Original Article

Prevalence and risk factors of diabetic neuropathy in Qassim, Saudi Arabia

Amal A Almohisen[1] , Lama M Almuhaysen[2], Khawlah K Alhatlany[2], Reham H Alghalth[3], Ashwaq M Almutairi[2], Fatmah A Almarzog y[3], Haneen A Alghasham[2], Ghaida M Almohaysen [3]

1. Assistant professor,Department of Statistics and OR, King Saud University

2. Medical intern,Unaizah College of Medicine, Qassim University

3 .Medical student,Unizah College of Medicine, Qassim university

Received on 25.09.2019, accepted for publication on 19.11.2019, (Doi : dx.doi.org/10.5455/mjhs.2020.02.004)

Corresponding author :Lama M Almuhaysen[2], Unaizah College of Medicine,

Qassim University, Qassim, Saudi Arabia, 19519. Email: dr.lama.mmm@hotmail.com

Abstract

Background:
Diabetic neuropathy is the commonest early and long-term complication of diabetes. Saudi Arabia has a high prevalence of diabetic neuropathy reaching (65%), which necessitate the establishment of a preventive program. The aim of the study was to measure the prevalence of diabetic neuropathy and its associated risk factors in Qassim, Saudi Arabia.

Methods:
A cross-sectional study that utilized an adopted a translated version of Michigan neuropathy screening instrument. An electronic questionnaire was filled by each participant after obtaining inform consent. The questionnaire included questions about neuropathy in addition to added questions about demography of participants. After data collection, SPSS version 21.00 was used for data analysis.

Results:
A total of 374 patients has been included in the analysis. Of which (54%) were females, and (97.1%) were Saudis with a mean age of (53.6±11.9). The prevalence of diabetic neuropathy was (38.2%). Significant associations with abnormal total scores included; low education (p= 0.007), hypertension (p = 0.017), high body mass index (p < 0.001), use of insulin and/or multidrug for diabetes (p < 0.001). Further analysis of sex, age, and smoking did not show any significance with diabetic neuropathy.

Conclusion:
Our study concluded that more than one third of diabetics in Qassim region are having diabetic neuropathy. Paying attention to risk factors is an important factor for early detection of the condition.

Key words:
Diabetic neuropathy - risk factors - Qassim - Saudi Arabia.

الملخص

الخلفية :
المرض العصبي السكري يعتبر أكثر المضاعفات الأولية التي تدوم مع مريض السكري ومعدل انتشارها في السعودية يصل الى (٦٥٪)، مما يبرز أهمية تنظيم برامج وقائية. هدف الدراسة الحالية يتمثل في تحديد معدل انتشار مرض العصبي السكري والعوامل المساعدة على المرض في منطقة القصيم بالمملكة العربية السعودية.

طريقة البحث:
دراسة مستعرضة استخدمت نسخة مترجمة من استبيان ميشقان للكشف عن العصبي السكري. تم جمع البيانات عن طريق تعبئة الاستبيان الالكتروني ع طريق المرضى. تم تحليل البيانات باستخدام البرنامج الالكتروني (SPSS).

النتائج :
تم تحليل (٣٧٤) استبيان. الإناث مثلن (٥٤٪) من العينة والجنسية السعودية (٩٧,١٪) ومتوسط الاعمار (٥٣,٦ سنة). تم اكتشاف علاقة بين مرض العصبي السكري وعدة عوامل هي: مستوى التعليم المنخفض (P<٠,٠٠١)، ارتفاع ضغط الدم (P=٠,٠١٧)، ارتفاع معدل كتلة الجسم (P< ٠,٠٠١)، استخدام الانسولين او تعدد الادوية (P< ٠,٠٠١). غير ان التحليل لم يجد أي علاقة مؤثرة مع الجنس او العمر او التدخين.

الخلاصة :
نستخلص من النتائج ان ما يقارب ثلث العينة من مرضى السكري في منطقة القصيم يعانون من مرض العصبي السكري. يجب مراعاة العوامل المساعدة على المرض للوصول للتشخيص المبكر.

Introduction

Diabetes and its complications have become a huge burden. Its prevalence is increasing year after year. Globally, it is affecting around (382) million people. Prevalence rates are variable from one country to another, and Saudi Arabia is considered as one of the top ten countries with a prevalence reaching (23.9%) [1].

