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A STUDY TO EVALUATE THE CORRELATION OF MUSCULOSKELETAL MANIFESTATIONS IN TYPE 2 DIABETES MELLITUS IN NORTH INDIAN POPULATION AND ITS CLINICAL RELAVANCE

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Abstract

Background: Diabetes may affect the musculoskeletal system in a variety of ways. The metabolic perturbations in diabetes including glycosylation of proteins; microvascular abnormalities with damage to blood vessels and nerves and collagen accumulation in skin and periarticular structures results in changes in the connective tissue which can result into musculoskeletal deformities in diabetic patients.

Objectives: This study was conducted to evaluate the correlation of periarthritis shoulder joint, osteoarthritis knee joint, muscle atrophy, foot and hand disorders among different age groups of diabetic patients in north Indian population.

Methods: For the analysis 200 diabetic patients with musculoskeletal symptoms were selected randomly from Department of orthopaedics and neurology, government doon hospital Dehradun and Shri Guru Ram Rai Institute of Medical and health Sciences, Dehradun, Uttarakhand.

Results: In this study, out of 200 diabetes patients had Periarthritis 80 patients (40 %), osteoarthritis 60 patients (30%), muscle atrophy 40 patients (20%) feet 10 patients (5%) hand 10 patients (5%)

Conclusion: Diabetes Mellitus is a systemic disease that not only causes metabolic problems but many types of musculoskeletal problems created in the human body due to the effect of this. Early assessment, detection, and management can prevent further disability.

KEYWORDS: Diabetes, Musculoskeletal, periarthritis, osteoarthritis.

INTRODUCTION

The overall prevalence of diabetes in India was 7·3%. The number of diabetic patient is increasing in india due to expurt in population growth, aging, western culture, changing eating habbits and sedentary lifestyles.[1] Regular physical activity is recommended for the patients with type 2 diabetes since it can reduce the glycosylated haemoglobin (HbA1c) by approximately 0.66 % as reported by Normand G et all in their meta analytic study of controlled clinical trials in 2001, that is expected to reduce the risk of diabetic musculoskeletal complications.[2] In the study conducted in dehradun for the prevalence of diabetes mellitus, it was found that the Among non-working group higher prevalence of non communicable disease viz diabetes (17.7%), was observed as compared to working group. Disease is highly prevalent in the age group of 45-55 years (28%).[3]Diabetes may affect the musculoskeletal system in a variety of ways. The metabolic perturbations in diabetes including glycosylation of proteins; microvascular abnormalities with damage to blood vessels and nerves; and collagen accumulation in skin and periarticular structures results in changes in the connective tissue.[4] Study on 500 adults of uttarakhand population determined the prevalence of diabetes 10% (hemoglobin (Hb) A1c $\geq$ 6.5%) and pre-diabetes 56.5% (5.7% $\leq$ HbA1c $\leq$ 6.4%). Remarkable high prevalence of diabetes and prediabetic condition put extra pressure on public health initiatives for responding this imminent diabetes crisis in mountainous regions of North India.[5] In contrast to life threatening complications of the Diabetes Mellitus, musculoskelatal disesases cause considerable mobidity.

Due to prolonged hyperglycemic conditions there is increased glycosylation of collagen fibril which makes it resistant to collagenase. Abnormal deposition of collagen in the connective tissues of joints, enzymatic and non-enzymatic glycosylation and abnormal cross linking of collagen leads to stiffening of joints in diabeties mellitus. And these factors are thought to stimulate calcification at the entheseal sites which are areas of increased mechanical stress. which further can enhance the stiffness of joints .[6] In contrast to the life-threatening macro- and microvascular complications of DM, RMSD causes considerable morbidity. The quality of life of patients can be improved if these complications are diagnosed early during the course of DM.

Osteoarthritis (OA) refers to a clinical syndrome of joint pain with multifactorial etiopathogenesis that is characterized by the gradual loss of articular cartilage, osteophyte formation, subchondral bone remodelling, and inflammation of the joint.[4]

The objectives of this study were to evaluate the correlation of periarthritis shoulder joint, osteoarthritis knee joint, muscle atrophy, foot and hand disorders with different age groups of Diabetic patients.

