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Immediate Effect of Buteyko Breathing Technique Versus Stacked Breathing Technique in Asthma Patients

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ABSTRACT

Background: Asthma is one of the most common chronic diseases in the world. It is estimated that around 300 million people in the world currently have asthma. Hyperventilation is a major cause of hypoxemia in asthmatics. Buteyko shows increasing evidence that reduce ventilation may be benefit for many patients with asthma. Stacked breathing increases the volume of breath, helps to improve depth of breathing, helps improve rib cage mobility and flexibility, stretches respiratory muscles, improves cough strength and effectiveness.
Purpose of Study: This study is conducted for the purpose of studying the effectiveness of Buteyko breathing technique and stacked breathing technique in asthmatics.
Materials and Methodology: Asthma patients aged 20-40 were included in the study in accordance with the inclusion criteria(n=60). Subjects were divided and Buteyko and stacked breathing techniques were given to them respectively. Pre and post measures were assessed using peak flow meter and modified Borg scale
Result: There was increase in peak flow rate of asthma patients with reduced dyspnea who performed Buteyko breathing as compared to stacked breathing technique. It is observed that between groups analysis is significant for both the variables across the pre, post and difference values at 5% level significance since p-value is less than 5% level. Thus, it is inferred that there is a substantial statistical significant difference between the groups and intra-group pre, post values.
Conclusion: It is thus concluded that Buteyko breathing is significant than stacked breathing technique both statistically and clinically.

Keywords: Asthma, Buteyko breathing, Stacked breathing

INTRODUCTION

Asthma is a serious health condition affecting large number of people both adult and children all over the world. World Health Organization has said asthma to be a major chronic health problem. (1) Asthma is a condition characterized by an increased responsiveness of bronchial smooth muscle to various stimuli and is manifested by widespread narrowing of the airways that changes in severity either spontaneously or as a result of treatment (Hogg, 1984; Rees, 1984). (2)

Asthma is a common pathology, affecting around 15% to 20% of people in developed countries and around 2% to 4% in the developing countries. Current estimates suggest that asthma affects 300 million people world-wide and an additional 100 million persons will be diagnosed by 2025. (3)

The airway obstruction in Asthma is recurrent and reversible. On occurrence of an Asthma attack, the airways constrict due to swollen bronchial tube lining and spasm of the muscles of the airways, reducing the flow of air in and out of the lungs. Even if Asthma

cannot be cured, appropriate management can control it and enable people to enjoy a good quality of life. It is often under-diagnosed and under-treated, creating a burden on individuals and families and most probably restricting individuals' activities for a lifetime

According to WHO 2016, 15–20 million people affected by asthma are from India, the prevalence of self-reported Asthma is 2.00% among women aged 15–49 years and 1.00% among young women aged 15–19 years as well as men aged 15–49 years. On exploring various literature to understand the environmental risk factors for Asthma, it was observed that exposure to indoor pollution caused due to the use of biomass fuels by the poor in low and middle-income countries like India, is a major risk factor, which has a significant impact upon the health of the people. The causes of Asthma are yet to be fully understood, however, dominant risk factors for developing Asthma are a complex interplay of genetic susceptibility and exposure to environmental particulate allergens and substances like indoor and outdoor allergens, tobacco smoke, chemical irritants in the workplace and air pollution. Asthma attacks can be triggered by exposure to cold air, extreme emotional states such as anger or fear, physical exercises, and certain drugs like aspirin, other non-steroid anti-inflammatory drugs, and betablockers. [(4)]

The main causes for Asthma are house dust mites in bedding, carpets and stuffed furniture, pollution, pet dander, tobacco smoke, chemical irritants in the workplace and air pollution. [(5)]

It is defined by history of dyspnea, cough, chest tightness and wheezing, that vary over time and in intensity, together with variable expiratory airflow limitation. It results from narrowing of the airways produced by a combination of muscle spasm, mucosal oedema and viscid bronchial secretion. The airflow limitation is generally reversible spontaneously or with treatment. Asthma is usually associated with bronchial hyper-reactivity to several stimuli. [(6)]

