

## Prevalence of Frozen Shoulder among Patients Undergoing Cardiothoracic Surgery

Md. Jamal Uddin<sup>1</sup>, MSA Mansur Ahmed<sup>2</sup>, Moniruzzaman<sup>3</sup>, Md. Habibur Rahman<sup>4</sup>, Md. Jalal Uddin<sup>5</sup>, Masoom Siraj<sup>6</sup>

### ABSTRACT

**Objective:** To determine the prevalence of frozen shoulder among patients undergoing cardiothoracic surgery as well as to find the factors associated with its development.

**Methods:** This study was carried out between March and June 2010 on 113 patients who underwent coronary artery bypass graft or cardiothoracic surgery and attended at follow up session as an out-patient in four different cardiac hospitals of Dhaka city. Consecutive sampling was done to select the respondents for interview. Data were collected by questionnaire with face to face interview.

**Results:** The respondents were on an average  $54.5 \pm 9.3$  years old and predominantly male. The youngest and oldest respondents interviewed were 32 and 74 years old respectively. The prevalence of frozen shoulder among the respondents was approximately 35% (39/113). The patients with age 60 years or more tend to be associated with the frozen shoulder significantly more (59.4%) than those with age < 60 years (24.7%), ( $\chi^2 = 12.209$ ,  $p < 0.001$ ). Females were particularly prone to develop frozen shoulder (53.3%) than their male counterparts (27.7%) ( $\chi^2 = 6.401$ ,  $p = 0.011$ ). The prevalence of frozen shoulder was considerably higher among the diabetics than that among the non-diabetics (38.9% vs. 26.8%,  $p = 0.195$ ). Frozen shoulders were found to be significantly higher (67%) in patients who didn't perform physiotherapy exercise than those who performed the same (33%) ( $p < 0.001$ ).

**Conclusion:** Over one-third of the patients undergoing cardiothoracic surgery develop frozen shoulder and physiotherapy is the key to reducing its incidence. Females and diabetics are at risk of developing frozen shoulder.

**Keywords:** Frozen shoulder; cardiothoracic Surgery; physiotherapy and treatment compliance.

### Introduction

The frozen shoulder, first identified as a distinct clinical entity by Duplay in 1872,<sup>1</sup> is one of the most common causes of shoulder pain and disability encountered by the physicians in their daily practice. The prevalence of frozen shoulder is 2% to 3% worldwide and usually starts between 40 - 70 years of age.<sup>2</sup> It is a common problem in our country in the 5<sup>th</sup> and 6<sup>th</sup> decades of life.<sup>3</sup> Males tend to be affected less frequently than females, and there is no predilection for race.

Frozen shoulder is a condition characterized by pain and global restriction of movement with loss of external rotation. It can be divided into primary and secondary forms. In the primary form there is no associated disease or a history of trauma, whilst in the secondary form it occurs after trauma or surgery. Its incidence in Caucasian populations is estimated to be between 2 and 5%.<sup>4</sup> The natural history of frozen shoulder is important not only for reassuring the patient that the condition will

eventually improve, but also for assessing the results of various treatments. Although its aetiology is still unknown, frozen shoulder is associated with several diseases or conditions. Diabetic patients have a higher incidence (10-20%) than the general population (2-5%), as do those with hyperthyroidism, hypothyroidism, Parkinson's disease.<sup>4</sup> It may occur after a shoulder injury or after prolonged immobilization of the shoulder, such as after surgery or an arm fracture. Many people are reluctant to move their shoulders after a heart procedure for fear of pain or affecting the chest wound. Immobilizing a joint seems to trigger the autoimmune response resulting in frozen shoulder. With rapid increase in the number of open heart surgery in Bangladesh, proper chest physiotherapy managements are essential to help patients reducing the risk of developing frozen shoulder. The findings derived from the present study might be helpful to minimize the incidence of frozen shoulder in patients undergoing cardiothoracic surgery.

### Authors' Information

1. Md. Jamal Uddin, (BSPT) DU, MPH (NCD) DU, Chest Physiotherapist ICHRI, Dhaka.
2. Prof. MSA Mansur Ahmed, Head, Department of Community Medicine, BIHS, Dhaka.
3. Moniruzzaman, (BSPT) DU, M. Phil (NCD) DU, Research Fellow, BIHS, Dhaka.
4. Md. Habibur Rahman, (BSPT)DU, Lecturer, Physiotherapy, BHPI, Savar, Dhaka.
5. Md. Jalal Uddin, MD, Ph.D, Senior Consultant, Department of Cardiac Surgery, ICHRI, Dhaka.
6. Dr. Masoom Siraj, FRCS (Edin), Head, Department of Cardiac Surgery, ICHRI, Dhaka.

