ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 05, pp.51409-51414, May, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

A STUDY OF RHEUMATOLOGICAL MANIFESTATIONS IN TYPE 2 DIABETES MELLITUS

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ARTICLE INFO

Article History:
Received 11th February, 2017
Received in revised form
15th March, 2017
Accepted 08th April, 2017
Published online 31st May, 2017

Key words:

Type 2 diabetes mellitus,
Rheumatological manifestations,
Limited Joint Mobility (LJM),
Adhesive shoulder Capsulitis (AC).

Abbreviations:

DC-Dupuytren's contracture,
CTS- carpal tunnel syndrome,
TF- Trigger finger,
DISH-Diffuse Idiopathic Skeletal Hyperostosis.

ABSTRACT

Background: Diabetes mellitus, a silent epidemic with micro and macroangiopthic complications and also has less recognized rheumatic syndromes which are debilitating.
Objective of the study: To study the prevalence of rheumatological manifestations uniquely associated with type 2 diabetes and to analyse the risk factors associated with these manifestations in them.
Methods: It is a cross sectional descriptive study done with a sample size of 200 persons having established type 2 diabetes mellitus at our institution. They are subjected to detailed history, clinical examination with special emphasis on the rheumatological problem. Investigations like CBC, diabetic profile, X ray spine and joints are also done. Clinical/criteria based assessment of rheumatological manifestations towards LJM, AC, CTS, DC, TF, DISH and charcot Joint are done. The data is analysed using SPSS version 20.0. Descriptive statistics such as mean, range and standard deviation are used to present continuous variables, and frequency (percentage) is used to present categorical variables. Analysis done with binary logistic regression method.
Results: The prevalence of rheumatological problem in type 2 diabetes is very common (36%). LJM(19%), AC(11%) were the commonest manifestation. Significant p value <0.01 were seen for the following factors: BMI, duration of diabetes, HbA1c level, dyslipidemia, retinopathy and nephropathy.
Conclusion: The rheumatological problem in type 2 diabetes had strong correlation with BMI, duration of diabetes, dyslipidemia, HbA1c, retinopathy and neuropathy. Hence lifestyle modification, effective glycemic control, addressing dyslipidemia, detecting and treating the rheumatological manifestation early may improve the quality of life.

Citation: Dhananjayan Kannan, Santhi Thoppappatty Sengottaiyan and Palani Kannan, 2017. "A study of Rheumatological manifestations in type 2 diabetes mellitus", *International Journal of Current Research*, 9, (05), 51409-51414.

INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia and type 2 diabetes accounts for about 85% of cases of diabetes in caucasians and virtually all in certain non caucasian ethnic groups. Modern therapeutics have helped to decrease the mortality of diabetes mellitus but has resulted in increased debilitating musculo- skeletal syndromes as these patients live longer. Hence, examination of periarticular regions of the hands, shoulders and feet, as well as the skeleton are extremely important. The pathophysiology is not obvious but it could be due to 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 with resultant changes in the connective tissue complicating the primary disease.

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A wide range of musculoskeletal/ rheumatological syndromes have been described in association with diabetes (Holt, 1981). Rheumatic syndromes commonly associated with diabetes mellitus are many, in which diabetic cheiroarthropathy (LJM), adhesive capsulitis of shoulder, flexor tenosynovitis, carpal tunnel syndrome, dupuytren's contracture are the foremost. This work is to study the prevalence of "Rheumatological manifestations uniquely associated with diabetes mellitus" among type 2 diabetes mellitus patients attending diabetic and general medical outpatient department and to analyse the risk factors associated with development of these manifestations in them. These disorders may cause pain and functional impairment, and influence the ability of patients to adhere to other aspects of diabetes treatment, particularly exercise and weight management. Therapies with corticosteroids and non steroidal anti-inflammatory drugs (NSAIDs), may be problematic in patients with diabetes. The diagnosis of the rheumatic conditions are made on the basis of standardized case definitions and criteria as *Cheiro-arthropathy or Limited Joint Mobility (LJM)* is considered

