

A Study to Evaluate the Effects of Pre Operative Education and Ventilatory Exercises Training in Reducing Anxiety and Improvement in Recovery among Cardiac Patients

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Abstract: After cardiac surgery, various complications that will require specific care, especially in the respiratory system, can be observed. These complications can lengthen the hospital stay of patients, causing increased hospital costs and becoming an important cause of morbidity and mortality. The preoperative and postoperative physical therapy management of patients in the ICU is a specialized area. It includes providing the patient with information about what to expect during the perioperative course relieves fear and anxiety. This study was conducted to evaluate the effects of pre operative physiotherapy instructions and ventilatory muscle training in patients undergoing cardiac surgery which is beneficial in improving recovery and reducing anxiety post operatively. This study includes 100 subjects both male and female undergoing elective cardiac surgery of age 18 - 60 years who were eligible as per the inclusion criteria. Pre - participation questionnaire along with the consent form was given to the subjects to fulfill criteria for selection. Subjects were allocated physiotherapy instructions and ventilatory exercise training pre operatively. The primary outcome was change in anxiety which was measured by BAI (Beck Anxiety Inventory) pre operatively before and after education and training and 4 days post operatively. Secondary outcomes were pain and SPO₂ which were measured by VAS (Visual Analogue Scale) and pulse oxymetry respectively. Results showed that anxiety score after pre operative instructions and ventilatory exercise training exercise was significantly higher ($p < 0.01$) in males as compared to females. There was a significant decrease in score of anxiety pre and post operatively after physiotherapy instructions and ventilatory exercise training ($p < 0.01$) and there was also a significant reduction in VAS score ($p < 0.01$) whereas SPO₂ was increased significantly ($p < 0.01$). Thus it showed that pre operative education and ventilatory exercise training is effective in reducing and improves recovery among patients undergoing cardiac surgery.

1. Introduction

The cardiac surgery continues having a fundamental role in the therapeutic arsenal of many heart diseases in spite of the spectacular advances that determined drugs or different forms of interventionist cardiology have experimented during the past few years. The present impact of the heart surgery is due to the constant increase of the cardiovascular risk factors, related to the increase in the life expectancy in last the three decades, the clinical approach of the ischemic cardiopathy towards the repair has taken to the creation and development of techniques and methods at the moment used in the myocardial revascularization surgery; the roll of the coronary surgery initiated and popularized in 1967 has had an exponential development with the purpose of to exclude the ill part from the artery by placing a bypass to improve the perfusion of the ischemic area.

Coronary artery disease is the leading cause of morbidity and mortality worldwide. For more than 15 years, WHO has been sounding an alarm on the rapidly rising burden of cardiovascular disorders. The reported prevalence of coronary artery disease (CAD) in adult surveys has risen 4 - fold over the last 40 years to a present level of around 10%.

The burden of CVD is projected to be the highest in India by the year 2020, as compared to other countries. In the WHO - PREMISE study, the proportion of CHD among patients less than 50 years of age, was highest in India (22.6% in males and 3% in females). In the Million Death Study (2009), the authors determined that CVD are the leading cause of death (20.3% in males and 16.9% in females) among Indian adults (age 25 - 69 years).

Cardiovascular diseases, especially coronary heart disease (CHD), are epidemic in India. The Registrar General of India reported that CHD led to 17% of total deaths and 26% of adult deaths in 2001 - 2003, which increased to 23% of total and 32% of adult deaths in 2010 - 2013.

Cardiovascular disease is the leading global cause of death, accounting for more than 17.3 million deaths per year, a number that is expected to grow to more than 23.6 million by 2030.

In 2013, cardiovascular deaths represented 31 percent of all global deaths, with 80 percent of those deaths taking place in lower and middle income countries. Nearly 801, 000 people in the U. S. died from heart disease, and other cardiovascular diseases in 2013. That's about one of every three deaths in America. About 2, 200 Americans die each day from these diseases, one every 40 seconds.

