"BUTEYKO BREATHING TECHNIQUE VERSUS INCENTIVE SPIROMETER ON BREATH HOLDING TIME AFTER CORONARY ARTERY BYPASS GRAFT"

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY
CHENNAI

In partial fulfilment of the requirements
for the award of the

MASTER OF PHYSIOTHERAPY DEGREE
(Advanced Physiotherapy in Cardio Respiratory)
Submitted by

Reg. No. 271430081

NANDHA COLLEGE OF PHYSIOTHERAPY
ERODE – 638 052
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Under the guidance of

Prof.R. SARAVANA KUMAR M.P.T(Cardio).,

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Dissertation Evaluated on _____

Internal Examiner **External Examiner**

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This is to certify that the dissertation entitiled "**BUTEYKO BREATHING TECHNIQUE VERSUS INCENTIVE SPIROMETER ON BREATH HOLDING TIME AFTER CORONARY ARTERY BYPASS GRAFT**".is a bonafide compiled work, carried out by **Register No: 271430081,** Nandha College of Physiotherapy, Erode -638 052 in partial fulfillment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree from **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-32.** This work was guided and supervised by **Prof. R. SARAVANA KUMAR, M.P.T.,**

I wish him a great success in his dissertation work.

DATE:

PLACE: **PRINCIPAL SIGNATURE**

CERTIFICATE BY THE GUIDE

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DATE:

PLACE: **GUIDE SIGNATURE**

DECLARATION

I here by and present my project work entitled "**BUTEYKO BREATHING TECHNIQUE VERSUS INCENTIVE SPIROMETER ON BREATH HOLDING TIME AFTER CORONARY ARTERY BYPASS GRAFT**".is outcome of original research work was undertaken and carried out by me under the guidance of **Prof. R. SARAVANA KUMAR M.P.T(Cardio).,**

To the best of my knowledge this dissertation has not been formed in any other basis for the award of any other degree, diploma, associateship, fellowship, previously from, any other medical university.

Reg.No.271430081

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Several special people have guided me and have contributed significantly to this effort.I thank my **faculty members** for their constant support and cheer all along in achieving the goal.

My hearty thanks to some Private Hospital Physiotherapists who gave me an opportunity to do my project work in their hospitals.

PREFACE

It was an immense pleasure for me to present this project work on "**BUTEYKO BREATHING TECHNIQUE VERSUS INCENTIVE SPIROMETER ON BREATH HOLDING TIME AFTER CORONARY ARTERY BYPASS GRAFT**".

I have done this work with my best level by referring many books, journals and websites. I believe this project will give basic knowledge in the field of CABG.

And also, I believe this project work will very helpful for the physiotherapists to give treatment for post-operative cardiac patients.

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CHAPTER – 1

INTRODUCTION

Pulmonary and associated complications are the major cause of morbidity and mortality in the period following coronary artery bypass graft (CABG) surgery. Chest physiotherapy is widely used in postoperative care to prevent pulmonary complications such as decreased lung volumes, atelectasis, decreased oxygenation and pneumonia . Arterial blood gases analysis is a test to evaluate the acid/base balance, partial pressure of oxygen and Co_2 in arterial blood. The Buteyko Method is one of many health-promoting breathing techniques to originate from Russia, made its way to Australia, Europe, and the United States in the 1990s. The attention given by the media to stories of apparent cures of seriously ill individuals popularized this treatment for asthma and eventually a range of other conditions from anxiety to sleep apnea . A number of clinical trials indicate that it is a successful treatment for asthma; however, there is little support for the CO_2theory that underpins the Buteyko Method. There are, however, many other possible reasons that the breathing techniques used by the Buteyko Method work. These reasons include change in symptom perception and improved sense of control, improved biomechanics of breathing, beneficial effects of low-volume breathing, altered nitric oxide (NO) levels, and resetting of respiratory rhythm generation by breath-holding techniques . Previous studies have shown the effect of IS on postoperative pulmonary complications (PPCs) of CABG. It is a well-recognized phenomenon that people practicing the Buteyko method develop an increased ability to comfortably hold their breath, a measure known as the control pause (CP). Buteyko practitioners consistently report that a longer CP is associated with decreased symptoms . The control pause correlates well with severity of the disease for asthma and heart patients. For example, functional heart disease corresponds to about 5 seconds (sec.) of oxygen in the body, moderate heart disease to about 10 sec. CP, and light forms of heart disease to about 15 sec. Similarly, asthmatics that experience symptoms have about 10 sec. of oxygen. In between attacks (or in stable conditions), asthmatics usually have about a 15 sec. CP. If they get up to a 20 sec. CP, they do not experience chest tightness, wheezing, blocked nose and other pathological effects . Up to our knowledge there are no previous studies to show the effect of BBT on reducing PPCs

in patients with CABG. Therefore this study attempted to evaluate the effect of BBT on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

1.1 CABG

Coronary artery bypass surgery, also known as **coronary artery bypass graft** (**CABG**, pronounced "cabbage")**surgery**, and colloquially **heart bypass** or **bypass surgery**, is a surgical procedure consisting of either diverting the left internal thoracic artery (left internal mammary artery or "LIMA") to the left anterior descending (LAD) branch of the left main coronary artery; or a harvested great saphenous vein of the leg, attaching the proximal end to the aorta or one of its major branches, and the distal end to immediately beyond a partially obstructed coronary artery (the "target vessel") - usually a 50% to 99% obstruction. The purpose is to restore normal blood flow to that partially obstructed coronary artery. It is performed to relieve angina unsatisfactorily controlled by maximum tolerated anti-ischemic medication, prevent or relieve left ventricular dysfunction, and/or reduce the risk of death. It does not prevent heart attacks. This surgery is usually performed with the heart stopped, necessitating the usage of cardiopulmonary bypass; however, two alternative techniques are also available allowing CABG to be performed on a beating heart either without using the cardiopulmonary bypass deemed as "off-pump" surgery or performing beating surgery using partial assistance of the cardiopulmonary bypass called as "on-pump beating" surgery. The latter gathers the advantages of the on-pump stopped and off-pump while minimizing their respective side-effects.

The obstruction being bypassed is due to arteriosclerosis, atherosclerosis, or both. Arteriosclerosis is characterized by thickening, loss of elasticity, and calcification of the arterial wall, most often resulting in a *generalized* narrowing in the affected coronary artery. Atherosclerosis is characterized by yellowish plaques of cholesterol, lipids, and cellular debris deposited into the inner layer of the wall of a large or medium-sized coronary artery, most often resulting in a *focal*partial obstruction in the affected artery, Each can limit blood flow if it causes a cross-sectional narrowing of at least 50%.

1.2 PATHOLOGY

Coronary artery disease (CAD) occurs when atherosclerotic plaque (hardening of the arteries) builds up in the wall of the arteries that supply the heart. This plaque is primarily made of cholesterol. Plaque accumulation can be accelerated by smoking, high blood pressure, elevated cholesterol, and diabetes. Patients are also at higher risk for plaque development if they are older (greater than 45 years for men and 55 years for women), or if they have a positive family history for early heart artery disease.

The atherosclerotic process causes significant narrowing in one or more coronary arteries. When coronary arteries narrow more than 50 to 70%, the blood supply beyond the plaque becomes inadequate to meet the increased oxygen demand during exercise. The heart muscle in the territory of these arteries becomes starved of oxygen (ischemic). Patients often experience chest pain (angina) when the blood oxygen supply cannot keep up with demand. Up to 25% of patients experience no chest pain at all despite documented lack of adequate blood and oxygen supply. These patients have "silent" angina, and have the same risk of heart attack as those with angina.

When a blood clot (thrombus) forms on top of this plaque, the artery becomes completely blocked causing a heart attack.