MATERIALS & METHODS

After the approval of institutional ethical committee,Randomly selected 200 diabetes patients having chief complains of musculoskeletal problems were selected fromDepartment of Rheumatology**,** Shri Guru Ram Rai Institute of Medical and health Sciences, Dehradun, Uttarakhand, who were suffering from periarteritis of shoulder joint (movement restriction shoulder joint, pain around the joint), osteoarthritis of knee joint (painful joint movement, difficulties in walking, swelling around knee joint), feet pathologies (inflammation around ankle joint), muscle pathologies (diabetic muscle infarction) hand disorders, diabetic cheiroarthropathy (stiff hand syndrome or syndrome of limited joint mobilities), flexor tenosynovitis (trigger finger), Dupuytren's contracture and carpal tunnel syndrome. Following this a detailed musculoskeletal examination was conducted and findings were noted All parameters were measured with .01 mm accuracy. Stastical analysis (Student Paired T test) was done using SPSS version 22. The study as approved by 'The Institutional Ethics Committee, Shri Guru Ram Rai Institute of Medical and health Sciences, Dehradun,

RESULTS

In the current study ,out of 200 diabetic patients aged between 30 yrs- 70 yrs. 34.5% population were present between the age group of 50-60 yrs.25 males and 38 females were enrolled for the study from the the Department of Rheumatology and Centre For Advance Research, Shri Guru Ram Rai Institute of Medical and health Sciences, Dehradun, Uttarakhand.

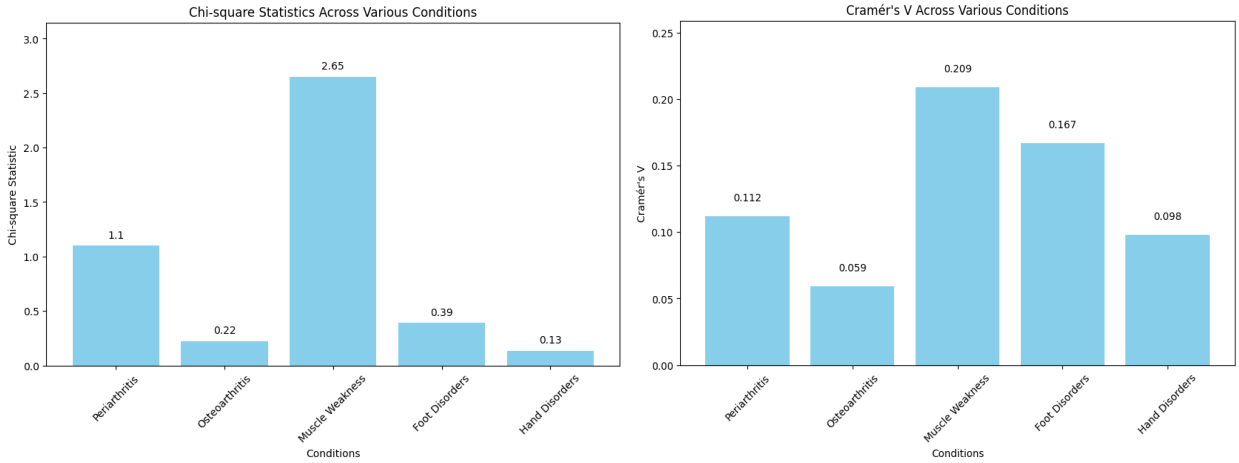
In this study, out of 200 diabetes patients had Periarthritis 80 patients (40 %), osteoarthritis 60 patients (30%), muscle atrophy 40 patients (20%) feet 10 patients (5%) hand 10 patients (5%).Hence maximum cases of periarthrites and osteoarthritis were observed among all musculoskeletal problems prevalent in diabetic patients. All the above musculoskeletal manifestations were seen maximum in the age groupof 50-60 years age group among diabetics except hand disorders which were more evident in the age group of 40-50 yrs .Refer to table 1&2

TABLE-1

Total no of Diabetic patients N=200	**Osteoarthritis knee joint (60)**	**Periarthritis shoulder joint (80)**	**Muscular weakness and atrophy (40)**	**Foot disorders (10)**	**Hand disorders (10)**
Age group (yrs)	**Percentage of patients with the above musculoskeletal menifestations in different age group**				
30-40	**6.6%**	**6.3%**	**5%**	**-**	**-**
40-50	**21.6%**	**26.3%**	**25%**	**40%**	**50%**
50-60	**38.3%**	**38.8%**	**45%**	**50%**	**30%**
60-70	**33.3%**	**28.8%**	**25%**	**10%**	**20%**

