



# “EFFECTS OF BUTEYKO BREATHING TECHNIQUE IN REDUCING SYSTOLIC BLOOD PRESSURE IN HYPERTENSIVE PATIENTS

*AN INTERVENTIONAL STUDY.”*

*Pragati Jani, Ruchi Yadav, Shristi Yadav,*

*Adyata Dave, Gaurav Patel.*

*Bachelor of physiotherapy*

*Faculty of physiotherapym*

*Parul university, Gujarat, India.*

## ABSTRACT

**BACKGROUND:** Hypertension can be defined as persistent high blood pressure. It is considered as invisible silent killer as symptoms are usually invisible until heart attack. Slow breathing has clinical effects on cardio vascular system, respiratory function and exercise tolerance. Buteyko breathing is a type of nasal breathing which has beneficial effects on cardio respiratory parameters. It was found by Dr. K.P. Buteyko in the year 1950. The programme is designed to help people to enhance the manner in which they breathe. It includes a sequence of lectures and practical training periods along with breathing exercises.

**AIM:** The projects aim was to see how successful the Buteyko breathing technique was in reducing systolic blood pressure in hypertensive patients of stage 1 and stage 2.

**METHOD:** It is an interventional study conducted on 30 hypertensive stage 1 and stage 2 patients. The inclusion criteria were recruited on sample population (15 males and 15 females) in this study. Outcome measures such as systolic and diastolic blood pressure, pulse rate, respiratory rate, vital capacity, breath holding time, inspiratory and expiratory time were recorded pre and post intervention. Duration of intervention was for 2 weeks. The Buteyko breathing technique was explained to the individuals by demonstrating them and showing videos of the same. Each session lasted for about 30 to 50 minutes with 3 sets of 10 repetitions.

**RESULT:** When distinguishing the pre and post interventional values of the final result, it calculated the statistically significant differences in systolic blood pressure, pulse rate, respiratory rate, vital capacity, breath holding time and I:E Ratio by Buteyko breathing technique. It proved to be meaningful. Whereas diastolic blood pressure did not show any significant changes.

**INTERPRETATION:** The results were interpreted by Microsoft Excel 2010. The result shows that Buteyko breathing is effective in reducing systolic blood pressure in hypertensive patients stage 1 and stage 2.

### **LIST OF ABBREVIATIONS**

- 1)BBT- Buteyko breathing technique.
- 2)HTN- Hypertension
- 3)PR-Pulse rate
- 4)RR- respiratory rate
- 5)SYBP- Systolic blood pressure
- 6)DYBP- Diastolic blood pressure
- 7)BHT-Breath holding time
- 8)VC- Vital capacity
- 9) CP- Control pause
- 10) MP-Maximum pause
- 11) I:E RATIO- Inspiratory expiratory ratio

### **INTRODUCTION**

Hypertension is the medical term for elevated blood pressure that persists over time. Hypertension affects more than a billion people all over the world. Since the signs are normally undetectable before a heart attack, it is referred to as a silent unseen killer. 1

Globally, about 17 million people die each year as a result of cardiovascular disease. 2 Those with hypertension, almost 22% are still unaware of their hypertension, 32% are not on treatment, and only 64% of those treated have BP under control. About 69% of people who have a first heart attack, 77% who have a first stroke, and 74% who have CHF have BP >140/90 mmHg. 3 HTN is directly responsible for 57 percent of all stroke deaths and 24 percent of all coronary heart disease in India. 2 HTN and its complications are responsible for 9.4 million deaths worldwide per year. 2 One in four men and one in five women are affected with hypertension. 1 There is an association of coronary artery disease, congestive heart failure, peripheral arterial diseases, sleep disorder, breathing difficulty, sleep apnea etc. due to hypertension. 2 Some environmental factors including socioeconomic factors, health system factors, and physical factors that may facilitate or constrain an individual's hypertension. 3 2 There is now

accumulating scientific evidence suggesting that slow breathing has many favourable clinical effects on the cardiovascular system, respiratory function and exercise tolerance.<sup>3</sup> A combination of both pharmacological and nonpharmacological

interventions is required for optimal BP control in most patients.<sup>3</sup> Most hypertensive patients need two or more drugs for blood-pressure control and concomitant statin treatment for risk factor reduction. Despite the availability of effective and safe antihypertensive drugs, hypertension and its concomitant risk factors remain uncontrolled in most patients.<sup>4</sup> The frequency of drug dosing, cost, and side effects often compromise long-term compliance with antihypertensive medications, making the use of nonpharmacological interventions even more attractive.<sup>3</sup> Slow, device guided breathing has been shown to effectively reduce blood pressure.<sup>18</sup> It increases the tidal volume while maintaining minute ventilation.

