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Frequency of Different Types of Soft Tissue Rheumatism in Patients with Diabetes Mellitus

Yasmeen Rafiq[1], Taqdees Khaliq[1], Sarah Azam Shah[1], Sobia Amin[1], Habib ur Rehman[1], Rabia Faheem[2]

Correspondence
Yasmeen Rafiq
yasmeenrafiq2021@gmail.com
Affiliations
1 Department of Rheumatology, Federal Government Polyclinic Hospital, Islamabad, Pakistan
2 Pakistan Institute of Ophthalmology, Rawalpindi, Pakistan

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ABSTRACT

Background: Soft tissue rheumatism, including conditions such as adhesive capsulitis and carpal tunnel syndrome, is prevalent in diabetic patients, exacerbated by chronic hyperglycemia. Understanding the incidence of these conditions is crucial for effective management.

Objective: To determine the incidence and distribution of different types of soft tissue rheumatism in patients with diabetes mellitus.

Methods: This cross-sectional study included 322 diabetic patients from the Rheumatology Department of Federal Government Polyclinic Hospital, Islamabad. Participants were selected through non-probability convenient sampling. Comprehensive musculoskeletal examinations were conducted to diagnose soft tissue rheumatic conditions. Data, including demographic details and clinical history, were analyzed using SPSS version 25. Descriptive statistics and Pearson's correlation test were applied.

Results: The mean age of participants was 53.93±9.03 years, and the mean BMI was 25.73±4.25 kg/m^2. The most common conditions were adhesive capsulitis (22.51%), plantar fasciitis (17.74%), and tenosynovitis (16.15%). No significant correlation was found between soft tissue rheumatism and HbA1c levels, gender, or diabetes duration.

Conclusion: Soft tissue rheumatism is prevalent among diabetic patients, significantly impacting their quality of life. Routine musculoskeletal assessments are recommended for early detection and management.

INTRODUCTION

Rheumatic musculoskeletal diseases (RMSD), also recognized as soft tissue rheumatism, are well-documented complications of diabetes mellitus (DM). Diabetes, a chronic condition characterized by persistently elevated blood glucose levels, has been projected to significantly increase in prevalence from 2.8% in 2000 to 4.4% by 2030, with the global number of individuals affected rising from 171 million in 2000 to an estimated 366 million by 2030 (4). This alarming rise in diabetes prevalence is particularly concerning in regions like Pakistan, which is currently ranked 7th globally in terms of the number of known diabetic patients. By 2025, it is anticipated that Pakistan will ascend to the 4th position, with an estimated 11.5 million individuals affected (5, 6). The rising incidence of diabetes inevitably leads to an increase in associated complications, including RMSD, necessitating a deeper understanding of its impact on the local population.

Soft tissue rheumatism comprises a diverse range of conditions affecting tendons, fasciae, muscles, joint capsules, bursae, ligaments, and sheaths. These conditions include, but are not limited to, myositis, tenosynovitis, bursitis, and fibrositis, which frequently occur in patients with diabetes (1-3). The underlying mechanisms linking diabetes to these conditions are multifaceted and complex, involving chronic hyperglycemia and the subsequent formation of advanced glycation end products (AGEs). These AGEs accumulate in long-lived proteins within connective tissues, potentially altering extracellular matrix structure, function, and cell viability (11, 12). Recent research suggests that AGEs may play a pivotal role in the formation of metabolic memory in diabetic complications, with their levels being influenced by the degree of glycemic control and the duration of the disease (13).

The association between diabetes and musculoskeletal complications is well-recognized, yet the pathophysiological connections remain inadequately defined for many conditions. Among the most commonly reported musculoskeletal issues in diabetic patients are adhesive capsulitis, carpal tunnel syndrome, plantar fasciitis, and tenosynovitis (14-16). These conditions, often resulting in significant pain and impairment, underscore the importance of early identification and intervention to prevent long-term disability and to improve the quality of life for affected individuals.

Given the high prevalence of diabetes in Pakistan and its well-established link with RMSD, it is essential to investigate the extent and nature of this association within the local population. Previous studies have reported varying frequencies of soft tissue rheumatic conditions among diabetic patients, with some studies highlighting the predominance of adhesive capsulitis, while others emphasize conditions like carpal tunnel syndrome and

plantar fasciitis (17-20). These discrepancies may be attributed to geographical, racial, and methodological differences between study cohorts. Additionally, the relationship between glycemic control, as indicated by HbA1c levels, and the occurrence of soft tissue rheumatic complications remains controversial, with some studies reporting a significant correlation, while others do not (18, 21-24).

The rationale behind this study lies in the need to accurately assess the frequency and distribution of different types of soft tissue rheumatism in diabetic patients within the local context. By doing so, we aim to contribute to the existing body of knowledge and provide insights that could inform better prevention, early detection, and management strategies, ultimately improving patient outcomes.