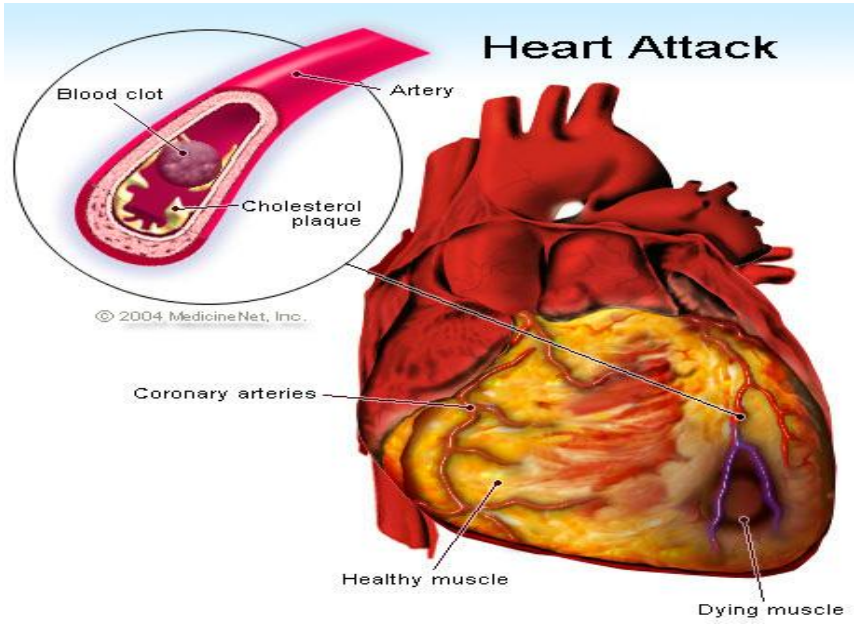

Fig 1.1 Heart Attack

1.3 EPIDEMIOLOGY

Studies of Indian immigrants and cross sectional studies in India, have demonstrated that coronary artery disease (CAD) is rampant in Indians and that its prevalence is several folds higher than in industrialized nations. The Global Burden of Diseases (GBD) study reported the estimated mortality from CAD in India at 1.6 million in the year 2000. Extrapolation of this estimate shows the current burden of CAD in India to be more than 32 million patients. Epidemiological studies show a sizeable burden of CAD in rural (3-5%) and urban (7-10%) populations. A conservative estimate indicates that there could be 30 million CAD patients in India of which 14 million are in urban and 16 million in rural areas. If the current trend continues by the year 2020, the burden of atherothrombotic CVD in India will surpass other regions of the world.

1.4 DIAGNOSIS

1.4.1 ECG (Electrocardiogram)

An ECG is a simple test that detects and records your heart's electrical activity. The test shows how fast the heart is beating and its rhythm (steady or irregular). An ECG also records the strength and timing of electrical signals as they pass through each part of the heart.

An ECG can show signs of heart damage due to CHD and signs of a previous or current heart attack.

1.4.2 Echocardiography

- Echocardiography (echo) uses sound waves to create a moving picture of your heart. The test shows the size and shape of your heart and how well your heart chambers and valves are working.
- Echo also can show areas of poor blood flow to the heart, areas of heart muscle that aren't contracting normally, and previous injury to the heart muscle caused by poor blood flow.

- There are several types of echo, including stress echo. This test is done both before and after a stress test. A stress echo usually is done to find out whether you have decreased blood flow to your heart, a sign of CHD.

1.4.3 Stress Test

- Some heart problems are easier to diagnose when your heart is working hard and beating fast.
- During stress testing, you exercise to make your heart work hard and beat fast while heart tests are done. If you can't exercise, you may be given medicine to raise your heart rate.
- The heart tests done during stress testing may include nuclear heart scanning, echo, and positron emission tomography (PET) scanning of the heart.

1.4.4 Coronary Angiography and Cardiac Catheterization

- Coronary angiography (an-jee-OG-rah-fee) is a test that uses dye and6 special x rays to show the insides of your coronary arteries.
- To get the dye into your coronary arteries, your doctor will use a procedure called cardiac catheterization (KATH-eh-ter-ih-ZA-shun).
- A thin, flexible tube called a catheter is put into a blood vessel in your arm, groin (upper thigh), or neck. The tube is threaded into your coronary arteries, and the dye is released into your bloodstream.
- Special x rays are taken while the dye is flowing through the coronary arteries. The dye helps to study blood flow through the heart and blood vessels. This helps to find blockages that can cause a heart attack.

1.5 OPERATIONAL DEFINITIONS

1.5.1 CABG

A form of bypass surgery that can create new routes around narrowed and blocked coronary arteries, permitting increased blood flow to deliver oxygen and nutrients to the heart muscle.

1.5.2 BUTEYKO BREATHING TECHNIQUE

The Buteyko method is named after its founder Doctor Konstantin Buteyko.The **Buteyko Breathing Technique** is a form of complementary or alternative physical therapy that proposes the use of **breathing exercises** as a treatment for **asthma** as well as other conditions

1.5.3 INCENTIVE SPIROMETER

An **incentive spirometer** is a medical device used to help patients improve the functioning of their lungs.

1.6 NEED FOR THE STUDY

Now-a- days almost all peoples have pulmonary complications after their Post operative surgeries. In order to improve their breathing capacity and their lung function test my study is attempted to evaluate the effect of BBT on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

1.7 AIM OF THE STUDY

The Aim of this study is to compare the effectiveness of BBT versus Incentive spirometry on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

1.8 OBJECTIVES OF THE STUDY

- To have in-depth knowledge CABG patients.
- To improve the quality of life in patients with CABG
- To find out the effectiveness of BBT on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

- To find out the effectiveness of Incentive spirometry on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG
- To compare the effectiveness of BBT versus Incentive spirometry on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG

1.9 HYPOTHESIS

1.9.1 NULL HYPOTHESIS

There is no significant difference in between the effect Buteyko Breathing Technique Versus Incentive Spirometer on Breath Holding Time after Coronary Artery Bypass Graft

1.9.2 ALTERNATE HYPOTHESIS

There is significant difference between the effect of effect Buteyko Breathing Technique Versus Incentive Spirometer on Breath Holding Time after Coronary Artery Bypass Graft

1.10 PROJECTED OUTCOME

- Based on the Review of literature the outcome of my study will be that both Buteyko Breathing Technique and Incentive Spirometer will improves the Breath Holding Time after Coronary Artery Bypass Graft . BBT is more effective in on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG

CHAPTER-2

REVIEW OF LITERATURE

1. **Wynne R, Botti M. (2004)**

This study States that Postoperative pulmonary complications are the most frequent and significant contributor to morbidity, mortality, and costs associated with hospitalization. Interestingly, despite the prevalence of these complications in cardiac surgical patients, recognition, diagnosis, and management of this problem vary widely.

In addition, little information is available on the continuum between routine postoperative pulmonary dysfunction and post operative pulmonary complications.

2. **Herdy AH, Marcchi PL, Vila A, Tavares C, Collaço J, Niebauer J, Ribeiro JP.(2008)**

This study is to evaluate the effects of an in hospital cardiopulmonary rehabilitation program performed before and after CABG on postoperative outcomes. Pre and post operative cardiopulmonary rehabilitation in patients who await CABG in the hospital is superior to standard care and leads to a reduced rate of postoperative complications and shorter hospital stay.

3. **Pinheiro AC, Novais MC, Neto MG, Rodrigues MV, de Souza Rodrigues E Jr, Aras R Jr, Carvalho VO.(2011)**

This study suggests that there was a high correlation between DVC measures with ventilometer and incentive spirometer in pre and post CABG surgery. Despite this, arises the necessity of further studies to evaluate the repercussion of this method in lowering costs at hospitals.

4. **Courtney R, Cohen M. (2008)**

Konstantin Buteyko, M.D., Ph.D., claimed that breath holding time (BHT) can be used to detect chronic hyperventilation and that BHT predicts alveolar CO(2)

(Pa(CO(2))) according to his patented mathematical formula. The Buteyko Breathing Technique (BBT) is believed to correct chronic hyperventilation as evidenced by increased BHT. In this study, we test Buteyko's claims and explore the relationship between BHT and end-tidal carbon dioxide (ETCO(2)) as well as measures of dysfunctional breathing (DB) including the Nijmegen questionnaire, the Self Evaluation of Breathing Questionnaire, and thoracic dominant breathing pattern.