present using the criteria of Rosenbloom *et al.,* 1981 *Prayer sign* and *Table test* were used to detect the patients with LJM. *Adhesive shoulder capsulitis(AC)* is diagnosed with the criteria of shoulder pain for at least one month, an inability to lie on the affected shoulder, restricted active and passive shoulder joint movements in at least three planes and excluding other causes such as trauma, stroke. *Carpal tunnel syndrome (CTS)* with the description of transient or persisting numbness or paresthesias of fingers innervated by the median nerve during activities such as driving, reading, or sewing. Provocative tests including Phalen and Tinel tests are used for diagnosis. *Dupuytren's contracture* (Noble *et al.,* 1984) is diagnosed by the observation of one or more of the following four features- a palmar or digital nodule, tethering of palmar or digital skin, a pretendinous band, and digital contracture. *Flexor tenosynovitis (FTS) or trigger finger* is diagnosed by presence of palpable nodule over the metacarpo phalangeal joint, thickening along the affected flexor tendon sheath on the palmar aspect of the finger and hand, and the locking phenomenon. *Diffuse idiopathic skeletal hyperostosis (DISH)* is diagnosed as per criteria of Resnick *et al.,* 1975 The diagnostic criteria for *Neuroarthropathy or Diabetic osteoarthropathy [Charcot joint(CJ)]* is the presence of different clinical features based on the stage of the disease (Sella and Barrette, 1999) and five patterns of foot involvement in diabetes (Sanders and Frykberg, 2001).

AIM OF THE STUDY

To study the prevalence of rheumatological manifestations in type 2 diabetes patients and the distribution of them with regard to age, sex, Body Mass Index (BMI), duration of diabetes, mode of treatment, glycemic control (HbA1c levels), lipid profile, hyperuricemia, nephropathy and retinopathy and also to analyze the significant risk factors associated with them.

MATERIALS AND METHODS

The present study titled *"A study of rheumatological manifestations in type 2 Diabetes Mellitus"* is a Cross sectional descriptive study done over 6 months. The study group included 200 persons with known type 2 diabetes without known rheumatological illness attending outpatient departments who met the inclusion criteria.

Inclusion criteria

Known type 2 diabetics who give informed consent to participate in the study.

Exclusion criteria

Patients with

- Known inflammatory or degenerative arthritis
- any rheumatological illness
- End stage renal disease
- Acute illness like sepsis, acute Myocardial Infarction, heart failure, cerebrovascular accident
- Hypothyroidism.

Detailed questionnaire, BMI calculation, blood pressure, complete blood count, ESR, CRP, FBS, PPBS, blood urea, serum creatinine, serum uric acid, urinalysis, urine spot PCR (protein creatinine ratio), ECG, chest X ray, fasting lipid profile, HbA1c, fundus examination and X ray of the involved joints are done. A thorough history is recorded with particular emphasis on symptoms of rheumatological problems like joint pain, limitation of movement, stiffness of joint, deformities and skin changes. General, systemic and musculoskeletal system examination along with fundus view to diagnose diabetic retinopathy is also done. The data is analysed using SPSS version 20.0. Descriptive statistics such as mean, range and standard deviation are used to present continuous variables, and frequency (percentage) is used to present categorical variables. Binary logistic regression model is made and analysis is performed to identify the risk factor associated with development of rheumatological problems in type 2 diabetic patients.

RESULTS AND ANALYSIS

The study sample included 200 persons with known type 2 diabetes mellitus without prior rheumatological illness attending our outpatient department who met the inclusion criteria. Statistical parameters of 10 continuous variables are shown in table 1.

