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Comparison of musculoskeletal manifestations in diabetic and prediabetic patients

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Abstract
The prevalence of type 2 diabetes mellitus for all age groups worldwide was estimated to be of 2.8% in 2000 and is predicted to affect 4.4% by 20301. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 20301.Diabetes mellitus has been defined as follows:

1. **American association of diabetes:** Diabetes is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both.
2. **Who definition:** Diabetes is a chronic disease, which occurs when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces.
3. **Harrison's principle of internal medicine:** DM refers to a group of common metabolic disorders that share the phenotype of hyperglycemia.

Aims: The study was aimed at comparing the range and association of musculoskeletal manifestations in patients with diabetes and pre-diabetes in the Kashmiri population.
Methodology: This observational study was performed at SKIMS MCH Bemina at Department of Orthopedics from November 2020 to November 2022. A total of 300 patients were enrolled for the study after obtaining relevant approval from the Ethical Committee of SKIMS MCH Bemina.
Results: As per GALS screening, 61 (40.7%) in Group D compared to 32 (21.3%) in Group PD were having abnormalities in Arms, 50 (33.3%) patients in Group D against 29 (19.3%) patients in Group PD had abnormalities in legs, 20 (13.3%) patients in Group D compared to 7 (4.7%} patients in Group PD with spine abnormalities. The difference observed was statistically significant with $p < 0.05$. Overall there were 91 (60.7%} patients in Group D with abnormalities compared to 62 (41.3%} patients as per GALS screening with a p value of 0.001.
Conclusion: These manifestations that seem to have a statistically significant difference across the two group are: Dequervains tenosynovitis, Carpal tunnel syndrome, Lateral epicondylitis, Rotator cuff tendintis, Osteoarthritis, Trochanteric bursitis, diffuse idiopathic skeletal hyperostosis (DISH), Osteoporosis. These manifestations should be specifically sought in diabetic patients so that a holistic management protocol can be offered to these patients.

Keywords: Musculoskeletal, manifestations, diabetic, pre-diabetic patients

Introduction
Macrovascular complications such as coronary artery disease leading to angina or myocardial infarction, Diabetic myonecrosis, Peripheral vascular disease, Stroke, Carotid artery stenosis, Female infertility. Musculoskeletal complications are also associated with the type 2 diabetes mellitus: Type 2 diabetes mellitus can cause chronic irreversible damage to many organs and systems, although the precise etiology of diabetes associated musculoskeletal disorders remains uncertain. There is evidence that hyperglycemia may accelerate non-enzymatic glycosylation and abnormal collagen deposition in periarticular connective tissues which alters structural properties and leading to diffuse arthrofibrosis [3, 4]. Recent data show that the prevalence of musculoskeletal manifestations in the hands and shoulders in patients with type 1 or type 2 diabetes is 30% [5]. As a result patient's quality of life may decrease and they may be debilitated by cheiroarthropathy, frozen shoulder, Dupuytren's contracture and trigger finger. Cheiroarthropathy also known as limited joint mobility of the hands, is characterized by a thick, tight, waxy skin, mainly on the dorsal aspect of hands, with flexion deformities of the metacarpophalangeal and interphalangeal joints. Rheumatic disorders in diabetes mellitus type 2 have been associated with disease duration, degree of metabolic control and the presence of

end organ damage. The pathogenesis of chieroarthropathy is multifactorial with reasons including overuse, inflammation, trauma, mechanical impingement, genetics, and changes of immunologic, biochemical and endocrinologic conditions [6, 7]. Pain is a frequent problem in patients with diabetes type 2. The musculoskeletal pain associated with higher BMI, reduced quality of life and low physical function. Diabetes mellitus type 2 is associated with an increased risk of having MSK pain.

