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Original Article

Assessing the Risk Factors Associated with Patients Diagnosed to have Adhesive Capsulitis

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Abstract

Background: Adhesive Capsulitis (AC) of the shoulder or Frozen Shoulder (FS) is the most common disabling shoulder condition which has serious functional implications in daily life. FS affects 2 to 3 percent of the population. In Pakistan, fewer studies have been performed in the past describing the common risk factors linked to AC.
Objective: The objectives of the study are to assess the risk factors e.g diabetes, thyroid disease, stroke, trauma, hyperlipidemia, rheumatoid and tuberculosis present in patients with AC, and whether the levels of HbA1c have a role in AC.
Study type, settings & duration: This descriptive study was carried out at Shifa Foundation Falahi Clinic and Pain and Medical Clinic at Shifa International Hospital, Islamabad between June 2018 and January 2021.
Methodology: Non probability convenience sampling technique was used. Consecutive patients more than 18 years old with shoulder pain or stiffness were identified and informed consent was obtained. A detailed survey using a questionnaire was used. Descriptive statistics were performed. Mean and standard deviation was calculated for age. The SPSS version 23 was used for data analysis. Frequency analysis of risk factors was performed. Further statistical analysis was done by applying chi-square test to assess the relationship between HbA1c levels(control of Diabetes Mellitus) and adhesive capsulitis.
Results: Data of 304 patients with mean age of 54±9 years. Frequency analysis showed 86 (28.3%) were males and 218 (71.7%) were females. The most common risk factor was diabetes 41.6% followed by hyperlipidemia 28.6%, shoulder trauma 14.8%, hypothyroidism 12.5%. High HbA1c levels were found in 78% of diabetic patients and it was strongly associated with AC (*p*-value <0.001).
Conclusion: Age above 50, female gender, presence of diabetes, poor control, hypothyroidism, hyperlipidemia were found to be associated with AC. Patients with the above risk factors should be closely monitored for the development of FS and control of primary disease to prevent morbidity.
Key words: Adhesive capsulitis, risk factors, diabetes, HbA1c.

Introduction

Frozen Shoulder (FS) or Adhesive Capsulitis (AC) is an extremely debilitating disease associated with pain and stiffness causing restriction of motion in the shoulder joint. It is a fairly common condition however understanding is poor, being difficult to define in terms of etiology, pathogenesis, and treatment. Clinicians have been trying to define and present management plans for AC for long. Duplay is considered to be the first one who described in 1872, a painful, stiffening condition of the shoulder.[1] Codman described "frozen shoulder" in 1934 and later Neviaser gave the name "adhesive capsulitis" in 1945.[1]

AC is the most common disabling entity affecting the shoulder which has serious functional implications in daily living. FS affects 2 to 3 percent of the population.[2] Secondary AC results from prolonged immobility which occurs in cases of shoulder trauma or surgery.[3] An association of different medical conditions to FS has been narrated and these comorbidities are correlated with frequent pain and dysfunction presentation.[4] The criteria used to diagnose AC described by Pal et al were, pain in the shoulder for about one month duration,

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Authors Contribution

MZ, SAS, TI, & MJI conceptualized the project. MHW did the data collection. MZ, & MK did the literature search and performed statistical analysis. Drafting, revision & writing of manuscript were done by MZ, SAS, TI, MHW & MK.

Unable to sleep on the affected shoulder side and restricted range of movements of the shoulder joint in three dimensions.[5]

In Pakistan, fewer studies have been conducted in the previous years describing the common risk factors linked to AC. Through this study, we wanted to identify, create awareness among physicians and patients, and treat the risk factors linked to AC to reduce morbidity. By performing the levels of HbA1c, assessing the duration of diabetes, and identifying whether patients are on oral hypoglycemic drugs or insulin, we aimed to find out whether poor glycemic control was associated with AC. The objective was to assess the risk factors and role of HbA1c level present in patients with adhesive capsulitis.