The American Heart Association gauges the cardiovascular health of the nation by tracking seven key health factors and behaviors that increase risks for heart disease. They call these "Life's Simple 7" and measure them to track progress towards 2020 Impact Goal: to improve the cardiovascular health. Life's Simple 7 are: not smoking, physical activity, healthy diet, body weight, and control of cholesterol, blood pressure and blood sugar.

In contrast to developed countries, where mortality from CHD is rapidly declining, it is increasing in developing countries. This increase is driven by industrialization, urbanization, and related lifestyle changes and is called epidemiological transition.

Epidemiological transition is divided into 5 stages: (1) age of pestilence and famines, marked by malnutrition, infectious diseases, and high infant and childhood mortality with low mortality from CVD (<10%); (2) age of receding pandemics, when better public health systems lead to decreased mortality from communicable diseases and emergence of CVD as important, with 10% - 35% mortality; (3) age of degenerative and human made diseases is characterized by mortality from CVD surpassing mortality from communicable diseases and leading to 35% - 65% of all deaths; (4) age of delayed degenerative diseases, when cancer and CVDs are predominant causes of deaths and CVD leads to >40% of all deaths but there is a declining trend in death rates; and (5) age of inactivity and obesity, when declining physical activity leads to epidemics of diabetes, hypertension, and lipid abnormalities, with increasing CVD deaths rates.

Cardiac surgery is a procedure performed in patients with cardiovascular disease. Surgical treatment remains the therapeutic option related to better survival of individuals with coronary heart disease, as well as in patients with valvular heart diseases.

After cardiac surgery, various complications that will require specific care, especially in the respiratory system, can be observed. These complications can lengthen the hospital stay of patients, causing increased hospital costs and becoming an important cause of morbidity and mortality.

The coronary artery bypass grafting presents satisfactory results, however, it has the pain caused by the nociceptive stimulus from sternotomy as an important cause of mortality and morbidity in the postoperative period, which leads less effectiveness of cough, by adopting a rapid and superficial breathing, and can cause pulmonary complications such as atelectasis.

Nevertheless, patients who had undergone heart surgery may suffer psychological disorders such as anxiety, which is hardly noticeable in the pre - operative, and it may go unnoticed by the medical team, since often such disorder is related to physical illnesses.

Despite the progress of science and technology, cardiac surgeries continue to be accompanied by complications that increase morbidity and mortality. Because of forthcoming cardiac surgery, patients experience anxiety that can burden perioperative psychosomatic health. Numerous studies have shown that preoperative anxiety increases significantly in elective and major operations, resulting in postoperative complications for a number of patients irrespective of the type of surgery. Preoperative anxiety has been found to be a risk factor for post operative complications.

Undergoing cardiac surgery can be physically and psychologically stressful for patients and their families. Patients awaiting cardiac surgery may experience high levels of anxiety and significant symptoms of depression due to fears, worries, and uncertainties about surgery. These can exacerbate symptoms of existing cardiovascular disease, adversely affect physiological parameters before and during anaesthesia, and can result in prolonged recovery.

According to the International Classification for Diseases tenth edition (ICD - 10), depression is characterized by low mood and/or anhedonia (loss of interest in activities that once were pleasurable) that lasts for two weeks or more and is accompanied by significant functional impairment and somatic complaints of disturbed sleep, fatigue, body aches, digestive or sexual problems, and negative thoughts. Anxiety on the other hand refers to feeling of apprehension and unease. Anxiety has somatic, physiological, and cognitive components. Somatic component refers to digital tremors, palpitations, and sweaty palms. The physiological component refers to tachycardia, hyperventilation, muscular tension, and an irritable bladder. The cognitive component is that of worry which refers to undue fear of something untoward happening

Anxiety may trigger activation of the sympathetic nervous system and the hypothalamic - pituitary - adrenal axis. This activation produces a variety of physiological responses such as increased oxygen consumption, reduced immune response, and altered coagulation and autonomic tone which in turn causes increased blood pressure, heart rate and cardiac output. Cardiac patients with a high level of anxiety can experience physical symptoms including headache, dizziness, nausea, muscle weakness, fatigue, sweating, and difficulty falling asleep, or even more intense symptoms such as chest pain, palpitations, shortness of breath. Chest pain is a common symptom of anxiety and may take form of a sharp pain or a feeling of visceral tightness.

