Immediate Effect of Buteyko Breathing in Hypertensive Patients: An Experimental Prospective Study

Samiksha Sanjiv Sathe[1], Tejal Rajandekar[2], Saurabh Hadake[3], Vinayak Shegaonkar[4]

[1]Assistant Professor, Datta Meghe College of Physiotherapy, Department of Musculoskeletal Physiotherapy, [2]Lecturer, Narayana Hrudayalaya College of Physiotherapy, Bangalore, [3]Assistant Professor Dept. of Medicine Datta Meghe Medical College, Shalinitai Meghe Hospital and Research Centre, Nagpur, [4]Professor Dept. of General Medicine Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi (Meghe), Wardha

Abstract

Background: There are ample studies showing effect of Buteyko breathing technique on cardiovascular parameters in asthmatics but very few studies have been done to see its immediate effect on hypertensive patients.

Aims: The aim of this study was to assess the immediate effectiveness of Buteyko breathing technique on hypertensive patients in terms of Systolic and Diastolic Blood pressure, Heart rate and Oxygen saturation (SpO2)

Method: The research design used was Experimental prospective study design. Total 50 participants were screened and those meeting the inclusion criteria (42) were included in the study. The participants were randomly divided into two groups-experimental and control Group, by computer generated randomised table into groups of 21 each. The experimental group performed the Buteyko breathing exercises. The control group did not receive any treatment. Pre and immediate post intervention scores were measured in terms of systolic BP, Diastolic BP, heart rate and SpO2.

Findings: On comparing the pre and post intervention values of the outcome measures, it was observed that there was statistically significant difference in Systolic BP, Heart rate and SpO2 values in Buteyko breathing group. No significant difference was seen in Pre and Post values of Systolic and Diastolic BP, Heart rate and SpO2 values in Control group. On comparing between the groups, it was observed that there was statistically significant difference between the two groups in terms of SpO2

Conclusion: Thus it can be concluded from the present study that Buteyko breathing technique has an immediate positive response on oxygen saturation level in hypertensives.

Keywords: *Hypertension, Buteyko breathing technique, SpO2, BP*

Introduction

Hypertension is defined as the persistent high blood pressure.[1] More than a billion people all over the world are affected with Hypertension[2] and it is anticipated that the number will increase to 1.56 billion in 2025[3,4] Globally, hypertension is the leading cause of premature deaths, with a rate of one in four men and one in five women.[5] For cardiovascular diseases, hypertension is one of the eminent risk factor. It is considered as a silent invisible killer as the symptoms are usually invisible in early stages until it takes a severe face later as of stroke, heart attack or chronic kidney disease.[2]

The Buteyko breathing technique named after its creator Dr. K P Buteyko was devised in 1950's.[6] It was basically developed to treat the asthmatics for hyperventilation. The beauty of Buteyko breathing technique is that it is easy to understand and patients can perform the exercise comfortably. It is a distinctive

breathing technique that utilises the breath holding and breath control exercises. This technique weighs more on shallow breathing pattern, correcting the hyperventilation. Thus basically it aims its attention on nasal breathing and holding the breath along with relaxation. The technique stresses on the optimum retention of CO2 which in succession has vasodialatory effect, resulting in the reduction in heart rate and blood pressure.[7]

There are several studies claiming successful effect of Buteyko breathing technique on Bronchial Asthma. A randomised control trial on Buteyko breathing technique as an addition to conventional treatment showed 39% increase in asthma control.[8] A similar study showing effects of Buteyko breathing technique on asthmatics revealed positive results.[9]Aslo there are a few studies showing immediate effect Buteyko breathing technique on Cardiorespiratory parameters in healthy adults[7], but to the best of our knowledge no study has been done to see the immediate effect of Buteyko breathing technique on cardiorespiratory parameters in Hypertensive patients. Thus the aim of our study was to evaluate the effect of Buteyko breathing technique on Blood pressure, heart rate and SpO2 in Hypertensive patients.

Methodology

The aim of the study was to assess the effect of Buteyko breathing technique on hypertensive patients.

Study Design:

Research Design: Experimental prospective study.

Sample Population: Hypertensive subjects residing in Nagpur region above 40 years of age.