5. **Cooper S, Oborne J, Newton S, Harrison V, Thompson Coon J, Lewis S, Tattersfield A.(2003)**

Patients with asthma are interested in the use of breathing exercises but their role is uncertain. The effects of the Buteyko breathing technique, a device which mimics pranayama (a yoga breathing technique), and a dummy pranayama device on bronchial responsiveness and symptoms were compared over 6 months in a parallel group study. The Buteyko breathing technique can improve symptoms and reduce bronchodilator use but does not appear to change bronchial responsiveness or lung function in patients with asthma. No benefit was shown for the Pink City Lung Exerciser.

6. **ARTOUR R (2006)**

The breath-holding test is simple and rapid. Its negative likelihood ratio was zero. Accordingly, a test result of 12 or greater might exclude the probability of poor perception of dyspnea in subjects with stable asthma.

7. **Westerdahl and Möller 2010,**

The results of this survey show that there are small variations in physiotherapy-supervised mobilization and exercise following cardiac surgery in Sweden. However, the frequency and duration of exercises and recommendations for sternal precautions reinforced for the healing period differ between physiotherapists. This survey provides an initial insight into physiotherapy management in Sweden. Comparison with surveys in other countries is warranted to improve the physiotherapy management and postoperative recovery of the cardiac surgery patient.

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8. **MCKEOWN P (2008)**

Fifty-six patients who had to wait for CABG in-hospital were randomly assigned to a cardiopulmonary rehabilitation (Rehab; n = 29) or to usual care (Control; n = 27). In the Rehab group, intervention lasted for at least 5 days preoperatively until discharge. The program consisted of phase I cardiac rehabilitation associated with respiratory physical therapy. Pre and postoperative cardiopulmonary rehabilitation in patients who await CABG in the hospital is superior to standard care and leads to a reduced rate of postoperative complications and shorter hospital stay

9. **Varga J (2015)**

Expiratory flow limitation can develop in parallel with the progression of COPD, and as a consequence, dynamic hyperinflation and lung mechanical abnormalities can develop. Dynamic hyperinflation can cause increased breathlessness and reduction in exercise tolerance. Achievement of critical inspiratory reserve volume is one of the main factors in exercise intolerance.

10. **Austin G (2013)**

The Buteyko breathing technique is recommended in national guidance for control of asthma symptoms. This article explores the evidence base for the technique, outlines its main principles and includes two cases studies.

11. **Burgess J, Ekanayake B, Lowe A, Dunt D, Thien F, Dharmage SC.(2011)**

The selection criteria were met by 41 articles. Most randomized controlled trials (RCTs) of the Buteyko breathing technique demonstrated a significant decrease in β (2)-agonist use while several found improvement in quality of life or decrease in inhaled corticosteroid use. Buteyko breathing technique and physiotherapist-led breathing training in improving asthma-related quality of life.

12. **Courtney R, Cohen M.(2008)**

Konstantin Buteyko, M.D., Ph.D., claimed that breath holding time (BHT) can be used to detect chronic hyperventilation and that BHT predicts alveolar CO(2) (Pa(CO(2))) according to his patented mathematical formula. The Buteyko Breathing Technique (BBT) is believed to correct chronic hyperventilation as evidenced by increased BHT. In this study, we test Buteyko's claims and explore the relationship between BHT and end-tidal carbon dioxide (ETCO(2)) as well as measures of dysfunctional breathing (DB) .

13. **Cowie RL, Conley DP, Underwood MF, Reader PG. (2008)**

Six months after completion of the interventions, a large majority of subjects in each group displayed control of their asthma with the additional benefit of reduction in inhaled corticosteroid use in the Buteyko group. The Buteyko technique, an established and widely recognised intervention, or an intensive programme delivered by a chest physiotherapist appear to provide additional benefit for adult patients with asthma who are being treated with inhaled corticosteroid.

14. **McHugh P, Aitcheson F, Duncan B, Houghton F. (2003)**

This study reveals that BBT is a safe and efficacious asthma management technique. BBT has clinical and potential pharmaco-economic benefits that merit further study.

15. **Cooper S, Oborne J, Newton S, Harrison V, Thompson Coon J, Lewis S, Tattersfield A.(2003)**

The Buteyko breathing technique can improve symptoms and reduce bronchodilator use but does not appear to change bronchial responsiveness or lung function in patients with asthma. No benefit was shown for the Pink City Lung Exerciser.

16. **Bruton A, Lewith GT.(2005)**

Breathing exercises and breathing retraining are often used in the management of asthma. One specific form of breathing therapy, known as the Buteyko breathing technique (BBT) has received considerable attention, but there is a paucity of rigorous research evidence to support its recommendation for asthma patients.

17. **Bowler SD, Green A, Mitchell CA. (1998)**

In this study those practising BBT reduced hyperventilation and their use of beta 2-agonists. A trend toward reduced inhaled steroid use and better quality of life was observed in these patients without objective changes in measures of airway calibre.

18. **Opat AJ, Cohen MM, Bailey MJ, Abramson MJ. (2000)**

The Buteyko Breathing Technique (BBT) is promoted as a drug-free asthma therapy. It is based on the premise that raising blood PaCO2 through hypoventilation can treat asthma. Our study was designed to examine whether the Buteyko Breathing Technique, as taught by a video, is an efficacious asthma therapy.

19. **Strickland SL, Rubin BK, Haas CF, Volsko TA, Drescher GS, O'Malley CA.(2015)**

Aerosolized medications are used as airway clearance therapy to treat a variety of airway diseases. These guidelines were developed from a systematic review with the purpose of determining whether the use of these medications to promote airway clearance improves oxygenation and respiratory mechanics, reduces ventilator time and ICU stay, and/or resolves atelectasis/consolidation compared with usual care.

20. **Westerdahl E, Lindmark B, Eriksson T, Hedenstierna G, Tenling A.(2003)**

To investigate the effects of deep breathing performed on the second postoperative day after coronary artery bypass graft surgery. The immediate effects of 30 deep breaths performed without a mechanical device with a blow bottle device and with an inspiratory resistance-positive expiratory pressure mask were studied. No difference between the three breathing techniques was found.

CHAPTER-3

MATERIALS AND METHODOLOGY

3.1 MATERIALS

- Treatment couch
- Treatment chair
- Towel
- Stop clock
- Stethoscope
- B.P Apparatus
- Incentive Spirometry

3.2 METHODOLOGY

Thirty patients of both sexes their ages ranged from 45-55 years (yrs) who underwent CABG and were selected randomly where the study was conducted. Patient's demographic data, clinical characteristic and all medical history was collected from the admission sheets to ensure that all patients were clinically and medically stable. Their Body mass index (25:29.9kg/m 2). Post operative pain was controlled medically. They were assigned into two groups with equal numbers: Group A –(Buteyko breathing technique (BBT) and incentive spirometer (IS)) Group –B(incentive spirometer)

3.3 EXCLUSION CRITERIA

Patients who had met one of the following criteria were excluded from the study: Obese patients (BMI ^30Kg/m2), patients who had developed hemodynamic complications (e.g. preoperative myocardial infarction, lung congestion or patients on Intra-aortic balloon), Post-operative renal failure or arrhythmia needed for a pacemaker, Post-operative mechanical ventilation (more than 24 hours) and smoker.

3.4 INSTRUMENTATION

3.4.1 For assessment:

Stop watch: It was used to measure the CP for each patient.

3.4.2 For treatment:

Flow-oriented incentive spirometer: Triflow II type. It is one of flow-centered incentive spirometer type.

3.5 INTERVENTION PROGRAM:

3.5.1 Pre operative procedures:

All patients who were involved in this study had been attended the preoperative meeting and they signed a consent form. All patients had been instructed and taught about the traditional chest physical therapy modalities including (deep breathing exercises, teach the patient right way of cough mechanism, bed mobility and ambulation exercises). The patients in the group A were taught about the post operative training program (Buteyko breathing technique) and Incentive Spirometry (IS) and patients from group B had received instructions for proper use of IS.