This results in increased cardiopulmonary stretch receptor stimulation, which reduces the sympathetic efferent discharge, resulting in vasodilation.<sup>3</sup>

BBT was developed in the 1950s and is named after its founder, Dr. K. P. Buteyko.<sup>1</sup> This respiratory technique is a unique form of breathing as human beings are requested to breath much less rather than more and holding is as essential as breathing. Research into the Buteyko technique tested its scientific effectiveness in treatment of bronchial allergies and recently sleep apnea (persistent over-breathing) , with a few studies exploring healing mechanisms however only few studies has been carried out on hypertension.<sup>33</sup>The Buteyko breathing technique allows you to reduce the intensity of your attacks as well as the amount of medications you take.<sup>20</sup> The Buteyko Breathing Method is a herbal manner of correcting terrible fitness and different problems because of a dysfunctional respiratory pattern.

The beauty of Buteyko breathing technique is that it is easy to remember and patients can carry out this exercise easily and comfortably.<sup>1</sup> This technique targets at reversing the persistent hyperventilation. The most important purpose of Buteyko Breathing Technique is long-term period normalization and optimization of automatic respiratory styles thru slow physiological habituation to breath much less, ultimately preventing hyperventilation and normalizing alveolar CO<sub>2</sub> ranges.<sup>21</sup> Buteyko Breathing Technique is supposed to lower pulmonary airflow which increases the carbon dioxide level withinside the body. The increase in the carbon dioxide range causes an increase in the oxygen partial pressure forcing oxygen to be released from haemoglobin (Bohr Effect).<sup>27</sup> This approach focuses on correcting hyperventilation by emphasising shallow breathing patterns. It focuses on nasal breathing and holding the breath, as well as relaxation which is great start to enhance fitness.<sup>1</sup> In a formal exercise consultation, reduced-volume breathing is carried out in combination with breath-holding techniques, the two maximum essential being a short breath hold, known as the Control Pause, and an extended breath hold, known as the Maximum Pause. Maximum Pause is normally double the time of Control Pause. A formal exercise session takes approximately 40-50 minutes. This is carried out way if means of sitting with an upright posture and relaxing the muscles of respiration until one senses a slight loss of air . Patient are requested to take a shallow breath thru nose. The breath is held after a mild exhalation until the first desire to breath or a little discomfort is felt by the patient.

During Control Pause breath is held for a shorter period until the patient feels the first urge of breathing back while the Maximum Pause, is normally held longer, as long as one can.<sup>33</sup> There are several studies done and claimed successful effects of Buteyko Breathing Technique on Bronchial Asthma, Asthma, Chronic Obstructive Pulmonary Disease, sleep Apnea etc. Some of the studies showing effects of Buteyko Breathing Technique on patients with above mentioned conditions has shown to give positive results. Some studies have also claimed that there is a positive impact on the body by the effect of Buteyko Breathing Technique on Cardiorespiratory parameters in adult patients. But there are very few studies showing effects of Buteyko Breathing Technique on Hypertensive patients. Thus the aims of our study is to get the estimation of the Effects of Buteyko Breathing Technique on Pulse Rate, Respiratory Rates, Blood Pressure, Vital Capacity, and Breath Holding Time in Hypertensive patients.

## RESEARCH METHODOLOGY

- The aim of this study is to see how effective the Buteyko breathing technique is in reducing systolic blood pressure in hypertensive patients stage 1&2.
  
