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Serum triglyceride level in type 2 diabetes mellitus patients with or without Frozen shoulder

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Abstract

Background: Musculoskeletal disorders are very common among the diabetic patients and frozen shoulder is one of the disabling conditions. The present study was conducted to compare the serum triglyceride level among the patients of type 2 diabetic presented with and without frozen shoulder. Methodology: This case control study was conducted from January 2008 to December 2009, in the department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka with an aim to compare the serum triglyceride level among diabetic patients presented with, and without frozen shoulder. Thirty types 2 diabetic patients with frozen shoulder were selected as cases and similar number well matched type 2 diabetic patients without frozen shoulder were selected as control. Results: We prospectively studied 30 diabetes mellitus (type 2) patients with the diagnosis of frozen shoulder. The blood sugar both fasting and 2 hours after breakfast, HbA1c and serum triglyceride levels were measured in all patients and compared with those in 30 diabetic patients without frozen shoulder. The blood sugar, fasting and 2 hours after breakfast, HbA1C and serum triglyceride levels were significantly elevated in the frozen-shoulder group (fasting blood sugar $p = 0.012$; blood sugar 2 hours after breakfast $p<0.01$; HbA_{1C} $p<0.05$; and triglyceride $p < 0.001$).Conclusion: Diabetic type 2 patients presented with frozen shoulder had higher serum triglyceride level compare to the diabetic type 2 patients without frozen shoulder.

Introduction

Frozen shoulder is a disabling but easily manageable condition in the primary health care setting, characterized by pain and loss of movement[1,2]. The term 'frozen shoulder' was first introduced by Codman in 1934 and described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty of sleeping on the affected side. Long before Codman, in 1872, the same condition had already been labelled 'peri-arthritis' by Duplay. In 1945, Naviesar coined the term 'adhesive capsulitis'[1]. Frozen shoulder is a condition difficult to define, treat, and explain from the point of view of pathology[3].

Frozen shoulder usually present in the sixth decade of life, and onset before the age of 40y is very uncommon. The peak age is 56y, and the condition occurs slightly more often in women than men[4]. Approximately 70% of patients presenting with adhesive capsulitis are women; however, the role of sex in the etiology, development, and outcome of treatment remains unclear[5]. The aetiology remains unknown although some aspects of the pathophysiology have recently been documented. The symptoms are generally self-limiting over one to three years[6]. Recurrence is highly unusual. Patients usually recover, but they may never regain their full range of movement[1].

There are associations with many medical conditions, the strongest being that with diabetes in which the incidence is reported as being between two and four times higher than that in the normal population[6]. Older people with diabetes demonstrate accelerated loss of skeletal muscle mass and strength and have considerable functional impairment associated with reduced health status. Diabetes is a known risk factor for frozen shoulder[7]. The association of diabetes and frozen shoulder is well documented, 17.9% in diabetics compared to 7% in non-diabetics[8].

Evaluation of patients with shoulder disorders often presents challenges[9]. Despite research in the last century, the etiology and pathology of frozen shoulder is remains enigmatic[10]. True frozen shoulder has a protracted natural history that usually ends in resolution[1]. Diagnosis of frozen shoulder based on the patient's symptoms and a physical examination. X-rays or MRI (magnetic resonance imaging) studies are sometimes used to rule out other causes[3].

Methodology

Serum triglycerides levels of 30 patients with type 2 diabetes mellitus having frozen shoulder were evaluated and compared with that of another 30 diabetic patients without frozen shoulder. Diabetic patients having frozen shoulder attended in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU) during the period of January 2008 to December 2009 were enrolled as case and 30 diabetic patients with musculoskeletal problems other than idiopathic frozen shoulder were enrolled as control. All of these patients were selected randomly. Frozen shoulder was diagnosed clinically on the basis of the presence of both active and passive restrictions of the glenohumeral joint in flexion, abduction and internal rotation, with external rotation restricted to less than 50% of the normal side with the arm at the side. 'Frozen shoulder' is a condition of gradual onset, pain felt near the insertion of the deltoid, inability to sleep on the affected side, painful and incomplete elevation and external rotation, and a normal radiological appearance first described by Codman[11]. All our patients fulfilled these criteria, and also had reduction of both active and passive movement. Patients with frozen shoulder secondary to soft tissue trauma, fracture, arthritis, hemiplegia or any other known causes were excluded from the study.