3.5.2 Post operative procedures:

Postoperative physical therapy program started when the patient was extubated from mechanical ventilation and hemodynamically stable in the first day postoperatively and continued after discharge from the ICU for five days postoperative. The patient's incisional pain had been controlled medically by analgesics if it was intolerable before the assessment. The breath holding test was evaluated before the training program.

3.6 POPULATION

- Patients with age group of 45-55 years

3.7 SOURCE OF DATA

- SIMS Hospital, Erode.
- Lotus Hospital, Erode
- KMCH Hospital, Erode
- Erode Trust Hospital
- Dhanvanthiri Critical Care, Erode

3.8 SAMPLE SIZES

☆ Sample size is 30 subjects

- Group A-15 patients
- Group B-15 patients

3.9 STUDY DESIGN

☆ Quasi Experimental design

- Pre and Post experimental Study Design

3.10 SAMPLING METHOD

- Convenient Sampling Method

3.11 DURATION OF THE STUDY

- 12 Months

3.12 TREATMENT DURATION

- Study was carried out for 5 days for each individual.
- BBT and Incentive Spirometry was performed for group A patient.
- Incentive Spirometry was performed for group B Patients.

3.13 PARAMETER

Breath holding (control pause) test:

Using a stop watch to measure CP as follows:

- The patient was sitting upright and adapts a good posture with relaxed shoulders and rested lower back.

- She/he didn't change breathing before taking CP. Patient was asked to take a small breath in (inspire two sec.) and a small breath out (expire three sec.) hold nose on the "out" breath, with empty lungs but not too empty. Holding nose is necessary to prevent air entering into the airways.

- Count how many seconds can comfortably last before the patient needs to breathe in again. Hold breath until feeling the first need to breathe in. Release nose and breathe in through it.

First intake of breath after CP should be no greater than breath prior to taking measurements; should not hold breath for too long as this may cause to take a big breath after measuring the CP . It was done 3 times and taking the mean of three trials.

3.14 PROCEDURE

3.14.1 Buteyko breathing technique:

Step 1: The "control pause":

- The patient was sitting upright and adapts a good posture with relaxed shoulders and rested lower back.
- She/he didn't change breathing before taking CP. Patient was asked to take a small breath in (inspire two sec.) and a small breath out (expire three sec.) hold nose on the "out" breath, with empty lungs but not too empty until feeling the first need to breathe in. Release nose and breathe in through it.

Step 2: Shallow breathing:

- To monitor the amount of air flowing through his/her nostrils by placing his/her finger under the nose in a horizontal position.
- Then, to breathe air slightly into the tip of his/her nostrils. For example, just take enough air to fill the nostrils and no more. Breathe in a flicker of air with each breath.
- The patient was asked to exhale that to pretend that his/her finger is a feather, and to breathe out gently onto his/her finger so that the feather does not move.
- Breathe out and to concentrate on calming his/her breath to reduce the amount of warm air he/she feel on the finger.
- As the patient reduces the amount of warm air onto his/her finger, the patient will begin to feel a need or want for air

Step 3: Putting it together:

- Take CP.
- Reduced breathing for 3min.
- Take CP.
- Reduced breathing for 3min.
- Take CP.
- Reduced breathing for 3min.
- Take CP.
- Reduced breathing for 3min.
- Take CP.
- Reduced breathing for 3min

3.14.2 Incentive spirometer training:

- Patient was asked to sit and relax quietly for a few min. and pay attention to their present breathing. Then he/she hold the spirometer by one hand and the tube, mouthpiece by the other hand.
- Take three to four slow, easy breaths and maximally exhale with the fourth breath.
- Then, he/she was asked to place the IS in his/her mouth and maximally inhale through the spirometer to try to raise the white ball in the chamber as high as he can, then hold the inspiration for 2-3 sec. before exhaling normally. These steps were repeated for a total of four to five times, and then he/she was instructed to stop and rest for 60 sec. This sequence was repeated for 15min.

CHAPTER-4

DATA PRESENTATION AND STASTISTICAL ANALYSIS

4.1 STATISTICAL TOOLS

The statistical tools used in the study are paired t-test and unpaired t-test.

4.1.1 PAIRED 't'-TEST

The paired t-test was used to find out the statistical significance between pre and post t-test values of DHI and VAS before and after treatment for Group A and Group B.

Formula for paired t-test,

$$S = \frac{\Sigma d^2 - \frac{(\Sigma d)^2}{n}}{n-1}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

d = difference between the pre- test V_s post- test

$\bar{d}$ = Mean difference

n = Total number of subjects

S = Standard deviation

4.1.2 UNPAIRED 't'- TEST

The unpaired t-test was used to compare the statistically significance difference of DHI and VAS before and after treatment for Group A and Group B.

Formula for unpaired t –test,

$$S = \sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}}$$

$$t = \frac{|\bar{x}_1-\bar{x}_2|}{s\sqrt{\frac{1}{n_1}+\frac{1}{n2}}}$$

n_1 = Total number of subject in group A.

n_2 = Total number of subject in group B.

x_1 = Difference between pre test and post test of Group A.

$\overline{x_1}$ = Mean difference between pre test and post test of group A.

X_2 = Difference between pre testand post test of Group B.

$\overline{X}_2$ = Mean difference between pre testandpost test of Group B.

S = Standard Deviation.

4.1(a) MAIN RESULTS

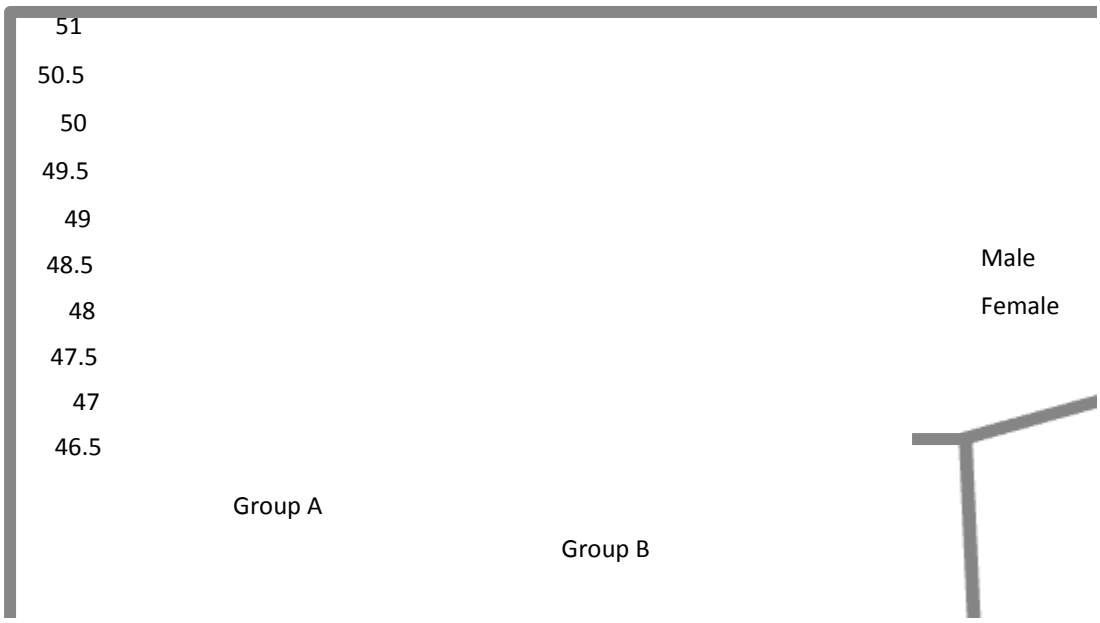
Table 4.1 and Figure 4.1 shows the age distribution among the study. The patients were in the range of 45-55 years. The mean average age of Group A and Group B were 50.