Table 1. Summary of statistics for continuous variables

Sl. No.	Variables	Minimum	Maximum	Mean	Std.Dev.
1	Age	34	76	53.15	9.028
2	BMI	18.8	34.7	24.562	3.4661
3	Duration in years	2	16	7.2	4.059
4	HbA1c	6.4	11.8	8.078	1.2969
5	Uric acid	3.2	9.8	4.872	1.1601
6	Total cholesterol	158	272	209.63	30.808
7	LDL	67	183	126.91	28.973
8	TGL	98	333	177.7	56.521
9	HDL	27	57	42.35	7.429
10	Urine Spot PCR	0	3.93	0.2811	0.67135

Out of 200 patients 36% (72/200) had rheumatological problem and 64% (128/200) were not having any rheumatological problem as shown in table 2/chart 1. The distribution of rheumatological manifestation out of 72 patients is as follows: 38 (19%) patients had limited joint motility, 22 (11%) had adhesive capsulitis, 6 (3%) had trigger finger, 3(1.5%) had carpal tunnel syndrome, 2(1%) had dupuytren's contracture and 1(0.5%) had diffuse idiopathic skeletal hyperostosis (table 3/chart 2). Of 72 patients with rheumatological problem, no cases are seen in age group less than 40 years, 20 (27.80%) are in age group 40-50 years, 37 (51.40%) were in age group 50-60 years and 15(20.80%) are above 60 years. Compared with group of patients without rheumatological problem it has no statistical significance ($p=0.66$) (table 4). Among gender, 29 (40.30%) are male and 43 (59.70%) are female. Compared with group without rheumatological problem it has no statistical significance ($p=0.474$) (table 5). Considering the BMI, in disease group 22.20% (16/72) patients are normal, 66.70% (48/72) are overweight and 11.10% (8/72) are obese. Compared with group without rheumatological problem it is statistically significant ($p<0.01$) as shown in table 6/chart 3. Taken the chronicity of diabetes with rheumatological problem, 5.60% (4/72) patients had diabetes less than 5 years, 38.90%(28/72) had duration between 5 to 10 years and 55.60% (40/72) are diabetic for more than 10 years. Compared with group without rheumatological problem it is statistically significant ($p<0.01$) as shown in table 7/chart 4.

Table 2. Distribution of cases according to presence of rheumatological problem

Rheumatologic problem	No. of cases	Percentage
No	128	64
Yes	72	36
Total	200	100

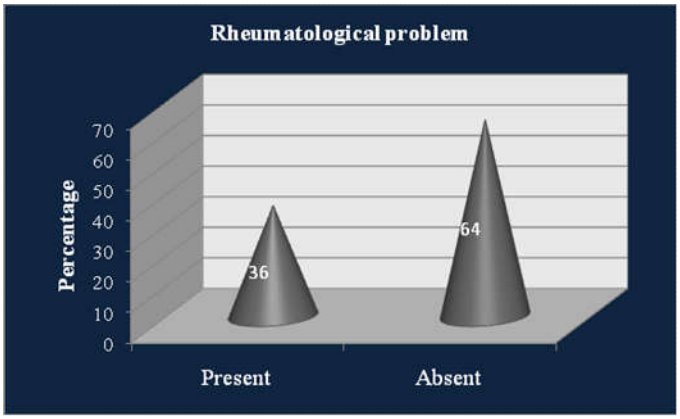

Chart 1. Distribution of cases according to presence of rheumatological problem

Table 3. Distribution of cases according to rheumatological diagnosis

Rheumatological diagnosis	No. of cases	Percentage
Limited joint motility (LJM)	38	19
Adhesive capsulitis (AC)	22	11
Trigger finger (TF)	6	3
Carpal tunnel syndrome (CTS)	3	1.5
Dupuytren's contracture (DC)	2	1
Diffuse idiopathic skeletal hyperostosis (DISH)	1	0.5
Charcot joint (CJ)	0	0