- **Research design:**
  - Interventional analysis
  
- **Sample population:**
  - Hypertension patients from Nanavati super specialty hospital in Mumbai,
  
- **Age criteria:**
  - 30-70 years( both male and female)
  
- **Sample size:**
  - As required for interventional analysis, 30 patients were included.
  
- **Source of sampling:**
  - Nanavati super speciality hospital, Mumbai
  
- **Duration of study:**
  - 5 months

➤ **Interventional duration:**

- 2 weeks

➤ **Inclusion Criteria:**

- Both males and females
- Patients from rural urban and suburban areas.
- Patients with history of hypertension for more than 1 year.
- Patients clinically diagnosed with stage 1 and 2 hypertensions.
- Age group between 30-70 years.
- Patients with addiction like alcohol, tobacco chewing.
- Patients having history of diabetes and thyroid.
- Patients who does not perform any breathing exercise.
- Patients who are taking hypertension drugs on a regular basis.
- Patients have no prior medical history.

➤ **Exclusion Criteria:**

- Patients with active respiratory infection or any other heart disease.
- Congestively unstable hypertensive patients.
- Patients developed hypertension in past 1 year.
- Patients unwilling to cooperate in the study.
- Patients aging below 30 and above 70 years.
- Patients undergoing any cardiac or respiratory rehabilitation program.
- Patients with any psychological or neurological problems.
- Patients who are not able to understand or perform this technique.
- Patients with stroke.

➤ **MATERIALS**

- Sphygmomanometer
- Pulse oximeter
- Spirometer
- Stopwatch
- Stethoscope
- Chair
- Pen and pencil

- Paper
- clipboard
- Mask

Sanitizer

The aim of our study is to check the effectiveness of Buteyko Breathing Technique in reducing Systolic Blood Pressure in Hypertensive stage 1 and 2 patents . The objective of study is To improve systolic blood pressure of the hypertensive patients, To increase Breath Holding Time in patients, To improve hyperventilation in patients, To increase Vital Capacity of patients, To teach an effective breathing to patients.

## **HYPOTHESIS**

Two hypothesis were assumed;-

### **NULL HYPOTHESIS:**

Buteyko Breathing Technique would have no meaningful impact, according to the null hypothesis, in reducing systolic blood pressure in patients suffering from stage 1 and 2 of hypertension for more than past 1 year with ongoing medications in both males and females.

### **ALTERNATIVE HYPOTHESIS:**

Buteyko Breathing Technique would have meaningful impact, according to the alternate hypothesis, in reducing systolic blood pressure in patients suffering from stage 1 and 2 of hypertension for more than past 1 year with ongoing medications in both males and females.

## **STATISCAL ANALYSIS**

The present study was aimed to observe the effect of Buteyko breathing technique in reducing systolic blood pressure in hypertensive patients. The data was analyzed using SPSS. The data were presented as the mean and standard deviation for all continuous variables. The data were performed using the paired T- test. A value of  $p < 0.05$  was considered statistically significant performed using Microsoft Excel 2007.

## PROCEDURE

All the patients have been screened for inclusion and exclusion criteria. The study used Sphygmomanometer and pulse oximeter which is a tool used throughout the healthcare as a screening tool which is easy to use and provides useful information about the oxygenation of patient.<sup>34</sup> To measure blood pressure and pulse rate. Spirometer which is valuable and reliable screening test for general respiratory health information was used to measure the vital capacity of the patient.<sup>11</sup> Before the Buteyko breathing technique, the patient's blood pressure, pulse rate, oxygen saturation and vital capacity were measured. The technique was explained to the patient by demonstrating and then made them perform. Videos were shown for better explanation for home program sessions. To achieve these goals blood pressure, pulse rate, respiratory rate, breath holding time, I:E Ratio and vital capacity were also measured at 5-minute intervals pre and post performing Buteyko breathing technique.

### Step 1: Control the pause phase: -

Have the patient sit upright in a chair and take a deep breath, relax for 30 seconds, and then breathe normally through the nose (keep the mouth closed).

### Instructions to the patient: -

- Change the breathing mode only after the control pause.
- Breathe in slowly, hold the nose on breath out with empty lungs but not too empty. (To prevent air from entering your respiratory tract)
- Before you have to breathe again, count the few seconds you can comfortably hold on.
- Hold your breath until you feel the urge to breathe in for the first time.
- Release the nose and inhale.