Methodology

Patients presenting with shoulder pain or stiffness attending Medical OPD at Shifa Foundation Falahi Clinic and Pain and medical Clinic at Shifa International Hospital were included. The study was approved by Institutional Review Board and Ethical Committee. Data was collected between June 2018 and January 2021.The patient's informed consent was obtained. A detailed survey using a pretest questionnaire about the presence of pain and stiffness in the shoulder, side, and handedness was used. Pilot testing of the questionnaire was carried out on 50 participants and minor adjustments made. The reliability calculated was Cronbach's Alpha Based on Standardized Items 0.874.

Consecutive patients of more than 18 years old using non probability convenience sampling technique with shoulder pain or stiffness were included. Participants who gave consent were included. Confidentiality was maintained regarding the identification of patients and their responses. Each patient was numbered with a special code, which was known to the researcher only. The potential benefits including prevention of complications and a better understanding of the disease process were explained to the patient.

A goniometer was used to examine passive external rotation of each shoulder and measurement was recorded. Data was collected through a specially designed questionnaire. Diabetes-related questions including presence, duration, treatment, and control were asked. HbA1c, TSH, and serum lipid profile were done for each patient. According to the WHO criteria, control of blood sugar was defined as HbA1c less than 7.[6]

SPSS version 23 was used for data analysis. Descriptive statistics were performed. Mean and standard deviation were calculated for age. Frequencies of risk factors were calculated. For association, chi-square test was used to assess the relationship between HbA1c levels (control of Diabetes Mellitus) and Adhesive Capsulitis.

The ethical approval was obtained from Institutional Review Board and Ethical Committee of Shifa International Hospital, Islamabad vide reference IRB#. 2053-102-2018.

Results

Data of 304 patients with a mean age of 54 years and a standard deviation of 9 were reviewed. 86 (28.3%) patients were males and 218 (71.7%) patients were females. Of the total 298 (98%) patients were right hand dominant and 6 (2%) were left hand dominant. The right side shoulder was involved in 155 (51%), the left side shoulder was involved in 114 (37.5%) and both shoulders were involved in 35 (11.5%) patients with adhesive capsulitis.

Table 1: Risk factors associated with adhesive capsulitis. (n=304)

Patient's Information		*Frequency (n)*	*Percentage (%)*
Diabetic	Yes	126	41.4
	No	178	58.6
Cholesterol levels	Normal	234	77.0
	High	70	23.0
Serum triglyceride levels	Normal	217	71.4
	High	87	28.6
Diagnosis of stroke	Yes	12	3.9
	No	292	96.1
Diagnosis of rheumatoid disease	Yes	19	6.3
	No	285	93.8
TSH	Normal	266	87.5
	High	38	12.5
Shoulder trauma	Yes	45	14.8
	No	259	85.2
Diagnosis of tuberculosis	Yes	12	3.9
	No	292	96.1

Table 2: Use of hypoglycemic medications by diabetic patients. (n=126)

	Medications	*Frequency (n)*	*Percentage (%)*
Hypoglycemic Drugs	Diet control	8	6.4
	Oral drugs	58	46.0
	Insulin	37	29.4
	Oral drugs & insulin	9	7.1
	No drug	14	11.1

Risk factors associated with adhesive capsulitis are shown in Table-1. The most common risk factors were diabetes 41.6% followed by hyperlipidemia 28.6%, shoulder trauma 14.8% and

hypothyroidism 12.5%. Table-2 shows the use of hypoglycemic medications by diabetic patients. Among all, 14 (11.1%) patients were not using drugs to control diabetes.

Table 3: Levels of HbA1c in patients with adhesive capsulitis. (n=304)

HbA1c Levels				
<7%	7-10%	>10%	Total	p-value
28	71	27	126	0.000
161	13	4	178	
189	84	31	304	

Table-3 shows the levels of HbA1c in patients with adhesive capsulitis. Of the total, 98 (78%) diabetic patients had high HbA1c levels showing uncontrolled blood sugar levels. The chi-square test statistic=146.084 (*p*-value =0.000) shows a strong relationship between HbA1c levels and diabetes in adhesive capsulitis patients. Total of 17 patients with adhesive capsulitis were incidentally diagnosed with diabetes as depicted by high HbA1c levels.