One complication is diabetic neuropathy. The commonest and earliest long-term complication [2]. The prevalence of diabetic neuropathy among diabetics has been reported as high as (50%) [3].Diabetic neuropathy is defined as sensorimotor polyneuropathy that is diagnosed in a diabetic patient when other causes are excluded [4]. While the association of pain is not necessary for diagnosis, it can accompany the condition in some cases [5].The pathogenesis of diabetic neuropathy is believed to be multifactorial. Which develops in the presence of risk factors through multiple pathways, including; oxidative stress, glycation end products and proinflammatory processes [6].Usually the diabetic patients who have developed neuropathy present with different clinical manifestations such as; numbness, loss of sensation, foot ulcers, and even amputation. With progression of complications, even mortality can result from such conditions [7]. Which makes the early recognition and management of diabetic neuropathy crucial for a better prognosis. Risk factors represent an important hint to the caring physician to screen and diagnose diabetic neuropathy. The risk factors can be easily identified. Hyperglycemia, high blood pressure, hyperlipidemia and smoking are well known risk factors [8]. Prevention is a key in diabetic neuropathy. Tight glycaemic control and lifestyle modification to reduce the cardiovascular risk are the mainstay of prevention. Other options represent symptomatic treatment by foot care, antidepressants and anticonvulsants [9].As we recognized the necessity of early diagnosis of diabetic neuropathy, and as no such topic has been studied in Qassim region, we conducted this study concerning the prevalence and associated risk factors of diabetic neuropathy.

Methods

Study design

This is was cross-sectional study.

The population

All the attendants primary care centers if Al-Qassim region were invited to participate in the questionnaire as long as they are eligible according to the criteria.

Inclusion criteria included patients diagnosed with type II diabetes mellitus, Age (25-90) of Both genders and all nationalities.

We excluded patients with neurological abnormalities (Epilepsy, Stroke, Parkinson, Cerebral Palsy, etc.) and patients whom age is less than 25 or more than 90.

Sample size

According to the General authority for statistical reports in Saudi Arabia, the general population of Al-Qasim is around (980,000) [10]. Which make the diabetic patients around (234220), considering that diabetes preva-

lence is (23.9%) [1].

Using an online sample calculator (Raosoft. com), with a margin error of (5%), confidence level (95%), and response distribution of (50%). The required sample size was calculated to be (384). Simple random sampling technique was used to include participants from outpatients of Al-Qassim primary health care centers.

Tools and data collection

The Michigan neuropathy screening instrument was translated and modified to include more questions regarding sociodemographic characteristics and diabetic history. The total score ranges from zero (0) up to (13). Total scores of 4 or more are considered as abnormal.

The data collection took place in primary health care and diabetic centers in Al-Qasim region. An electronic questionnaire form was developed via Google drive. The electronic form was used and accessed only by the investigators, the investigators did an interview with each participant and submit the answers directly to the form.

Statistical analysis

The statistical package for the social sciences (SPSS – version 21.0) were used to analyze the data. Tables and graphs were used to show the participants' responses and important findings. A new variable was computed to include all the Michigan questions to get the total scores, the mean and standard deviation was then calculated for the new variable. The Chi-square test was used to detect the significant findings.

Ethical considerations

Prior to collecting data, an ethical approval was obtained from the regional research ethics committee in Qassim province. Centres' managers were notified to gain permission for data collection. Furthermore, after explaining the nature and purpose of the study, an individual consent was gained from each participant.

Results

A total of (374) diabetic patients has been included in the analysis. The sociodemographic results showed most Saudi patients (97.1%), females represent (54%) of the total sample, about one third (33.2%) are well educated (university or higher), and more than half of our population were from Onaiza province. The mean age in our population was (53.61), with a standard deviation of (11.88), minimum age (25) and the maximum age (88) years.

The screening tool for diabetic neuropathy included a total of (15) questions. The responses are demonstrated in (Table 1).