Sample size: 50

Type of sample: Convenience sampling

Source of sampling: Nagpur district and outskirts

Place of study: Datta Meghe College of Physiotherapy

Duration of study: 1 month

Inclusion criteria:

1. Males and females clinically diagnosed with hypertension.
2. Age group -above 40 years
3. Patients with history of Coronary artery bypass grafting or angioplasty in the past 20 years.
4. Patients with addictions like alcohol, tobacco.
5. Patients having history of diabetes and thyroid.
6. Patients engaging in mild physical activity on daily basis.
7. Patients who have taken or are taking medications for hypertension.
8. Patients with a history of respiratory disorders but currently stable.

Exclusion Criteria:

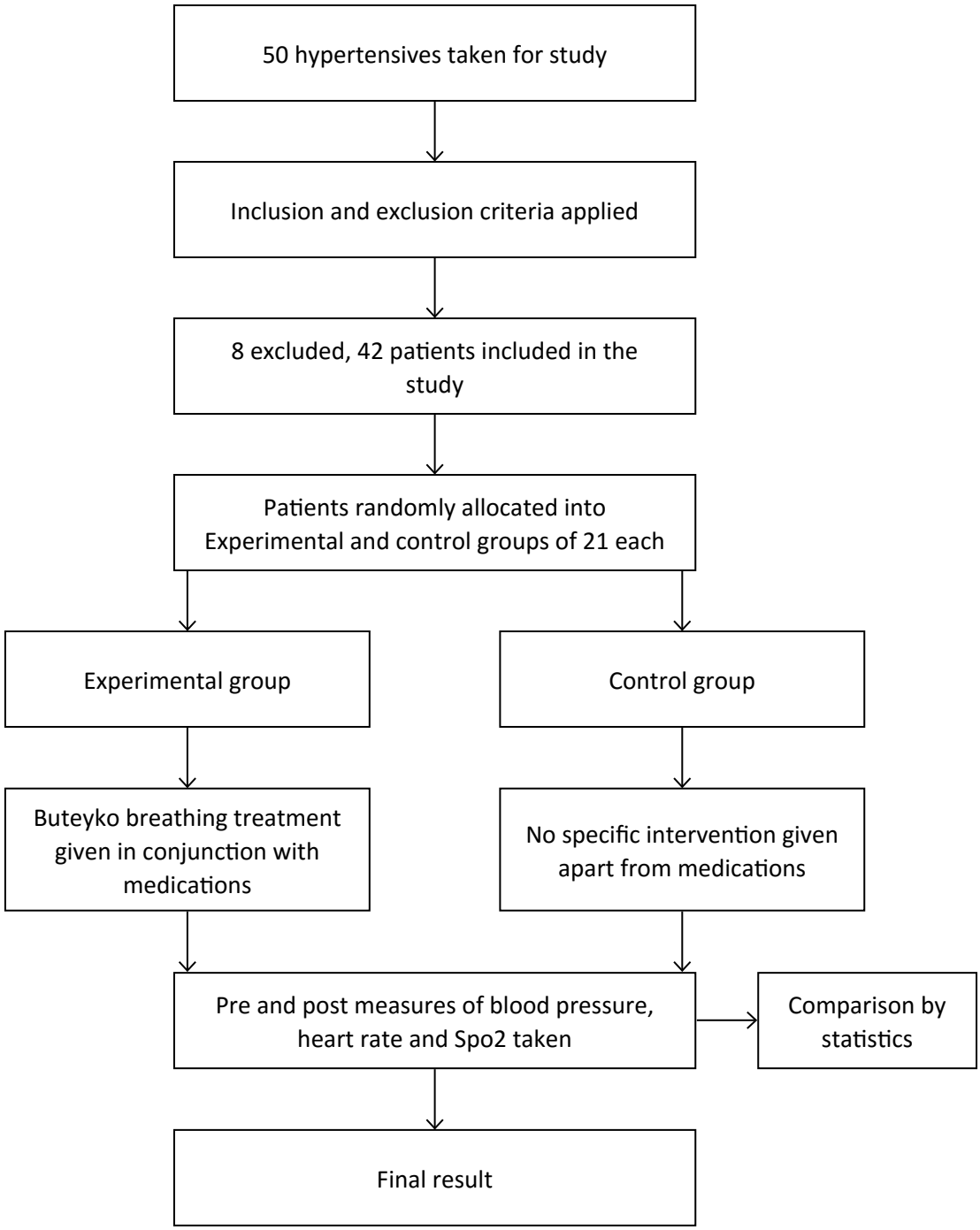
1. Patients with active respiratory infection or kidney problems.
2. Cognitively unstable hypertensive patients.
3. Patients unwilling to cooperate in the study.
4. Patients with a history of organ transplant.
5. Patients undergoing any cardiac or respiratory rehabilitation program.