All patients were fasted overnight for 12 hours before venepuncture for the measurement of serum triglyceride, blood sugar (fasting) and HbA1c. Two hours after breakfast all were again tested for blood sugar again.

Continuous variables are expressed as mean ± SD and compared with both groups by Student's t test and categorical variables are presented as frequency and percentage and compared with both groups by the chi-square test. Risk ratio with 95% confidence interval was calculated. All reported P values were two-sided and $P < 0.05$ was considered significant. The statistical tests were performed using Statistical Package for the Social Sciences (SPSS) version 12 (version 12.0; SPSS Inc, Chicago, IL, USA).

Results

Total 30 diabetic patients with frozen shoulder as case and 30 diabetic patients without frozen shoulder as control were included in this study. Out of 30 patients 10 (33.3%) had right sided, 14 (46.7%) had left sided, and 6 (20.0%) had bilateral frozen shoulder. Average age of the patients of both groups was 56.77 (SD 8.07) years (Table I).

Mean duration of frozen shoulder was 2.07 months (SD 0.52) and maximum 56.7% had complaints of suffering from 6 to 12 months.

The triglyceride concentration in the frozen shoulder group was 200.13 mg/dL (SD 21.26) and in control group 140.03mg/dL(SD12.58) ($p<0.001$, Student's t-test) (Table II).

The mean blood sugar both fasting and 2 hours after breakfast was 7.25 mmol/L (SD .96) and 8.54 mmol/L (SD 0.954) respectively compared with 6.67 mmol/L (SD0.76), and 7.86 mmol/L (SD 0.88) respectively in the control patients ($p=0.012$ and $p=0.006$ respectively, student's t-test). The mean HbA1c in frozen shoulder group was 7.15 (SD 0.77) and in control group 6.77 (SD 0.51) ($p=0.028$, Student's t test) (Table III).

Table I: Frozen shoulder and duration of symptom (n=30)

	Frequency	Percentage
Affected shoulder		
Right side	10	33.3
Left side	14	46.7
Bilateral	06	20.0
Duration of symptoms (Mean ±SD) (months)	8.30±3.40	

Table II: Triglyceride level and frozen shoulder

Level of TG	DM with Frozen shoulder (n=30)	DM without Frozen shoulder (n=30)
Normal (<150 mg/dl)	0 (0)	19 (63.3)
Abnormal (≥150 mg/dl)	30 (100)	11 (36.7%)
Total	30 (100.0)	30 (100.0)

Odd ratio (95% CI)= 3.73 (2.25, 6.18); p value=0.002 (chi square test)

Table III: Blood glucose and HbA1C level of the patients of both groups

Mean±SD	DM with Frozen shoulder	DM without Frozen houlder	P value#
Fasting glucose (mmol/L)	7.25±0.96	6.67±0.76	0.012
2 hours ABF (mmol/L)	8.54±.954	7.86±0.88	0.006
HbA1C (%)	7.15±0.77	6.77±0.51	0.028
Serum triglyceride (mg/dl)	200.13±21.26	144.03±12.58	<0.001

P value was derived from unpaired t test was done.

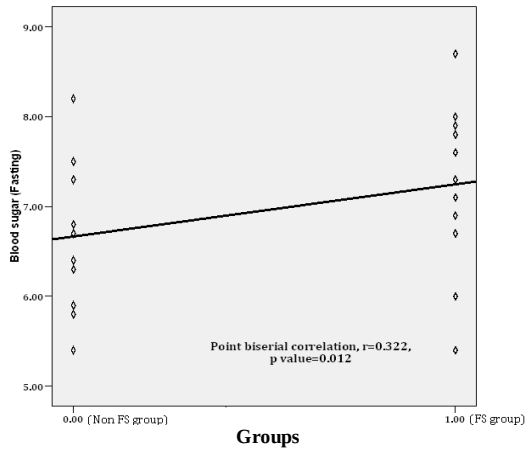

Figure 1: Correlation between fasting blood sugar and groups
Here blood sugar level is continuous variable and group is a categorical variable (0= Non frozen shoulder [non-FS], 1= Frozen shoulder [FS] group). So, Point biserial correlation is appropriate to measure the correlation of above mentioned variables.

