

# Prevalence of Adhesive Capsulitis and its associated risk factors in post CABG patients

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## ARTICLE INFORMATION

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## ABSTRACT

**Background:** Patients suffering from heart disease and having heart surgery are more prone to develop fibrotic capsulitis/adhesive capsulitis. This need to addressed and managed because it can lead disability of shoulder and can affect the daily activities.

**Objectives:** To find out the prevalence of Adhesive Capsulitis (AC) and its associated risk factors in post Coronary Artery Bypass Grafting patients.

**Methodology:** This analytical cross-sectional study was conducted in Imran Idrees Teaching Hospital, Pervaiz Ellahi Institute of Cardiology, Allama Iqbal Teaching Hospital and Islam Teaching Hospital from February 2023 to May 2023. Data was collected from 124 participants both female and male with ages above forty; that underwent CABG three months before, and were coming for follow up. Data was collected using Apley's scratch test to reconfirm diagnosis and self-structured Questionnaire regarding associated factors, while SPADI was used to measure disability. Data was analyzed using SPSS version 22. Chi square-test was used to find association and then results were presented in form of frequencies and crosstabs.

**Results:** Results showed that mean age of participants were  $54.78 \pm 7.61$ , mean of SPADI was  $29.94 \pm 20.53$  and prevalence of Frozen Shoulder among post CABG patient was 23.4%. The results also showed that age, female gender, Hypertension, Diabetes Mellitus, shoulder immobility after surgery, lack of physical activity, lack of physical therapy follow-up and SPADI were significantly related to the development of AC in post CABG patients.

**Conclusion:** The study showed prevalence of AC among post CABG patients and risk factors including hypertension, female gender, age, increased duration of shoulder immobility, physical inactiveness before surgery, diabetes and no physiotherapy follow-up significantly contributes to its increased prevalence.

**Keywords:** Adhesive Capsulitis, cardiac surgery, Frozen Shoulder, , hypertension, diabetes, Risk Factors



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## Original Research Article

### Introduction:

Coronary arteries (blood vessels that deliver blood and oxygen to the heart), sometimes become narrowed or blocked due to atherosclerosis, or the accumulation of fat and plaque within these blood vessels resulting in a condition known as Coronary Artery Disease (CAD) <sup>(1)</sup>. To deal with this condition, a surgical procedure was introduced known as Coronary Artery Bypass Grafting (CABG). CABG is a kind of open-heart surgery that involves grafting a portion of a blood vessel from the aorta to the coronary artery in order to bypass a blocked coronary artery and establish a new blood flow path to the ischemic region. <sup>(2)</sup> However, many musculoskeletal and neurological problems following CABG are clinically observed, that need rehabilitation using different interventions to minimize the complications <sup>(3, 4)</sup>. One of them was the potential risk of developing AC. It was noticeably seen more in post CABG

patients. Patients suffering from numerous heart diseases and those who had undergone heart surgery were more prone to develop fibrotic capsulitis than general population. According to a study, adhesive capsulitis occurred in 33% of the male patients who underwent cardiac surgery <sup>(5)</sup>. Adhesive Capsulitis, also known as "frozen shoulder," "fibrotic capsulitis," "primary idiopathic stiff shoulder," and "contracture of the shoulder," was a condition that develops gradually and causes deltoid insertion pain, difficulty sleeping, painful incomplete external rotation and incomplete elevation, and limitation of movements actively as well as passively. However, the condition is characterized by normal radiograph <sup>(6)</sup>. The natural axillary recess was lost as a result of thickness, fibrosis, rigidity, and chronic inflammation of the capsular sub synovial layer <sup>(7)</sup>. It was classified as primary or secondary, depending on whether the condition developed suddenly,