TABLE 2

CONDITION	CHI-SQUARE	P-VALUE	CRAMER'S V	INTERPRETATION
PERIARTHRITIS	1.052	0.789	0.112	Very weak/no significant association
OSTEOARTHRITIS	0.223	0.974	0.059	Very weak/no significant association
MUSCLE WEAKNESS	1.923	0.588	0.209	Weak association
FOOT DISORDERS	0.389	0.943	0.167	Very weak/no significant association
HAND DISORDERS	0.134	0.988	0.098	Very weak/no significant association



DISCUSSION

The most common Musculoskeletal disorder in the current study was found to be periarthritis (40%) and osteoarthritis (30%) in knee. This is found much higher than the values of Mathew AJ et al study in 2008 in which 7.6% osteoarthritis knee was reported in general population.[7] Howsoever our study findings coincides with the findings of Sarkar et al. in which 31% of the diabetic population have reported osteoarthritis .Majority of the cases (85%)were type 2 diabetes mellitus have described 31% of their population with DM to have osteoarthritis, out of which 85% belonged to the T2DM group. [8]An another study conducted by Douloumpakas I et all in Greece population has also reported a higher proportion of osteoarthritis of the upper extremities.[9] In the current study about 5% of diabetic population were found to have feet and hand musculoskeletals disorders each which approximate the findings of Ardic F et al on turkey population in 2003. [10] A. Majjad et al, Rheumatology Department, Morocco (2018) in their A cross-sectional study on 376 subjects were included found that 34.4% had one or more MS disorders, Osteoarthritis waspresent in 19.4% of patients, Hand disorders were seen in 14.4%.And Shoulder capsulitis was present in 12.5%. Long duration of diabetesand dyslipidemia were associated with increased prevalence of hand abnormalities. Age and dyslipidemia were associated with shoulder capsulitis. [11]

M. Merashli1T.A. Chowdhury and A.S.M. Jawad in 2015 in their review article concluded that the musculoskeletal complications usually occur in patients with poorly controlled diabetes of long duration and in those who have othermore serious complications such as vascular, neuropathic, renalretinal problems. Early recognition of these complications, and multidisciplinary management between diabetes and rheumatology specialists is necessary for proper management.[12]

Shraboni Ghosal Arnab Ghosal et al in 2020 in their review article concluded that Diabetes is associated with musculoskeletal disorders like OA, RA, and osteoporosis and fibromyalgia syndrome along withpain. Insufficient glycaemic control can lead to worsening of thesedisorders.[13]

Thomas Rehling et al in 2019 reported 9,238 participants with diabetes 99,980 participants without diabetes and concluded that Diabetes was associated with elevated odds of having musculoskeletal pain. Diabetes was also associated with elevated odds of having osteoarthritis, osteoporosis, and rheumatoid arthritis. [14] Ashish J. MATHEW et all in 2011 studied the Prevalence of Rheumatic musculoskeletal disorders in type 2 diabetes mellitus and concluded the prevalence in 310 cases and controls was 42.58%; 95% CI: 37.08–48.08 and 31.61%; 95% CI: 26.43–36.79, respectively. 33.4% of the subjects complaint of knee pain which was the commonest symptom. Prevalence of common RMSD was osteoarthritis knee (20.64%; 95% CI 16.14–25.16), frozen shoulder (16.45%; 95% CI: 12.32–20.58), diffuse idiopathic skeletal hyperostosis (14.52%; 95% CI: 10.6– 18.44) and limited joint mobility (8.06%; 95% CI: 5.03–11.09). There was found to be statistically significant correlation of age, duration of type 2 DM and the levels of glycosylated hemoglobin with Rheumatic musculoskeletal disorders .[15]LL Smith et all in 2015 in their review article on musculoskeletal menifestations of diabetes mellitus concluded that prevalence of Adhesive capsulitis (frozen shoulder) in diabetic patient as 11–30% and in non diabetic patient as 2–10%. Limited joint mobility in diabetic and non diabetic as 8–50% and 0–26% respectively. Dupuytren's contracture prevalence in diabetic was 20–63% while without diabetes as 13%. Prevalence of Carpal tunnel syndrome and Flexor tenosynovitis in diabetic and non diabetic population was found to be as 11–16%, 125/100000* and18, 11%respectively.[16] BALCIET AL in 1999 in their study examine the association of adhesive sholder capsulitis with the duration of diabetes (p 5 0.03) and diabetic complications.29% of diabetic patient [297] was detected with the adhesive sholder capsulitis. Most common diabetic complication was found to be retinopathy however there was no association with neuropathy and macroprotienuria.[17] Arian L et al in 1982 observed the limited joint mobility In the prospective study on 309 childhood diabetics patients of north florida and concluded 30 % had limited joint mobility. Expression of limited joint mobility was not influenced by race and sex rather it was found to be more influenced by age than by duration of diabetes. There had been found the significant correlation between hemoglobin AI and limited joint mobility in the diabetic patients having diabetes for duration less than5 years, but the variability in values explained by this association was small (11%).[18] In the study quoted by Reeves B, Forgács SS, Griggs SM, et al and Bridgman JF Musculoskeletal disorder Adhesive capsulitis (frozen shoulder)was found to be 11–30% in diabetic patients and 2–10% in non diabetic patient.[19,20,21,22] Limited joint mobilitywas found to be 8–50% in diabetics and 0–26% in non diabetics in the study done by Lequesne M et al, Balci N et all .[23,24,25] Dupuytren's contracture was found to be 20–63% in diabetics and 13% in non diabetics while Carpal tunnel syndrome was reported to be 11–16% in diabetics and 125/100000*in non diabetics. [26,27]