TABLE-4.1

MEAN AVERAGE AGE GROUP OF GROUP A AND GROUP B

Mean Age Group	**Group A**	**Group B**
Female's	51	50
Male's	49	48

FIG-4.1 THE MEAN AVERAGE AGE OF GROUP A AND GROUP B



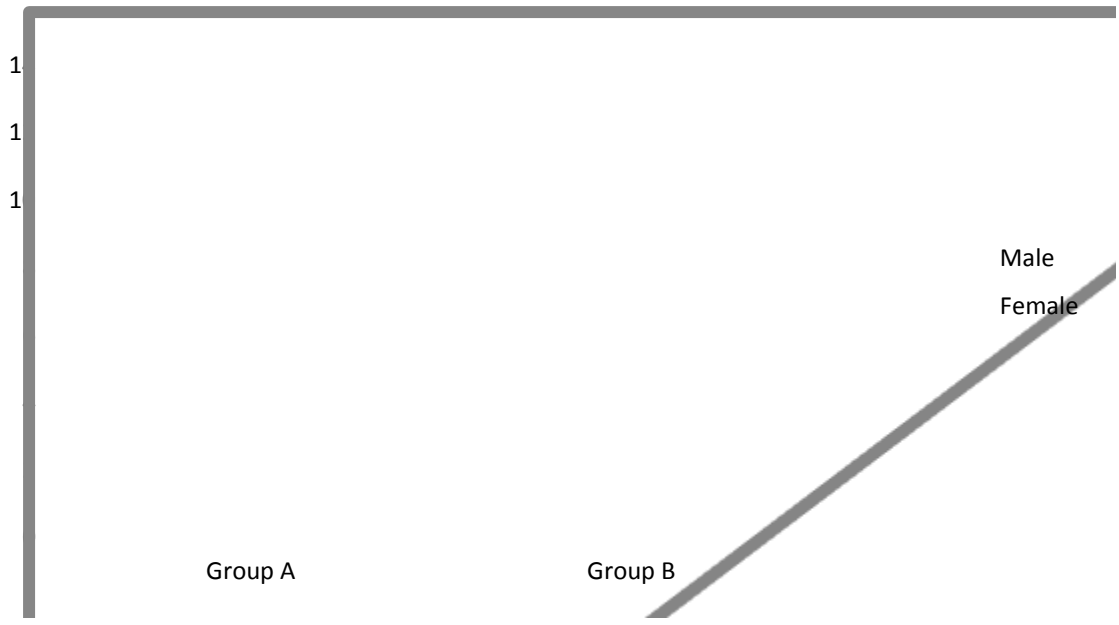
4.2 SEX DISTRIBUTION OF GROUP A AND GROUP

Table 4.2 and Figure 4.2shows the sex distribution among the study. There are 60% of males and 40% of females in both Groups.

TABLE-4.2

Sex Distribution	Group A	Group B
Male's	13	14
Female's	2	1

FIG 4.2 SEX DISTRIBUTION OF GROUP A AND GROUP B

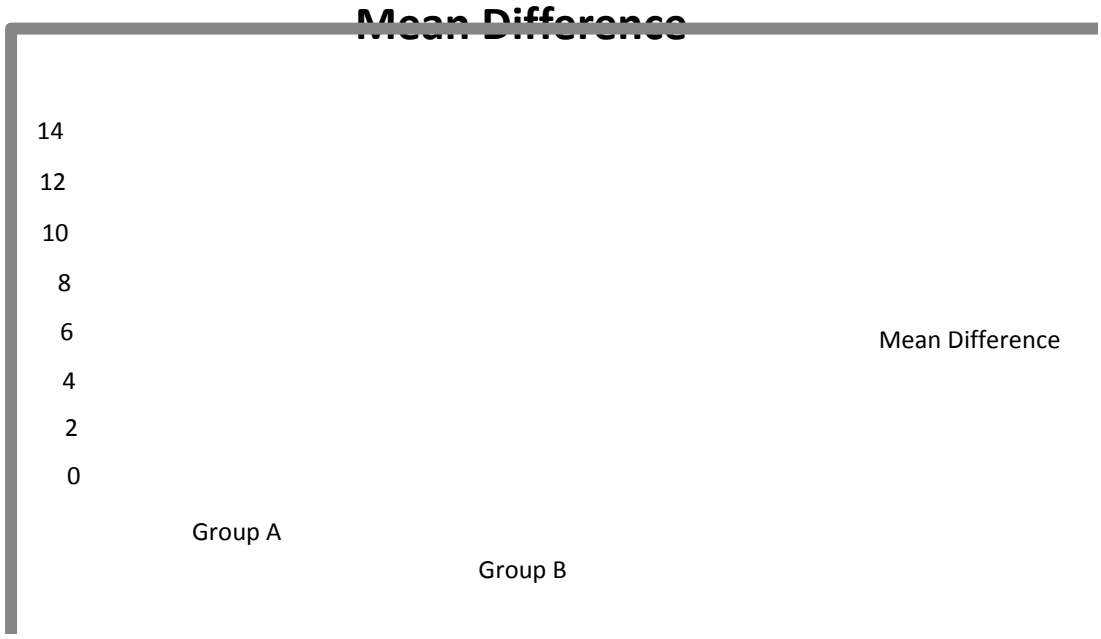


4.3 MEAN DIFFERENCE BETWEEN GROUP A(BBT &IS) AND GROUP B(IS)

TABLE-4.3

GROUPS	Mean Difference
Group A	14
Group B	9

FIG.4.3 MEAN DIFFERENCE BETWEEN GROUP A(BBT &IS) AND GROUP B(IS)

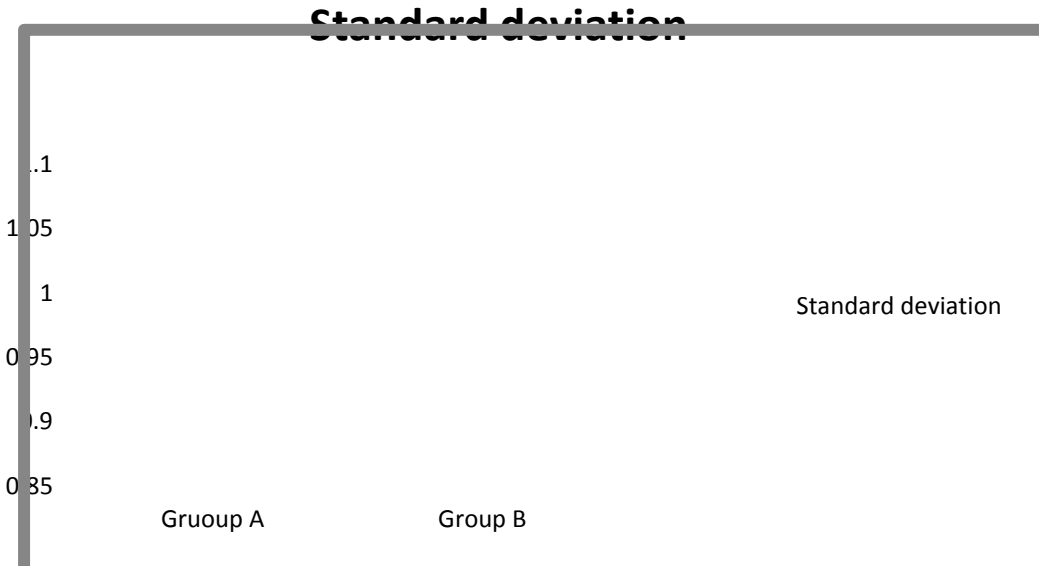


4.4 STANDARD DEVIATION BETWEEN GROUP A(BBT &IS) AND GROUP B(IS)

TABLE-4.4

Groups	Standard deviation
Group A	1.09
Group B	0.96

FIG.4.4 STANDARD DEVIATION BETWEEN GROUP A(BBT &IS) AND GROUP B(IS)