Materials used: Digital B.P. apparatus, Pulse oximeter

Outcome measures: Blood pressure, Pulse rate, Oxygen saturation

The study was carried out at the Datta Meghe College of Physiotherapy, Wanadongri Nagpur. Ethical approval was obtained from Institutional Ethical Committee & an informed consent was obtained from the participants. 50 patients with hypertension residing in Nagpurregion were included in the study. The study was conductedfor a month. Inclusion and exclusion criteria were applied and 8 patients were excluded from the study. The study was conducted on 42 hypertensives fulfilling the inclusion criteria. The participants were randomly divided into two groups-experimental and control Group, by computer generated randomised table into groups of 21 each.

The Experimental group was given Buteyko Breathing technique.



A Digital B.P. apparatus and Pulse Oximeter were used in the study to measure Systolic and Diastolic Blood pressure, Heart rate and oxygen saturation. The blood pressure, heart rate and SpO2 of the patients were measured before the Buteyko technique. The technique was explained through video and audio to the patients and the patients were made to perform it. Immediately after the technique, the post reading were taken. The control group did not receive any treatment . The pre and the immediate post reading of the blood pressure, heart rate and Spo2 was taken in this group aswell after a 5 min interval.

Buteyko technique:

Step 1: Control pause phase:

The patient was asked to sit upright in a chair and breathe normally through the nose for 30 seconds (keeping mouth closed)

Subsequently instructions were given to the patient:

- Do not change your breathing pattern before taking control pause.
- Take a small breath in and a small breath out.
- Hold the nose on the "out" breath, with empty lungs but not too empty. (In order to prevent the air to enter the airways)
- Count for how many seconds you can last comfortably before need to breathe in again.
- Hold breath until feeling the first urgency to breathe in.
- Release nose and breathe in through it.
- First intake of breath after the CP should not be greater than the breath prior to taking measurement; patients were advised not to hold breath for too long as this may leadto taking a deep breath after measuring the CP.

Step 2: Shallow breathing

The patient were asked to:

- Sit up straight.
- Observe the air flow through the nostrils by placing a finger under the nose in a horizontally
- The patients' finger should lie just below the nostrils so that the airflow can be felt, but at the same time not blocking the airflow.[10]

Step 1 and 2 were repeated for 5 mins or 6 cycles approximately.

Once the pre and post measures of Blood pressure, heart rate and Spo2 were obtained, the statistics of the respective outcome parameters were calculated on the basis of SPSS software.

Result

The software MYSTAT 12 was used in this study. Outcome measures used were systolic and diastolic blood pressure, heart rate and oxygen saturation. Descriptive statistics such as mean and standard deviations were calculated to describe all the variables. The paired t-test and the unpaired t-test were used to verify differences between pre- and post-intervention. The statistical analysis was conducted at 95% confidence level, and $p<0.05$ was considered statistically significant.

The gender ratio was 12:9 (12 females and 9 males) in Group A and 11:10 (11 females and 10 males) in Group B. The difference in the mean age of both the groups was statistically not significant. (Table 1).

Table 1. Baseline demographic data of both the groups

Group	Group A Buteyko	Group B Conventional	t value	p value	Inference
Age (Years)	60.57 ± 8.50	60.71 ± 10.54	2.02	0.96	Not significant
Gender ratio (M:F)	12:9	11:10			

On comparing the pre and post intervention values of the outcome measures, it was observed that there was statistically significant difference in Systolic BP, Heart rate and SpO2 values in Buteyko breathing group. No significant difference was seen in Pre and Post values of Systolic and Diastolic BP, Heart rate and SpO2 values in Control group. On comparing between the groups, it was observed that there was statistically significant difference between the two groups in terms of SpO2 whereas no statistically significant difference was found between Systolic and Diastolic BP and Heart rate. (Table 2).