Previous studies have supported the theory that the control of preoperative anxiety can reduce the morbidity and mortality of patients undergoing cardiac surgery. One study reported that preoperative anxiety had predictive value for postoperative mortality and suggested the addition of preoperative anxiety to the risk model in order to refine the risk factors associated with increased mortality. According to several studies, a reduction of perioperative anxiety of patients undergoing cardiac surgery can be achieved by preoperative education. There is also evidence that preoperative education leads to better recovery and a reduction in the length of hospital stay. Preoperative education is defined as 'providing the patient with health - related information, psychosocial support and the opportunity to learn selected skills in preparation for surgery. The patients' preoperative education is designed to prevent risk factors that may lead to complications by adopting behaviours that will enhance patients' ability to cope with cardiac surgery. Emphasising the risk factors and the ways of avoiding them may motivate patients to modify their behaviour in order to reduce these factors.

Decreases in essential parameters of vital capacity, functional residual capacity, and forced expiratory volume may directly contribute to atelectasis, which can contribute to postoperative pulmonary complications. Pulmonary function is further compromised by hypoventilation, decreased mucous clearance, decreased respiratory muscle function, increased work of breathing, and hypoxia—all ramifications of the surgical procedure. Additionally, walking ability is limited after CABG surgery.

To prevent or diminish postoperative complications, pre- and postoperative physical therapy treatment is often prescribed to cardiac surgery patients during the hospital stay. The physical therapy treatment consists of early mobilization, range of motion exercises, and breathing exercises. Different breathing techniques with and without mechanical devices are recommended after cardiac surgery.

The preoperative and postoperative physical therapy management of patients in the ICU is a specialized area. It includes providing the patient with information about what to expect during the perioperative course relieves fear and anxiety. Patients need to be reassured that their incisions will not be disrupted with movement and physical therapy and that supporting themselves while moving will maximize comfort. Until the patient has stabilized, the patient's mobility is restricted to low-intensity mobilization to promote its benefits on gas exchange and reduce metabolic demands and body positioning to optimize alveolar ventilation. Exercise should be prescribed progressively to maximize oxygen transport at each step of rehabilitation period.

Breathing exercises and ventilatory training are fundamental interventions for the prevention and management of postoperative complications (PPC'S). Breathing exercises and ventilatory training includes diaphragmatic breathing, segmental breathing, inspiratory resistance training, glossopharyngeal breathing, breathing techniques for the relief of dyspnea during exertion.

Chest mobilization exercises combine active movements of the trunk or extremities with deep breathing. They are designed to maintain or improve mobility of the chest wall, trunk and shoulder girdles when it affects ventilation or postural alignment.

Airway clearance is an important part of management of patients. An effective cough is necessary to eliminate respiratory obstructions and keep the lungs clear. ACBT (active cycle of breathing technique) can be used to stimulate a stronger cough, improving clearance of secretions. Postural drainage, another intervention for airway clearance, is a means of mobilizing secretions in one or more lung segments to the central airways and cleared by coughing or endotracheal suctioning.

Incentive spirometry is a form of ventilatory training that emphasizes sustained maximum inspirations.

Need of the Study

Despite advances in surgical procedures or techniques and improvements in peri-operative and postoperative cases, the heart surgeries are responsible for high rates of morbidity and mortality.

Patients undergoing CABG surgery often develop pulmonary dysfunction, such as atelectasis, restrictive ventilatory disorder and hypoxemia.

The pain and postoperative fear or anxiety associated with changes in lung mechanics resulting from the surgery affect the performance of periodic deep inspiration and effective

cough, allowing the accumulation of secretion, alveolar collapse and changes in gas exchange.

Pre-operative education is defined as providing the patient with health related information, psychosocial support and the opportunity to learn specific skills in preparation for surgery. Pre-operative program might include a number of components and inclusion of family members, teaching of specific skills.

