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Burden of Undiagnosed DM Among the Newly Detected Frozen Shoulder: A Tip of Iceberg

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ABSTRACT
DM is a chronic metabolic disorder with steady increase in trends from past decade, affecting the musculoskeletal system in common. Frozen Shoulder is a clinical condition characterized by significant restriction in both active and passive movements of shoulder joint. India has a large pool of undiagnosed diabetic subjects, who are being diagnosed at the later stage of the course of the disease. Our aim is early detection and to assess the 'prevalence' of undiagnosed DM among patients with frozen shoulder, by using fasting blood sugar and HbA1c. Patients were selected in this cross sectional study after obtaining the informed consent on the basis of our inclusion and exclusion criteria. Total of 31 patients were included into this study. The mean age was 53.9 years withmarginally high tendency to female patients and majority of patients had right shoulder affection.HbA1c value of 23 patients (74.1%) was below 6.5% and 8 patients (25.8%) had a HbA1c value of more than 6.5%. Among them 11 patients (35.4%) had HbA1c value in the range of 6.1-6.5. Fasting blood glucose values in 8 patients had impaired glucose level (25.8%) and 14 patients had values of diabetic range (45.16%). Our study concludes that early detection of diabetes has to be borne in mind with a full diabetic workup to screen Undiagnosed DM/prediabetic and glycemic control by HbA1c, among the patients presenting with frozen shoulder for the first time.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disorder. About 463 million people have diabetes worldwide and around 1.6 million deaths are associated with DM each year[1]. Flier[2] incidence and prevalence of diabetes have been increasingsteadily from past decade. Musculoskeletal disorders are commonly seen in patients with diabetes.

Frozen Shoulder, also known as Adhesive capsulitis, is a clinical condition characterized by significant restriction of both active and passive movements of shoulder joint, which occurs even in the absence of a known intrinsic shoulder disorder[3]. Patients with DM are more severely affected by frozen shoulder as it is a chronic inflammatory condition that might lead to increased shoulder joint synovitis[4,5]. The most common systemic condition and risk factor for frozen shoulder is DM[6-9]. The prevalence of frozen shoulder in diabetic patients is higher at 10%-36%, when compared with general population at 2%[9,10]. Incidence of frozen shoulder is higher among DM patients, but studies are lacking from Indian subcontinent.

India has a large pool of undiagnosed diabetic subjects, who are being diagnosed at the later in the course of the disease leading to high risk complications. Providing it to be need of an hour for early detection. This study is designed for early detection and to assess the incidence of undiagnosed DM among patients with frozen shoulder therebydiagnosing and preventing future diabetic complications.

Objectives:

- To estimate the prevalence of diabetes in patients with Frozen Shoulder
- Effectiveness of HbA1c as glycemic control

MATERIALS AND METHODS

The study was conducted after ethical clearance from the institutional ethical Committee. Patientsin the age group of 30-65 years with painful restricted movement of shoulder without history of DM were included in this cross sectional study after obtaining the informed consent. Patients were selected on the basis of our inclusion and exclusion criteria.

Inclusion Criteria:

- Painful and restricted shoulder movement
- Age between 30-65 years
- Subjects with no history of diabetes

Exclusion Criteria:

- Prior trauma/any shoulder joint surgery and prolonged immobilization
- Subjects with renal failure, liver and cardiac diseases
- Subjects with history of tuberculosis, Hypothyroidism and Rheumatoid Arthritis
- Subjects of frozen shoulder on drugs known to cause hyperglycaemia
- Subjects of frozen shoulder with altered sensorium, disturbed mental state, pregnant and lactating women

The selected patients were subjected to a detailed history and clinical examination. Patients were advised for investigation - FBS, HbA1c, USG and Radiograph of shoulder joint was taken to rule out presence of abnormalities of shoulder joint and trauma.

RESULTS

Total of 31 patients were included in this study who fulfilled inclusion and exclusion criteria (Fig. 1).

Figure 1 shows the distribution of patients with respect to age. The mean age was 53.9 years with minimum age of 36 years and maximum age of 65 years.