Need for the study

Diabetes mellitus (DM) is among the first seven leading causes of death worldwide. It involves multiple organs diagnosis and management of musculoskeletal complications leads to more inactive life style, poorer control of blood sugar, earlier appearance of DM complications and consequently, worsened quality of life. Early diagnosis of musculoskeletal complications in diabetic patients can prevent early onset of long-term morbidities. A few investigators demonstrated age and DM duration as risk factors for musculoskeletal manifestations. For instance, Hoff *et al.* [8] demonstrated an odds ratio (OR) of 1.6 for patients aged < 60 with DM versus subjects aged < 60 with no DM, whereas for those aged ≥ 60 years, the OR was only 1.1. Similarly, Mathew *et al.* [6] showed an OR of about 1.5 for DM duration as a significant risk factor for musculoskeletal manifestations. Two studies also revealed musculoskeletal-associated co-morbidities such as retinopathy inpatients with DM [3, 11]. For example, Attar *et al.* [3] showed an OR of 3.21 for retinopathy. The prevalence of pre-diabetic state is increasing worldwide and will include closeto half a billion world population by 2030. 12 Rough estimates show that for every diabetic patient, there are three pre-diabetic patients aged ≥ 20 years in the US the picture of musculoskel *et al*. involvement in this phase has been less clearly drawn. The nature, prevalence and the determinant factors of musculoskeletal manifestations in diabetic and pre-diabetic patients have not yet been studied in detail in Iran. The current study was conducted to assess the pre-valence of musculoskeletal manifestations in a sample of patients with DM and those with prediabetes and com-pare the findings between the two groups.

Aim of the study

The study was aimed at comparing the range and association of musculoskeletal manifestations in patients with diabetes and pre-diabetes in the Kashmiri population

Materials and Methods

This observational study was performed at SKIMS MCH Bemina at Department of Orthopedics from November 2020 to November 2022. A total of 300 patients were enrolled for the study after obtaining relevant approval from the Ethical Committee of SKIMS MCH Bemina. Inclusion Criteria are all diabetic and pre diabetic patients attending the OPD of the Orthopedics and General Medicine departments were examined for musculoskeletal manifestations. At least 300 patients attending the OPD with more than 25 years age and fulfilling the National Diabetes Data Group Classification for diabetes, which defines diabetes as present from any two of the following tests on different days40 and pre-diabetes was taken up for this study. Diabetes criteria are Symptoms of diabetes mellitus plus random glucose concentration >200mg /di., FBS >126mg/dl., 2 hours postprandial blood sugar >200mg/dl during an oral glucose tolerance test, Or HbAlC >6.5% pre-diabetic criteria Before people develop type 2 diabetes, they almost always have prediabetes - blood glucose levels that are higher than normal but not yet high enough to be diagnosed as diabetes. Pre-diabetes is impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), depending on what test was used when it was detected. This condition puts you at a higher risk for developing type 2 diabetes and cardiovascular disease. Fasting Plasma Glucose (FPG) 100-125mg/dl. OGTT Blood sugar level of 140-199 mg/dl 2hrs after taking 75gram of glucose HbA1C - 5.7 - 6.4% Levels above these limits would justify a diagnosis of diabetes. Exclusion Criteria are Patients with connective tissue disease like rheumatoid arthritis, secondary osteoarthritis, SLE and spondyloarthritides. The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean± SD and categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar and pie diagrams. Student's independent t-test or Mann-Whitney U-test, whichever feasible, was employed for comparing continuous variables. Chi-square test or Fisher's exact test, whichever appropriate, was applied for comparing variables. A P-value of less than 0.05 was considered statistically significant.

Results

Table 1: Shoulder manifestations in the two groups

Shoulder manifestations	Group D		Group PD		P-value
	No.	% age	No.	%age	
Rotator cuff tendinitis	18	12.0	6	4.0	0.018*
Bicipital bursitis	2	1.3	1	0.7	1.000
Adhesive Capsulitis	7	4.7	1	0.7	0.067

*Statistically Significant Difference (P-value <0.05)