### Step 2: Shallow breathing: -

- Ask the patient to sit upright, place your fingers horizontally under the nose and observe the air flow through the nostrils.
- The patient's fingers should be directly under the nostrils so that the airflow can be felt without obstructing the airflow.
- 10 Repetition into 3 sets each session take 30-50 mins.
- After preliminary and subsequent measurements of blood pressure, pulse rate, respiratory rate, vital capacity, breath holding time and I:E Ratio of each outcome parameter was calculated.

## RESULTS

The software SPSS (version) was used in our study. Outcome measures used were Systolic and Diastolic Blood Pressure, Pulse Rate, Vital Capacity, Respiratory Rate, Breath Holding Time and Inspiratory: Expiratory Ratio. Variables were defined using statistics like Mean and Standard Deviation. Paired T- test was used to simplify differences between pre and post intervention. Table 2.0

The statistical analysis was performed at 95% confidence level where  $p < 0.05$  was stated as statistically significant.

On differentiating pre and post interventional values of final result measures, it modified that statistically sizable distinction seen in Systolic Blood Pressure, Pulse Rate, Respiratory Rate, Vital Capacity, Breath Holding Time, Inspiratory: Expiratory Ratio by Buteyko Breathing Technique was proven to be Significant.

On differentiating pre and post interventional values of final result measures, it modified that statistically sizable distinction seen in Diastolic Blood Pressure by Buteyko Breathing Technique was proven to be non-Significant.

Table 1.0

## DISCUSSION

This study showed that the Buteyko breathing technique measured physiological parameters such as Blood Pressure, Pulse Rate, Respiratory Rate, Vital Capacity, Breath Holding Time and Inspiratory and Expiratory ratio.<sup>27</sup>

The Buteyko Method is based on the idea that hyperventilation is the root cause of all diseases which is a wide variety of medical conditions.<sup>1</sup> The main goal of the Buteyko kit is to minimise hyperventilation by reducing the amount of oxygen in the blood.<sup>12</sup> There are positive changes compared to the Buteyko breathing technique in systolic blood pressure, respiratory rate and breath holding time in hypertensive patients. This is due to vasodilation due to carbon dioxide retention, this results cardiopulmonary stretch receptor stimulation, which reduces the sympathetic efferent discharge, ensuing in vasodilation which further leads to decreased partial pressure and hence decreased blood pressure.<sup>2</sup> A review published in 2003 found that reducing blood pressure by 5 mmHg can reduce the risk of ischemic stroke by 34%. Heart disease is reduced by 21%, as is the risk of heart failure, dementia, and death from cardiovascular disease.<sup>3</sup>

The physiological function of the arterial baroreflex is usually to change the pulse rate and blood pressure due to changes in the tension of the arterial wall. Regular slow breathing is likely to improve arterial baroreflex sensitivity and lower blood pressure in the long term. Buteyko breathing reduces respiratory rate, changes airway