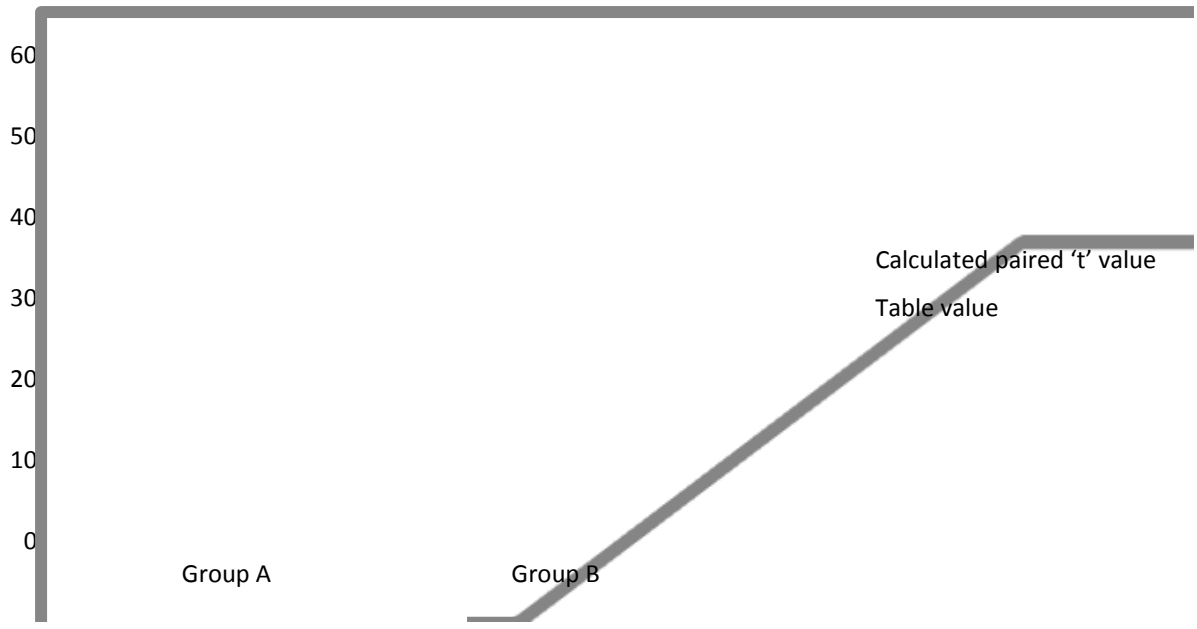


4.5 COMPARISION OF THE PAIRED ‘t’ TEST AND TABLE VALUE BETWEEN GROUP A AND GROUP B

TABLE-4.5

Groups	Calculated paired ‘t’ value	Table value	**SIGNIFICANCE**
Group A	54.41	2.15	**SIGNIFICANT**
Group B	31.37	2.15	**SIGNIFICANT**

FIG 4.5 COMPARISION OF THE PAIRED ‘t’ TEST AND TABLE VALUE BETWEEN GROUP A AND GROUP B



4.6 COMPARISION OF UNPAIRED ‘t’ TEST AND TABLE VALUE BETWEEN GROUP A AND GROUP B

TABLE-4.6

PARAMETERS	UNPAIRED ‘t’ TEST	TABLE VALUE	SIGNIFICANCE
Breath Hold	13.51	2.05	SIGNIFICANT

FIGURE-4.6 UNPAIRED ‘t’ TEST AND TABLE VALUE FOR GROUP A AND GROUP B

Breath Hold

CHAPTER-5

RESULTS AND DISCUSSION

5.1 RESULTS

The study sample comprised 30 patients, of which 26 were male and 4 were female. The mean age of patients was 50 years. The pre and post test values were assessed by breathe holding in Group A and Group B. The mean difference value is 19 and 9 respectively. The standard deviation value is 1.09 and 0.96 respectively. The paired 't' test value for breathe holding is 55.41 and 31.37.The paired ' t' test value is more than table value 2.15 for 5% level of significance at 14 degrees of freedom.

The calculated 't' values by unpaired 't' test were 13.51. The calculated 't' values were more than the table value 2.05 for 5% level of significance at 28 degrees of freedom.

The paired 't' test values have shows that BBT and IS was more effective than IS for patients with coronary artery bypass graft. The unpaired 't' test values have shown that there was significant difference between two groups in showing on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

5.2 DISCUSSION

In the literature a wide variety of treatments have been suggested. Many strategies and diverse therapies are applied postoperatively and these differ within and between countries . The CP test not only defines oxygenation of the human body, it also tells us about your minute ventilation (or how much you breathe). If you have normal breathing, your CP should be about 40 seconds. If your CP is about 20 sec., you breathe for 2 times more than the normal. If your CP is 10 sec., you breathe 4 times more than the normal.

The deviation of the pre-treatment results from the normal values could be explained by who stated that, many factors have been suggested to be responsible for the decrease in pulmonary function and muscular strength after CABG. Some suggested factors include anesthesia, analgesics, surgical stress, pain, reduced ventricular function, phrenic nerve injury, cardiovascular drugs, and the position of the drains. Added that the

peak of postoperative diaphragm dysfunction, with a decrease in its strength, occurs between 2 and 8 hours postoperatively.

The changing in all the measurable variables in post-treatment results in the Group A comes in agreement with who concluded that, a randomized clinical trial demonstrates that in patients who wait for CABG, a pre-and postoperative pro-gram of cardiopulmonary rehabilitation leads to a reduced rate of postoperative complications and a shorter hospital stay . added that, the physiotherapy treatment during the hospital stay generally consists of early mobilization, range of motion exercises and breathing exercises.

The improvement in the measuring variables recorded in the post treatment results of BBT and IS is supported by **Courtney & Cohen** who reported that, it is a well-recognized phenomenon that people practicing the Buteyko Method develop an increased ability to comfortably hold their breath, a measure known as the CP. **Buteyko** practitioners consistently report that a longer CP is associated with decreased symptoms. **Buteyko** claimed that the control pause correlated with alveolar CO2, and people learning the **Buteyko** Method are taught that longer control pauses reflect increased CO2 levels. In a recent study, who investigated the correlation between alveolar CO2 and the CP, and they found that there was a very slight negative correlation between the CP and end tidal CO2, directly opposite to Buteyko's claims. They also found that the shorter CP found in asthmatics had a significant correlation with a thoracic-dominant breathing pattern.

The current study reflected that improvement of CP in BBT and IS group which was better than conventional chest physiotherapy intervention only could be explained by who reported that, however, there are several possible neurological, biochemicals, and biomechanical pathways that may also explain the Buteyko effect. One possible biochemical mechanism of Buteyko may be through its influence on NO. Nitric oxide is involved in a large number of physiological responses including bronchodilation, vasodilatation, tissue permeability, immune response, oxygen transport, neurotransmission, insulin response, memory, mood, and learning. Buteyko practitioners' insistence on nasal breathing at all times is likely to affect NO levels, as a large percentage of the body's NO levels are made in the paranasal sinuses.

O'Donnell mentioned that, the work of breathing is most efficient when coordinated contribution from the diaphragm, abdominal muscles, and rib cage muscles

results in balanced motion between the upper rib cage and the lower rib cage and abdomen. Unevenness of motion of the chest wall where the upper rib cage movement dominates and lower rib cage expansion is impaired can indicate biomechanically induced dysfunctional breathing that result in hyperinflation and contributes to breathing symptoms such as Dyspnea.

People practicing the Buteyko Method are taught to reduce their volume of breathing by using a combination of increased abdominal muscle tone and relaxation of all the other muscles of breathing, particularly the shoulders and chest. Concluded from their study that, it is proposed that altered breathing pattern could contribute to breathing symptoms such as dyspnea and that breathing therapies such as BBT might influence symptoms by improving the efficiency of the biomechanics of breathing.

Improvement observed in the post-treatment results of the IS group comes in agreement with others who found that, IS can be used as a preventive measure to reduce pulmonary complications most of which are due to decreased inspiratory capacity and chronic retention of secretions due to decreased expiratory pressure and flow as well as it improves neuromuscular coordination. This is also confirmed by **Restrepo et al**., who mentioned that, respiratory therapy that includes daily sessions of IS plus deep breathing exercises, directed coughing, early ambulation, and optimal analgesia may lower the incidence of PPCs.