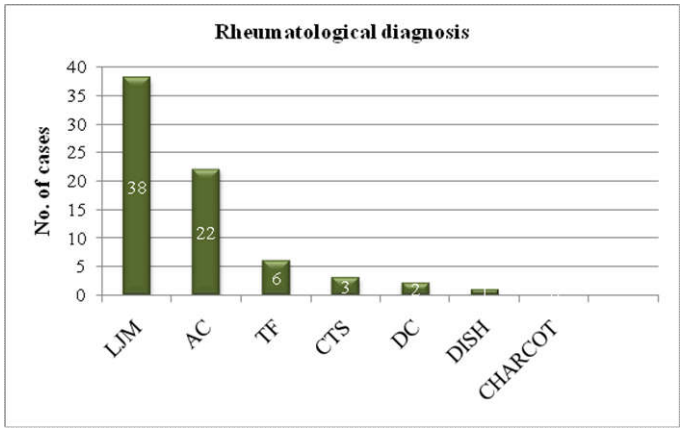

Chart 2. Distribution of cases according to rheumatological diagnosis

Table 4. Rheumatological problem VS Age group

Age group	Rh. problem		Total
	No	Yes	
<40 Years	14 (10.90%)	0 (0.00%)	14
40-50 Years	40 (31.20%)	20 (27.80%)	60
50-60 Years	45 (35.20%)	37 (51.40%)	82
>60 Years	29 (22.70%)	15 (20.80%)	44
Total	128 (100.00%)	72 (100.00%)	200

p = 0.66 (not significant)

In patients with rheumatological problem, 11.10% (8/72) patients had HbA1c value <7 (good control), 19.40% (14/72) had HbA1c value between 7 and 8 (fair control) and 69.40% (50/72) had HbA1c value >8 (poor control). Compared with group without rheumatological problem it is statistically significant (p<0.01) as shown in table 8/chart 5. Features of retinopathy seen among diseased in 54.20% (39/72) and normal fundus observed in 45.80% (33/72) patients.

Table 5. Rheumatological problem VS Gender

Gender	Rh. Problem		Total
	No	Yes	
Male	45 (35.20%)	29 (40.30%)	74
Female	83 (64.80%)	43 (59.70%)	126
Total	128 (100.00%)	72 (100.00%)	200

p = 0.474 (not significant)

Table 6: Rheumatological problem VS BMI

BMI group	Rh. Problem		Total
	No	Yes	
Normal	60 (46.90%)	16 (22.20%)	76
Over weight	61 (47.60%)	48 (66.70%)	109
Obese	7 (5.50%)	8 (11.10%)	15
Total	128 (100.00%)	72 (100.00%)	200

p <0.01 (significant)*

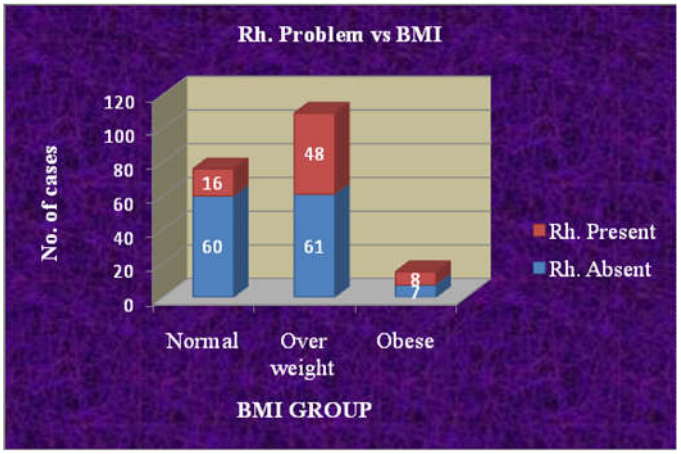

Chart 3. Rheumatological problem VS BMI

Table 7. Rheumatological problem VS Duration of diabetes

Duration	Rh. Problem		Total
	No	Yes	
<5 years	68 (53.10%)	4 (5.60%)	72
5 – 10 years	38 (29.70%)	28 (38.90%)	66
> 10 years	22 (17.20%)	40 (55.50%)	62
Total	128 (100.00%)	72 (100.00%)	200