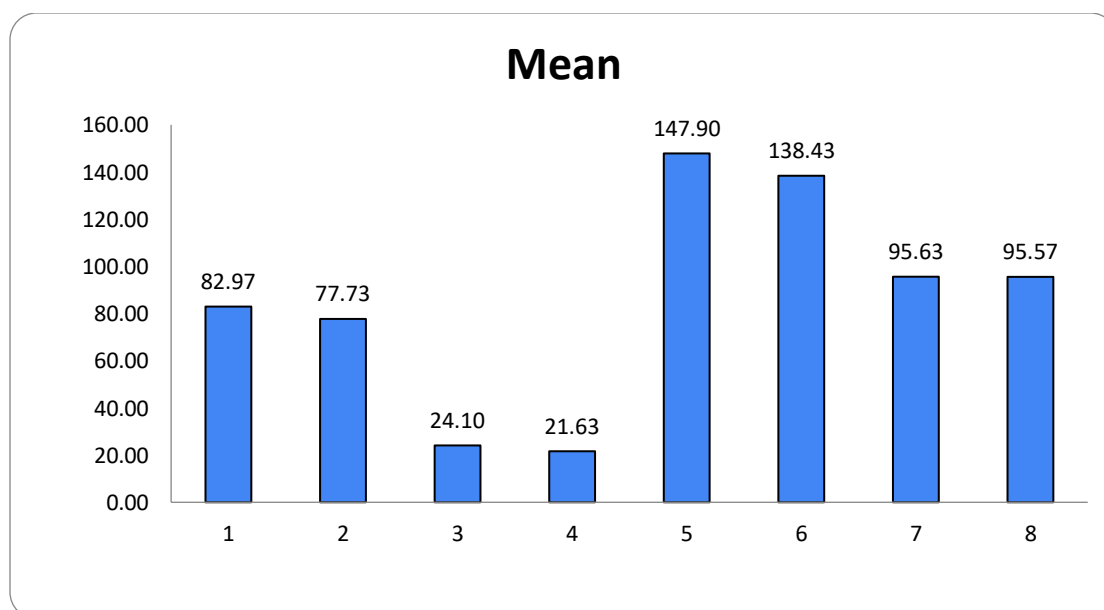
pattern and lowers blood pressure.<sup>22</sup>

Scientists have observed that people with high blood pressure have dramatically higher respiratory rates than people with normal blood pressure, indicating an acute response to stress. (Mckeown, 2015) In the scientific text it is common knowledge that the fact, physical exercise will help lower blood pressure In addition, slow breathing resulted in further reductions in respiratory rate and blood pressure (Mckeown, 2015).<sup>27</sup>

The present study showed a huge increase in the control pause. Reversing chronic hyperventilation by relaxing the respiratory muscles, which resulted in a decrease in minute ventilation and, over time, a feeling of a slight lack of air.<sup>21</sup> Cells manage to absorb oxygen from the blood during a breath hold, but oxygen levels are not replenished. The breath holding exercise causes a decrease in blood acidosis, greater tolerance to anoxia, a slowed metabolism, and an increase in lung volume.<sup>19</sup>

A typical routine of formal Buteyko practice that begins and ends with a control pause is an integral part of this technique as it increases the state of health and breathing, and reduces the degree of hyperventilation.<sup>33</sup> Repeated use of breath holding after exhalation during training has shown to increase duration of control pause.<sup>21</sup> The Buteyko method teaches people to voluntarily monitor for minor air shortages during breathing exercises. If it increases spontaneously during exercise, this will lead to positive changes in people's response to shortness of breath. Repeated use of prolonged breathing will increase the production of endogenous antioxidants in the body. And increase the anaerobic threshold, thereby improving physical performance at higher training levels.<sup>17</sup> This study showed that there are positive changes seen in patients inspiratory and expiratory ratio due to retention of oxygen in the lungs in the patients performing Buteyko breathing exercise.<sup>34</sup>

Graph 1: Showing Mean comparison of PR, RR, SYBP, DYBP



- To study the effectiveness of BBT on PR.

PR was measured before and after the intervention and paired T-TEST was performed. Since p value for PR is  $0.000 < 0.05$ , hence the test is significant and the technique is effective in reducing PR.

- To study the effectiveness of BBT on RR.

RR was measured before and after the intervention and paired T-TEST was performed. Since p value for RR is  $0.000 < 0.05$ , hence the test is significant and the technique is effective in reducing RR.

