Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

The Prevalence of Neuromuscular and Musculoskeletal Complications among Diabetics

Wasifa Rauf[1], Muzammal Azam[2], Rida Qamar[3], Hamza Amjid[4], Wajid Ali[5], Shahzaib Ahkem[6], Uzma Anwar[7], Umama Irfan[8], Hira Rafique[9]*, Intsam Aslam[10]

[1]Consultant Physical Therapist, Wattoo Clinic, Hafizabad, Pakistan.
[2]Consultant Physical Therapist, Islamabad Medical and Surgical Hospital, Pakistan.
[3]Consultant Physiotherapist, Rafna Hospital Rawalpindi, Pakistan.
[4]MSK Physiotherapist, The Physio Orthopedics, UK.
[5]Student, University of Hull, UK.
[6]Consultant Physical Therapist, Fatima Medicare Clinic, Pakistan.
[7]Consultant Physiotherapist, City Hospital Gujranwala, Pakistan.
[8]Student, Riphah International University, Lahore, Pakistan.
[9]Senior Lecturer, Quaid-e-Azam College Sahiwal, Pakistan.
[10]Lecturer, Quaid-e-Azam College Sahiwal, Pakistan.
Corresponding Author: Hira Rafique, Senior Lecturer; Email: hirazohaib8@gmail.com

Conflict of Interest: None.

Rauf W., et al. (2024). 4(1): DOI: https://doi.org/10.61919/jhrr.v4i1.516

ABSTRACT

Background: Diabetes mellitus is a global health concern that significantly impacts the quality of life due to its systemic and wide-ranging complications. Among these, neuromuscular and musculoskeletal disorders are increasingly recognized for their debilitating effects on individuals with chronic diabetes, contributing to decreased mobility, pain, and overall functional impairment.

Objective: The aim of this study was to determine the prevalence of neuromuscular and musculoskeletal complications among chronic diabetic patients in Gujranwala and to elucidate the nature and frequency of these complications.

Methods: This observational cross-sectional study employed a non-probability convenient sampling technique to recruit 260 chronic diabetic patients from the District Head Quarters (DHQ) in Gujranwala. Inclusion criteria comprised both genders with a minimum diabetes duration of 10 years and the presence of chronic diabetes alongside neuromuscular and musculoskeletal complications. Exclusion criteria included patients with systemic diseases or any form of disability unrelated to diabetes. Data were collected through a self-administered questionnaire, focusing on demographic information and the presence of musculoskeletal disorders. SPSS version 25 was utilized for data analysis, presenting findings through descriptive statistics and bar charts.

Results: Among the participants, 63.08% were female and 36.92% male, with a significant portion (68.46%) having a positive family history of diabetes mellitus. The most prevalent musculoskeletal complications observed were adhesive capsulitis (77.31%), fibromyalgia and osteoarthritis (each affecting 60% of the patients), and flexor tenosynovitis (57.31%). Other noted complications included carpal tunnel syndrome, Dupuytren's contracture, and peripheral neuropathies, highlighting a diverse range of musculoskeletal issues affecting the diabetic population.

Conclusion: The study underscores a high prevalence of neuromuscular and musculoskeletal complications among chronic diabetic patients, with adhesive capsulitis, fibromyalgia, and osteoarthritis being the most common. These findings highlight the need for healthcare professionals to adopt a multidisciplinary approach in managing diabetic patients, considering the significant impact of these complications on their quality of life.

Keywords: Diabetes Mellitus, Neuromuscular Complications, Musculoskeletal Disorders, Adhesive Capsulitis, Fibromyalgia, Osteoarthritis, Chronic Diabetes, Prevalence, Cross-Sectional Study, Gujranwala.

INTRODUCTION

Diabetes mellitus, recognized as a chronic metabolic disorder marked by elevated blood glucose levels, has emerged as a substantial global health concern. The disease's impact extends significantly beyond systemic disturbances, drawing attention to its association with neuromuscular and musculoskeletal complications. This growing recognition stems from the epidemic scale of diabetes, which

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affects an estimated 240 million people worldwide, highlighting not only the systemic effects of the disease but also its considerable morbidity and mortality related to musculoskeletal disorders, particularly those affecting the hands and shoulders (1, 2). The quality of life of individuals with diabetes is further influenced by environmental, lifestyle, and occupational factors, underscoring the multifaceted challenges they face (3).