without any known reason or any trauma(primary),or it was brought on by trauma, another disease i.e. Sub acromial discomfort or surgery (secondary) <sup>(8)</sup>. Some of the studies show a significant association between AC and a number of diseases, including autoimmune diseases and cardiovascular diseases <sup>(9)</sup>. Studies also show that the frequency of fibrotic capsulitis is (3%-5%) in between general population, but between (28%-40%) in people with diabetes <sup>(10)</sup>. The incidence of AC increased with the increasing age as with the increasing age and most commonly affected women between the ages of 40 and 60 <sup>(11)</sup> and was unusual in patients aged over 70 years <sup>(12)</sup> After open heart surgery, immobilizing the shoulder joint for 1-4 weeks out of concern for the incision or pain control leads to adhesive capsulitis <sup>(13)</sup> It was also not surprising that AC develops following CABG because procedures like replacement of valves and others that include sewing the sternum and rib separation can impinge on pain-sensitive structures and immobilize the shoulder, which can result in adhesive capsulitis. The exact reason for the development of AC following CABG is still unknown however various theories state numerous secondary reasons, including nonunion of sternum after surgery ,ribs fracture, any injury to musculoskeletal structure during surgery, sternum separation from costal cartilages, to use sternal wires that put pressure on the shoulder, any infection to the wound, and prolonged immobility of shoulder as a result of sternal wires.<sup>(14)</sup> With rapid increase in number of heart surgeries in Pakistan, it was essential to determine the prevalence of frozen shoulder in post CABG patients as disabling effects of CABG are mostly ignored thus restricting the activities of shoulder joint .Therefore by doing this research we wanted to raise awareness regarding importance of pre-operative and post-operative physiotherapy to avoid complications caused by CABG and its disabling effects on shoulder joint.

**Methodology:**

All the participants were informed about nature of study and its purpose. Data was collected using Non probability convenience Sampling Technique. Participants were both male and female with ages above forty and who underwent CABG 3

months before and were coming for follow-up. Exclusion criteria included those participants who had a history of thyroid disease, fibrotic capsulitis, arthritis, and any shoulder musculoskeletal disease before surgery, Parkinson’s disease or stroke. Informed consent was received from all participants in written form before data collection procedure. A Self Structured Questionnaire regarding associated factors i.e. demographics of patients, details of co morbid diseases such as diabetes and hypertension, shoulder immobility duration, hospital stay duration, follow-up of physiotherapy and physical activity before surgery was used. SPADI Questionnaire was also used to measure pain and disability. It contains thirteen questions to assess both disability and pain, a five item questionnaire measuring pain and eight item questionnaire measuring disability, every item is scored on an 11-point ordinal rating scale ranging from 0 meaning (having no pain or difficulty) to 10 meaning (having worst imaginable pain or so difficult that help is required) <sup>(15)</sup> Reliability co-efficient of ICC for pain scale was 0.989 and for disability scale was 0.990 <sup>(16)</sup>.Its score was calculated by separately calculating average subscale score for five pain items and eight disability items and then calculating their average. Its greater score indicated greater impairment and disability <sup>(17)</sup>. Its cut-off value is 46.8<sup>(18)</sup>. Then Apley scratch test was used to confirm the diagnosis of AC patients by checking their restricted range of motion pertaining to LAM (lateral rotation, abduction, medial rotation) pattern. To perform this test, patients are asked to reach their arm behind their head and touch superior aspect of opposite scapula. Through this test abduction and external rotation was checked. In order to check internal rotation, patients were asked to reach behind their back and touch inferior angle of opposite scapula. Its reliability coefficient of ICC range (0.89-0.99) (19). The data was then analyzed using SPSS version 22.