It is said that what the sphygmomanometer is to the hypertensive subject, so is the peak flow meter to the asthmatics. A peak flow meter is a hand-held device that measures how fast a person can blow air out of the lungs when there is forceful exhalation, after maximum inhalation. This measurement is called the 'peak expiratory flow' (PEF). The peak flow meter helps to assess the airflow through the airways and helps to determine the degree of obstruction. One of the hallmarks of asthma is variation in airflow obstruction. Considerable variations in PEF over short periods can be recorded by measuring the peak expiratory flow. [(7)]

The Buteyko method of breathing has its origin in Russia. This technique is said to the golden cure for asthmatic patients. The technique is named after its originator Pavlovich Buteyko. This technique aims to diminish hyperventilation by raising carbon dioxide levels. [(8)]

Breath stacking is a breathing exercise to help improve and maintain the size of the breath. Various researches have stated that stacked breathing could be more effective than deep breathing exercises and incentive spirometry in improving gas exchange during the postoperative period. Stacked breathing exercise is a breathing technique which helps to improve and maintain the volume of breath you take and can be used regularly to clear mucus from airway (secretion clearance), It helps in rib cage mobility and felicity of respiratory muscles. It also improves cough strength and effectiveness. Studies have also showed that stacked breathing exercise can improve peak cough flow or peak expiratory flow rate in various neuromuscular conditions and also post cardiac surgery. [(9)]

However, there have been no studies to prove the efficacy of stacked breathing exercise on PEFR in asthmatic patients. Hence, we aim to compare the immediate effect between Buteyko breathing and stacked breathing on peak expiratory flow rate using peak flow meter in asthmatic patients.

AIM: To study the immediate effect of Buteyko breathing technique vs stacked breathing technique on PEFR and Dyspnea Level in Asthma patients

OBJECTIVE

- To find out the effectiveness of Buteyko breathing technique on PEFR and Dyspnea Level in Asthma patients
- To find out the effectiveness of Stacked breathing technique on PEFR and Dyspnea Level in Asthma patients
- To compare the effectiveness of Buteyko breathing technique vs Stacked breathing technique on the PEFR and Dyspnea Level in Asthma patients

LITERATURE REVIEW

1. Zahra Mohamed Hassan et al (2012)

Their study shows the effect of the Buteyko breathing technique on peak expiratory flow rate, asthma daily symptoms, the Control pause and medications in patients with bronchial asthma Forty patients with bronchial asthma participated in this study, their age ranged between 30 and 50 years. They were divided into two equal groups, group (A) received Buteyko breathing technique (BBT), and the medications prescribed (B) did not perform any physical therapy program just their medications prescribed by the physician. Peak expiratory flow rates (PEFR), Control pause test and asthma daily symptoms (asthma control questionnaire) were measured at the beginning and after the treatment program for both groups. The results revealed a significant decrease in asthma daily symptoms, a significant improvement in PEFR, and Control pause test in group (A), while there was insignificant change in group (B). thus, they concluded that Buteyko breathing is an effective cure for asthma

2. Singh et al (2020)

This study shows prevalence of asthma in young women of India. The Analytical methods used in this paper include multivariate logistic regression to examine the adjusted effects of various independent variables on self-reported Asthma and poor-rich ratios (PRR) and concentration index (CI) to understand the economic inequalities in the prevalence of Asthma. For the spatial analysis in the prevalence of Asthma, univariate and bivariate local Moran's I statistic have been computed in addition to measure of spatial autocorrelation and auto regression using spatial error and spatial lag models. Thus, the research concluded that any programmatic effort to curb the prevalence of Asthma through vertical interventions may hinge around the use of clean fuel, poverty, and lifestyle of subjects, irrespective of urban-rural place of their residence, environmental and ecological factors.