Figure 2 shows the distribution of patients with respect to sex. There were 14 (45.16%) male patients and 17 (54.84%) female patients, Male: Female ratio is 0.82:1.

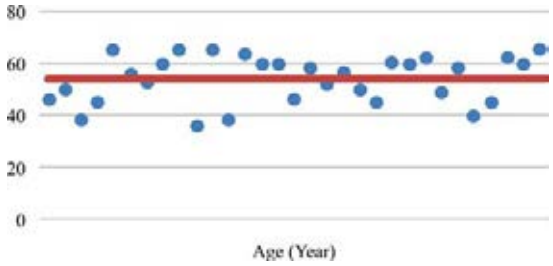


Fig. 1: Distribution of patients with respect to age

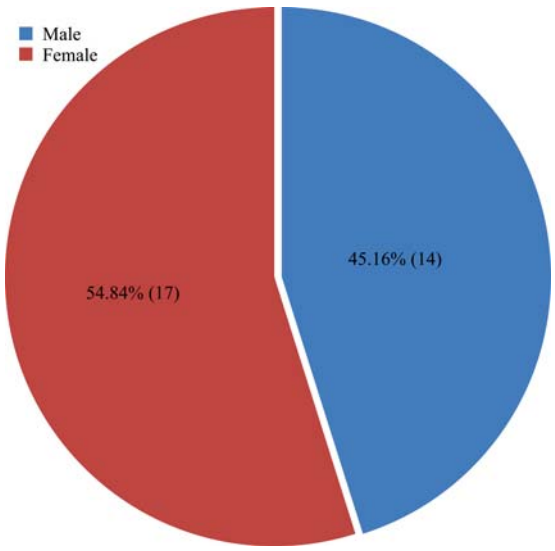


Fig. 2: Distribution of patients with respect to sex

Figure 3 shows the affection of shoulder joint in study population. 20 patients were suffering from right sided frozen shoulder (64.51%) and 11 patients were suffering from left sided Frozen Shoulder (35.45%). None of the patients had bilateral involvement of shoulder joint in our study.

Figure 4a-b depicts the different level of HbA1C in the study population. HbA1c value of 23 patients (74.1%) was below 6.5% and 8 patients (25.8%) had a HbA1c value of more than 6.5%. Among them 11 patients (35.4%) had HbA1c value in the range of 6.1-6.5.

Figure 5a-b out of 31 people, based on fasting blood glucose values 9 people (29.03%) were in the normal range; 8 patients had impaired glucose level (25.8%) and 14 patients had a values of diabetic range (45.16%). Only 3 patients had sugar level around 200 mg dL^{-1}.

Statistical Analysis: Data obtained by the sample of Fasting Blood Glucose and HbA1c were expressed as their Mean±SD (Table 1).

DISCUSSION

The pathophysiology of "Frozen Shoulder" involves the hypothesis of inflammation in the joint capsule followed by adhesions and fibrosis of the synovial joint[11-12]. Chronic inflammatory mediators like IL-6, TNF-α, Platelet derived growth factor(PDGF), TGF-β play an important role in the thickening and contraction of joint capsule. DM, a chronic metabolic disorder causes abnormal collagen repair which predisposes to Frozen Shoulder[13]. Due to increased blood glucose concentration inthe tissue undergoes cross linking and leads to accumulation of advanced glycation end products (AGE). These advanced glycation end products along with inflammatory mediators facilitates adhesions and progressive fibrosis which eventually leads to the contracture of joint capsule causing pain and stiffness at shoulder joint[14,15].

In this observational study, we evaluated the presence of undiagnosed diabetes among the firsttime presentation of frozen shoulder. In the present study, the patient with newly detected diabetes status was found to be 25%. Which is much similar to studydone by Tighe and Oakley examined a subpopulation of 52 patients who had IFS without a previous diagnosis of diabetes or pre-diabetes[16]. It was found prevalence of 3.8% for diabetes and 48% for pre-diabetes in this group and they concluded that patients with frozen shoulder should be routinely screened for diabetes. But in their study they used the 2 hours glucose test and significant number of patients in the age group of seventh to eighth decade.