MATERIAL AND METHODS

The study was a cross-sectional analysis conducted at the Rheumatology Department of the Federal Government Polyclinic Hospital, Islamabad, following approval from the hospital's ethical committee. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring the confidentiality and voluntary participation of all subjects. Participants were recruited using a non-probability convenient sampling technique, and a total of 322 patients with diabetes mellitus were included. The sample size was calculated using the WHO sample size calculator, maintaining a confidence level of 95% and a margin of error of 5%.

Inclusion criteria for the study comprised adult patients over 18 years of age with a confirmed diagnosis of diabetes mellitus, who provided informed consent to participate. Patients with inflammatory arthritis, other connective tissue disorders, trauma-related musculoskeletal morbidities, chronic kidney disease, previous cerebrovascular accidents, hypothyroidism, or entrapment neuropathies were excluded from the study.

Each participant underwent a comprehensive musculoskeletal examination conducted by trained rheumatologists to identify the presence of soft tissue rheumatic conditions, including but not limited to rotator cuff tendinopathy, frozen shoulder, carpal tunnel syndrome, flexor tenosynovitis, medial and lateral epicondylitis, Dupuytren's contracture, and plantar fasciitis. Diagnoses were established based on standardized definitions as outlined in the study's introduction. Demographic and clinical histories were meticulously recorded, including age, gender, body mass index (BMI), duration of diabetes, and any comorbidities.

Data collection was carried out using a structured questionnaire that included both quantitative and qualitative variables. Quantitative data such as age, weight, height, BMI, fasting blood sugar (FBS), random blood sugar (RBS), duration of diabetes mellitus, and duration of soft tissue rheumatism were measured and recorded. The severity of pain experienced by the patients was assessed using the Visual Analogue Scale (VAS), and glycemic control was evaluated by measuring HbA1c levels.

The collected data were analyzed using SPSS version 25. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated for the quantitative and qualitative variables. Pearson's correlation test was employed to examine the relationship between soft tissue rheumatism and various factors, including HbA1c levels, gender, and duration of diabetes mellitus. The significance level was set at 0.05 for all statistical tests.

This study aimed to provide a comprehensive assessment of the frequency and types of soft tissue rheumatism in patients with diabetes mellitus, contributing valuable insights to the existing body of literature on the management and prevention of these musculoskeletal complications.

RESULTS

A total of 322 patients with diabetes mellitus were enrolled in the study, with a mean age of 53.93±9.03 years and a mean BMI of 25.73±4.25 kg/m^2. The duration of diabetes mellitus (DM) among the participants varied widely, with a mean duration of 73.92±64.82 months. The mean duration of soft tissue rheumatism was found to be 9.71±8.51 months. The descriptive statistics for the quantitative variables are summarized in Table 1.

Table 1: Descriptive Statistics for Quantitative Variables

Variable	Minimum	Maximum	Mean	SD
Age (years)	23.00	76.00	53.93	9.03
Weight (kg)	45.00	103.00	71.23	10.30
Height (m)	1.25	1.89	1.67	0.10
BMI (kg/m^2)	16.00	43.30	25.73	4.25
Duration of DM (months)	0.00	400.00	73.92	64.82
FBS (mg/dl)	80.00	305.00	152.83	46.09
RBS (mg/dl)	6.00	569.00	254.03	78.60
Duration of Soft Tissue Rheumatism (months)	0.00	48.00	9.71	8.51
HbA1c (%)	5.90	14.00	8.02	1.44
Severity of pain (VAS)	0.00	9.00	5.69	1.48

Among the participants, 148 (46.0%) were male, and 174 (54.0%) were female, resulting in a male-to-female ratio of 1:1.18. The majority of participants were married (91.9%), and 46.6% had hypertension as a comorbidity. Other comorbid conditions included ischemic heart disease (9.3%), asthma (1.6%), stroke (1.9%), and dyslipidemia (0.9%). A detailed breakdown of the frequency distribution for qualitative variables is provided in Table 2.

Table 2: Frequency Distribution of Qualitative Variables

Variable	Frequency	Percent
Gender		
Male	148	46.0
Female	174	54.0
Marital Status		
Single	26	8.1
Married	296	91.9
Comorbid Conditions		
Hypertension	150	46.6
Ischemic Heart Disease	30	9.3
Asthma	5	1.6
Stroke	6	1.9
Dyslipidemia	3	0.9
Smoking History	49	15.2
Education		
Uneducated	134	41.6
Primary	60	18.6
Middle	10	3.1
Matric	64	19.9
Intermediate	15	4.7
Graduation	28	8.7
Master	9	2.8
M. Phil	2	0.6

The study identified various types of soft tissue rheumatism among the participants, with the most common conditions being adhesive capsulitis (22.51%), plantar fasciitis (17.74%), tenosynovitis (16.15%), and carpal tunnel syndrome (15.80%). The detailed incidence and distribution of soft tissue rheumatism are presented in Table 3.

