 2014;14:230–5, http://dx.doi.org/10.1093/bjaceaccp/mkt063.
11. Goh LY, Shahrom EE, Ganesan CC, Vethakkan SR, Goh KJ. The prevalence and associated factors of neuropathic pain symptoms in a cohort of multi-ethnic Malaysian patients with diabetes mellitus. Neurol Asia. 2017;22:325–31.

12. Jambart S, Ammache Z, Haddad F, Younes A, Hassoun A, Abdalla K, et al. Prevalence of painful diabetic peripheral neuropathy among patients with diabetes mellitus in the Middle East Region. J Int Med Res. 2011;39:366–77, http://dx.doi.org/10.1177/147323001103900204.
13. Spallone V, Morganti R, D'Amato C, Greco C, Cacciotti L, Marfia GA. Validation of DN4 as a screening tool for neuropathic pain in painful diabetic polyneuropathy. Diabet Med. 2012;29:578–85, http://dx.doi.org/10.1111/j.1464-5491.2011.03500.x.
14. Sample size calculator [Internet]. Seattle: Raosoft, Inc; 2004. Available from: http://www.raosoft.com/samplesize.html [cited 29.03.18].
15. Dworkin RH, Turk DC, Revicki DA, Harding G, Coyne KS, Peirce-Sandner S, et al. Development and initial validation of an expanded and revised version of the Short-form McGill Pain Questionnaire (SF-MPQ-2). Pain. 2009;144:35–42, http://dx.doi.org/10.1016/j.pain.2009.02.007.
16. Katz S, Akpom CA. Index of ADL. Med Care. 1976;14 Suppl. 5:116–8, http://dx.doi.org/10.1097/00005650-197605001-00018.
17. Al-Mahmood SM, Abdul Razak T, Nik Ahmad NNF, Mohamed AH, Che Abdullah ST. Factors influencing the severity of pain in patients with peripheral diabetic neuropathy. Asian J Pharm Clin Res. 2017;10:306–9, http://dx.doi.org/10.22159/ajpcr.2017.v10i10.20043.
18. Gylfadottir SS, Christensen DH, Nicolaisen SK, Andersen H, Callaghan BC, Itani M, et al. Diabetic polyneuropathy and pain, prevalence, and patient characteristics: a cross-sectional questionnaire study of 5,514 patients with recently diagnosed type 2 diabetes. Pain. 2020;161:574–83, http://dx.doi.org/10.1097/j.pain.0000000000001744.
19. Dobrota VD, Hrabac P, Skegro D, Smiljanic R, Dobrota S, Prkacin I, et al. The impact of neuropathic pain and other comorbidities on the quality of life in patients with diabetes. Health Qual Life Outcomes. 2014;12:171, http://dx.doi.org/10.1186/s12955-014-0171-7.
20. Singh-Franco D, Jacobs RJ. Patient perspectives on peripheral neuropathic pain experience within the community. Diabetes Metab Syndr. 2017;11 Suppl. 1:S243–6, http://dx.doi.org/10.1016/j.dsx.2016.12.038.