There was significant difference between the effect of IS and BBT, in favour of IS. Incentive spirometer provides deep breathing exercises mentioned that a mechanical device could help patients to remember to carry out the respiratory exercises, and that patients find these devices both useful and motivating. As previously mentioned, in our case the patients used a flow-based IS and carried out 30 slow maximal inspiratory maneuvers, as well as daily deep breathing exercises. They found immediate effects of deep breathing per-formed on the second post-operative day after cardiac surgery and concluded that there was a significant decrease of the atelectic area, increase in aerated lung area and a small increase in PO2 after performance of 30 deep breathing.

Our results are supported by **Roy** who conducted a study to compare between the effect of deep BBT and IS in patients with upper abdominal surgeries. She observed that the patients in BBT group showed more improvement after a single session of treatment. The chances of PPCs were reduced. As a result, the patient who underwent the intervention involving BBT demonstrates a better result than the group of patients who received IS.

5.3 LIMITATIONS

- The study has been conducted on small sized sample only.
- This study took shorter duration to complete.
- This study is not extended more than 5 days for a patient due to time constraint.

5.4 RECOMMENDATIONS

- A similar study may be extended with larger sample.
- The future study can be compared with various manuevers also.
- The BBT and IS may be applied to the other conditions like asthma, COPD, Diaphragm Palsy, RLD also.
- This BBT and IS may be compared with other exercises like ACBT also.

CHAPTER-6

SUMMARY AND CONCLUSION

Even though both BBT and IS and IS techniques are found to have significant effect in reducing PPCs after CABG, BBT and IS technique has a better effect than the IS and thereby on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

Through the results, **alternate hypothesis is accepted and also the study could be concluded that there is a significant difference between BBTand IS and IS** on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

CHAPTER-7

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APPENDIX –I

ASSESSMENT PERFORMA

PERFORMA FOR DATA COLLECTION

A.PERSONAL DETAILS

1. Name :
2. Age :
3. Sex :
4. Occupation :
5. Father's/Mother's name :
6. I.P. No. /O.P. No :
7. Date :
8. Address :
9. Chief Complaints :

B.HISTORY OF PRESENT ILLNESS AND REVIEW OF SYSTEMS

General

The following characteristics of each symptom should be elicited and explored:

- Onset – sudden or gradual
- Location – radiation
- Duration – frequency, chronology
- Characteristics – quality, severity
- Aggravating and precipitating factors
- Relieving factors
- Current situation (improving or deteriorating)
- Effects on Activities of Daily Living (ADL)
- Previous diagnosis of similar episodes
- Previous treatments and efficacy

Cardinal Signs and Symptoms

In addition to the general characteristics outlined above, additional characteristics of specific symptoms should be elicited, as follows:

Cough

- Quality
- Severity
- Timing
- Duration: greater than 2 weeks (screen for Tuberculosis (TB)

Sputum

- Colour
- Amount
- Consistency
- Purulence, odour, foul taste
- Time of day, worse

Haemoptysis

- Amount of blood
- Frank blood or mixed with sputum
- Association with leg pain, chest pain, shortness of breath

Shortness of Breath

- Exercise tolerance (number of stairs client can climb or distance client can walk)
- Posture – orthopnea or tripoding
- Shortness of breath at rest
- Association with Paroxysmal Nocturnal Dyspnea (PND)
- Associated swelling of ankles or recent weight gain

Cyanosis

- Central vs peripheral
- When does it occur
- Any recent changes in pattern of
- Associated wheeze

Chest Pain

- Associated symptoms
- Relation to effort, exercise, meals, bending over
- Explore the pain carefully – include quality, radiation, severity, timing

Fainting or Syncope

- Weakness, light-headedness, loss of consciousness
- Relation to postural changes, vertigo or neurological symptom

Extremities

- Edema:

  - site

  – relation of edema to activity or time of day

- Intermittent claudication (exercise-induced leg pain)

  - distance client can walk before onset of pain related to claudication

  - time needed to rest to relieve claudication

  - temperature of affected tissue (warm, cool or cold)

- Tingling
- Leg cramps or pain at rest
- Presence of varicose veins

Other Associated Symptoms

- Fever
- Malaise
- Fatigue
- Night sweats
- Weight loss
- Palpitations

- Nausea and vomiting
- Gastro intestinal reflux

C.MEDICAL HISTORY SPECIFIC TO CARDIO-RESPIRATORY SYSTEMS

- Allergies, including seasonal and environmental
- Medications currently used (prescription and Over The Counter (OTC) e.g., angiotensinconvertingenzyme (ACE) inhibitors, ß-blockers (acetylsalicylic acid or ASA), steroids, nasal sprays and inhaled medications (puffers), antihistamines, hormones, diuretics, antacids, steroids, digoxin)
- Herbal/traditional preparations
- Immunizations (e.g., pneumococcal, annual influenza)
- Medical conditions:

  - Frequency of colds and respiratory infections, recent viral illness, joint pain or swelling

  - History of rheumatic fever

  - Nasal polyps, chronic sinusitis, asthma, bronchitis, pneumonia, chronic obstructive pulmonary disease (COPD), TB (disease or exposure), cancer, cystic fibrosis

  - Dyslipidemia, hypertension, diabetes mellitus, thyroid disorder, chronic renal disease, systemic lupus erythematosus

  - Coronary artery disease (CAD), angina, myocardial infarction (MI)

  - Cardiac murmurs, valvular heart disease

  - Down's Syndrome
- Date and result of last Mantoux test and chest x-ray
- Admissions to hospital and/or surgery for respiratory or cardiac illness
- Blood transfusion
- Family History (Specific to Cardio-respiratory Systems)

Family History (Specific to Cardio-respiratory Systems)

- Others at home with similar symptoms
- Allergies, atopy
- Asthma, lung cancer, TB, cystic fibrosis, bronchitis
- Diabetes mellitus

- Heart disease: hypertension, ischemic coronary artery disease, MI (especially in familymembers < 50 years of age), sudden death from cardiac disease, dyslipidemia, hypertrophic cardiomyopathy

Personal and Social History (Specific to Cardio-respiratory Systems)

- Smoking history (number of packages/day, number of years)
- Exposure to second hand smoke, wood smoke, pets, mould
- Crowded living conditions
- Poor personal or environmental cleanliness
- High stress levels (personal or occupational)
- Institutional living Occupational or environmental exposure to respiratory irritants (mining, forest fire fighting)
- Substance use (e.g., alcohol, caffeine, street drugs, including injection and inhaled drugs / solvents)
- Human immunodeficiency virus (HIV) risks
- Obesity
- Immigration or travel abroad

D.PHYSICAL ASSESSMENT

Examination of the ear, nose, and throat should also be carried out because of the interrelatedness between these systems and structures and the functioning of the lower respiratory tract.

Vital Signs

- Temperature
- Pulse
- Respiratory rate
- SpO2
- Blood pressure (BP)
- Peak flow

General Appearance

- Acutely or chronically ill
- Degree of comfort or distress
- Position to aid respiration (e.g., tripod)
- Diaphoresis
- Ability to speak a normal-length sentence without stopping to take a breath
- Colour
- Nutritional status
- Hydration status
- Mental staus

Inspection

- Colour, cyanosis
- Shape of chest
- Symmetry of chest movement
- Rate, rhythm and depth of respiration, respiratory distress
- Intercostal indrawing
- Use of accessory muscles
- Precordium: visible pulsations
- Chest wall scars, bruising, signs of trauma
- Jugular venous pressure (JVP)
- Color of conjunctiva
- Extremities
- Hands – edema, cyanosis, clubbing, nicotine stains, cap refill

- Feet and legs – changes in foot color with changes in leg position i.e., blanching with elevation, rubor with dependency, ulcers, varicose veins, edema (check sacrum if client is bedridden), colour (pigmentation, discoloration), distribution of hair Skin – rashes, lesions,

- Xanthomas

Palpation

- Tracheal position (midline)
- Chest wall tenderness or crepitus
- Respiratory excursion
- Tactile fremitus
- Spinal abnormality
- Nodes (axillary, supraclavicular, cervical)
- Masses
- Apical beat