Along with balanced diet and medicational therapy, Exercise is considered to be one of the three important mainstay for optimal diabetes treatment. Since poor glycemic control is directly associated with increased prevalence of diabetic complications ,hence proper supervision of glycemic control is required to avoid any musculoskeletal manifestations.[28] Complications of long term diabetes mellitus are numerous and increase the prevalence of several rheumatic conditions which get even more worsened by poor glycemic control. Prevention is better than cure and hence Early detection of diabetes, timely appropriate Pharmacotheray, balanced diet, sensible physiotherapy and exercises programme is necessary in order to reduce the frequency and severity of complications. Diabetes Mellitus is a systemic disease that not only causes metabolic problems but many types of musculoskeletal problems in the human body. In the meta-analysis study done by Boule NG concluded that exercise training in patients with type 2 diabetes mellitus reduces the risk of diabetic complications to such level by reducing HbA1C levels. Howsoever this was not associated with any significant change in the body mass in the the intervention group compared with the control group, suggesting that apart from weight loss exercise training in patients with type 2 diabetes is also helpful in decreasing further musculoskeletal complications thereby proving the importance of Physical activity for the treatment for patients with diabetes .[29]

CONFLICT OF INTEREST–NONE

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REFERENCES

1. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, Adhikari P, Rao PV, Saboo B, Kumar A, Bhansali A. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR–INDIAB population-based cross-sectional study. The lancet Diabetes & endocrinology. 2017 Aug 1;5(8):585-96.
2. Normand G ,Haddad E, Kenny G P,George A Ronald J.Effect of exercise on glycemic control and body mass in type 2 diabetes mellitus .A Metaanalysis of Controlled Clinical trials. Journal of American Medical Association 2001 Sep -Vol 286:1218-1227
3. Kakkar R, Aggarwal P, Kandpal SD, Bansal SK. An epidemiological study to assess morbidity profile among geriatric population in District Dehradun. Indian Journal of Community Health. 2013 Mar 31;25(1):39-44.
4. Foundation CH, "in Improving AGSP, Care for Elders withDiabetes C. Guidelines for improving the care of the older per-son with diabetes mellitus," Journal of the American GeriatricsSociety, vol. 51, no. 5s, pp. 265–280, 2003.
5. Anderson P, Grills N, Singh R, Singh R, Evans RG, Sengupta P, Thrift AG. Prevalence of diabetes and pre-diabetes in rural Tehri Garhwal, India: influence of diagnostic method. BMC Public Health. 2019 Dec;19(1):1-8.
6. S.M. Attar, "Musculoskeletal Menifestation in diabetic patients at a tertiary center."Libyan journal of medicine ,vol 7 ,no.1,2012
7. Mathew AJ, Goyal V, Varghese D, et al. (2008) Rheumaticmusculoskeletal disorders in South Kerala – A WHO ILAR COPCORD Bhigwan model study. Ind J Rheumatol 3 (Suppl), S18–45.
8. Sarkar RN, Banerjee S, Basu AK, Bandyopadhyay R (2003) Rheumatological manifestations of diabetes mellitus. J Ind Rheumatol Assoc 11, 25–9.
9. Douloumpakas I, Pyrpasopoulou A, Triantafyllou A, Sampanis Ch, Aslanidis S (2007) Prevalence of musculoskeletal disorders in patients with type 2 diabetes mellitus: a pilot study. Hippokratia 4, 216–8 in a diabetic population.]