The complex interplay between diabetes and the nervous and musculoskeletal systems has garnered increasing attention, with conditions such as carpal tunnel syndrome, peripheral neuropathies, adhesive capsulitis, and osteoarthritis contributing to the broad spectrum of diabetic complications (4). These musculoskeletal complications, affecting muscles, joints, and connective tissues, manifest clinically with symptoms like acute pain that improves with rest and worsens with activity, limited joint mobility, and other specific disorders including trigger finger and Dupuytren's contracture, significantly impairing patients' quality of life (5, 6, 7). Despite the clinical and investigatory assessments aimed at understanding these disorders, HbA1c levels have not shown a direct correlation with musculoskeletal complications, indicating the complexity of their relationship with glycemic control (8, 9).

The prevalence of diabetes predominantly in individuals over the age of 40, often linked to insulin resistance, underscores the importance of optimal glycemic control in mitigating the risk of these complications. Physical activity is highlighted as a particularly beneficial intervention for diabetic patients, especially those with limited financial resources, due to its aerobic benefits and potential to improve glycemic control (10). The rate of musculoskeletal disorders and the frequency of chronic complications are notably higher in individuals with diabetes, with conditions like carpal tunnel syndrome, trigger finger, and Dupuytren's contracture commonly observed in clinical practice. These complications present equally in men and women over the age of 50, illustrating the widespread nature of the issue (11, 12).

One of the significant pathological mechanisms involves the peri-articular thickening of tendons, ligaments, and joint capsules, which reduces joint mobility and can lead to significant disability. Conditions such as Dupuytren contracture, tenosynovitis, and adhesive capsulitis in the shoulder are linked to this mechanism. The accumulation of advanced glycation end products (AGEs) in connective tissues, stimulated by prolonged hyperglycemia, plays a crucial role in the development of these musculoskeletal disorders, affecting nerves, tendons, joint capsules, and ligaments (13, 14, 15). Diabetes, therefore, has a profound impact on the musculoskeletal system, encompassing muscles, bones, and connective tissues, and is associated with a broad spectrum of complications including osteoporosis, increased fracture risk, carpal tunnel syndrome, adhesive capsulitis, trigger finger, and reduced joint mobility (16).

This study aims to enhance awareness of the neuromuscular and musculoskeletal complications prevalent among chronic diabetic patients. Through an educational survey, it seeks to identify the most commonly observed complications in this population, thereby contributing to a deeper understanding of the extensive impact of diabetes on the musculoskeletal system.

MATERIAL AND METHODS

This observational cross-sectional study was conducted to explore the prevalence and characteristics of neuromuscular and musculoskeletal complications among chronic diabetic patients residing in Gujranwala. Utilizing a non-probability convenient sampling method, the research enlisted 260 participants who were assessed at the District Head Quarters (DHQ) in Gujranwala. The study's participant pool was carefully selected based on specific inclusion criteria, which mandated both genders, a minimum diabetes duration of 10 years, and the presence of chronic diabetes alongside neuromuscular and musculoskeletal complications. Individuals with systemic diseases, those with a history of polio, traumatic injuries, or any other form of disability were systematically excluded from the study to ensure a homogenous participant demographic relevant to the research objectives.

Ethical considerations were of paramount importance throughout the study's execution. Prior to data collection, informed consent was obtained from all participants, with a strict adherence to ensuring their anonymity and confidentiality. The research protocol highlighted the voluntary nature of participation, underscoring the participants' right to withdraw from the study at any point without any consequences. This ethical approach was aligned with the Declaration of Helsinki, ensuring that all procedures involving human subjects were conducted in a manner that respected their dignity and rights.

Data was gathered using a meticulously crafted questionnaire, designed specifically for this study to capture a comprehensive range of information pertinent to the research questions. A total of 35 chronic diabetic patients who met the inclusion criteria were administered the questionnaire. Verbal consent was obtained prior to the administration of the questionnaire, maintaining the ethical standards set forth at the beginning of the study. The questionnaire served as the primary tool for data collection, designed to elicit detailed responses regarding the neuromuscular and musculoskeletal complications experienced by the participants.