p <0.01 (significant)*

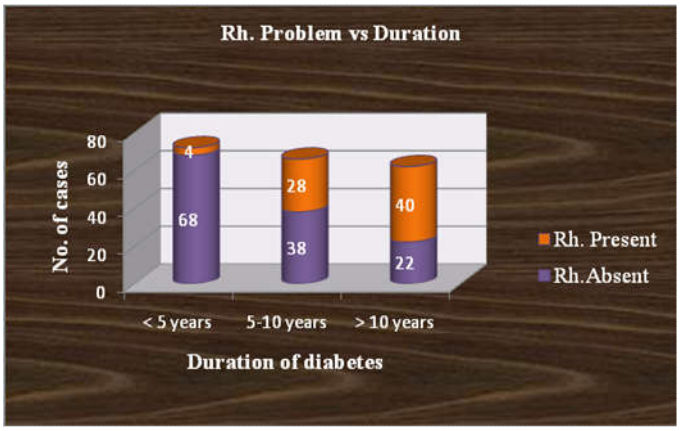

Chart 4. Rheumatological problem VS Duration of diabetes

Table 8. Rheumatological problem VS HbA1c

HbA1c group	Rh. Problem		Total
	No	Yes	
Good control (<7)	45 (35.20%)	8 (11.10%)	53
Fair control (7-8)	47 (36.70%)	14 (19.40%)	61
Poor control (>8)	36 (28.10%)	50 (69.50%)	86
Total	128 (100.00%)	72 (100.00%)	200

p <0.01 (significant)*

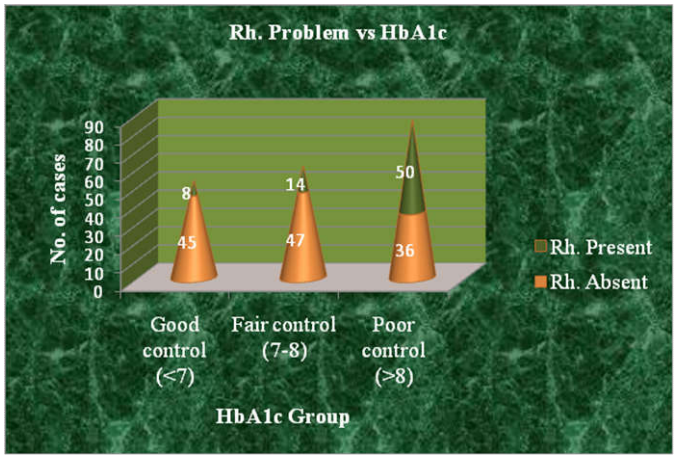

Chart 5. Rheumatological problem VS HbA1c

Compared with group of patients without rheumatological problem it is statistically significant (p<0.01) as shown in table 9/chart 6. With respect to nephropathy 52.8% (38/72) patient had nephropathy and 47.20% (34/72) did not have nephropathy. Compared with group without rheumatological problem it is statistically significant (p<0.01) as shown in table 10/chart 7.

Table 9. Rheumatological problem VS Retinopathy

Fundus	Rh. Problem		Total
	No	Yes	
Normal	117 (91.40%)	33 (45.80%)	150
Retinopathy	11 (8.60%)	39 (54.20%)	50
Total	128 (100.00%)	72 (100.00%)	200

p <0.01 (significant)*

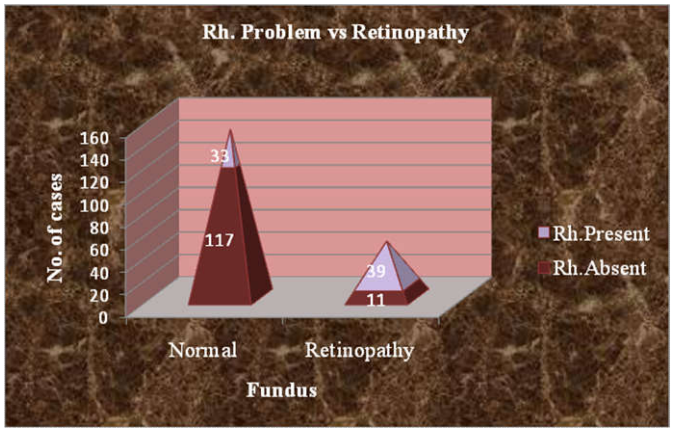

Chart 6. Rheumatological problem VS Retinopathy

Table 10. Rheumatological problem VS Nephropathy

Nephropathy	Rh. Problem		Total
	No	Yes	
No	113 (88.30%)	34 (47.20%)	147
Yes	15 (11.70%)	38 (52.80%)	53
Total	128 (100.00%)	72 (100.00%)	200