Table 1: Michigan Neuropathy Screening Instrument responses

Question	Yes	No
1. Are your legs and/or feet numb?	45.7%	45.3%
2. Do you ever have any burning pain in your legs and/or feet?	45.7%	54.3%
3. Are your feet too sensitive to touch?	26.5%	73.5%
4. Do you get muscle cramps in your legs and/or feet?	26.5%	73.5%
5. Do you ever have any prickling feelings in your legs or feet?	44.4%	55.6%
6. Does it hurt when the bed covers touch your skin?	15.5%	84.5%
7. When you get into the tub or shower, are you able to tell the hot water from the cold water?	94.4%	5.6%
8. Have you ever had an open sore on your foot?	11.2%	88.8%
9. Has your doctor ever told you that you have diabetic neuropathy?	8.6%	91.4%
10. Do you feel weak all over most of the time?	45.7%	54.3%
11. Are your symptoms worse at night?	24.3%	75.7%
12. Do your legs hurt when you walk?	41.7%	58.3%
13. Are you able to sense your feet when you walk?	90.6%	9.4%
14. Is the skin on your feet so dry that it cracks open?	36.4%	63.6%
15. Have you ever had an amputation?	2.9%	97.1%

Considering a total score of four or more as abnormal. The overall percentage of abnormal scores was (38.2%), the frequencies of diabetic neuropathy is shown in (Table 2). The mean of total scores was (3.09) with a standard deviation of (2.44).

Table 2: The prevalence of diabetic neuropathy among our sample

Total scores	Frequency	Percentage (%)
1-3	231	61.8
More than (3)	143	38.2

The prevalence of hypertension among our sample (49.5%). Smoking prevalence was (15.8%), while (8%) were ex-smokers. The duration since the diagnosis of diabetes ranged from one year up to (37) years, with a mean of (11.31) and a standard deviation of (8.28).

Upon asking about pharmacological treatment, the responses were variant with the majority indicating multidrug approach to control diabetes (Table 3).

Significant associations of diabetic neuropathy were found with lower educational levels, presence of hypertension, use of insulin or multidrug, and higher body mass index (Fig 1).

Further analysis did not show any significant findings with smoking, age, sex or income. The analysed P-values are shown in (Table 4).

Table 3: Distribution of antidiabetic medications

Medication	Frequency	Percentage (%)
Metformin	96	25.7
Hypoglycemics agent	24	6.4
Insulin	57	15.2
Multidrug	178	47.6
I don't know	19	5.2

Fig. 1: Association of risk factors with diabetic neuropathy

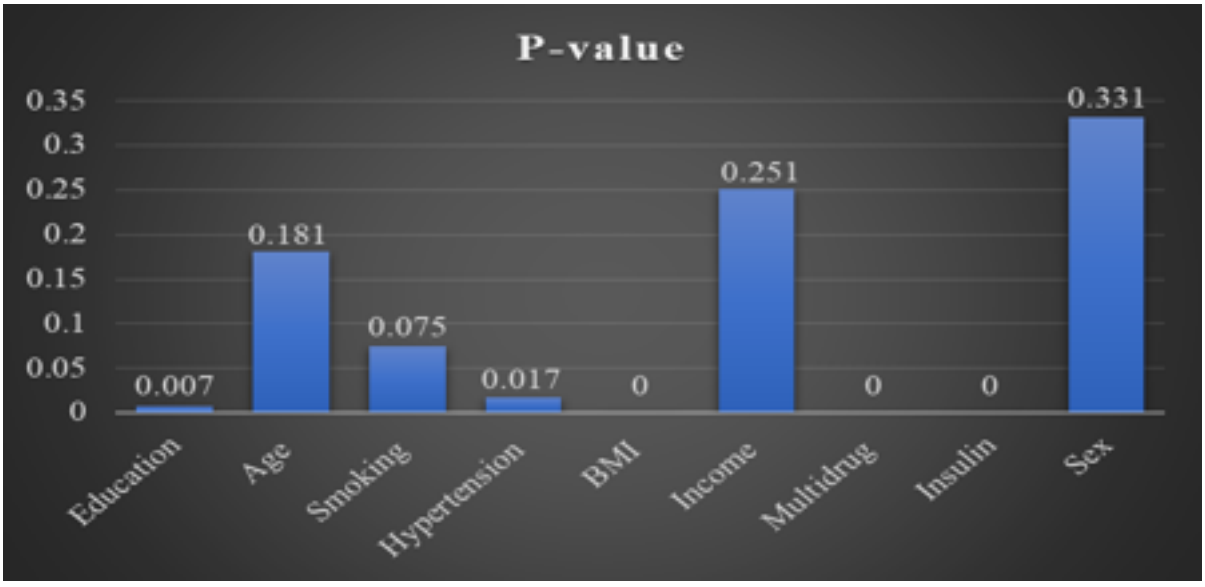


Table 4: Risk factors and its association with the presence of Diabetic Neuropathy