Physiotherapists play an important role in the preparation and rehabilitation of patients who had undergone surgical procedures. In addition to having a large arsenal of techniques, the physiotherapist has been one of the professionals that more time is next to the patients. As such, it is suggested that time spent is better spent, by favoring professionals to clarify the doubts of the patients and guide them to the new situations that they will have to face.

Early mobilization, positioning, breathing exercises and techniques for bronchial hygiene are the usual techniques utilized.

The BAI (BECK ANXIETY INVENTORY) was found to have internal consistency and test-retest reliability and good concurrent and discriminant validity. The BAI was able to discriminate homogeneous heterogeneous anxiety diagnostic groups from other psychiatric groups.

Aims & Objectives

- 1) To assess the anxiety level among preoperative patient who are admitted for cardiac surgery.
- 2) To verify the effects of physiotherapeutic instructions at the anxiety level on patients undergoing cardiac surgery.
- 3) To evaluate the effects of physiotherapeutic instructions at the anxiety level on postoperative cardiac patients.

Hypothesis

Null Hypothesis: There is no significance in reducing anxiety and improving recovery in response to ventilator training and preoperative education among cardiac patients.

Alternate Hypothesis: There is significance in reducing anxiety and improving recovery in response to ventilator training and preoperative education among cardiac patients.

2. Methodology

A randomized interventional study design was identified as appropriate to carry out the study, to evaluate the effects of preoperative education and ventilatory training in reducing anxiety and improvement in recovery among cardiac patients. A sample of 100 individuals undergoing cardiac surgery was taken from CTVS ICU Geetanjali Medical College and Hospital (GMCH) which are eligible as per inclusion and exclusion criteria. A total 100 number of both males and females were selected for the body. A convenient random sampling technique is used for data collection.

Inclusion Criteria

Both male and female, Age 18 to 60 years, Study samples those undergoing non emergency cardiac procedures, Measures of anxiety or depression detailed as outcome variable on patients.

Exclusion Criteria:

Acute and Chronic Asthma, Previous Cardiac Surgical history, Unstable vitals, Cardiac pacemaker, Shortness of breath more than grade 3 or 4, Pregnancy, Unstable angina pectoris

3. Procedure

Subjects were given detailed information about the study and its importance and were requested to fill the questionnaires voluntarily. Informed Consent was taken from all the subjects. First the pre - participation data was collected from the subjects, which included personal details name, age, sex, occupation etc were collected and documented. Approval for this study was obtained from the ethical committee of the Geetanjali University, Udaipur.

Then, information and demonstrations of ventilatory exercises was performed to the patients individually, for the improvement of pulmonary ventilation and bronchial hygiene. Explanation to the patients was given regarding sternotomy and the importance of maintaining an appropriate pulmonary ventilation and cough, so avoiding

possible pulmonary complications. Each patient received on written, physiotherapeutic guidelines on ventilatory exercise that could be performed after surgery. After guidance, anxiety was evaluated pre and post operatively by Beck Anxiety Inventory. When it was necessary, the ventilatory exercises were reminded to patients.

- 1) Diaphragmatic breathing
- 2) Segmental breathing
- 3) Pursed lip breathing
- 4) Spirometry
- 5) Coughing and huffing
- 6) Coughing with splinting

Data Recording and Tabulation

The values of all parameters of the sessions were recorded accurately in the printed data collection sheet. The collected data was edited, coded and a master chart was prepared for the statistical analysis.