**Results:**

Total 124 patients were included. The mean age of the study participants was 54.78±7.61 and results revealed that the prevalence of AC among post CABG patients was n=29(23.4%) (Table 1)

Study variables	Categories	Adhesive Capsulitis			P-value
		n (%)	n=29(23.4%) Yes	n=95(76.6%) No	
			n (%)	n (%)	
Age in years(Category)	41-50	35(28.2%)	6(4.8%)	29(23.2%)	0.02
	51-60	64(51.6%)	12(9.7%)	52(41.93%)	
	61-70	25(20.2%)	11(8.8%)	14(11.29%)	
BMI(kg/m <sup>2</sup> )	Underweight	12(9.7%)	2(1.61%)	10(8.06%)	0.02
	Normal	83(66.9%)	14(11.2%)	69(55.64%)	
	Overweight	22(17.7%)	10(8.06%)	12(9.67%)	
	Obese	7(5.6%)	3(2.41%)	4(3.22%)	
Gender	Male	84(67.7%)	15(12%)	69(55.64%)	0.03
	Female	40(32.3%)	14(11.29%)	26(20.96%)	
Hypertension	Positive	55(44.4%)	20(16.1%)	35(28.2%)	0.02
	Negative	69(52.4%)	9(7.2%)	60(48.3%)	
Diabetes	Positive	59(47.6%)	19(15.3%)	40(32.2%)	0.02
	Negative	65(52.4%)	10(8%)	55(44.3%)	
Duration of shoulder immobility after surgery	1week	9(7.3%)	1(0.8%)	8(6.45%)	0.01
	2weeks	41(33.1%)	16(12.9%)	25(20.1%)	
	4weeks	74(59.7%)	12(9.6%)	62(50%)	
Duration of hospital stay after surgery	<10days	79(63.7%)	17(13.7%)	62(50%)	0.55
	11-20days	34(27.4%)	8(6.45%)	26(20.9%)	
	>20days	11(8.9%)	4(3.2%)	7(5.64%)	
	Yes	83(66.9%)	14(11.2%)	69(55.6%)	

Physical activeness before surgery	No	41(33.1%)	15(12%)	26(20.9%)	0.01
Followed instructions of physiotherapy after surgery	Yes	32(25.8%)	3(2.4%)	29(23.3%)	0.03
	No	92(74.2%)	26(20.9%)	66(53.2%)	

\*P value was significant at <0.05

**Table1: Risk Factors associated with Adhesive Capsulitis after CABG**

Results also showed that the mean of SPADI was (29.94±20.53) and risk factors such as age (p=0.02), female gender (p=0.03), Hypertension (p=0.02), Diabetes Mellitus (p=0.02) and BMI (p=0.02) were significantly associated with development of AC in post CABG patients. It was also found that the patients who were instructed to keep their shoulder immobile by the surgeon for 1, 2 and 4 weeks were significantly associated (p=0.01) with AC. Those patients who had a sedentary lifestyle and lack of physical activity before surgery were also significantly associated (p=0.01) with AC. Participants who did not follow physical therapy after CABG were also significantly associated (p=0.03) with AC. A significant association (p=0.00) between SPADI and Apley positive patients was seen indicating greater pain and disability in post CABG AC patients. Duration of stay at hospital after surgery (p=0.55) was however not significantly associated with AC after CABG.

### Discussion

This analytical sectional study was aimed to evaluate the prevalence of Adhesive Capsulitis (AC) and its associated risk factors among postoperative CABG patients. Data was collected from 124 participants and analysis was done to find out the prevalence of Adhesive Capsulitis, Shoulder pain and disability and association of Adhesive Capsulitis with its associated risk factors in post CABG patients. Results revealed that AC was highly prevalent in post CABG patients (23%). Mean of SPADI in post CABG patients was 29.94±20.53. A significant association of Adhesive Capsulitis with associated factors (Age (0.02), Gender (0.03), Hypertension (0.02), Diabetes (0.02), physical activeness before surgery (0.01), duration of shoulder immobility after surgery (0.01), BMI (0.02), followed instructions of physiotherapy after surgery (0.03) and SPADI (0.00) was also revealed.