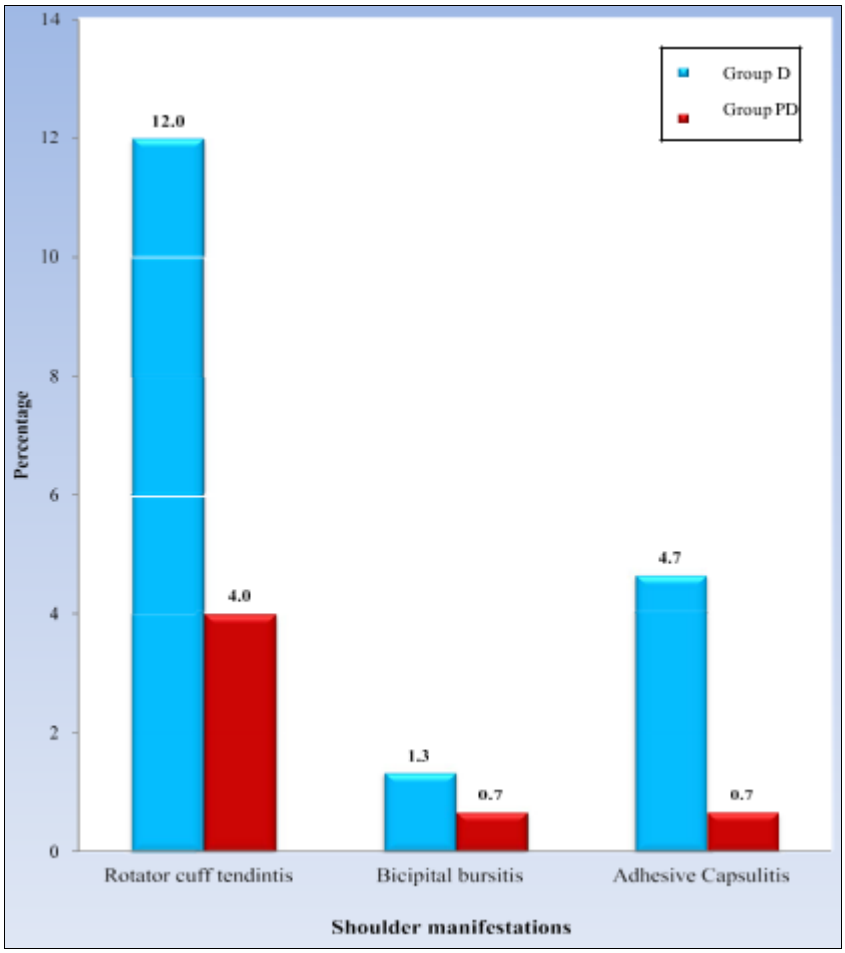

Fig 1: Shoulder manifestation in the two groups

Rotator cuff tendinitis was involved in 18 (12%) patients in Group D compared to 6 (4%) patients with Group PD with a statistically significant difference (p 0.018). Bicipital bursitis was observed in 2 (1.3%) patients compared to 1 (0.7%) patients with an insignificant statistical difference (p 1.000). Adhesive capsulitis was seen in (4.7%) patients in Group D compared to 1 (0.7%) patient in Group PD with a statistically insignificant difference (p 0.067).

In Group D, 4 patients had both rotator cough tendinitis and adhesive capsulitis.

Table 2: Knee manifestations in the two groups

Knee manifestations	Group D		Group PD		P-value
	No.	% age	No.	%age	
Prepatellar bursitis	0	0.0	1	0.7	1.000
Anserine bursitis	4	2.7	4	2.7	1.000
Osteoarthritis	49	32.7	24	16.0	0.001*

*Statistically Significant Difference (P-value <0.05)

Prepatellar bursitis was seen in 1 (0.7%) patient in Group PD against none in Group D with a statistically insignificant difference (p 1.000). Anserine bursitis was observed in 4 (2.7%) patients in Group D and Group PD each. Osteoarthritis was found in 49 {32.7%) patients in Group D against 24 (16%) patients in Group PD with a statistically significant difference (p 0.001).

In Group D, 3 patients had both osteoarthritis and anserine bursitis.

