Immediate Effect of Buteyko Breathing and Bhramari Pranayama on Blood Pressure, Heart Rate and Oxygen Saturation in Hypertensive Patients: A Comparative Study

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Abstract

Aim: There are studies showing the use of Buteyko breathing technique & Bhramari Pranayama in reducing cardiorespiratory parameters in normal healthy individuals but to the best of our knowledge there is hardly any study that has reported comparative immediate effect of these two techniques. Thus the aim of our study was to evaluate the immediate effect of these two techniques on Blood pressure, heart rate and SpO2 in Hypertensive patients.

Method: The research design used was Comparative Experimental study design. Total 52 participants were screened and those meeting the inclusion criteria (n=42) were included in the study. The participants were randomly divided into two groups- Buteyko breathing and Bhramari pranayama Group of 21 each. Pre and immediate post intervention scores were measured in terms of systolic BP, Diastolic BP, heart rate and SpO2.

Findings: Inter group comparison (student's unpaired t test) showed that there was no statistically significant difference between the two groups in terms of Systolic and Diastolic BP, Heart rate and SpO2. The comparison of pre and post intervention valuesof the outcome measures in Buteyko group showed a significant difference in Systolic BP, Heart rate and SpO2 values whereas in Bhramari group there was statistically significant difference only the in Systolic BP values.

Conclusion: It can be concluded from the present study that Buteyko breathing and Bhramari pranayama are equally effective in immediately reducing the systolic blood pressure in hypertensive patients.

Keywords: *Buteyko breathing, Bhramari pranayama, Immediate effect, Hypertension.*

Introduction

Hypertension is defined as the persistent high blood pressure.[1] Systemic hypertension is one of the commonest non-communicable diseases in our country and also a prominent hazard to health[2] Around the world, hypertension is the foremost cause of premature mortality, with a rate of one in four men and one in five women.[3] Even though there is remarkable advancement in disease management, 30% of the global mortality are due to CVD.[2] It is considered as a silent invisible killer as the symptoms are usually invisible in early stagesupto occurrence of severe results. The international guidelines (2020) of Hypertension or elevated blood pressure diagnoses a patient with Hypertensionif systolic blood pressure (SBP) in the office or clinic is ≥140 mm Hg and/or diastolic bloodpressure (DBP) is ≥90 mm Hg. Further classification- Grade 1 Hypertension if SBP is

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140–159mmHg and/or DBP is 90–99 mmHg and Grade 2 Hypertension if SBP is≥160 mmHg and/or DBP is ≥100mmHg.[4]

Out of many treatment alternatives, the non-pharmacological interventions comprise a range of measures like reduction of weight, increasing physical activity, diet modification, tobacco and alcohol consumption restriction, yoga & meditationetc[6,7] Main aim of yoga is to makethe individual attain and maintain the "sukhasthanam" that is a dynamic sense of physical, mental and spiritual wellbeing. Pranayama - the science of well-ordered, conscious expansion of Prana (the life force) has many useful effects. A type of Pranayama, Bhramariis originated from the Sanskrit word 'Bhramar' meaning Wasp. The name Bhramari pranayama has come from the humming noise impersonating the flying wasp.[8] There are studies showing the immediate positive effect of Bhramari pranayama on resting cardiorespiratory parameters in normal healthy individuals.[10]

Yet another breathing technique was devised in 1950's by Dr. K P Buteyko.[9] It was basically developed to treat the asthmatics for hyperventilation. It is a unique breathing technique that utilises the breath holding and breath control exercises. Easy to understand and easy to perform are the merits of this technique. There are several studies claiming positive immediate effect of Buteyko breathing technique on cardiorespiratory para metes in healthy adults[12].

Aim: There is hardly any study that has reported comparative immediate effect of these two techniques. Thus the aim of our study was to evaluate the immediate effect of these two techniques on Blood pressure, heart rate and SpO2 in Hypertensive patients.

Materials and Methodology

Our study was a Comparative study. Total 52 Hypertensive (above 40 years of age) subjects residing in Nagpur region and outskirts were considered in the study. Study continued over a period of one month.