Table 1: Fasting Blood Glucose and HbA1c were expressed as their Mean±SD

Group	Mean±SD
Fasting Blood Glucose	130.984±32.34
HbA1c	6.29±0.674

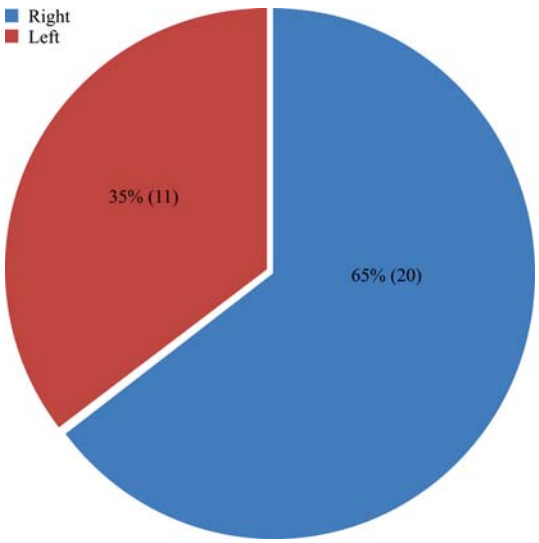
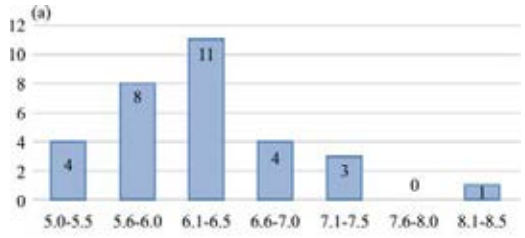