Correspondence: Md. Jamal Uddin, Mobile: 01824-630856, E-mail: uddinj83@gmail.com

## Methodology

This cross sectional study was designed to assess the prevalence of frozen shoulder in patients undergoing cardiothoracic surgery. The study was carried out on 113 respondents who underwent cardiothoracic surgery in ICHRI, United Hospital, National Heart Foundation & Research Institute and National Institute of Cardiovascular Diseases (NICVD), Dhaka and attended at their respective Out-patient Departments for follow-up between March and June 2010. Convenient sampling was done to select the respondents for interview. Keeping compliance with Helsinki Declaration for Research Involving Human Subject 1964, data were collected on key variables of interest from the respondents using a structured questionnaire. Respondents presenting with pain and restricted movement of shoulder joint with positive LAM test (limitation in lateral rotation, abduction and medial rotation) were considered as having frozen shoulder. The frozen shoulders were clinically categorized into three stages - Stage-I (patients could not actively move their shoulder due to acute pain, but full range of passive movement was possible), Stage-II (both active and passive movements of shoulder were restricted) and Stage-III (shoulder pain was negligible and patients could move their shoulder to certain extent).<sup>5</sup> Compliance to physiotherapy was categorized into fully complied, partially complied and not complied. If the patient followed physiotherapy exercises as instructed by the physiotherapists, it was considered full-compliance, if the instructions are partially followed, it was termed partial compliance and if not followed at all, it was termed non-compliance. Collected data were analysed using SPSS (Statistical Package for Social Sciences), version 16.0. The test statistics used to analyse the data were descriptive statistics and Chi-square ( $\chi^2$ ) Probability Test. Level of significance was set at 0.05 and  $p < 0.05$  was considered significant.

## Results

The mean age of the respondents was 54.5 years with a standard deviation of  $\pm 9.3$  years. Nearly three-quarters (73.5%) of the respondents was male with male to female ratio being 3:1. The incidence of frozen shoulder among patients who have had cardiothoracic surgery was 35%. Analysis of demographic factors demonstrated that older patients (age = 60 years) tend to be associated with the frozen shoulder significantly more (51.3%) than those with age  $< 60$  years (18.9%) ( $\chi^2 = 12.717$ ,  $p < 0.001$ ) (Table I). Females demonstrated their significant presence among those who developed frozen shoulder (53.3%) than among those who did not develop the same (17.6%) ( $\chi^2 = 8.869$ ,  $p = 0.003$ ) (Table II). Diabetes was

considerably higher among those who developed frozen shoulder (71.8%) than those who did not develop the condition (59.5%) ( $\chi^2 = 1.681$ ,  $p = 0.159$ ) (Table III). Of the 113 respondents, 80(70.8%) performed physiotherapy following cardiothoracic surgery and the rest 33(29.2%)

**Table-I. Association between demographic characteristics and frozen shoulder.**

Age (yrs) <sup>#</sup>	Frozen shoulder		Chi-square ( $\chi^2$ )	p-value
	Developed (n = 39)	Not developed (n = 74)		
< 60	19(48.7)	60(81.1)	12.717	<0.001
= 60	20(51.3)	14(18.9)		

<sup>#</sup> Data were analysed using Chi-square ( $\chi^2$ ) Test.

Figures in the parentheses denote corresponding percentage

**Table-II. Association between sex and development of frozen shoulder.**

Sex <sup>#</sup>	Frozen shoulder		Chi-square ( $\chi^2$ )	p-value
	Developed (n = 39)	Not developed (n = 74)		
Male	22 (56.4)	61(82.4)	8.869	0.003
Female	17(43.6)	13 (17.6)		

<sup>#</sup> Data were analysed using Chi-square ( $\chi^2$ ) Test.

Figures in the parentheses denote corresponding percentage

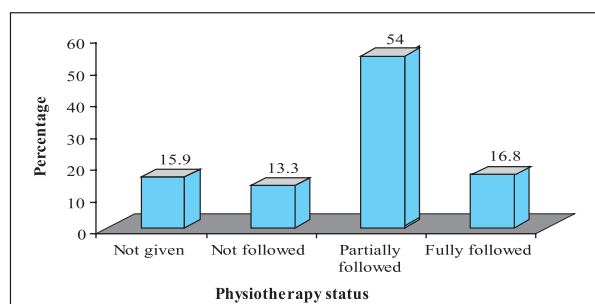
**Table III. Association between diabetes and frozen shoulder.**

Diabetes <sup>#</sup>	Frozen shoulder		Chi-square ( $\chi^2$ )	p-value
	Developed (n = 39)	Not developed (n = 74)		
Present	28 (71.8)	44 (59.5)	1.681	0.195
Absent	11 (28.2)	30 (40.5)		

<sup>#</sup> Data were analysed using Chi-square ( $\chi^2$ ) Test.