Inclusion Criteria:

1. Participants clinically diagnosed with hypertension in the past 20 years[13]
2. Age group -above 40 years
3. Participants with history of Coronary artery bypass grafting or angioplasty in the past 20 years.
4. Participants with addictions like alcohol, tobacco.
5. Participants having history of diabetes and thyroid.
6. Participants engaging in mild physical activity on daily basis.
7. Participants who have taken or are taking medications for hypertension.
8. Participants with a history of respiratory disorders but currently stable.

Exclusion Criteria:

1. Participants with active respiratory infection or kidney problems[21]
2. Cognitively unstable hypertensive patients.
3. Participants unwilling to cooperate in the study.
4. Participants with a history of organ transplant.
5. Participants undergoing any cardiac or respiratory rehabilitation program.

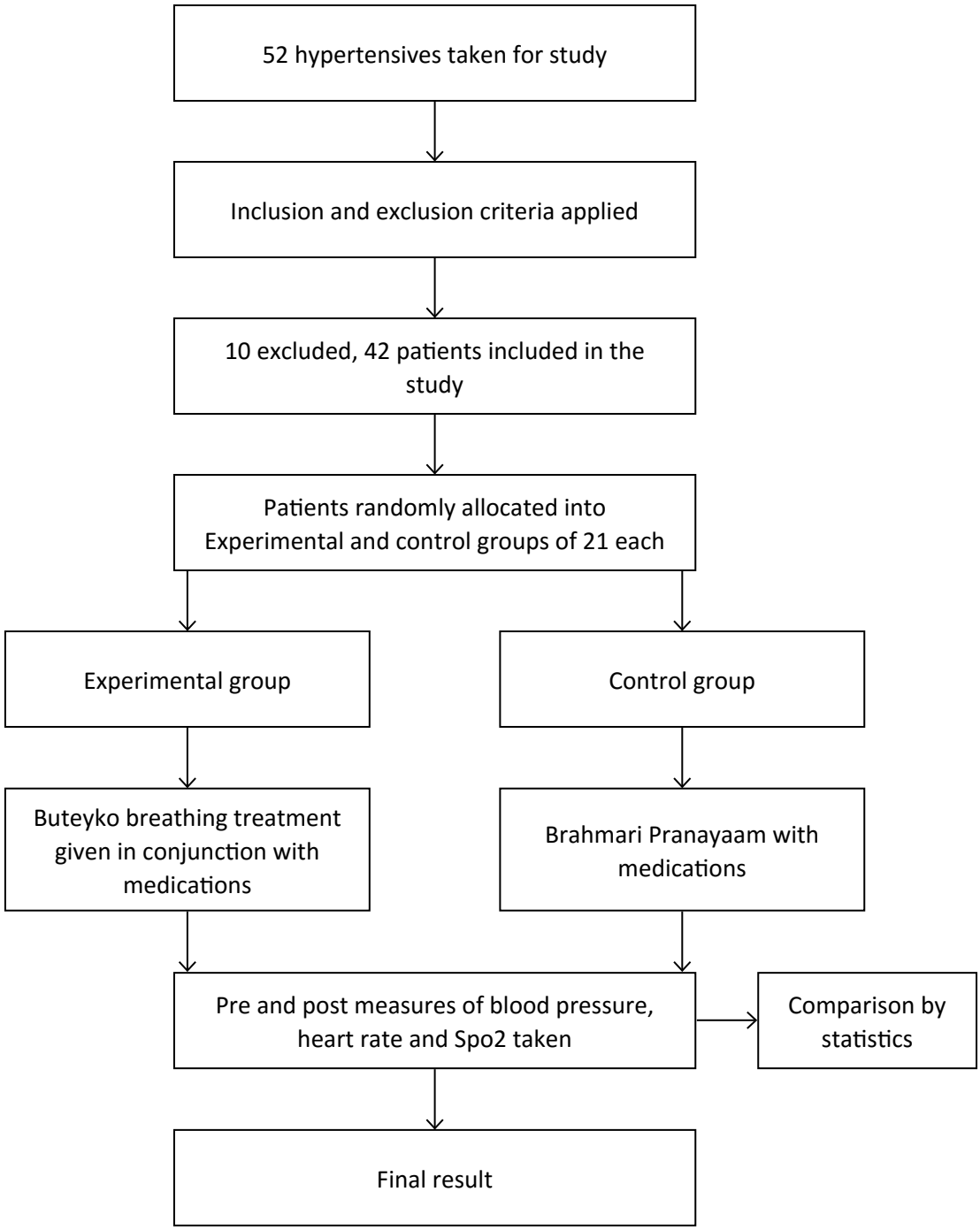
Materials: Digital B.P. apparatus, Pulse oximeter

