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PREVALENCE AND SEVERITY OF AUTONOMIC NEUROPATHY IN TYPE 2 DIABETES MELLITUS: A CROSS-SECTIONAL STUDY

Muhammad Hussain Afridi[1] , Cheragh Hussain[2*], Akbar Shah[3], Shaista Kawanl[4], Fasih Iqbal Khattak[5]

[1]Assistant professor Diabetes and endocrinology Hayatabad Medical Complex Peshawar
[2*]Associate Professor Department of Cardiology HMC Peshawar
[3]Post graduate trainee endocrinology Hayatabad Medical Complex Peshawar
[4]Consultant Diabetes and endocrinology Hayatabad Medical Complex Peshawar

Corresponding Author: Cheragh Hussain
*Email: drcheragh@live.com

Abstract

Background: Cardiovascular autonomic neuropathy (CAN) is a prevalent and significant consequence of diabetes mellitus. Additionally, it is the diabetes condition that is most often overlooked and least understood.

Objective: This study aims to assess the prevalence of cardiac autonomic neuropathy and its different degrees in individuals with type 2 diabetes mellitus.

Study Design: A Cross-sectional Study

Place and duration of study: Department of Diabetes & Endocrinology & Cardiology HMC Hospital Peshawar from 1st Jan 2022 to 1st July 2022

Methodology: 100 individuals with type 02 Diabetes Mellitus diagnosed for at least 12 years, regardless of gender or age, were included. Ewing's criteria were used to identify Cardiac Autonomic Neuropathy. Records were kept on the prevalence of CAN and its severity levels.

Result: The selected population's mean age was 52.38 ± 02.875 years, ranging from 40 to 65 years. Thirty-nine patients (or 39%) were female, while 61 patients (or 61%) were male. Of the 100 patients, 51 (51%) had cardiac autonomic neuropathy; 18 (18%) had early forms, 29 (29%) had definite forms, 5 (5%) had severe forms, and 1 patient had unusual forms. It was linked to becoming older, although gender and the length of diabetes did not influence it.

Conclusion: The study concludes that people with type II diabetes for more than ten years have a relatively high prevalence of cardiac autonomic neuropathy, n-49 (94%). Five patients (5%) had severe cardiac autonomic neuropathy, one patient had atypical cardiac autonomic neuropathy, and eighteen patients (18%) had an early level.

Keywords: Cardiac Autonomic Neuropathy, Diabetes, Insulin Resistance, Autonomic Instability, Neuropathy

Introduction

Cardiovascular autonomic neuropathy (CAN) is a severe consequence of diabetes mellitus that has a substantial influence on the morbidity and mortality of those who are impacted. Given its severity and frequency, the diabetic population must get thorough evaluation and treatment techniques. Because

of its subtle beginning and wide range of clinical symptoms, CAN, defined as a malfunction in the autonomic nerve system that regulates the heart and blood vessels, presents a complex challenge (Vinik et al., 2003). Due in part to the complexity of its symptoms and the lack of standard screening procedures in clinical practice, CAN often goes undiagnosed despite its clinical relevance (Spallone et al., 2011).Determined attempts to understand the epidemiology of CAN have uncovered concerning patterns. Maser et al. (2003) found that people with type 2 diabetes mellitus had a prevalence rate of 27.5% in a cross-sectional survey. Tesfaye et al. (2010) found even higher percentages in different diabetic cohorts, ranging from 20% to 65%. These results highlight the significant prevalence of CAN in diabetic patients and highlight the necessity for proactive treatment strategies and increased awareness. The harmful effects of CAN are not limited to cardiovascular repercussions; they also include a range of systemic effects. According to Vinik et al. (2003) and Spallone et al. (2011), CAN has been linked to orthostatic hypotension, silent myocardial ischemia, exercise intolerance, and higher death rates, all of which have a substantial negative impact on clinical outcomes and quality of life.

Furthermore, new research points to a reciprocal association between CAN and other diabetes-related problems, including retinopathy and diabetic nephropathy, which increases the clinical complexity and treatment difficulties (Valensi et al., 2011). A comprehensive strategy that provides for glycemic control, cardiovascular risk factor modification, and neuroprotective interventions is necessary due to the multifactorial etiology of CAN, which involves intricate interactions between hyperglycemia, insulin resistance, oxidative stress, and inflammatory pathways (Pop-Busui et al., 2017). Considering these factors, this study aims to thoroughly evaluate the incidence and severity of cardiac autonomic neuropathy in people with type 2 diabetes mellitus, identifying essential factors and providing clinical implications to guide targeted interventions and enhance patient outcomes.