p <0.01 (significant)*

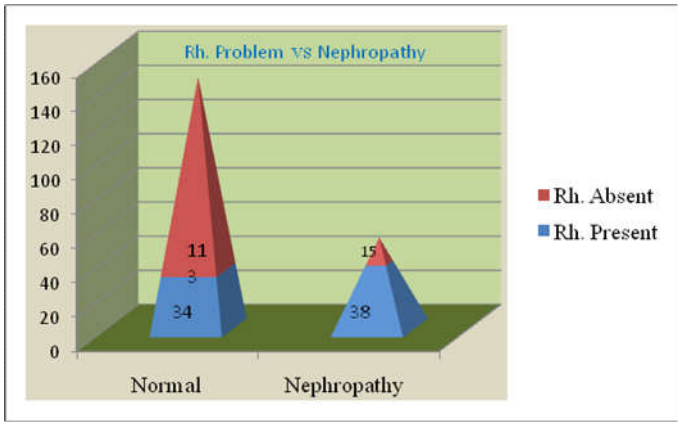

Chart 7. Rheumatological problem VS Nephropathy

Table 11. Rheumatological problem VS Total cholesterol

Rh. Problem	No.	Mean	Std. Dev.	Std. Err. Of mean
No	128	200.52	27.976	2.473
Yes	72	225.81	29.076	3.427
Total	200	209.63	30.808	2.178

p<0.01 (significant)*

Table 12. Rheumatological problem VS LDL-C

Rh. Problem	No.	Mean	Std. Dev.	Std. Err. Of mean
No	128	118.29	25.532	2.257
Yes	72	142.24	28.541	3.364
Total	200	126.91	28.973	2.049

p <0.01 (significant)*

Table 13. Rheumatological problem VS TGL

Rh. Problem	No.	Mean	Std. Dev.	Std. Err. Of mean
No	128	161.83	50.34	4.45
Yes	72	205.92	56.21	6.624
Total	200	177.7	56.521	3.997

p<0.01 (significant)*

Table 14. Rheumatological problem VS HDL-C

Rh. Problem	No.	Mean	Std. Dev.	Std. Err. Of mean
No	128	44.37	6.967	0.616
Yes	72	38.75	6.879	0.811
Total	200	42.35	7.429	0.525

p<0.01 (significant)*

Table 15. Rheumatological problem VS Mode of treatment

Treatment	Rh. Problem		Total
	No	Yes	
Oha	107 (83.60%)	53 (73.60%)	160
Insulin + oha	21 (16.40%)	19 (26.40%)	40
Total	128 (100.00%)	72 (100.00%)	200

p = 0.091 (not significant)

The mean total cholesterol level (table 11), LDL-C (table 12), TGL (table 13) and HDL-C (table 14) of group of patients with rheumatological problem is 225.81mg/dl, 142.24mg/dl, 205.92mg/dl and 38.75mg/dl and for group of patients without rheumatological problem is 200.52 mg/dl, 118.7mg/dl, 161.83mg/dl, 44.37mg/dl respectively. Comparing the two groups, the difference is statistically significant (p <0.01). Among patients with rheumatological problem, 73.60% (53/72) are getting treated with oral hypoglycemic agents (OHA) and 26.40% (19/72) with both insulin and oral hypoglycemic agents. Compared with group without rheumatological problem it has no statistical significance (p=0.091) as shown in table 15. Out of 72 patients with

rheumatological problem, 9.70% (7/72) patients had hyperuricemia and 90.30% (65/72) did not have hyperuricemia. Compared with group of patients without rheumatological problem it has no statistical significance (p=0.260) as shown in table 16.