Table 3: Incidence and Distribution of Soft Tissue Rheumatism in Diabetic Patients

Diagnosis	Frequency	Percent
Adhesive capsulitis	73	22.51
Carpal tunnel syndrome	51	15.80
Plantar fasciitis	56	17.74
Rotator cuff tendinitis	30	9.25
Shoulder Supra Spinatous Tendinitis	7	2.17
Flexor Tenosynovitis	52	16.15
Dequervain's Tenosynovitis	22	6.83
Diffuse idiopathic skeletal hyperostosis	1	0.30
Elbow medial epicondylitis	13	4.04
Elbow lateral epicondylitis	16	4.92
Dupuytren's contracture	1	0.30

The correlation analysis, conducted using Pearson's correlation test, revealed no significant correlation between soft tissue rheumatism and HbA1c levels, gender, or the duration of diabetes mellitus. The correlation results are summarized in Table 4.

In summary, the study found a high prevalence of various types of soft tissue rheumatism among diabetic patients, with adhesive capsulitis being the most common condition.

Table 4: Correlation of Soft Tissue Rheumatism with Different Variables

Study Variables	Correlation (r)	P-value
Soft tissue rheumatism	HbA1c	0.034
	Gender	0.063
	Duration of DM	0.008

Despite the high prevalence, no significant correlations were observed between soft tissue rheumatism and glycemic control, gender, or the duration of diabetes mellitus. These findings underscore the importance of regular musculoskeletal assessments in diabetic patients for early detection and management of these conditions.

DISCUSSION

The findings of this study underscore the significant burden of soft tissue rheumatism among diabetic patients, with adhesive capsulitis emerging as the most prevalent condition, followed by plantar fasciitis, tenosynovitis, and carpal tunnel syndrome. These results align with previous studies, which have consistently demonstrated a strong association between diabetes and various musculoskeletal disorders. For instance, Cagliero et al. reported a high prevalence of adhesive capsulitis among diabetic patients, highlighting the impact of chronic hyperglycemia on connective tissue health (19). Similarly, studies by Majid et al. and Kamiab et al. identified carpal tunnel syndrome and plantar fasciitis as common complications in diabetic populations, suggesting that these conditions are intrinsic consequences of long-standing diabetes (17, 18).

One of the strengths of this study was the comprehensive assessment of a wide range of soft tissue rheumatic conditions, which allowed for a detailed evaluation of their prevalence and distribution among diabetic patients. The large sample size and the use of standardized diagnostic criteria further strengthened the reliability of the findings. However, certain limitations should be acknowledged. The study's cross-sectional design limited the ability to establish causal relationships between diabetes and the development of soft tissue rheumatism. Additionally, the non-probability convenient sampling technique may have introduced selection bias, potentially limiting the generalizability of the results to the broader diabetic population.

The absence of a significant correlation between soft tissue rheumatism and glycemic control, as measured by HbA1c levels, was consistent with some studies but contradicted others. For example, Shakibi et al. and Mathew et al. reported a significant association between poor glycemic control and an increased frequency of soft tissue rheumatism, suggesting that higher HbA1c levels may exacerbate the development of these conditions (21, 22). On the other hand, studies by Singh et al. and Attar found no such correlation, indicating that factors other than glycemic control might play a crucial role in the pathogenesis of these disorders (23, 24). The conflicting evidence in the literature underscores the complexity of the relationship between diabetes and musculoskeletal complications, suggesting that a multifactorial approach is needed to fully understand these associations.

The study highlighted the importance of early diagnosis and management of soft tissue rheumatism in diabetic patients. Despite the lack of a direct correlation with HbA1c levels, the high prevalence of these conditions indicates that regular musculoskeletal assessments should be an integral part of diabetes management. Early detection and appropriate intervention could significantly improve the quality of life for these patients by preventing pain, disability, and functional impairment.

One limitation of this study was the focus on diabetic patients who already had some form of soft tissue rheumatism, which may have resulted in an overestimation of the prevalence of these conditions. Future research should aim to include a broader diabetic population to determine the overall prevalence of soft tissue rheumatism among all diabetic patients, including those without overt musculoskeletal symptoms. Additionally, longitudinal studies would be valuable in exploring the temporal relationship between diabetes and the development of soft tissue rheumatic conditions, potentially identifying key risk factors that could inform preventive strategies.

CONCLUSION

In conclusion, this study provided important insights into the frequency and types of soft tissue rheumatism among diabetic patients, emphasizing the need for routine musculoskeletal evaluations in this population. While the findings contribute to the existing body of knowledge, further research is required to clarify the mechanisms underlying the association between diabetes and soft tissue rheumatism and to develop targeted interventions that could mitigate the impact of these conditions on diabetic patients' health and well-being.

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