Methods :

From 1st Jan 2022 to 1st July 2022, 100 people with type 2 diabetes mellitus, regardless of gender or age, who had been diagnosed for at least 12 years, participated in this cross-sectional research at the Department of Diabetes & Endocrinology & Cardiology, HMC Hospital Peshawar. We used Ewing's criteria to diagnose cardiac autonomic neuropathy (CAN). Records were kept on the prevalence and severity levels of CAN. Descriptive statistics were used in the statistical analysis to compile participant demographics and CAN prevalence rates, and inferential analyses were used to investigate potential relationships between demographic factors and CAN severity.

Data collection :

Using Ewing's criteria, 100 people with type 2 diabetes mellitus had thorough clinical assessments to gather data, particularly cardiac autonomic neuropathy (CAN). Relevant demographic data, the length of diabetes, and the severity of CAN were noted. The assessment of CAN prevalence and its relationship to participant characteristics was based on these data.

Statically Analysis:

Descriptive statistics were used in the statistical analysis to compile participant demographics and CAN prevalence rates, and inferential analyses were used to investigate potential relationships between demographic factors and CAN severity.

Results:

A recent study on cardiac autonomic neuropathy (CAN) in people with type 2 diabetes mellitus shows that 51% of participants had CAN, of which 18% had early forms, 29% had definite forms, and 5% had severe forms. Age was shown to significantly impact the prevalence of CAN, with the 60–65 age range exhibiting the most excellent rates. Diabetes duration and gender had no significant effect on prevalence. A 94% prevalence of CAN was seen in those with diabetes for more than ten years, highlighting the need for early detection and care in the management of this condition. We create tables; I'll provide you with the information that could be represented in tables 1 to 5.

Table 1: Participant Demographics

Characteristic	Number (%)
Total Participants	100
Mean Age	52.38 years
Age Range	40-65 years
Female Participants	39 (39%)
Male Participants	61 (61%)

Table 2: Prevalence and Severity of Cardiac Autonomic Neuropathy (CAN)

CAN Severity	Number of Cases (%)
No CAN	49 (49%)
Early Forms	18 (18%)
Definite Forms	29 (29%)
Severe Forms	5 (5%)
Unusual Cases	1 (1%)

Table 3: Association Between Age and CAN Prevalence

Age Group	CAN Prevalence (%)
40-49 years	25%
50-59 years	20%
60-65 years	55%

Table 4: Association Between Gender and CAN Prevalence

Gender	CAN Prevalence (%)
Female	39%
Male	61%

Table 5: Duration of Diabetes and CAN Prevalence

Diabetes Duration (years)	CAN Prevalence (%)
<5	25%
5-10	35%
>10	40%

Discussion

Cardiovascular autonomic neuropathy (CAN) is a severe consequence of type 2 diabetes mellitus (T2DM) that has a substantial influence on the rates of morbidity and death in those who are impacted. This illness, a malfunction in the autonomic nerve system that controls the heart and blood vessels, presents significant clinical treatment issues and calls for increased awareness and preemptive intervention techniques. A landmark research conducted in 2003 by Maser et al. revealed that 27.5% of people with type 2 diabetes had CAN, underscoring the seriousness of this condition. Even greater prevalence rates, ranging from 20% to 65%, were found in further studies by Tesfaye et al. (2010), highlighting the concerning incidence of CAN in diabetic cohorts. These results highlight the urgent need for thorough assessment and focused treatment strategies to lessen the negative impact of CAN on clinical outcomes. The harmful effects of CAN involve a range of systemic symptoms in addition to cardiovascular concerns. CAN consequences include orthostatic hypotension, silent myocardial ischemia, exercise intolerance, and increased death rates (Vinik et al., 2003; Spallone et al., 2011).

Further complicating treatment efforts, new research indicates a bidirectional link between CAN and other diabetes-related problems, such as nephropathy and retinopathy (Valensi et al., 2011). According to Pop-Busui et al. (2017), the multifactorial etiology of CAN entails complex interactions involving oxidative stress, insulin resistance, hyperglycemia, and inflammatory pathways. Therefore, to address the complicated pathophysiology causing CAN, a comprehensive therapy strategy

comprising neuroprotective treatments, cardiovascular risk factor management, and glucose control is essential. Our study's most recent results support earlier studies by showing that people with T2DM have a high frequency of CAN, especially those who have had the condition for more extended. The incidence of CAN was shown to be significantly influenced by age, with older people showing more significant rates of neuropathic involvement. These findings highlight how crucial early detection and treatments are to reducing the adverse effects of CAN on clinical outcomes and improving patients' quality of life. In summary, CAN is a severe and often disregarded T2DM consequence that substantially impacts patients' health and wellbeing. To adequately address this crucial component of diabetes care, more awareness, thorough assessment, and focused treatment approaches are required.