Outcome Measures: Blood pressure, Pulse rate, Oxygen saturation

Methodology: 52 patients with hypertension were screened for the study. Ethical approval was obtained from Institutional Ethical Committee & an informed consent was obtained from the participants.Inclusion and exclusion criteria was applied and 10 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 Buteyko and Bhramariof 21 each. One group performed the Buteyko breathing exercises and the other performed Bhramari pranayama.

The blood pressure, heart rate and Spo2 of the patients were taken pre Buteyko and Bhramari technique. The techniques were explained through video and audio to the patients and the patients were made to perform it. Immediately after the technique, the post readings of the blood pressure, heart rate and Spo2 were measured.



Buteyko technique:

Step 1: Control pause phase:

The patient was asked to sit in an upright chair, close the mouth and breath in normally through the nose for 30 seconds.

The patients were further instructed to:

- Breathe in a small breath and breathe out
- Then close both the nostrils with empty lungs, taking care lungs are not too void of air
- Keep a count for how much time one is comfortable before feeling urgency to breathe in again and hold on until then
- Breathe in byreleasing the nostrils
- Patients were asked to keep a watch on first breath after CP, to avoid taking a breath deeper than the one taken before CP. Patients were instructed to not

hold the breath for a longer duration as this may lead to deep breathing after measuring the CP.

Step 2: Shallow breathing

The patient was asked to:

- Sit up straight.
- Monitor the amount of air flowing through nostrils by placing the finger under the nose in a horizontal position.
- The patients' finger should lie close enough to nostrils so that the airflow can be felt, but not so close that the airflow is blocked[16]

Patients were asked to repeat Step 1 and 2 for 5 mins (or approximately 6 cycles)

Bhramari pranayama: In an ambient atmosphere patients were made to perform the Bhramari pranayama. The breathing technique was explained and demonstrated in the following manner

To start with, one has to be atease in a relaxed position (Sukhasana) with eyes closed, and maintainan erect and steady posture.

Placing the thumbs on the external auditory meatus, index and ring finger on the closed eyes and ring finger near the nostrils one should breath in slowly through both the nostrils for maximum of 5sec and exhale out completely again through both the nostrils for about 15sec. While exhaling one has to chant the word "AUMmmmmm" with a simultaneous nasal humming sound impersonating the sound of humming wasp. This leads to vibration of the inner nostril and laryngeal walls. With the completion of these steps one completes a cylcle of Bhramari pranayama. (RR 3/min).After 5 minutes of practicing Bhramari pranayama, the outcome measures were reassessed.

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 MYSTAT 12 software.

Results

MYSTAT 12 software was used to calculate the results in this study. The outcome measures used were Systolic and diastolic blood pressure, heart rate and oxygen saturation.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 gender ratio was 10:11 (10 females and 11 males) in Buteykogroup and 11:10 (11 females and 10 males) in Bhramari group. 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	Buteyko group	Bhramari group	t value	p value	Inference
Age (years)	60.57 ± 8.96	59.71 ± 8.95	2.17	0.86	Not significant
Gender ratio(M:F)	10:11	11:10			