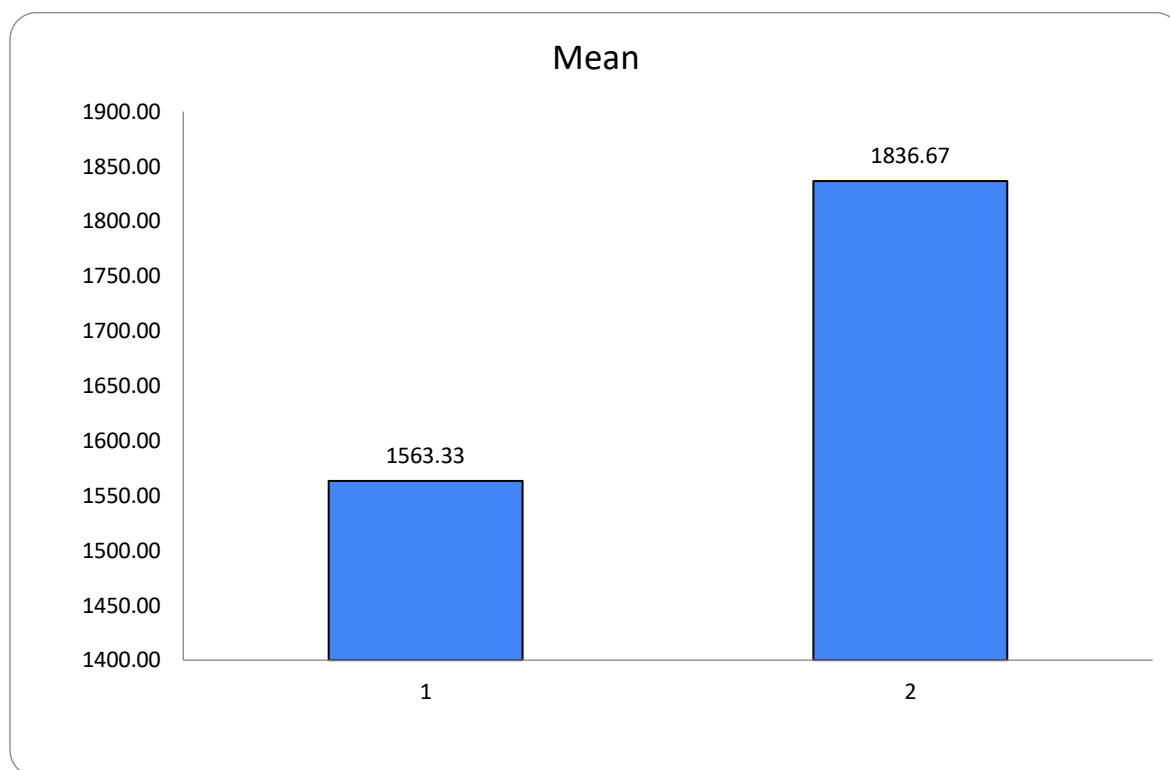
- To study the effectiveness of BBT on SYBP.

SYBP was measured before and after the intervention and paired T-TEST was performed. Since p value for SYBP is  $0.000 < 0.05$ , hence the test is significant and the technique is effective in reducing SYBP.

- To study the effectiveness of BBT on DYBP.

DYBP was measured before and after the intervention and paired T-TEST was performed. Since p value for DYBP is  $0.000 > 0.05$ , hence the test is NOT significant and the technique is not effective in reducing DYBP.