The results of the study demonstrated that 29 out of 124 subjects reported Adhesive Capsulitis (AC) following CABG. Hence, estimation of true prevalence of Adhesive Capsulitis (AC) in this study was 23%. This result is almost similar to the rate reported in a prior study conducted in Rawalpindi, Pakistan to discover the occurrence of frozen shoulder in Post CABG patients. According to the results of their study, 29% of patients who underwent CABG experienced Frozen Shoulder (FS) / Adhesive Capsulitis (AC). (14). Another study was conducted in Chennai, India about occurrence of adhesive capsulitis and clinical profile of patients after heart surgery patients; it showed that 20% patients suffered from AC after undergoing cardiac surgery(5) Our study revealed a significant association of Age with Adhesive Capsulitis (p=0.02). Our results were supported by another study which also showed a significant association of age with adhesive capsulitis (p=0.001)(11). Age proved to be a significant risk factor for AC since the likelihood of developing frozen shoulder increased as people aged..(20). A study also showed that Adhesive Capsulitis is highly prevalent in 50s and 60s, with the major occurrence in the mid-50s. (8) Results also showed a significant association between Gender and adhesive Capsulitis(p=0.03) showing that females were more prone to develop Adhesive Capsulitis than males .The

results of this study were supported by another study which showed significant association with female gender and Adhesive capsulitis (p=0.02). This study stated that women's are at more risk than males<sup>(21)</sup>.

The association between adhesive Capsulitis and diabetes mellitus was also revealed in our study (p=0.02). Our study's results were supported by another study whose results also showed a significant association between diabetes and adhesive capsulitis (p=0.001). Our study showed significant association of HTN with Adhesive Capsulitis (p=0.02). Similar results were shown by a study which stated that the incidence of hypertension increases with age and in subjects with diabetes, implying an association between hypertension and age and diabetes (0.009) thus stating that hypertension is not an independent factor and that AC is more prevalent in people who have both, HTN and Diabetes <sup>(22)</sup>. The current study also showed a strong association between AC development and shoulder joint immobility (p=0.01). A study supported our results by stating that it may be due to improper shoulder positioning of patient or muscular division or trauma to long thoracic nerve and injury to internal jugular vein and leading to shoulder disability and thoracic pain <sup>(13)</sup>.

Our results showed significant association between lack of physical activity and Adhesive Capsulitis (p=0.01). A recent study states that living a sedentary lifestyle is the primary risk factor for the onset of insulin resistance and the buildup of advanced glycation end products in the ligaments and capsule regions of the non-dominant shoulder, which results in frozen shoulder <sup>(23)</sup>.

Participants who did not follow physical therapy after CABG were also significantly associated with AC (0.03). Another study supported our results by stating that those who followed physical therapy were at lower risk of developing Adhesive capsulitis <sup>(24)</sup>. Patients also tend to restrict their upper limb movement in the postoperative phase out of fear of pain <sup>(25)</sup>, which further contributes to the development of AC. A significant association between SPADI and positive Apley scratch test was seen (p=0.00). Another study supported our results by stating that occurrence of shoulder pain (47%) is much higher than reported in previous studies among the cardiac population thus resulting in greater disability <sup>(26)</sup>.

With the maintenance of an active lifestyle, doing certain exercises after CABG, monitoring your blood pressure and glucose levels, and avoiding complete shoulder immobilization for an extended period of time following CABG can all help prevent AC. Lack of knowledge, instruction, and cooperation with surgeons could be the main cause of the development of AC following surgery. Due to time constraint, we had a small sample size and thus it limits our study generalization.

### Conclusion:

This study concluded that CABG increases the chances of frozen shoulder as we have found frozen shoulder has a higher prevalence in post CABG patients and the factors i.e. increasing age, DM, hypertension, female gender, shoulder immobility and physical inactivity h are contributing factors

**Conflict of Interest:** None declared

**Source of Funding:** None declared

**Disclaimer:** The study was based on undergraduate thesis

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