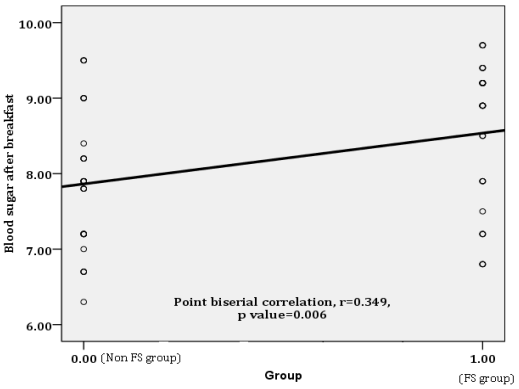

Figure 2: Correlation between blood sugar after breakfast and groups
Here blood sugar after breakfast level is continuous variable and group is a categorical variable (0= Non frozen shoulder [non-FS], 1=Frozen shoulder [FS] group). So, Point biserial correlation is appropriate to measure the correlation of above mentioned variables.

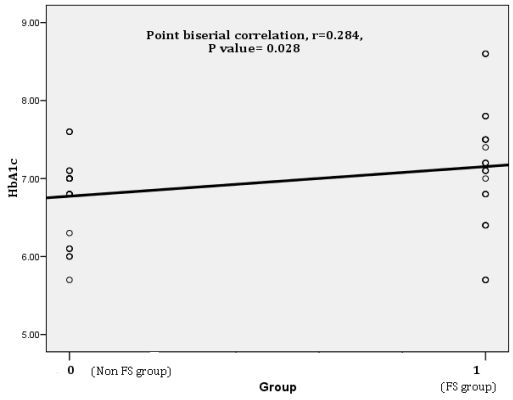

Figure 3: Correlation between HbA_{1c} and groups
Here Glycated haemoglobin (HbA1c) level is continuous variable and group is a categorical variable (0= Non frozen shoulder [non-FS], 1= Frozen shoulder [FS] group). So, Point biserial correlation is appropriate to measure the correlation of above mentioned variables

Discussion

Frozen shoulder is a condition difficult to define, treat and explain from the point of view of pathology[3]. The causes of frozen shoulder are largely undetermined. Most of the patients with frozen shoulder are complaints of stiffness and pain in their shoulder joint[2]. Diabetes is a known risk factor for frozen shoulder[7]. In our study both groups had fairly controlled diabetes mellitus, but blood sugar levels, both fasting and 2 hours after breakfast, were significantly higher in frozen shoulder group. Glycated haemoglobin (HbA1c) level was also significantly higher in cases. Lequesne et al[12] found an abnormal glucose tolerance test in 28% patients with frozen shoulder compared with 12% in control patients. Bridgman[13] found more patients of frozen shoulder in diabetic group than non diabetic group, and Pal et al[14] reported incidences of 19% in diabetics and 5% in non diabetics. In our study positive correlation was observed between incidence of frozen shoulder and blood sugar levels (fasting [r=0.322, p=0.012], 2 hours after breakfast [r=0.349, p=0.006] and HbA1c [r=0.284, p=0.028]) (Figure: 1,2,3)

Uncontrolled diabetes mellitus is one of the most common causes of hypertriglyceridemia[15]. Triglyceride level was normal in our control group (<150 mg/dl) but in frozen shoulder group mean triglyceride level was 200.13 mg/dL (SD 21.26) ($p<0.001$). In univariate analysis elevated serum triglyceride level was associated with increased risk for frozen shoulder [odds ratio (OR) 3.73, 95% confidence interval (CI) 2.25–6.18, $P < 0.001$).

An association between frozen shoulder and diabetes was demonstrated by Bunker and Esler[16]. It appears that hypertriglyceridemia may be associated with frozen shoulder of diabetic patients. Other risk factors should be explored.

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