Table 16: Rheumatological problem VS Hyperuricemia

Hyperuricemia	Rh. Problem		Total
	No	Yes	
No	121 (94.50%)	65 (90.30%)	186
Yes	7 (5.50%)	7 (9.70%)	14
Total	128 (100.00%)	72 (100.00%)	200

p = 0.260 (not significant)

Binary logistic regression analysis

Binary logistic regression model analysis done for presence of rheumatological problem with the significant variables made out in our study. p value of < 0.05 is taken as significant. Analysis showed significant association between presence of rheumatological problem and the following risk factors: *Duration of Diabetes, over weight and presence of retinopathy, of which duration of diabetes has very significant association* as shown in table 17.

Table 17. Binary logistic regression analysis for rheumatological problem

Variables	B	Significance	Odds ratio
BMI group		0.076	
Over weight	1.121	0.024	3.068
Obese	0.918	0.385	2.504
Duration group		<0.001	
5-10 years	2.923	<0.001	18.588
> 10 years	3.148	<0.001	23.288
HbA1c group		0.22	
Fair control (7-8)	0.518	0.448	1.678
Poor control (>8)	1.948	0.088	7.017
TC group	0.099	0.901	1.104
LDL group	-0.281	0.701	0.755
TGL group	0.743	0.417	2.103
HDL group	-0.454	0.577	0.635
Nephropathy	-0.209	0.721	0.811
Retinopathy	1.398	0.023	4.046

Table 18. Binary logistic regression analysis for limited joint mobility

Variables	B	Significance
BMI group		0.019
Over weight	1.276	0.04
Obese	2.874	0.009
Duration group		0.044
5-10 years	2.048	0.031
> 10 years	2.617	0.013
HbA1c group		0.1
Fair (7-8)	-0.684	0.433
Poor (>8)	2.765	0.139
TC group	-2.219	0.172
LDL group	0.937	0.332
TGL group	-0.312	0.825
HDL group	-0.241	0.823
Nephropathy	-0.988	0.163
Retinopathy	2.286	0.001

Binary logistic regression model analysis is done for the commonly manifested pattern observed in our study (LJM and AC). Analysis showed significant correlation between presence of Limited joint motility and the following risk factors: *Duration of diabetes (especially over 10 years), Body Mass Index (especially obese) and presence of retinopathy.* Among these, presence of *retinopathy* showed very strong association (Table 18). Binary regression analysis for *Adhesive capsulitis* did not show any significant association.

DISCUSSION

The musculoskeletal syndromes cause pain and functional impairment resulting in inability of the patients to adhere to other aspects of diabetes treatment, particularly exercise and weight management. The rheumatological symptoms cause functional impairment which affects the quality of life. In our study the overall prevalence of rheumatological problem is 36% of which 99.5% is with hand and Shoulder manifestations (LJM and AC) whereas the study by Ashish Mathew *et al.,* 2011 reported 42.58 % which did not exclude degenerative disorders. Among them LJM is the commonest, seen in 19% of our patients whereas the study done by Subhabrata Ray *et al.,* 2011 reported 28.1%. The next common is AC which is seen in 11% of our patients compared to 18% in Subhabrata Ray et al., 2011study ,and 16.4% in Ashish J Mathew *et al.,* 2011 study. Other conditions like trigger finger, dupuytren's contracture, DISH, and carpal tunnel syndrome in our study is very low similar to Ashish J Mathew *et al.,* 2011 and Subhabrata Ray *et al., 2011* studies. Although the prevalence of DISH in diabetes is common in western literature the true incidence and prevalence is unknown in our country and in our study it is 0.5% which may be due to small size of study group. In relation to charcot joint none of the study including our study showed significant cases. Correlation between the rheumatological problem and variables like duration of diabetes, BMI, HbA1c level, retinopathy, nephropathy and dyslipidemia (TC, LDL-C, HDL, TGL) were statiscally significant (p<0.01). But with variables like age, gender, mode of treatment, and hyperuricemia didn't have statistical significance. Binary logistic regression analysis to identify the risk factors associated with rheumatological problem in type 2 diabetes mellitus population also reveals that there is a stronger association seen with duration of diabetes, overweight and the presence of retinopathy in our study which is similar to Ashish J Mathew et al and Douloumpakas *et al.,* 2007. Similar type of analysis for LJM in our study revealed significant association with duration of diabetes especially over 10 years, BMI especially obesity and the presence of retinopathy. Among the above three variables, retinopathy showed very strong association. However in our study towards AC there is no significant association.