10. Ardic F, Soyupek F, Kahraman Y, Yorgancioglu R (2003) The musculoskeletal complications seen in type 2 diabetes: predominance of hand involvement. Clin Rheumatol 22, 229–33.
11. Majjad A, Errahali Y, Toufik H, H Djossou J, Ghassem MA, Kasouati J, Maghraoui AE. Musculoskeletal disorders in patients with diabetes mellitus: a cross-sectional study. International journal of rheumatology. 2018 Jun 19; 2018.
12. Merashli M, Chowdhury TA, Jawad AS. Musculoskeletal manifestations of diabetes mellitus. QJM: An International Journal of Medicine. 2015 Nov 1;108(11):853-7.
13. Ghosal S, Ghosal A. Diabetes and musculoskeletal disorders-a review. Journal of Diabetes, Metabolic Disorders & Control. 2020;7(2):63-71.
14. Rehling T, Bjørkman AS, Andersen MB, Ekholm O, Molsted S. Diabetes is associated with musculoskeletal pain, osteoarthritis, osteoporosis, and rheumatoid arthritis. Journal of diabetes research. 2019 Dec 6;2019.
15. A. J. Mathew, J. B. Nair, and S. S. Pillai, "Rheumatic-musculoskeletal manifestations in type 2 diabetes mellituspatients in south India," International Journal of Rheumatic Diseases, vol. 14, no. 1, pp. 55–60, 2011.
16. Smith L, Burnet S, McNeil J. Musculoskeletal manifestations of diabetes mellitus. British journal of sports medicine. 2003 Feb;37(1):30.
17. Balci N, Balci MK, Tüzüner S. Shoulder adhesive capsulitis and shoulder range of motion in type II diabetes mellitus: association with diabetic complications. Journal of Diabetes and its Complications. 1999 May 1;13(3):135-40.
18. Rosenbloom AL, Silverstein JH, Lezotte DC, Riley WJ, Maclaren NK. Limited joint mobility in diabetes mellitus of childhood: natural history and relationship to growth impairment. The Journal of Pediatrics. 1982 Nov 1;101(5):874-8.
19. Reeves B. The natural history of the frozen shoulder syndrome. Scand J Rheumatol 1975;4:193–6.
20. Forgács SS. Endocrine and hemoglobin arthropathies: diabetes mellitus. Rheumatology. London: Mosby-Year Book Europe Ltd, 1994.
21. Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis. A prospective functional outcome study of nonoperative treatment. J Bone Joint Surg [Am] 2000;82:1398–407.
22. Bridgman JF. Periarthritis of the shoulder and diabetes mellitus. Ann Rheum Dis 1972;31:69–71
23. Lequesne M, Dang N, Bensasson M, et al. Increased association of diabetes mellitus with capsulitis of the shoulder and shoulder-hand syndrome. Scand J Rheumatol 1977;6:53–6.
24. Balci N, Balci MK, Tuzuner S. Shoulder adhesive capsulitis and shoulder range of motion in type II diabetes mellitus: association with diabetic complications. J Diabetes Complications 1999;13:135–40.

25. Arkkila PE, Kantola IM, Viikari JS, et al. Shoulder capsulitis in type I and II diabetic patients: association with diabetic complications and related diseases. Ann Rheum Dis 1996;55:907–14
26. Jennings AM, Milner PC, Ward JD. Hand abnormalities are associated with the complications of diabetes in type 2 diabetes. Diabet Med 1989; 6:43–7.
27. Starkman HS, Gleason RE, Rand LI, et al. Limited joint mobility (LJM) of the hand in patients with diabetes mellitus: relation to chronic complications. Ann Rheum Dis 1986; 45:130–5.
28. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. The Diabetes Control and Complications Trial Research Group. N Engl J Med 1993; 329:977–86.
29. Boule NG, Haddad E, Kenny GP, et al. Effects of exercise on glycemic control and body mass in type 2 diabetes mellitus: a meta-analysis of controlled clinical trials. JAMA 2001;286:1218–27.