Statistical Analysis

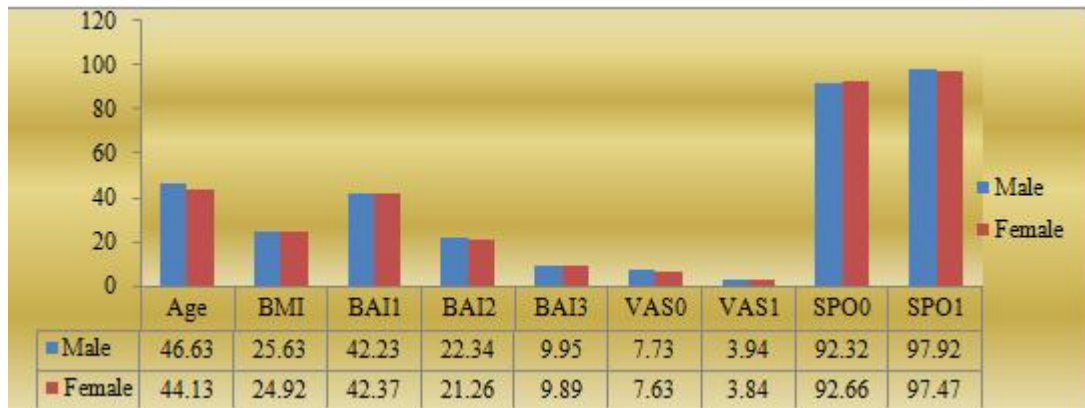
Descriptive statistics for comparison between pre and post operative scores including means and standard deviations were calculated. Statistically the characteristics of the scores and the results were compared using independent sample t test and paired t tests. A level of probability at 0.01 levels was assumed to draw significance.

4. Result

Table 6.1: Descriptive statistics of mean between males and females for different variables

Variables	Sex	N	Mean	SD	Difference	SEd	T	Df	P
Age	M	62	46.63	11.193	2.497	2.497	1.000	98	0.320
	F	38	44.13	13.511	2.497	2.612	0.956	67.437	0.342
BMI (Body Mass Index)	M	62	25.63	6.395	0.708	1.401	0.505	98	0.614
	F	38	24.92	7.419	0.708	1.452	0.488	69.610	0.627
Pre - Operative BAI score at the time of Admission	M	62	42.23	1.945	- 0.143	0.369	- 0.387	98	0.700
	F	38	42.37	1.496	- 0.143	0.346	- 0.412	92.896	0.681
Pre - Operative BAI score after physiotherapeutic instructions	M	62	22.34	1.941	1.076	0.383	2.806	98	0.006
	F	38	21.26	1.719	1.076	0.372	2.889	85.683	0.005
Post - Operative BAI scores	M	62	9.95	1.962	0.057	0.365	0.156	98	0.877
	F	38	9.89	1.410	0.057	0.338	0.168	95.416	0.867
Pre - Operative VAS score	M	62	7.73	0.657	0.094	0.152	0.621	98	0.536
	F	38	7.63	0.852	0.094	0.161	0.584	63.771	0.561
Post - Operative VAS score	M	62	3.94	0.744	0.093	0.148	0.630	98	0.530
	F	38	3.84	0.679	0.093	0.145	0.644	83.914	0.522
Pre - Operative SPO2 score	M	62	92.32	3.001	- 0.335	0.605	- 0.554	98	0.581
	F	38	92.66	2.831	- 0.335	0.597	- 0.562	81.949	0.576
Post - Operative SPO2 score	M	62	97.92	1.178	0.446	0.260	1.714	98	0.090
	F	38	97.47	1.390	0.446	0.271	1.647	68.662	0.104

Table 6.1 compares between the genders for different parameters recorded at different stages. This table reveals that anxiety score after counseling (BAI2) was significantly higher ($p < 0.01$) in males as compared to females. For rest of the parameters there was no difference between males and females.



Graph 6.1: Difference between pre and post interventions between genders.

Table 6.2: Significance of values between pre and post operative scores

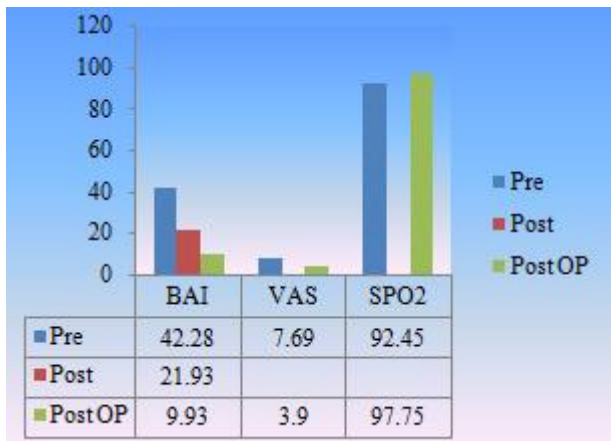
Pair	Variables	Mean	SD	SEm	T	Df	P
1	Pre operatively BAI at the time of admission and BAI after physiotherapy instructions	19.887	2.753	0.350	56.887	61	0.000
2	Pre operatively BAI after physiotherapy instructions and BAI post operatively	12.387	2.836	0.360	34.389	61	0.000
3	Pre operative VAS and post operative VAS	3.790	0.813	0.103	36.730	61	0.000
4	Pre operative SPO ₂ and post operative SPO ₂	- 5.597	2.854	0.362	- 5.440	61	0.000

