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Original Research

Shoulder disorders in patients with diabetes mellitus

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Abstract

Background and Aims: Shoulder disorders are common manifestations of musculoskeletal issues affecting patients with diabetes, but get relatively little attention. The aim of the study was to evaluate prevalence of shoulder disorders and its association with glycemic control, duration, and certain epidemiological factors in a section of population with type II diabetes. **Material and Method:** We conducted a prospective study including 32 consecutive patients with type II diabetes and 32 consecutive patients without diabetes attending the outpatient department for shoulder symptoms. Patients underwent physical examination and the proforma and UCLA-m (modified University of California at Los Angeles) Shoulder Rating Scale form were filled. Data was compiled on frequency and contingency tables. Central tendency was measured by mean and standard deviation. For determining the co-relation unpaired t test and chi-square test were used. **Results:** We observed that as the fasting blood glucose and HbA1c values decrease, the UCLA scores increase. Hence, proper glycemic control may help in reducing shoulder pain and complications. There was no relation between the UCLA score and diabetic duration or the age of the patient. **Conclusions:** We conclude frozen shoulder was the most common shoulder disorder in the diabetic group. It is more prevalent in diabetics when compared to non-diabetics. Evaluation of upper limb manifestations in diabetics must include estimation of glycemic control and an examination for other diabetic complications.

Keywords: Diabetes mellitus, frozen shoulder, musculoskeletal disorders, rotator cuff tendinitis.

Background and Aims

Musculoskeletal disorders are commonly associated with diabetes mellitus, but these get relatively little attention [1, 2]. Out of the numerous musculoskeletal complications, shoulder dysfunction and pain due to frozen shoulder and degenerative rotator cuff tear are the most common complaints. They are marked by impaired function, pain, and limited range of movement of the shoulder joint. Mechanisms of these disorders are due to defective microcirculation and non-enzymatic glycosylation processes in and around the shoulder joint. Although it might be related to the diabetic duration, the relationship between shoulder disorders and glycemic control is so far not known [2, 3].

Recognition of the association between diabetes and frozen shoulder facilitates its accurate diagnosis in the setting of diabetes and initiation of proper treatment, which may include correcting glycemic control. Recognition of characteristic musculoskeletal complications of diabetes may be helpful for early diagnosis and initiation of anti-diabetic therapy in delaying the development of complications [4]. The strength of the relation between diabetes and its musculoskeletal manifestations varies in different disorders and is based on other epidemiologic data.

Shoulder disorders are prevalent in diabetics and are usually seen in patients with

poor glycemic control and other complications of diabetes [5]. Some authors have reported a positive association between diabetic complications, diabetes duration, and control while others did not find any association [6].

Current available treatment includes analgesics and intra-articular steroid injections, along with physiotherapy. In atypical and severe cases, surgical interventions may be contemplated [2].

Hence, considering high prevalence of diabetes in our country and the relationship between diabetes and musculoskeletal complications [7], it is necessary to find out the strength of this relation in our South Indian population and its associated factors. This study was performed to establish the prevalence of shoulder diseases and its association with glycemic control (HbA1c and fasting blood glucose) and diabetic duration, in a section of South Indian population with type II diabetes mellitus (T2DM).

Material and Method

Study design and patients

Once the study was approved by the Institutional Ethics Committee, patients visiting the out-patient department during the study duration of two months having shoulder symptoms with or without Diabetes Mellitus who were willing to participate were included in this prospective observational study conducted at the university hospital by purposive (non-random) sampling patients with neurological and rheumatologic diseases, shoulder trauma, and professions requiring enormous effort of the upper limbs; those who were not willing to participate were excluded. Sample size was calculated by (with 95% confidence interval (CI) level and 80% power) using the formula

$$n = \frac{Za^2pq}{d^2}$$

Where Zα = 1.96 at 95% Confidence Level
p = prevalence (78.5%)
q = (1 – p)
d = 20% of p (80% power)

Laboratory, anthropometric and clinical data collection

We included a sample size of 64 participants—32 consecutive patients with type II diabetes mellitus and 32 consecutive patients without diabetes— attending outpatient department for shoulder symptoms. All participating patients were provided with a patient information sheet and procedural matters were explained to them along with informed consent form. Patients underwent history and physical examination and then the proforma and UCLA-m (modified University of California at Los Angeles) Shoulder Rating Scale form were filled. Information on epidemiological data from both the groups and on anti-diabetic treatment and diabetic duration was collected, in addition to the levels of fasting blood glucose and HbA1c (glycemic control), from the diabetic group. Rotator cuff pathology and subacromial bursitis with impingement was suspected after a positive Hawkin's or Neer's sign. These patients were further subjected for ultrasonography of shoulder. Frozen shoulder was diagnosed by severe restriction of active and passive abduction and both rotations. Plain shoulder radiograph was done in all these patients. Patients were not subjected to MRI imaging as no surgery was planned for any of the patients. The domains in the UCLA scale included: pain (10 points), function (10 points), range of flexion (10 points), and patient's satisfaction (5 points). Physical examination accounted for 20 points out of the total 35 points, and subjective parameters were accountable for the rest of the 15 points [8]. The domains pain and patient satisfaction were determined by interview, and the domains range of flexion and function by physical examination. Interpreting the UCLA Shoulder rating scale, with a maximum score of 35 points, is as follows: >27 for good/excellent, <27 for fair/poor. Excellent/good implies satisfactory results, whereas fair/poor implies unsatisfactory results.