Table 2: Mean and SD scores of Buteyko and Control groups, Pre intervention and Post intervention

	Buteyko Group A				Conventional Group B				Between groups	
			Paired t test				Paired t test		Unpaired t test	
	Pre intervention Mean ± SD	Post intervention Mean ± SD	Mean Difference	p value	Pre intervention Mean ± SD	Post intervention Mean ± SD	Mean Difference	p value	p value	Inference
Systolic BP	139.57±23.48	126.00±28.44	13.57	0.002	139.57±22.82	19.42±20.83	0.14	0.79	0.08	Not Significant
Diastolic BP	83±12.51	84.42±6.86	-1.42	0.59	82.85±12.95	82.71±12.75	0.14	0.32	0.59	Not Significant
Heart rate	79.28±13.81	75±11.21	4.28	0.001	79.28±13.81	79.14±13.52	0.14	0.08	0.28	Not Significant
SpO2	97±1.22	98±1.44	-1	0.0001	97±0.94	97±1.09	0.00	1	0.01	Significant

Discussion

Table 2 shows the Pre-Post immediate effect comparison of Experimental and Control group. In data analysis, paired t test was applied for intra group comparison and unpaired t test was applied for intergroup comparison. On the basis of intra group comparison it can be said that there are positive changes of Buteyko breathing technique on Systolic blood pressure, heart rate and oxygen saturation in hypertensives. The results for the inter group comparison, showed a significant difference with Buteyko on SPO_2 (p value 0.01) as compared to the control group and thus it is seen that Buteyko technique has an immediate effect on increasing the SPO_2 level in hypertensive subjects.

Following could be the some of the reasons for the above results. According to the study by Yosreah et al(2019) titled "The effect of Buteyko breathing technique among patients with bronchial asthma: Comparative study" the major component of the Buteyko 'package' is to reduce hyperventilation through bouts of controlled reduction in breathing, known as 'slow breathing' and 'reduced breathing', combined with bouts of breath holding, known as 'control pauses' and 'extended pauses.'[10]

The Buteyko method is based on the concept that hyperventilation is the underlying cause of variety of medical conditions (Rosalba Courtney, 2008.) One possible biochemical mechanism of Buteyko may be through its influence on nitric oxide (NO). NO is involved in avarious of physiological responses including bronchodilation and vasodilatation[12]

According to Richa et al, Buteyko performed for 5 min at rest showed a significant increase in heart rate and reduction in systolic blood pressure, which is a normal physiological response. But however,they have notnoted any immediate changes in cardio respiratory parameters in the instances 'sub maximal exercise with Buteyko' and 'sub maximal exercise without Buteyko'.As also seen Review of the 'Australian government rebate on natural therapies' for private health insurance is is stated that there is no evidence about Buteyko Breathing Technique improving pulmonary function in adults. The reason for this can be that deep inspiration that is required to perform a lung function test might lead to bronchoconstriction and override any beneficial effect from the Buteyko breathing technique. This can explain the no significant change in diastolic Blood pressure and heart rate[7]Ritu et al(2013) stated that Buteyko breathing exercise is useful in management of respiratory rate and heart rate in chronic obstructive pulmonary disease patients[13,14]

Apart from this, it is also mentioned in studies that holding the breath can cause accumulation of carbon dioxide[15,16,17] that will lower blood pressure, as also breath holding will also improve the collateral ventilation which can be effective reasons for reduction of blood pressure, heart rate and improvement in SPO_2 in some patients. Thus these can be the reasons of the improvement in SPO_2 and reduction in systolic blood pressure in hypertensive patients in the study[18,19]. Also, since the immediate effect only was seen in the study, that can also justify why the diastolic blood pressure and heart rate was not significantly affected. The limitation of this study can be that it was a single intervention based study. Also it is recommended to use a larger sample size in further studies.

Conclusion

It can be concluded from the present study that Buteyko breathing technique has an immediate positive response on oxygen saturation level in hypertension.

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

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