Table 6.2 depicts that the score of anxiety after counseling reduced significantly ($p < 0.01$) which reduced further significantly post operatively too ($p < 0.01$). Similarly, the VAS score was also reduced from pre to post operatively ($p < 0.01$). The score of SpO₂ was increased significantly from pre to post operatively.

post operative anxiety and VAS was significantly positive whereas no correlation was observed for SPO₂.

5. Discussion

According to the results of the study, preoperative education reduced the anxiety of patients undergoing cardiac surgery and had an effect on postoperative complications. This finding is consistent with that reached by Guo Ping, who found a significant reduction in post operative anxiety after pre operative education of patients who underwent CABG. Only one study by Deyirmenjian M showed that pre operative education increased the post operative anxiety of patients. This is probably due to the difference in the timing and the manner of education delivery. Heather et al. applied a protocol of preoperative intervention in patients undergoing coronary artery bypass grafting by a multidisciplinary team of cardiologists, surgeons and physiotherapists. There was a reduction of one week in hospital stay in the group receiving the intervention, as well as improvement in quality of life of these patients, which lasted for 6 months. However, mortality rates and levels of anxiety both preoperatively and postoperatively did not differ between groups.



Graph 6.2: Comparison between pre and post op counseling

Table 6.3: Correlation between pre and post operative scores

Pair	Variables	Correlation	Sig.
1	Pre operatively BAI at the time of admission and BAI after physiotherapy instructions	0.127	0.209
2	Pre operatively BAI after physiotherapy instructions and BAI post operatively	0.052	0.607
3	Pre operative VAS and post operative VAS	0.381	0.000
4	Pre operative SPO ₂ and post operative SPO ₂	0.231	0.021

Table 6.3 depicts the correlation between pre and post operative score was significant for VAS and SPO₂. The trend was same in males. However, in case of females, the correlation between pre and post counseling anxiety, pre and

Physiotherapists play an important role in the preparation and rehabilitation of patients who had undergone surgical procedures. In addition to having a large arsenal of techniques, the physiotherapist, notoriously, has been one of the professionals that more time is next to the patients. As such, it is suggested that time spent is better spent, by favoring professionals to clarify the doubts of the patients and guide them to the new situations that they will have to face. Some symptoms reported by anxious patients, such as tachycardia, tachypnea, and high systemic blood pressure, may be mistaken as part of the presentation developed by coronary artery disease. Conceição et al. reported that the measurement of blood pressure and heart rate are not good parameters to measure the patient's anxiety level, requiring the assessment of the disorder by means of validated scales such as the Beck anxiety Inventory. According Trame et al.,

the Inventory is widely used because of its cost - effectiveness, ease of application and interpretation.

In our study, results showed that except anxiety score after counseling which was significantly higher in males as compared to females ($p < 0.01$), there was no difference for rest of the parameters. Score of anxiety and pain has been reduced after pre operative education and ventilatory training significantly ($p < 0.01$). Score of SPO_2 increased significantly. The correlation was significantly positive for anxiety and pain pre and post operatively.

6. Conclusion

This study provides empirical support for the hypothesis that a pre operative education intervention involving counseling, verbal explanation and ventilatory training are effective in reducing anxiety and pain among patients undergoing cardiac surgery. This study not only have important implications for effective strategies to control patient's elevated anxiety in anticipation of cardiac surgery, but also help make recommendations for quality improvement of pre operative education in practice.