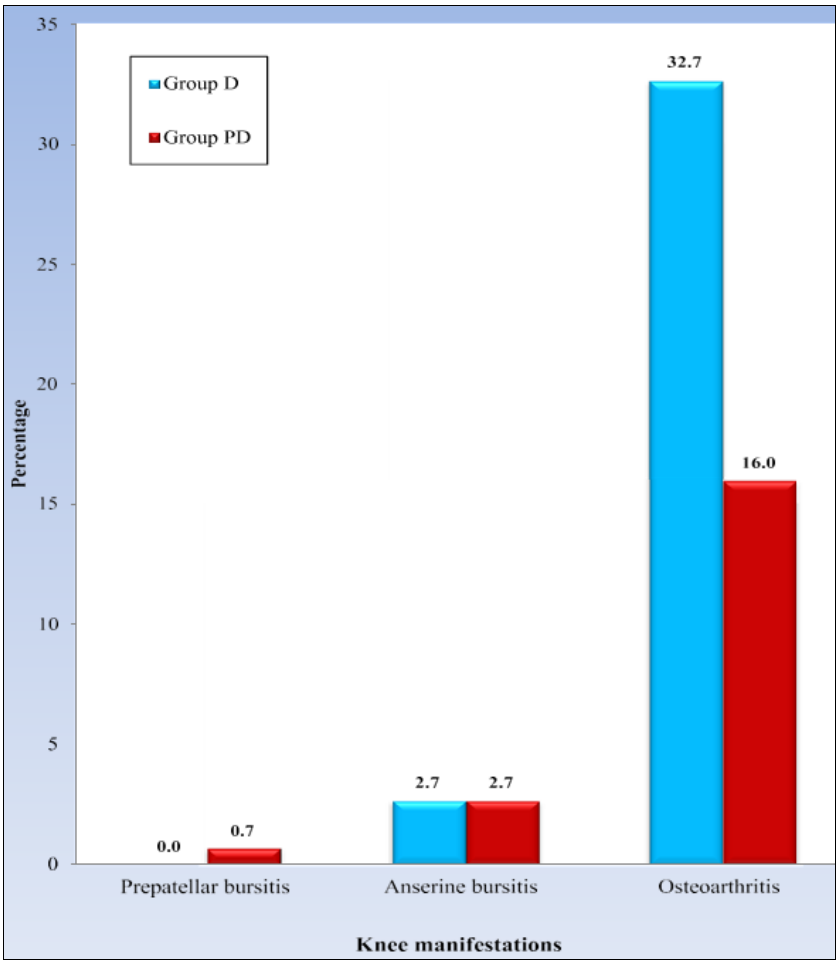

Fig 2: Knee manifestation in the two groups

Discussion

The present study was conducted on 300 patients equally distributed into two groups *viz*. Diabetics (Group D, n=150) and Pre¬ Diabetic (Group PD, n=150). Patients age ranged between 26-70 years in both the study groups. The mean age in Group D was 48.1.±11.45 years and in Group PD the mean age was 46.5_±10.65. There was statistically insignificant association between age and two study groups. There was female predominance in both the study groups' *viz*. 80 (53.3%) females against 70 (46.7%) males in Group D. In group PD, females constituted 86 (57.3%) patient population against 64 (42.7%) males. There was statistically insignificant association between gender and two study groups ($p > 0.05$).AI-Oayan LI *et al*., (2020) 37 did a study in which 208 patients were included with average age of 53 years with a range of 31-63 years with a female dominance, 76.6% females against 23.4% males. Bhat TA *et al*., (2016)26 did a study on 703 patients with 403 diabetics and 300 non¬ diabetics. There was insignificant statistical difference between age and two study groups. Average age of the patients in Diabetes Group was 51.6 years compared with 52.1 years in Non-Diabetic Group. Females were considerably more in both the study groups in their study with 259 females against 144 males in Diabetic Group and 196 females against 104 males in Non-Diabetic Group. Bhat TA *et al*., (2019) 35 also studied musculoskeletal manifestations in type 2 Diabetes mellitus in rural population of Himachal Pradesh, India. In their study of 350 cases 135 (38.5%) were males and 215 (61.5%) females with an average age of 51.5 years with range from 42 to 79 years.

Conclusion

These manifestations that seem to have a statistically significant difference across the two group are: Dequervains tenosynovitis, Carpal tunnel syndrome, Lateral epicondylitis, Rotator cuff tendintis, Osteoarthritis, Trochanteric bursitis, diffuse idiopathic skeletal hyperostosis (DISH), Osteoporosis. These manifestations should be specifically sought in diabetic patients so that a holistic management protocol can be offered to these patients. The present study was conducted on 300 patients equally distributed into two groups *viz*. Diabetics (Group D, n=150) and Pre- Diabetic (Group PD, n=150). Study patients age ranged between 26-70 years in group PD and age ranged between 26-72 year in groups D.

Conflict of Interest

The authors certify that they have no involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this paper.

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