Variable	Test	P-value
Sex	Pearson Chi-square	0.309
Age	Pearson Chi-square	0.653
Education	Pearson Chi-square	0.031
BMI	Pearson Chi-square	0.032
Type of medication	Pearson Chi-square	0.000
Diagnosis of hypertension	Pearson Chi-square	0.009
Smoking	Pearson Chi-square	0.818
Years since diagnosis of DM	Pearson Chi-square	0.002

Discussion

In our study, we have used the Michigan neuropathy screening instrument considering total scores of four or more as abnormal. According to Herman et al. [11] this will make the performance of the instrument better. The overall prevalence of diabetic neuropathy DN considering four or more total scores as abnormal in Herman's study was (18%). However, our study found that (38.2%) had abnormal total scores. In the UK, the prevalence was found to be (34%), which is like the overall prevalence of our study [12]. From a local perspective, the reported number was variable. In a meta-analysis done in middle east countries and North Africa, Saudi Arabia was the highest country of DN prevalence (65.3%) [13]. Moreover, among Saudi diabetics who have the disease for ten years, the prevalence of distal DN is (38%) [14].

This study has focused on the significant association with diabetes neuropathy. Educational level, the BMI, hypertension, use of insulin and/or multidrug approach to control diabetes were risk factors significantly associated with total scores of four or more. The mentioned risk factors are well known and have been highlighted in the literature. While few studies have not indicated any risk factors to predict DN [15], many other major studies have indicated the importance of assessing risk factors in order to suspect DN and perform nerve conduction study accordingly. Factors found to be significant in this study has been supported in addition to other factors such as hyperlipidemia [16-19].

Algeffari [20] in a multicentre cross-sectional study that was carried in Riyadh. The study

has indicated smoking and female gender as important predictors to be looked for when considering painful diabetic neuropathy. Although, a similar prevalence to Algeffari was found in our study of about one third of our population, there were no significance found with smoking or female gender on our study. Advanced age, older duration with diabetes, and insulin use are associations suggested by Wang, et al. in a cross-sectional study among Saudi population. However, our study did not show any significance with age as a cofactor for developing the disease. The explanation could rely on the number of patients with type I diabetes mellitus (DM) included in the study. Such finding is predictable in Wang, et al. study as almost (95%) of the participants had type II DM. A well-known risk factor is longer duration since the diagnosis of DM. also, DN is found to be more among patients of DM type II [21]. Thus, it is expected that longer duration with DM type II will be found in older age, which results in the accumulation of two risk factors and make the patient more prone to develop DN.

Our population has a very low percentage (2.9%) in which they have undergone amputation due to complications of DM. However, literature showed that among diabetics in Saudi Arabia (23.5%) ended doing amputation due to diabetic complications. The commonest complication is peripheral diabetic neuropathy. Furthermore, it is the most frequent complication leading to limb amputation [22-23]. In such cases, the importance of patient education and awareness must be fulfilled to prevent foot ulcers and possible amputation [19].

Conclusion

The prevalence of diabetic neuropathy among diabetics of Qassim region is (38.2%). Although, is considered relatively low in compare to previous studies, it is important to predict the condition and diagnose it early for a better prognosis. The common risk factors include; hypertension, high BMI, insulin use, and low education. This emphasizes the importance of implementing a health program to educate diabetic patients about possible complications and neuropathy in specific.

Acknowledgment

The authors would like to thank all the participants and the centres' staff for their time and cooperation. The authors also would like to five a special acknowledgment for dr. Abdullah Ahmad Alhatlani for his help in data collection. This research project was supported by a grant from the "Research Center of the Female Scientific and Medical Colleges", Deanship of Scientific Research, King Saud University.

References

[1] Naeem Z. Burden of Diabetes Mellitus in Saudi Arabia. International Journal of Health Sciences 2015;9(3):5-6.

[2] Sheshah E, Algreeshah F, Al-Madani K, Al

Qaisi D, Madanat A. Diabetic peripheral neuropathy and sudomotor dysfunction in Saudi patients with newly diagnosed type 2 diabetes mellitus. J Diabetes Metab Disord Control 2017;4(2):70–72.

[3] Davies M, Brophy S, Williams R, Taylor A. The prevalence, severity, and impact of painful diabetic peripheral neuropathy in type 2 diabetes. Diab Care 2006; 29(7): 1518-1522.

[4] Petropoulos IN, Javed S, Azmi S, Khan A, Ponirakis G, Malik RA. Diabetic neuropathy and painful diabetic neuropathy in the Middle East and North Africa (MENA) region: Much work needs to be done. J Taibah Univ Med Sc 2016;11(4):284e294.