Statistical analysis

Data was compiled on frequency and contingency tables. Central tendency was measured

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by mean and standard deviation. For determining the co relation unpaired t test and chi-square test were used. A statistical package SPSS vers.17.0 was used to do the analysis. $p < 0.05$ was considered significant.

Results

A total of 32 consecutive patients with T2DM and 32 consecutive patients without diabetes attending the outpatient department for shoulder symptoms were included in our study. The non-diabetic patients were aged between 24 to 68 years (median age = 54.5) and the diabetic patients were aged between 42–68 years (median age = 58). 59.4% of non-diabetic patients (n = 19) were females and 40.6% (n =13) were males whereas 56.3% of diabetic patients (n = 18) were females and 43.8% (n = 14) were males. In total the study included 37 females (57.8%) and 27 males (42.2%).

The mean of HbA1c of diabetic patients was 6.934 ± 1.36, the mean of fasting blood glucose was 154.375 ± 77.32 mg and the mean of diabetic duration was 10.969 ± 13.31 years (table 1).

The left side was affected in 37.5% of non-diabetic patients (n = 12), the right side was affected in 59.4% (n = 19) and 3.1% (n = 1) were affected bilaterally whereas in 40.6% of diabetic patients (n = 13) the left side was affected, the right side was affected in 56.3% (n = 18) and 3.1% (n = 1) were affected bilaterally (table 2).

The most common condition seen in the non-diabetic group was rotator cuff tendinitis and was seen in 15 patients (46.9% of non-diabetics) whereas frozen shoulder was the most common condition in the diabetic group and was seen in 27 patients (84.4% of diabetics). This data is highly significant statistically with a p value < 0.001 (table 3).

The mean of UCLA score of non-diabetic patients was 19.438 ± 8.545 whereas in diabetic patients the mean of UCLA score was 17.500 ± 6.4658. This data is statistically significant with a p value of 0.045 (table 4).

The UCLA score has a negative relation with the HbA1c and fasting blood glucose (r = –0.375 and –0.433, respectively), which is statistically significant with p value 0.035 and 0.013, respectively, that is as the HbA1c and fasting blood glucose level decreases the UCLA score increases. Hence, proper glycemic control may help in reducing shoulder pain and complications. There is weak, not significant, relation between the UCLA score and diabetic duration (r = –0.059; $p = 0.747$) as well as between the UCLA score and the age of the patient (r = 0.028; $p = 0.878$). The age of the patient is positively (r = 0.377) and significantly ($p = 0.033$) related to diabetic duration, probably because our study included patients with T2DM who were aged above 40 years. Also, the age of the patient is weakly and not significantly related to HbA1c (r = –0.023; $p = 0.902$) and fasting blood glucose (r = 0.086; $p = 0.642$). The fasting blood glucose was found to have a strong (r = 0.931) and significant ($p < 0.001$) relation with HbA1c, which was probably because the patients in our study had very poor glycemic control (table 5).

Discussion

Shoulder disorders are commonly associated with diabetes mellitus. Frozen shoulder is the most common and disabling disorder. The mechanism of its development is not well explained. It is noted that increased level of blood glucose leads to accumulation of glycosylated products in the joint cavities, collagen and makes them susceptible to damage and degeneration [6, 7].

In our study, we found a high prevalence of frozen shoulder and associated complications in patients with T2DM. Frozen shoulder was the most common shoulder disorder in the diabetic group and was seen in 27 out of 32 patients (84.4%

Table 1: Diabetic history.

Diabetic history	Mean	Standard Deviation
HbA1c	6.934	0.680
Fasting blood glucose	154.375	38.660
Duration	10.969	6.655

Table 2: Side affected ($p = 0.967$, ns).

			Group		
			Diabetic	Non-diabetic	Total
Side affected	Bilateral	Count	1	1	2
		%	3.1%	3.1%	3.1%
	Left	Count	12	13	25
		%	37.5%	40.6%	39.1%
	Right	Count	19	18	37
		%	59.4%	56.3%	57.8%
Total		Count	32	32	64
%			100.0%	100.0%	100.0%

Table 3: Diagnosis($p < 0.001$, vhs).