Fig. 3: Distribution of patients according to the affection of shoulder joint



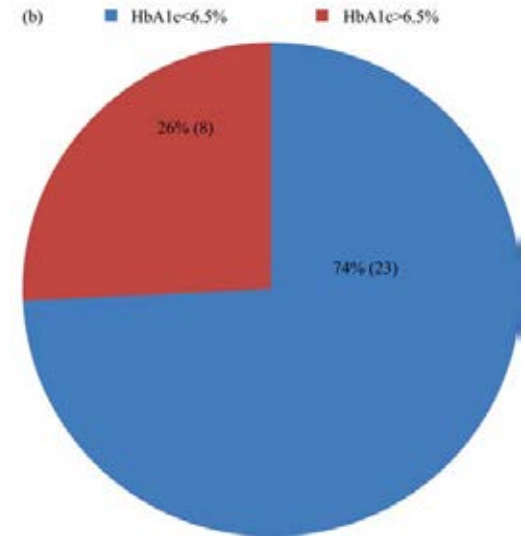


Fig. 4a-b: Different level of HbA1C in the study population

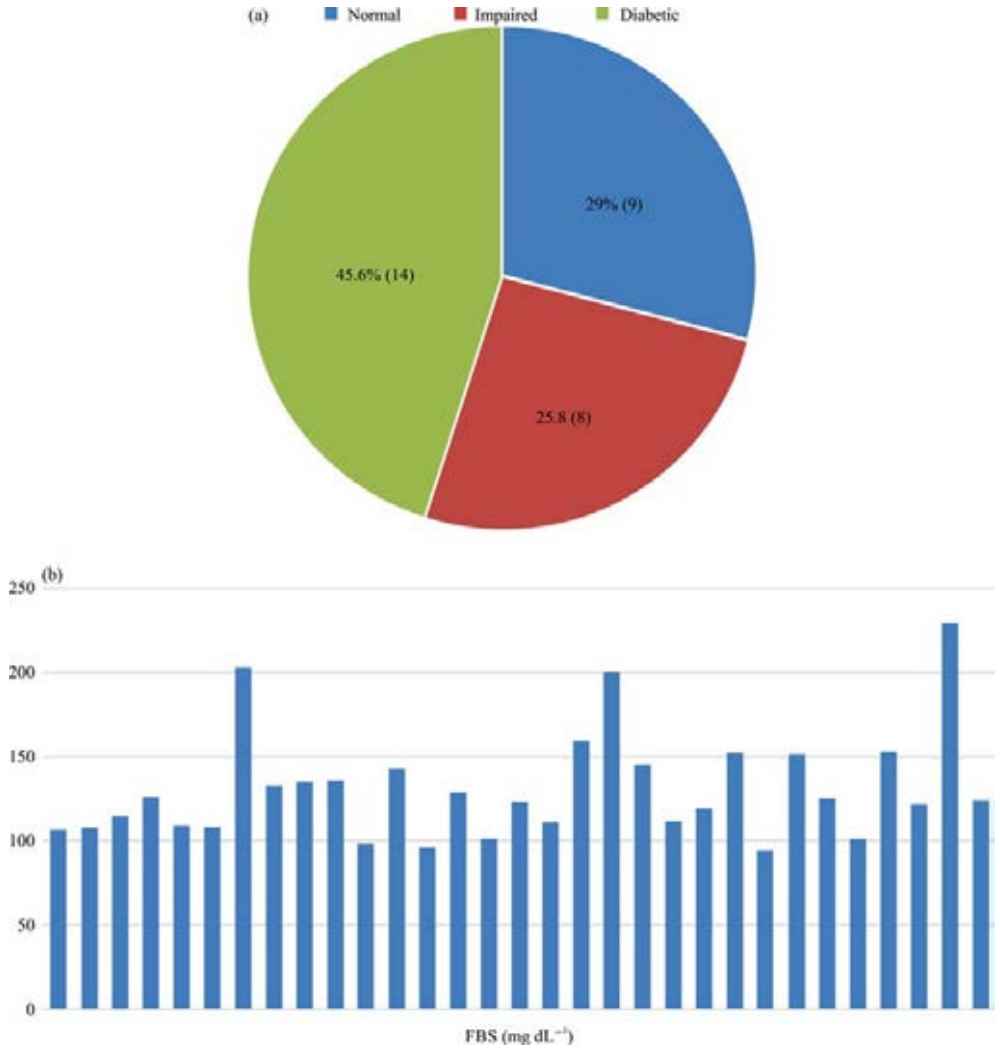


Fig. 5a-b: Fasting blood glucose values

Recent meta-analysis study done by Zreik *et al*. demonstrates an overall mean prevalence of adhesive capsulitis in diabetics is as high as 13.4% and concluded that routine screening should be done for diabetes[17]. However study by Safrar *et al*. defer by low the prevalence of prediabetic where he reported only 8%[18]. Studies from the Indian sub-continent showed similar results. Study from Verma et al showed 39.61% patients had undiagnosed DM and 12.39% had impaired glucose tolerance[19]. Study from Rai et al showed results: 15.5% pre-diabetic and 27.4% diabetic[20]. There may be variable prevalence of diabetes, which can vary with Race, ethnicity, BMI and geographical location with different food habits.

Determination of HbA1c levels in blood gives the accurate evidence of an individual's average blood glucose levels during the previous two to three months[21]. The HbA1c is now used as a standard technique for testing and monitoring the glucose levels in diabetic patients, especially in type-2 DM[22]. People with HbA1c levels between 5.7% and 6.4% correspond to pre-diabetes, who are likely to develop DM in future[23]. From our study patients with frozen shoulder have showed HbA1c value between 5.7 to 6.4% in 19 patients (61%) in pre-diabetic status and 8 patients (25%) in diabetic status. These findings are correlating with the earlier researcher Justin *et al*. which concluded poor control of blood sugar for long time may lead to increased tendency of developing frozen shoulder[24].

CONCLUSION

Our study revealed that along with management of frozen shoulder, the early detection of diabetics has to be kept in mind with a full diabetic workup to screen for pre-diabetes and glycemic control should be assessed using HbA1cwhich correlates the development of frozen shoulder in type-2 DM.

With above positive correlation from our study, we would suggest it would be prudent to evaluate patients for DM who have presented with frozen shoulder. So the health care professionals should routinely screen the patients presenting with frozen shoulder for prediabeties and diabetes. Thereby early detection of undiagnosed diabetes can leads to prevention of future diabetic related complications.

Limitation: Limitations of our study are lack of control group, long term follow up and small study population.

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