[5] Javed S, Petropoulos IN, Tavakoli M, Malik RA. Clinical and diagnostic features of small fiber damage in diabetic polyneuropathy. Handb Clin Neurol 2014; 126: 275e290.

[6] Yagihashi S, Mizukami H, Sugimoto K. Mechanism of diabetic neuropathy: Where are we now and where to go? Journal of Diabetes Investigation 2011;2(1):18-32.

[7] Boulton AJ, Vinik AI, Arezzo JC, Bril V, Feldman EL, Freeman R, Malik RA, et al. Diabetic neuropathies a statement by the American Diabetes Association. Diabetes Care. 2005;28:956–62.

[8] Kahn RC, Weir CG. Diabetes Mellitus. 13th edition. Pennsylvania, Lea & Febiger inc;1994.

[9] Tesfaye S. Advances in the management of diabetic peripheral neuropathy. Current Opinion in Supportive and Palliative Care 2009, 3:136–143.

[10] General authority for statistics, Kingdom of Saudi Arabia. Home > services guide > the twelfth guide 2001 > Inventory services in cities and villages by Administrative Regions. (Accessed 6th December 2018). Available from: https://www.stats.gov.sa/en/106.

[11] Herman WH, Pop-Busui R, Braffett BH, Martin CL, Cleary PA, Albers JW, et al. Use of the Michigan Neuropathy Screening Instrument as a measure of distal symmetrical peripheral neuropathy in Type 1 diabetes: results from the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications. Diabet Med. 2012;29(7):937-44.

[12] Abbott CA1, Malik RA, van Ross ER, Kulkarni J, Boulton AJ. Prevalence and characteristics of painful diabetic neuropathy in a large community-based diabetic population in the U.K. Diabetes care. 2011;34(10):2220-4.

[13] Garoushi, Sabri & Johnson, Mark & Tashani, Osama. Point Prevalence of Painful Diabetic Neuropathy in the Middle East and North Africa Region: A Systematic Review with Meta-analysis 2018;2(3):86-89.

[14] Vesti Nielsen, Jørgen. Peripheral neuropathy, hypertension, foot ulcers and amputations among Saudi Arabian patients with type 2 diabetes Diabetes Research and Clinical Practice 1998;41(1):63-69.

[15] Akbar, Daad. Diabetic Neuropathy: Discordance between Symptoms and Electrophysiological Testing in Saudi Diabetics. Bahrain Medical Bulletin 2002;24: 10-12.

[16] Mojaddidi M, Aboonq M, Al Nozha O, Abdulkadir SA, Elbab MF. Early Diagnosis of Diabetic Neuropathy in Almadinah Almunawwarah. Journal of Taibah University Medical Sciences. 2011;6:121-31.

[17] Wang DD, Bakhotmah BA, Hu FB, Alzahrani HA. Prevalence and correlates of diabetic peripheral neuropathy in a Saudi Arabic population: a cross-sectional study. PloS one. 2014;9(9):1-8.

[18] AlQuliti KW. Predictors of Painful Diabetic Neuropathy in Saudi Patients with Type 2 Diabetes: A Case-Control Study. J Pain Relief 2015;4:181.

[19] Goweda, Reda. Assessment of Knowledge and Practices of Diabetic Patients Regarding Diabetic Foot Care, in Makkah, Saudi Arabia. Journal of Family Medicine and Health Care 2017;3(1):17-22.

[20] Algeffari, Metab A. Painful Diabetic Peripheral Neuropathy among Saudi Diabetic Patients is Common but Under-recognized: Multicenter Cross-sectional study at primary health care setting. Journal of family & community medicine 2018;25(1):43-47.

[21] Kasim K & Al Nozha O. Prevalence and risk factors fo peripheral neuropathy in diabetic patients attending prince Abdul Aziz Bin Majed diabetes centre in Madinah, Saudi Arabia. Journal of disease and global health 2015;2:1-7.

[22] Elhadd T, Al-Amoudi AA, Alzahrani A. Epidemiology, Clinical and Complications Profile of Diabetes in Saudi Arabia: A Review. Annals of Saudi medicine. 2007;27:241-50.

[23] Omar MS, Khudada K, Safarini S, Mehanna S, Nafach J. DiabCare survey of diabetes management and complications in the Gulf countries. Indian J Endocr Metab 2016;20:219-27