- Point of maximum impulse (PMI) normally located at the fifth intercostal space, midclavicular line - Assess quality and intensity of apical beat

- Apical beat (PMI) may be laterally displaced, which indicates cardiomegaly

- Identify and assess pulsations and thrills
- Hepatomegaly, right upper quadrant (RUQ) tenderness
- Assess peripheral pulses

– radial, brachial, femoral, popliteal, posterior tibial, dorsalis pedis

- Check for synchrony of radial and femoral pulses

- Edema: pitting (rated 0 to 4) and level (how far up the feet and legs the edema extends) sacral edema

Percussion of lung fields

- Resonance

- Increased resonance over hyperinflated areas

- Dullness to percussion over areas of consolidation

- Location and excursion of the diaphragh

Auscultation of lungs

- Listen for sounds of normal air entry before trying to identify abnormal sounds
- Degree of air entry throughout the chest (should be equal)
- Quality of breath sounds (e.g., bronchial, bronchovesicular, vesicular)
- Ratio of inspiration to expiration
- Adventitious sounds:
- Wheezes (rhonchi), crackles (rales), pleural rub, stridor, decreased breath sounds.

Auscultation of heart

- Listen to normal heart sounds before trying to identify murmurs
- Auscultate at aortic, pulmonic, Erb's point, tricuspid, and mitral. Attempt to identify:

  - Rate and rhythm

  - S1 and S2 sounds and their intensity

  - Added heart sounds (S3 and S4), rubs, splitting of S2

  -Murmur

  - Auscultate carotid arteries, abdominal aorta, renal arteries, iliac arteries and femoral arteries for bruits

Associated Systems

A complete respiratory assessment includes the Ear, Nose and Throat (ENT) system

- Consider Gastro Intestinal (GI)/Genito-Urinary (GU) assessment if appropriate

E. DIAGNOSTIC TESTS

F.TREATMENT

- ACBT
- Postural-Drainage

APPENDIX-II

ETHICAL CLEARANCE

Ethically permission for the study will be obtained from the subjects and a written consent will be taken from each subject who participates in the study, As this study involve human subjects the Ethical Clearance has been obtained from the Ethical committee of Nandha college of Physiotherapy, Erodeas per the Ethical guidelines for Bio-medical research on human subjects, 2000 ICMR,(Indian Council of Medical Research) New Delhi.

NANDHA COLLEGE OF PHYSIOTHERAPY,

ERODE-52

Informed consent form for the volunteers at "Nandha college of Physiotherapy, Erode", who will be participating in the research project entitled: **"BUTEYKO BREATHING TECHNIQUE VERSUS INCENTIVE SPIROMETER ON BREATH HOLDING TIME AFTER CORONARY ARTERY BYPASS GRAFT"**

Name of Principal Investigator	271430081 Post graduate student
Name of Organization	Department of Physiotherapy, Nandha college of Physiotherapy, Erode.

This Informed Consent Form has two parts:

- Information Sheet (to share information about the research with you)
- Certificate of Consent (for signatures if you agree to take part)

You will be given a copy of the full Informed Consent Form

PART I: Information Sheet

Introduction

I, _____, Postgraduate student in the Department of Physiotherapy, Nandha college of Physiotherapy, Erode, am working on my dissertation titled **"BUTEYKO BREATHING TECHNIQUE VERSUS INCENTIVE SPIROMETER ON BREATH HOLDING TIME AFTER CORONARY ARTERY BYPASS GRAFT "**

I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them and get yourself clarified.

Type of Research Intervention

In this study if you are selected, detailed history taking, clinical examination and routine investigations will be done.

Participant selection

Study group: Adult between age groups of 45-55 years presenting with history of brief history of Bronchiectasis.

Procedures and Protocol

Thirty patients who are between 45-55 years with CABG will be recruited in study group after obtaining the informed consent. Detailed history, clinical examination and routine blood investigation will be done. After explaining the procedure all the patients will bedivided into 2 study groups each study group consisting of atleast 15patients. First study group will be treated with BBT and IS. Second study group with IS

and outcome will be done for each study group at the end of treatment session. The data will be analysed statistically.

Duration: 12 months

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choicewhether you choose to participate or not, it will not affect our patient's treatment process.

Benefits

Personally you might be or may not be benefited in any way directly from the research. But by taking part in this research, you will be helping the scientific community.

Possible risks

There are no major physical risks for the person associated with these methods. Complications include exacerbation of symptoms after maneuver which is rare possibility.

Reimbursements

You won't be given any monetary incentives or gifts for being a part of this research.

Confidentiality

The information that we collect from this research project will be kept confidential. Information about the patient that will be collected during the research will be put away and no-one but the researchers will be able to see it.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so. You may also stop participating in the research at any time you choose. It is your choice and all of your rights will still be respected.

Who to Contact

This proposal has been reviewed and approved by the Research and Ethical committee of Nandha College of Physiotherapy,Coimbatore, which is a committee whose task it is to make sure that research participants are protected from harm.

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

PART II: Certificate of Consent

I have read the foregoing information, or it has been read to me. I have been explained the procedure and complications. I am willing to participate in the study. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant_____

Signature of Participant _____

Date _____Day/month/year

If illiterate a literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb-print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness_____ Thumb print of participant

Signature of witness _____

Date _____

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. Blood investigations:

   Hb,TC,DC,ESR,RBS,Serum electrolytes, Blood Urea and Serum Creatinine.
2. BBT.
3. IS.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this informed consent from has been provided to the participant.

Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____ Day/month/year

APPENDIX - III

GROUP-A

S.No	Age	Sex	Breath Hold	
			Pre test	Post test
1.	46	M	2	16
2.	47	M	3	17
3.	49	F	1	16
4.	46	M	4	20
5.	48	F	3	18
6.	50	M	2	17
7.	52	M	1	16
8.	51	F	1	15
9.	55	M	2	16
10.	55	M	3	18
11.	49	M	3	17
12.	50	M	2	16
13.	50	M	2	16
14.	50	M	4	19
15	51	M	2	15

F- Female

M-Male

APPENDIX - IV

GROUP-B

S.No	Age	Sex	Breath Hold	
			Pre test	Post test
1.	50	M	3	10
2.	52	M	1	12
3.	48	M	4	13
4.	55	M	2	11
5.	51	M	3	12
6.	49	M	2	11
7.	51	M	1	10
8.	51	M	2	13
9.	53	M	2	12
10.	54	F	3	12
11.	53	M	2	11
12.	45	M	2	11
13.	45	M	4	12
14.	49	M	2	13
15.	50	M	3	12

F- Female

M-Male

ABSTRACT

Aim:

The Aim of this study is to compare the effectiveness of BBT versus Incentive spirometry on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG

Materials and Methodology:

A Quasi Experimental study design consiting of reviews of charts of CABGpatients. Thirty patients were included, (60%) were males,(40%) were females ; the average age was 50 years. All the patients are presented with post operative Coronary Artery bypass Graft. Pre- and Post-Treatment scores of Breath hold are assessed to know their breathing capacity by Control Pause Test (CP).

Results:

The pre and post test values were assessed by breathe holding in Group A and Group B. The mean difference value is 19 and 9 respectively. The standard deviation value is 1.09 and 0.96 respectively. The paired 't' test value for breathe holding is 55.41 and 31.37.The paired 't' test value is more than table value 2.15 for 5% level of significance at 14 degrees of freedom.

The calculated 't' values by unpaired 't' test were 13.51.

The calculated 't' values were more than the table value 2.05 for 5% level of significance at 28 degrees of freedom.

Conclusion:

The paired 't'test values have shown that BBT and IS technique has a better effect than the IS and thereby on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

The unpaired ‘t’ test values have shown that there was significant difference between two groups in showing improvement on reducing PPCs after CABG which will cause reduction in hospital stay and overall cost of CABG.

Keywords:

ButeykoBreathing Technique, Incentive Spirometry, Breath Hold, Control Pause(CP).