

# Prevalence of Musculoskeletal Disorders in Type 2 Diabetes Mellitus Patients of Tertiary Care Center of Gwalior, India

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## Abstract

**Objective:** In the current scenario, many patients were suffering from musculoskeletal disorders (MSDs) due to uncontrolled diabetes. Type 2 diabetes mellitus (T2DM) causes secondary complications of articular surface of capsular membrane of joints. That's why this study is intended to evaluate the prevalence of musculoskeletal disorders in type 2 diabetic subjects of tertiary care centre of Gwalior, India. **Methods:** 400 diabetic subjects, selected via screening through survey in the OPD and IPD of Department of Orthopedics, J. A. Group of Hospitals, Gwalior (M.P.). The standard screening procedures such as glycated haemoglobin and musculoskeletal complication assessment were the criteria for selecting type 2 diabetes mellitus patients and T2DM patients with musculoskeletal disorders. The musculoskeletal complications were assessed by standard methods. **Result:** The prevalence of MSDs in T2DM was 75% with 43.5% male and 31.5% female suffered from various MSDs. The Dupuytren's contracture, frozen shoulder had more prevalence in T2DM. The male T2DM and female T2DM had maximum prevalence of frozen shoulder and Dupuytren's contracture respectively. **Conclusion:** The MSDs were prevalent in T2DM patients. So, proper care must be taken to prevent the complications of MSDs in T2DM patients. Good glycemic control is necessary to prevent the MSDs complications in T2DM.

**Keywords:** T2DM, MSDs, Dupuytren's contracture, frozen shoulder, collagen, AGEs.

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## INTRODUCTION

Diabetes mellitus is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia which leads to acute and chronic biochemical and anatomical consequence which can damage tissues, organ or organ system [1, 2]. Diabetes is rapidly increasing epidemic in India affecting more than 62 million individuals. The number will increase to 366 million in 2030 with maximum Indian diabetic patients in the World [3]. The chronic complication of Diabetes mellitus is a leading cause of death and disability. Type 2 diabetes mellitus (T2DM) is a multi-systemic disease with development of additional manifestation such as musculoskeletal disorders (MSDs) [4]. The hyperglycemia in T2DM is the main cause of organ dysfunction like frozen shoulder (adhesive capsulitis), limited joint mobility (diabetic chiroarthopathy Dupuytren's contracture, carpal tunnel syndrome, flexor tenosynovitis (trigger finger), DISH (diffuse idiopathic skeletal hyperostosis), Charcot's joints, osteomyelitis, reflex sympathetic

dystrophy, and diabetic amyotrophy [5]. Numerous musculoskeletal disorders had been found in diabetic patients in various research studies [6-8]. Therefore, this study is intended to determine the prevalence of musculoskeletal disorders in T2DM patients.

## MATERIAL AND METHODS

The cross-sectional hospital survey based study design was conducted on 400 diabetic subjects, selected via screening through survey in the OPD and IPD of Department of Orthopedics, G.R. medical college and J. A. Group of Hospitals, Gwalior (M.P.). The standard screening procedures such as glycated haemoglobin and musculoskeletal complication assessment were the criteria for selection T2DM patients and T2DM with MSDs patients. The musculoskeletal complications was assessed by various methods like the 'prayer sign' for Cheiroarthopathy, pain in the shoulder for at least 1 month, an inability to lie on the affected shoulder and restricted active and passive shoulder joint movements in at least three

planes for frozen shoulder, features examination on a palmar or digital nodule, tethering of palmar or digital skin, a pretendinous band and a digital flexion contracture for Dupuytren's contracture, thickened flexor tendon with locking phenomenon during extension or flexion of any finger for Trigger finger, joint pain, swelling, and stiffness, tenosynovitis include de Quervain tendinopathy and stenosing tenosynovitis for tenosynovitis. The subject with age below 40, type 1 Diabetes mellitus, history of trauma, patient having DM but complication develop after fracture, dislocations, malignancy and Autoimmune disease were excluded from the study. For the statistical analysis, the data was entered in Microsoft Excel and coding and cleaning was done in same. The data was analyzed by using the Statistical Package for the Social Sciences, version 24.0 (SPSS software).

**RESULTS**

The prevalence of MSDs in T2DM is 75% with 43.5% male and 31.5% female suffered from