Figures in the parentheses denote corresponding percentage

did not. About 16% did not receive any physiotherapy advice, 13.3% received the advice but did not act accordingly, 54% partially complied to the advice and 16.8% fully complied (Fig. 1). The incidence of frozen shoulder was much higher among patients who were not exposed to or did not comply to physiotherapy advice



**Fig.1: Distribution of patient by physiotherapy status.**

**Table IV. Association between physiotherapy and development of frozen shoulder.**

Physiotherapy advice <sup>#</sup>	Frozen shoulder		$\chi^2$	OR (95% CI of OR)	p-value
	Developed (n = 39)	Not developed (n = 74)			
Not complied	22 (64.7)	12 (35.3)	19.615	6.7(2.7 - 16.2)	< 0.001
Complied	17 (21.5)	62 (78.5)			

<sup>#</sup>Data were analysed using Chi-square ( $\chi^2$ ) Test., Figures in the parentheses denote corresponding percentage

following cardiothoracic surgery (64.7%) than those who complied to physiotherapy advice (21.3%). The risk of developing frozen shoulder was about 7(95% CI = 2.7 - 16.2) times higher in patients who did not complied to physiotherapy advice than those who did it (p < 0.001).

### Discussion

Shoulder pain is the third most common cause of musculoskeletal disability after low back pain (LBP) and neck pain. The estimated prevalence of frozen shoulder is 2-3% in the general population and 5-6% in patients evaluated by shoulder surgeons.<sup>6</sup> The present study demonstrated that older and female patients were significantly prone to develop frozen shoulder than the relatively younger and male patients. Physiotherapy was found to be main determinant of frozen shoulder after cardiothoracic surgery with patients complying to physiotherapy were less likely to be associated with frozen shoulder. In a study, where 101 patients of open heart surgery were followed prospectively, the incidence of shoulder girdle pain was observed to be 50% which is much higher than that observed in the present study (35%).<sup>7</sup> Though frozen shoulder may be idiopathic, the presence of shoulder capsulitis was highly dependent on the age and the duration of diabetes, particularly in type II diabetics. The prevalence of shoulder capsulitis increased after the age of 40 and 50 years.<sup>8</sup> Chemeris and Lathey described that frozen shoulder is a self-limiting regional skeletal problem whose etiology remains an enigma. However, it may occur after a shoulder injury or after prolonged immobilization of the shoulder, such as after surgery or an arm fracture.<sup>9</sup>

No racial variation of frozen shoulder is described, in the literatures but it affects women more frequently than men, with a female-to-male ratio of about 1.4:1. Menopause is often reported as a cause of frozen shoulder in women, although Lundberg ruled out this hypothesis by demonstrating that age is the principal predictor<sup>10</sup>.

Mac Gillvray and Drakos<sup>6</sup> reported that long-term complications of diabetes may include changes in connective tissue that occur as a result of high glucose levels. Adhesive capsulitis, often referred to as frozen shoulder (a pathological condition of the shoulder joint) which causes a gradual loss of motion usually occur in one shoulder. Adhesive capsulitis has a prevalence of 2% in the general population, but is reported to occur in 10-29% of those with diabetes.

One of the study shows that the prevalence of rheumatological diseases like frozen shoulder is more common in the diabetic population as compared to nondiabetics. The association of diabetes and frozen shoulder is well-documented. Bridgmen reported an incidence of 11% among diabetics.<sup>11</sup>

As highlighted by Anton,<sup>12</sup> many treatment modalities have been advocated for frozen shoulder. Of them physiotherapy is the most commonly prescribed treatment for patients with frozen shoulder. They must understand that they will probably improve and eventually recover, but their rate of improvement will be slow.

In this study the frequency of frozen shoulder was significantly higher who did not have physiotherapy advice or follow the physiotherapy advice (64.7%) than those have had followed the maneuver (35.3%). The risk of having frozen shoulder in patients who did perform physiotherapy following cardiothoracic sugary is estimated to be about 7 times higher than those who followed the procedre.

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