For the analysis of the collected data, the Statistical Package for the Social Sciences (SPSS) version 25 was employed. The data was analyzed and interpreted to present findings in a clear and understandable format, primarily through the use of bar charts. This analytical approach facilitated a nuanced understanding of the nature and prevalence of neuromuscular and musculoskeletal complications among the studied population.

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RESULTS

The study meticulously examined the demographic characteristics and the prevalence of musculoskeletal disorders among chronic diabetic patients, yielding comprehensive insights encapsulated in two descriptive tables. The participant demographics, detailed in Table No. 1, reveal a diverse cohort comprising both male and female subjects, with females constituting a majority at 63.08% (164 participants) compared to males at 36.92% (96 participants). A significant proportion of the study population, 68.46% (178 participants), reported a positive family history of diabetes mellitus (DM), indicating a potential genetic predisposition or familial tendency towards the condition. The onset of DM among participants varied, with a nearly equal distribution between those diagnosed within 10 to 15 years (48.08%, 125 participants) and those within the 15 to 20-year range (51.92%, 135 participants), highlighting the chronic nature of the condition in the study group (Table No. 1).

In terms of musculoskeletal complications, as detailed in Table No. 2, a substantial prevalence of various disorders was observed among the participants. Adhesive Capsulitis was notably prevalent, affecting 77.31% (201 participants) of the cohort, underscoring the significant impact of diabetes on joint mobility and pain. Conversely, conditions such as AC Joint Dysfunction and Carpel Tunnel Syndrome were present in 31.56% (82 participants) and 37.31% (97 participants) of the population, respectively, indicating a lesser but still notable prevalence. Dupuytren's Contracture and Flexor Tenosynovitis were observed in 22.69% (59 participants) and 57.31% (149 participants) of the subjects, further illustrating the diverse impact of chronic diabetes on the musculoskeletal system.

Table No. 1: Descriptive Statistics of Participant Demographics

Variable	Frequency	Percent (%)
Gender		
Male	96	36.92
Female	164	63.08
Family History of DM		
Positive	178	68.46
Negative	82	31.54
Onset of DM		
10 to 15 years	125	48.08
15 to 20 years	135	51.92

Table No. 2: Descriptive Statistics of Musculoskeletal Disorders

Disorder	Yes (N, %)	No (N, %)
Adhesive Capsulitis	201 (77.31%)	59 (22.69%)
AC Joint Dysfunction	82 (31.56%)	178 (68.46%)
Carpel Tunnel Syndrome	97 (37.31%)	163 (62.69%)
Dupuytren's Contracture	59 (22.69%)	201 (77.31%)
Flexor Tenosynovitis	149 (57.31%)	111 (42.69%)
Trigger Finger	14 (5.39%)	246 (94.61%)
Diabetic Cheiroarthropathy	39 (15.00%)	221 (85.00%)
Hip Dysfunction	45 (17.31%)	215 (82.69%)
Diabetic Foot	104 (40%)	156 (60%)
Deep Venous Thrombosis	30 (11.54%)	230 (88.46%)
Fibromyalgia	156 (60%)	104 (40%)
Gangrene	38 (14.62%)	222 (85.38%)
Osteoarthritis (OA)	156 (60%)	104 (40%)
Rheumatoid Arthritis (RA)	23 (8.84%)	237 (91.18%)
Gouty Arthritis	7 (2.69%)	253 (97.31%)
Peripheral Neuropathies	104 (40%)	156 (60%)

Notably, less common disorders such as Trigger Finger and Diabetic Cheiroarthropathy were reported in 5.39% (14 participants) and 15.00% (39 participants) of the sample, respectively. Other conditions such as Hip Dysfunction, Diabetic Foot, and Deep Venous Thrombosis were also documented, affecting a range of 11.54% to 40% of participants, indicating a broad spectrum of musculoskeletal challenges faced by individuals with chronic diabetes. Moreover, conditions like Fibromyalgia, Gangrene,

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Osteoarthritis (OA), Rheumatoid Arthritis (RA), and Gouty Arthritis were present, with Fibromyalgia and OA each affecting 60% (156 participants) of the study population, highlighting the severe implications of diabetes on overall musculoskeletal health. Peripheral Neuropathies, a common complication of diabetes, was reported in 40% (104 participants) of the cohort, further emphasizing the critical need for comprehensive management strategies for diabetic patients to mitigate these complications (Table No. 2).