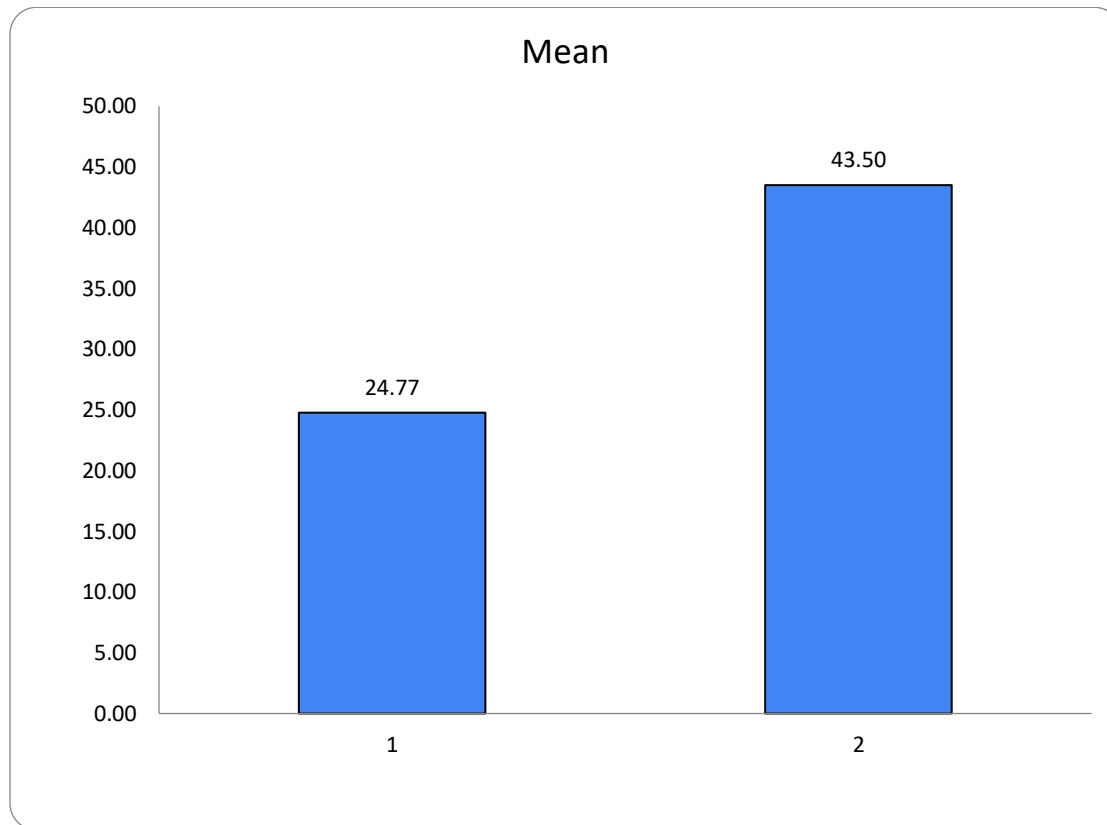
GRAPH 2. Showing mean comparison of VC pre and post



To study the effectiveness of BBT on VC.

VC was measured before and after the intervention and paired T-TEST was performed. Since p value for VC is  $0.000 < 0.05$ , hence the test is significant and the technique is effective in increasing VC.