Conclusion

The prevalence of rheumatological problem in type 2 diabetic patients is common and is 36% in our study which is often unidentified. Limited joint mobility (LJM) is the most common rheumatological problem followed by adhesive capsulitis in this study. These rheumatological problems had stronger correlation with the variables like BMI, duration of diabetes, HbA1c levels, dyslipidemia, retinopathy and nephropathy. Binary logistic regression analysis revealed significant association of rheumatological problem with duration of diabetes as a very strong risk factor. Hence thorough physical examination of musculoskeletal system, early screening towards microvascular complications, exercise and life style modification to maintain ideal BMI, effective glycemic control and active physiotherapy towards the detected problems improves the quality of life in these patients.

Acknowledgement

We the authors sincerely thank the patients, their care-takers, paramedics and the statistician for their contribution and cooperation towards our scientific study. Also we declare that no grant is received towards the study.

Conflict of interest: All authors contributed equally to the development and revision of this manuscript.

REFERENCES

Holt, P.J.L. 1981. Rheumatological manifestations of diabetes mellitus. *Clin RheumDis.,* 7: 723-46.

Joint and Bone Manifestations of Diabetes Mellitus M. Elaine Husni Susan F. Kroop Lee S. Simon Joslin's Diabetes Mellitus 14th Edition, 1061-1068

Noble, J., Heathcote, J.G., Cohen, H. 1984. Diabetes mellitus in the aetiologyof Dupuytren ' s disease. *J Bone Joint Surg Br.,* 66 : 322 – 325 .

Prevalence of musculoskeletal disorders in patients with type 2 diabetes mellitus: a pilot study Douloumpakas I, Pyrpasopoulou A, Triantafyllou A, SampanisCh, Aslanidis S 2nd Propedeutic Department of Internal Medicine, Hippokration General Hospital, Thessaloniki, Greece-Hippokratia 2007, 11, 4

Prevalence of rheumatic conditions in patients with diabetes mellitus in a tertiary care hospital Subhabrata Ray, Ananta Kr Datta, PradyotSinhamahapatra, Indranil Ray, PradipMukhopadhyay, Somnath Dasgupta- *J Indian Med Assoc.,* Vol 109, no 2, February 2011.

Resnick, D., Shaul, S.R., Robins, J.M. 1975. Diffuse idiopathic skeletal hyperostosis (DISH): Forestier ' s disease with extraspinal manifestations Radiology, 115 : 513 – 524 .

Rheumatic-musculoskeletal manifestations in type 2 diabetes mellitus patients in south India Ashish J. MATHEW, Jayakumar B. NAIR and Saran S. PILLAI Department of Internal Medicine, Medical College Hospital, Trivandrum, Kerala, India- *International Journal of Rheumatic Diseases,* 2011; 14: 55–60.

Rosenbloom, A.L., Silverstein, J.H., Lezotte, D.C., Richardson, K., McCallum, M. 1981. Limited joint mobility in childhood diabetes mellitusindicates increased risk for microvasculardisease. *N Engl J Med.,* 305 : 191 – 194 .

Sanders, L.J., Frykberg, R.G. 2001. Charcot neuroarthropathy of the foot. In: BowkerJH , Pfeifer MA , eds. Levin and O ' Neal' s The Diabetic Foot ,6th edn. St Louis: Mosby.

Sella, E.J., Barrette, C. 1999. Staging of Charcot neuroarthropathy along the medial column of the foot in the diabetic patient. *J Foot Ankle Surg.,* 38 : 34 – 40 .

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