Discussion

The present study provides an overview of the risk factors linked to adhesive capsulitis. The most common risk factors found in our study were diabetes, hyperlipidemia, shoulder trauma, and hypothyroid is associated with AC. Other risk factors found in our study were stroke, rheumatoid disease, and tuberculosis. Poor control of disease was present in more than three-quarters of diabetic patients with high HbA1c levels. High HbA1c levels show a strong correlation with AC (*p*-value <0.001). A small percent of the population with adhesive capsulitis was incidentally diagnosed with diabetes as depicted by high HbA1c levels.

Hand C et al found female gender and age range between 40 and 60 years were commonly affected[7] which strongly correlates with our results. Bilateral shoulder joint involvement is frequent and the contralateral side might get affected few years after the onset of the symptoms in the first shoulder. A study by Kingston K et al shows non-dominant shoulder was more prone to be affected[8] however in our study dominant and non-dominant shoulders were equally affected with consideration of right-sided dominance in the majority. Another study shows that diabetic patients have a high rate of bilateral AC.[9]

A strong association between frozen shoulder and diabetes was first described by Bridgman.[10] He studied 800 diabetic patients and found a 10.8% incidence of AC and in 600 non-diabetic patients only a 2.3% incidence of AC. Recent meta analysis also shows AC is five times more prevalent in diabetic patients as compared to non-diabetics.[11] Our study corresponds to these findings. Diabetes came out to be the most common risk factor in patients with AC.

Yian et al studied the diabetic population and did not find an association between AC and blood glucose levels control.[12] These results are in contrast with our study findings. Our study shows that almost eighty percent diabetic population with AC had poorly controlled blood sugar levels. However, by Yian et al study diabetes duration of more than 10 years was associated with an increased number of frozen shoulder patients.[12] Another study by Justin H et al showed that HbA1c was positively associated with an increased incidence of adhesive capsulitis. This finding suggests that diabetic patients are more prone to the development of adhesive capsulitis. Patients with uncontrolled blood sugar levels over a longer period are at more risk of the development of adhesive capsulitis.[13] Our study reinforces the suggested results.

Maini S et al reported a 36% prevalence of diabetes among AC patients and had poor control of blood sugar.[14] Our study shows a higher percentage of about 41.4 diabetics among FS patients and strongly in line with the findings. Cakir et al found an association of hormonal dysfunctions such as thyroid and ACTH with AC.[15] Another study reported that patient with thyroid disease has 10.9% incidence of AC.[16] In our study, 12.5% of patients with AC were found hypothyroid, these findings are in accordance with the above-mentioned study.

Our study shows that about one-quarter of AC patients had hypercholesterolemia and hypertriglyceridemia being risk factors for AC which was also reported by Hand et al.[6] The series of studies found 17% of capsulitis associated with hypercholesterolemia. A recent study in 2020 also reinforces that risk factors like female sex, diabetes, thyroid disease, and hypercholesterolemia were associated with increased prevalence of the FS with either primary or secondary AC.[17]

The study by Wang K et al shows that diabetes; hypothyroidism and strong family history of FS were associated with AC.[18] Local study conducted by Awan et al in post cardiac surgery patients showed increasing age, diabetes, female gender, longer duration of immobility of shoulder and inactivity before surgery were contributors in the prevalence of AC.[19] Our study results second the finding and also suggest that other risk factors like

stroke, rheumatoid disease, shoulder trauma, and tuberculosis were associated with frozen shoulder.

To conclude, we found age more than 50, female gender, presence of diabetes, poor control of diabetes, hypothyroidism, hyperlipidemia were found to be associated with adhesive capsulitis. Patients with the above risk factors should be closely monitored for the development of frozen shoulder and control of primary disease to prevent morbidity. Further studies are recommended to see the independent predictors, their correlation, and mechanism to cause adhesive capsulitis.

Conflict of interest: None declared.

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