GRAPH 3: Showing mean comparison of CP pre and post

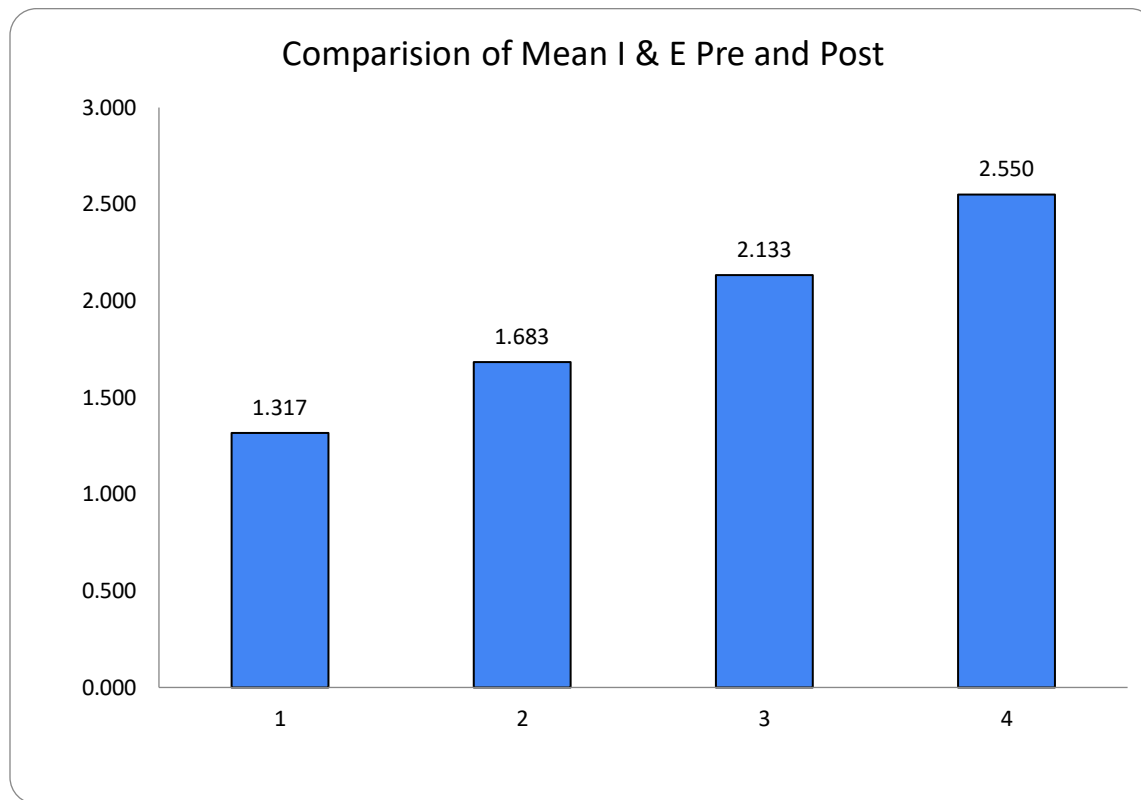


- To study the effectiveness of BBT on CP.

CP was measured before and after the intervention and paired T-TEST was performed.

Since p value for CP is  $0.000 < 0.05$ , hence the test is significant and the technique is effective in increasing CP.

GRAPH 4: Showing mean comparison of I:E RATIO pre and post.



- To study the effectiveness of BBT on I:E RATIO.

I:E RATIO was measured before and after the intervention and paired T-TEST was performed.

Since p value for I:E RATIO is  $0.000 < 0.05$ , hence the test is significant and the technique is effective in increasing I:E RATIO.

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**FIGURES AND TABLES**

Table 1.0 Base line comparison of pre and post intervention of outcome measures.

Paired Samples Test											
			Paired Differences				t	Df	Sig. (2-tailed)	Obs.	
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
						Lower					Upper
Pair 1	PR_PRE - PR_POST	5.233	4.629	0.845	3.505	6.962	6.192	29	0.000	Reject the null hypothe sis	
Pair 2	RR_PRE - RR_POST	2.467	2.374	0.433	1.580	3.353	5.691	29	0.000	Reject the null hypothe Sis	
Pair 3	SYBP_PRE - SYBP_POST	9.467	4.637	0.847	7.735	11.198	11.183	29	0.000	Reject the null hypothe Sis	
Pair 4	DYBP_PRE - DYBP_POST	0.067	6.496	1.186	-2.359	2.492	0.056	29	0.956	Do not NOT Reject the null hypothe Sis	
Pair 5	VC_PRE - VC_POST	-273.333	152.978	27.930	-330.456	-216.210	-9.786	29	0.000	Reject the null hypothe Sis	
Pair 6	CP_PRE - CP_POST	-18.733	7.400	1.351	-21.496	-15.970	-13.867	29	0.000	Reject the null hypothe Sis	
Pair 7	I_PRE - I_POST	-0.3667	0.3198	0.0584	-0.4861	-0.2472	-6.279	29	0.000	Reject the null hypothe sis	
Pair 8	E_PRE - E_POST	-0.4167	0.2306	0.0421	-0.5028	-0.3306	-9.898	29	0.000	Reject the null hypothe sis	

Table 2.0 Mean and Std. Deviation of pre and post intervention.

**Paired Samples Statistics**

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PR_PRE	82.97	30	9.995	1.825
	PR_POST	77.73	30	8.145	1.487
Pair 2	RR_PRE	24.10	30	2.857	0.522
	RR_POST	21.63	30	1.790	0.327
Pair 3	SYBP_PRE	147.90	30	12.246	2.236
	SYBP_POST	138.43	30	11.785	2.152
Pair 4	DYBP_PRE	95.63	30	7.323	1.337
	DYBP_POST	95.57	30	8.617	1.573
Pair 5	VC_PRE	1563.33	30	483.153	88.211
	VC_POST	1836.67	30	576.244	105.207
Pair 6	CP_PRE	24.77	30	11.485	0.0604
	CP_POST	43.50	30	14.696	0.0604
Pair 7	I_PRE	1.317	30	0.2451	0.0604
	I_POST	1.683	30	0.3592	0.0604
Pair 8	E_PRE	2.133	30	0.2604	0.0604
	E_POST	2.550	30	0.3309	0.0604

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