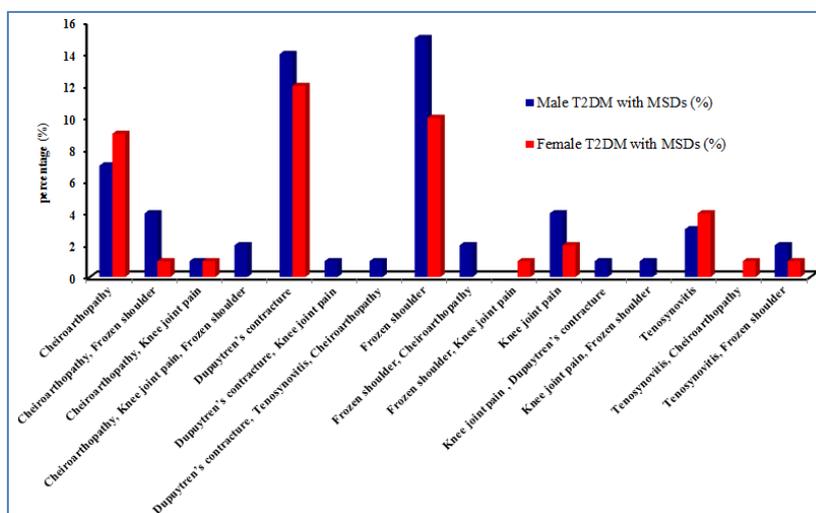
various MSDs shown in table 1. Prevalence of T2DM with MSDs subjects according to musculoskeletal disorders was shown in Table 2. Likewise gender wise prevalence of T2DM with MSDs subjects according to musculoskeletal disorders was shown in figure1. The Dupuytren's contracture had maximum prevalence in T2DM patients followed by frozen shoulder then cheiroarthopathy. The male T2DM had maximum prevalence of frozen shoulder then Dupuytren's contracture. The female T2DM had maximum prevalence of Dupuytren's contracture then frozen shoulder.

**Table-1: Distribution of total T2DM subjects (400) and T2DM with MSDs subjects and further gender wise distribution of the same**

T2DM		T2DM with MSDs subjects	
400		N= 300 (75%)	
Male	Female	Male	Female
234	166	174 (43.5%)	126 (31.5%)

**Tabl-2: Prevalence of T2DM with MSDs subjects according to musculoskeletal disorders**

Musculoskeletal disorders	T2DM with MSDs (%)
Cheiroarthopathy	16
Cheiroarthopathy, Frozen shoulder	5
Cheiroarthopathy, Knee joint pain	2
Cheiroarthopathy, Knee joint pain, Frozen shoulder	2
Dupuytren's contracture	26
Dupuytren's contracture, Knee joint pain	1
Dupuytren's contracture, Tenosynovitis, Cheiroarthopathy	1
Frozen shoulder	25
Frozen shoulder, Cheiroarthopathy	2
Frozen shoulder, Knee joint pain	1
Knee joint pain	6
Knee joint pain , Dupuytren's contracture	1
Knee joint pain, Frozen shoulder	1
Tenosynovitis	7
Tenosynovitis, Cheiroarthopathy	1
Tenosynovitis, Frozen shoulder	3



**Fig-1: Gender wise prevalence of various musculoskeletal disorders in type 2 diabetes mellitus patients**

## DISCUSSION

Our results showing the prevalence of MSDs in T2DM was 75% which is supported by the study conducted in the Diabetes Center of the Hippokratia University Hospital which showed the 82.6% musculoskeletal abnormalities in T2DM patients [9]. This study shows that the prevalence is very common in T2DM patients. That why, there should be musculoskeletal examination for DM patients. One of the study conducted by Halesha BR *et al.* in 2014 at the tertiary care centre of southern India also found that the MSDs is more common in diabetic population than non-diabetic population [10]. Few researches also had shown very less prevalence of MSDs in T2DM patients which was not in favor of our study [11-12]. The female T2DM had maximum prevalence of Dupuytren's contracture then frozen shoulder which is also supported by Kamath *et al.* [13] and Aydeniz A [14]. The exact etiology of MSDs in T2DM is still not clear. The MSDs in T2DM is very complex and multifactorial. The factors may leads to alteration of the subcutaneous tissues, joints capsule, fibrous capsule, synovial membrane and finally the alteration in the structure and composition of collagens [15]. In T2DM, prolonged hyperglycemia causes nonenzymatic glycosylation of collagen. There are two types of advanced glycated end products (AGEs)-those that form intermolecular cross-links and those that remain non-cross-linked. Cross-linked collagen molecules obstruct collagen degradation primarily by decreasing their conformational flexibility and elasticity. Non-cross-linking AGEs makes the collagen more vulnerable to collagenolysis [16]. This glycosylated cross-linked collagens are usually resistant to mechanical and enzymatic degradation, and glycosylated cross-linked collagens accumulation in the connective tissue of patients with DM. Non-enzymatic glycosylation of protein resulting in AGEs formation, connective tissue stiffening, nerve damage (Neuropathy), vascular damage (blood vessel), hyperuricemia, reduced bone density, low grade chronic inflammation and abnormal levels of insulin and insulin like growth hormone [17]. The glycosylated collagen may increase extracellular matrix accumulation by entrapping potentially harmful nonglycosylated proteins (eg, albumin, immunoglobulins, and coagulation proteins). Nonenzymatic glycosylated collagen may also disturb the cellular and structural components of the microvasculature, ensuing in the thickening of the capillary basement membrane. This is the main morphological change in diabetic microangiopathy, which may leads to fibrosis by inducing low-grade ischemia and chronic tissue injury. Injury to connective tissue also may be mediated by excessive flux through the aldose reductase pathway, resulting in depletion of essential osmolytes, cytotoxic edema, and membrane injury [16], which finally leads to various MSDs and its complications.

## CONCLUSION

The prevalence of MSDs in T2DM is very high and hyperglycemia in T2DM causes may irreversible damage of the tissues. That's why there should be regular checkup of musculoskeletal disorders in T2DM. So that, proper precaution may be taken prior to development of any MSDs. Proper treatment and maintenance good glycemic control is necessary to prevent the onset of MSDs in T2DM patients.

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