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

	Buteyko Group				Bhramari Group				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	140.75±21.27	125.55±26.42	15.2	0.003	139.61±6.04	129.95±8.25	9.66	0.004	0.56	Not Significant
Diastolic BP	83.15±10.75	84.56±6.56	1.41	0.56	81.28±5.22	82.77±4.98	1.49	0.31	0.31	Not Significant
Heart rate	78.31±12.55	75±8.21	3.31	0.001	75.06±9.07	74±9.65	1.06	0.86	0.62	Not Significant
SpO2	95.91 ± 2.23	97.89 ± 1.36	1.98	0.002	96.35 ± 2.65	97± 1.44	0.65	0.49	0.42	Not Significant

Inter group comparison (student's unpaired t test) showed that there was no statistically significant difference between the two groups in terms of Systolic and Diastolic BP, Heart rate and SpO2 (Table 2). The comparison of pre and post intervention values of the outcome measures in Buteyko group showed a significant difference in Systolic BP, Heart rate and SpO2 values whereas in Bhramari group there was statistically significant difference only the in Systolic BP values.

Discussion

The readings for pre and post values of Heart rate,SpO2 and blood pressure were taken for both Buteyko patients and Bhramari patients. Both the groups were compared for the effects using an unpaired t test. The results showed that there was no significant difference in systolic blood pressure, diastolic blood pressure, heart rate and SpO2 when the two groups were compared (p value - systolic B.P - 0.56,diastolic B.P - 0.31,heart rate - 0.62,SPO2 - 0.42)

However,individually Buteyko technique was helpful in improving systolic blood pressure (p value 0.003) and SpO_2 (p value 0.002), heart rate (p value -0.001)and bhramari was effective in improving systolic blood pressure. (p value 0.004)

The following could be the mechanism of action for Bhramari Pranayaam. Bhramari pranayama being a type of slow speed breathing exercise, it stimulates the parasympathetic nervous system. More they described that while exhaling, vibration effect on the nasal/ laryngeal mucous membrane together with the humming of "AUMmmm" lead to reflex apnoea by turning off inspiratory centre. It causes bradycardia through chemoreceptor sinu-aortic mechanism[14]

Further the neural respiratory elements may be responsible for a mechanism that clarifies how slow deep breathing affects the autonomic nervous system. During extended voluntary expiration, there is an increase in intrathoracic pressure causing more blood flow to the heart from lung and thus increasing the stroke volume. This leads to increased blood pressure causing stimulation of the carotid sinus baroreceptors. The increase in baroreceptor discharge leads to inhibitory action on the vasoconstrictor nerves and excites the vagus innervations of the heart. These may be the possible reasons for reduction in blood pressure in the present study. Another study by Jerath et al. explained that there is decreased oxygen consumption, heart rate and blood pressure resulting from slow deep breathing in pranayama, thus adding more strength to our study[15]

The Buteyko method is based on the concept that hyperventilation is the underlying cause of numerous medical conditions (Rosalba Courtney,2008)[16,17] One possible biochemical mechanism of Buteyko may be through its influence on nitric oxide (NO). NO is involved in a large number of physiological responses including bronchodilation and vasodilatation.[18] Ritu et al (2013) state that Buteyko breathing exercise is useful in management of respiratory rate and heart rate in chronic obstructive pulmonary disease patients.[19]Apart from this, it is also mentioned in studies that holding the breath can cause accumulation of carbon dioxide, 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. These can be the reasons that individually Buteyko and Bhramari have a significant effect on vital parameters.

The reason for no significant difference in both these two techniques can be that it was an immediate effect study. If the study was for a longer time, then maybe there would have been a significant difference noticed. There are several studies showing the effectiveness of Buteyko in cardiac and respiratory disorders over a long term.[9,10] There are also studies which show the effectiveness of Bhramari in long term on cardiac and respiratory disorders.[8] There are also studies that have shown that there is immediate effect on cardiorespiratory parameters by Buteyko technique.[12] So the study here proves thatButeyko and Bhramari techniques are both effective in hypertensive patients individually, but have no significant difference when compared for immediate effect.

Conclusion

It can be concluded from the present study that Buteyko breathing and Bhramari pranayama are equally effective in immediately reducing the systolic blood pressure in hypertensive patients.

Limitation: The present research was to study the immediate effect, thus the effect of long term treatment was not studied. Also the sample size was less.

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

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