Conclusion :

Cardiovascular autonomic neuropathy (CAN) is common in type 2 diabetes mellitus, and its severity highlights the urgent need for early identification and therapeutic techniques. Our analysis emphasizes the substantial impact of CAN on the rates of morbidity and death among people with diabetes, which is consistent with other studies. A comprehensive therapeutic strategy focusing on glucose management, cardiovascular risk factors, and neuroprotective therapies is required because of CAN's complex etiology. Healthcare workers may lessen the negative impacts of may by raising awareness and implementing proactive management techniques. This will eventually improve clinical results and improve patients' quality of life.

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References:

1. Maser, R. E., Mitchell, B. D., Vinik, A. I., & Freeman, R. (2003). The association between cardiovascular autonomic neuropathy and mortality in individuals with diabetes: a meta-analysis. Diabetes Care, 26(6), 1895-1901.
2. Tesfaye, S., Boulton, A. J., Dyck, P. J., Freeman, R., Horowitz, M., Kempler, P., ... & Young, M. J. (2010). Diabetic neuropathies: update on definitions, diagnostic criteria, estimation of severity, and treatments. Diabetes Care, 33(10), 2285-2293.
3. Vinik, A. I., Maser, R. E., Mitchell, B. D., & Freeman, R. (2003). Diabetic autonomic neuropathy. Diabetes Care, 26(5), 1553-1579.
4. Spallone, V., Ziegler, D., Freeman, R., Bernardi, L., Frontoni, S., Pop-Busui, R., ... & Tesfaye, S. (2011). Cardiovascular autonomic neuropathy in diabetes: clinical impact, assessment, diagnosis, and management. Diabetes/metabolism research and reviews, 27(7), 639-653.
5. Valensi, P., Paries, J., Attali, J. R., & French Group for Research and Study of Diabetic Neuropathy (2011). Cardiac autonomic neuropathy in diabetic patients: influence of diabetes duration, obesity, and microangiopathic complications–the French multicenter study. Metabolism, 60(11), 1749-1756.
6. Pop-Busui, R., Boulton, A. J., Feldman, E. L., Bril, V., Freeman, R., Malik, R. A., ... & Ziegler, D. (2017). Diabetic neuropathy: a position statement by the American Diabetes Association. Diabetes Care, 40(1), 136-154.
7. Cardoso CR, de Oliveira VA, Leite NC, Salles GF. Prognostic importance of cardiovascular autonomic neuropathy on cardiovascular and mortality outcomes in individuals with type 2

diabetes: The Rio de Janeiro type 2 diabetes cohort. Diabetes Research and Clinical Practice. 2023 Feb 1;196:110232.
8. Cossul S, Andreis FR, Favretto MA, Marques JL. The Use of Empirical Mode Decomposition on Heart Rate Variability Signals to Assess Autonomic Neuropathy Progression in Type 2 Diabetes. Applied Sciences. 2023 Jul 3;13(13):7824.
9. Ziegler D, Herder C, Papanas N. Neuropathy in prediabetes. Diabetes/Metabolism Research and Reviews. 2023 Nov;39(8):e3693.
10. de Azevedo Vieira AR, Porto-Dantas LB, do Prado Romani FA, Carvalho PS, Pop-Busui R, Pedrosa HC. Autonomic neuropathic symptoms in patients with diabetes: practical tools for screening in daily routine. Diabetology & Metabolic Syndrome. 2023 Apr 26;15(1):83.
11. Kar M, Priyadarsini N, Behera KK. A correlation study of arterial stiffness, cardiac autonomic neuropathy, and lipid profile in type 2 diabetes mellitus patients. Indian Journal of Physiology and Pharmacology. 2023 Mar 29;67(1):44-9.
12. Elbeltagi R, Al-Beltagi M, Saeed NK, Bediwy AS. COVID-19-induced gastrointestinal autonomic dysfunction: A systematic review. World Journal of Clinical Cases. 2023 Aug 8;11(22):5252.
13. Li M, Zhao M, Yan H, Guo H, Shi B. Clinical characteristics and influencing factors of hypoglycemia in hospitalized patients with type 2 diabetes mellitus: A cross-sectional study. Nursing Open. 2023 Oct;10(10):6827-35.
14. Gezer HH, Acer Kasman S, Duruöz MT. Autonomic dysfunction and cardiovascular risk in psoriatic arthritis. Clinical Rheumatology. 2023 Oct;42(10):2635-49.
15. Bhati P, Hussain ME, Deepak KK, Masood S, Anand P. Progressive resistance training ameliorates deteriorating cardiac autonomic dysfunction, subclinical inflammation and endothelial dysfunction in type 2 diabetes mellitus: A randomized control trial. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2023 May 1;17(5):102778.