Diagnosis		Group		Total
		Non-diabetic	Diabetic	
Acromio-clavicular joint osteoarthritis	Count	1	1	2
	%	3.1%	3.1%	3.1%
Acromio-clavicular joint osteoarthritis with shoulder joint Impingement syndrome	Count	1	2	3
	%	3.1%	6.2%	4.7%
Calcific tendinitis	Count	3	0	3
	%	9.3%	0.0%	4.7%
Cervical Spondylolisthesis with rotator cuff tendinitis	Count	1	0	1
	%	3.1%	0.0%	1.6%
Frozen shoulder	Count	9	27	36
	%	28.1%	84.4%	56.3%
Rotator cuff tendinitis	Count	15	1	16
	%	46.9%	3.1%	25.0%
Shoulder joint impingement syndrome	Count	1	0	1
	%	3.1%	0.0%	1.6%
Subacromial bursitis	Count	0	1	1
	%	0.0%	3.1%	1.6%
Supraspinatus tendinitis and subacromial bursitis	Count	1	0	1
	%	3.1%	0.0%	1.6%
Total	Count %	32	32	64
		100.0%	100.0%	100.0%

of diabetics) as compared to 9 out of 32 non-diabetic patients (28.1%) ($p < 0.001$).

Frozen shoulder was present in 12% of diabetics and none of the general patients in a study by Cagliero and Perlmutter [1]. A prevalence of 25% was found in study conducted by Ramchurn et al [5]. In a study by Tighe et al [7], the prevalence of diabetes in patients with frozen shoulder was 71.5% (63 of 88) and it proved that the occurrence of frozen shoulder was two- to four- times

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Table 4: UCLA (University California Los Angeles) score ($p = 0.045$, significant).

			UCLA score	HbA1c	Age	Fasting blood glucose
Diabetic correlations	Duration	r	–0.059	0.158	0.377	0.232
		p	0.747	0.387	0.033	0.202
		N	32	32	32	32
	UCLA score	r		–0.375	0.028	–0.433
		p		0.035	0.878	0.013
		N		32	32	32
	HbA1c	r			–0.023	0.931
		p			0.902	0.000
		N			32	32
	Age	r				0.086
		p				0.642
		N				32

Table 5: Diabetic correlations.

Group	Mean	Standard Deviation
Non-diabetic	19.438	4.2725
Diabetic	17.500	3.2329

more in diabetics than the non-diabetics. The presence of frozen shoulder in patients with T2DM in our study was greater than previously reported and more in diabetics when compared to non-diabetics.

The musculoskeletal manifestations of diabetes mellitus are very prevalent and, although non-fatal, lead to pain and dysfunction, thereby affecting the quality of life [10, 11, 12]. Identification and understanding the correlation between diabetes mellitus and shoulder joint disorders is necessary for enhancing the quality of life of diabetics. Recognition of characteristic musculoskeletal complications of diabetes, its correct diagnosis in the setting of diabetes, and initiation of proper treatment, which may include initiation of glycemic control, delay the development of other diabetic complications [13].

The mean of UCLA score of non-diabetic patients was 19.438 ± 8.545 whereas in DM the mean of UCLA score was 17.500 ± 6.4658 ($p = 0.045$). The UCLA score was significantly lower in diabetics compared to the non-diabetics. The UCLA score had a negative correlation with the HbA1c and fasting blood glucose ($r = –0.375$ and –0.433 and $p = 0.035$ and 0.013 respectively), as the HbA1c and fasting blood glucose level decreases the UCLA score increases. Proper glycemic control may help in reducing incidence of shoulder pain and complications. But there is no correlation between the UCLA score and diabetic duration or age of the patient.

The strength of this study is that it compares shoulder disorders in diabetic and non-diabetic individuals. This type of study was not reported from this part of the world. The weakness of the study includes smaller samples and selection criteria, purely based on clinical parameters. A larger sample size with a looking out for more outcome measures would have provided better information.

Conclusions

We conclude that there is a very high prevalence of shoulder disorders in the studied population with T2DM. Frozen shoulder was the most common shoulder disorder in the diabetic group and was seen in 27 out of 32 patients (84.4% of diabetics) as compared to 9 out of 32

non-diabetic patients (28.1%). The presence of frozen shoulder in diabetics in our study was greater than previously reported and more in diabetics when compared to non-diabetics. The UCLA score was remarkably lower in diabetics as measured against the non-diabetics. The UCLA score had a negative co relation with the HbA1c and fasting blood glucose, that is as the HbA1c and fasting blood glucose level decreases the UCLA score increases. The information gained by the study can be utilized for the early diagnosis and management of shoulder problems in diabetic patients. Evaluation of upper limb manifestations in diabetics must include estimation of glycemic control and an examination for other diabetic complications like retinopathy or nephropathy.

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Conflict of Interest

The authors declare no conflict of interest.

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