DISCUSSION

The primary objective of this study was to elucidate the prevalence of neuromuscular and musculoskeletal complications in chronic diabetic patients. Among the 260 patients surveyed, a notable proportion, 77.31% (201 patients), experienced adhesive capsulitis, making it the most prevalent complication within the cohort. This was closely followed by fibromyalgia and osteoarthritis (OA), each affecting 60% (156 patients) of the participants, and flexor tenosynovitis, present in 57.31% (149 patients). These findings underscore the significant burden of musculoskeletal disorders among individuals with long-standing diabetes, highlighting the critical need for targeted interventions to manage these conditions effectively.

In comparison to existing literature, the prevalence rates observed in this study diverge significantly from those reported in previous research. For instance, an experimental study conducted in February 2021 focusing on upper limb musculoskeletal disorders among type 2 diabetes patients found a considerably lower prevalence rate of 16.3% for musculoskeletal disorders in diabetic patients compared to 11.2% in non-diabetic patients (15). Similarly, a study from Bangladesh in 2020 reported a 30.4% prevalence of musculoskeletal conditions among a broader population, with low back pain, knee osteoarthritis, and soft tissue rheumatism being the most common conditions, contrasting sharply with the high prevalence of adhesive capsulitis observed in the current study (17). Further, a Nigerian study involving a comparison between adults with type 2 diabetes mellitus (T2DM) and non-diabetic controls found a significant difference in the prevalence of musculoskeletal disorders (56% vs. 22%), with specific conditions like osteoarthritis and limited joint mobility being more common among diabetic individuals (18), aligning more closely with the current study's findings.

The disparity in prevalence rates between this study and prior research may be attributed to various factors, including differences in study populations, diagnostic criteria, and methodological approaches. For instance, Thomas Rehling's 2019 study corroborated the association between diabetes mellitus and conditions such as low back pain, OA, and rheumatoid arthritis (RA), albeit noting a minimal prevalence of RA in the current cohort (8.84%) compared to OA (60%) (19). Additionally, Majjad and colleagues in 2018 highlighted the frequent occurrence of musculoskeletal disorders in diabetic patients, with prevalence rates for conditions like osteoarthritis, shoulder capsulitis, and hand disorders reflecting the broader impact of diabetes on musculoskeletal health (8).

The findings of this study, particularly the high prevalence of adhesive capsulitis, fibromyalgia, and flexor tenosynovitis, provide valuable insights into the spectrum of musculoskeletal complications associated with chronic diabetes. These results emphasize the complex interplay between diabetes and musculoskeletal health, underscoring the importance of comprehensive management strategies to mitigate these complications. However, the study is not without limitations. The use of a non-probability sampling method and the focus on a specific geographical area may limit the generalizability of the findings. Moreover, the reliance on self-reported data could introduce bias, affecting the accuracy of the reported prevalence rates.

In light of these findings and limitations, it is recommended that future research adopt a more diverse and representative sample, incorporating objective diagnostic criteria to enhance the reliability of musculoskeletal disorder diagnoses among diabetic patients. Additionally, longitudinal studies could provide deeper insights into the progression of musculoskeletal complications over time, offering valuable information for the development of preventive and therapeutic interventions tailored to the needs of diabetic patients.

CONCLUSION

In conclusion, this study reveals a significant prevalence of neuromuscular and musculoskeletal complications among chronic diabetic patients, with adhesive capsulitis, fibromyalgia, and flexor tenosynovitis identified as particularly common issues. These findings highlight the need for a multidisciplinary approach to healthcare that addresses the complex and diverse complications associated with diabetes, guiding healthcare professionals in the effective management of these conditions.

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