3. Mohamed et al (2019)

This study aimed to assess the effect of practicing Buteyko breathing technique on asthma symptoms among patients with bronchial asthma. A purposive sample of 100 patients with bronchial asthma, 50 were assigned in experimental group and 50 patients in control group. Three tools were utilized; All 3 being questionnaire the first tool used to collect patients' clinical data Part 1 including Demographic characteristics and part 2 clinical data involving 7 subitems, the second tool used to assess bronchial asthma symptoms' severity by using Severity of bronchial asthma symptoms assessment questionnaire and the third tool used to assess level of asthma control through asthma control questionnaire. Thus, they concluded there is a positive effect for practicing Buteyko Breathing exercise on reducing asthma symptoms' severity and improve the ability to control asthmatic patients

4. Adeniyi et al (2011)

This study shows the effects of peak flow meter in clinical use. It has listed down the types of peak flow meter, how to use the instrument, when is the best time to use it, it's benefits and limitations and have concluded that it is a valuable and reliable device for asthmatic patients in both diagnosing and determining the progression of the disease

5.Arora et al. (2019)

The study shows the effect of Buteyko Breathing Technique in Obstructive

Airway Disease. The subjects were screened to select 28 patients. The Control group received conventional Physiotherapy and Experimental group received Conventional Physiotherapy with Buteyko breathing technique. The treatment was given thrice a week for both the groups for 4 weeks. All the outcome measures i.e. Single Breath Count Test (SBCT), Resting Respiratory Rate (Resting RR) , Breath Holding Time (BHT), Percent Predicted Value of 6 Minute Walk Distance (%PV of 6MWD) & Peak Expiratory Flow Rate (PEFR)were recorded at baseline and post treatment in both the groups. The study concluded that Buteyko Breathing was effective in improving breathing control, breath holding and reducing the work of breathing in subjects with Obstructive Airway disease.

6. Rekha B Marbhate et al (2019)

The study shows the immediate effect of Stacked Breathing Exercise (SBE) on Peak Expiratory Flow (PEFR) in cardiac surgery patient, a pilot study was carried out on 11 subjects with age 40-70yrs planned for cardiac surgery through the mediastinal approach. After screening of patient for the inclusion, Patients were treated with a Stacked Breathing Exercise (SBE) on Post-Operative Day (POD) 1, 2 and 3 twice daily. Pre-exercise and post-exercise values for PEFR was collected in six treatment session as IA, IB, IIA, IIB, IIIA, IIIB (A=Morning session, B=Afternoon session and I, II, III was POD (post-operative day)-1, 2 and 3 respectively. There is a statistically significant change seen in PEFR value comparing IA vs. IIIA, IB vs. IIIB and IA vs. IIIB (mean difference -86.364, -73.636 and -106.36). There is net 29.77% improvement in PEFR value seen at the end of the sixth (IIB) treatment session over pre-exercise value at IA. Thus the study concluded that stacked breathing exercise is significantly effective in improving PEFR. Hence can be an effective tool to help in improving lung function.

MATERIALS & METHODS

Material:

- Peak expiratory flow meter
- Client consent form
- Pen
- Modified Borg scale (Rate of Perceived Exertion)

0	No breathlessness at all
0.5	Very very slight (just noticeable)
1	Very slight
2	Slight breathlessness
3	Moderate
4	Somewhat severe
5	Severe
6	
7	Very severe breathlessness
8	
9	Very very severe (almost maximal)
10	Maximal

Methodology:

Study design: Randomised Clinical trial
Study duration: 6 months
Study setting: Tertiary Care hospitals in Miraj
Type of study: Experimental
Type of sample: Simple Random Sampling Method
Sample size: 60

Inclusion Criteria

1. Subjects with the age 20-49 years
2. Both male and female genders will be included in the study
3. Subjects who have been clinically diagnosed with Asthma.
4. Subjects who have mild to moderate obstruction with PEFR ranging from 100-300 l/min
5. Subjects with MBS score ranging from 0-3
6. Subjects who were on regular treatment (both inhalers and medication)
7. Subjects who were clinically stable before study.
8. Subjects who will be willing to take part in this study

Exclusion Criteria

1. Subjects with epilepsy
2. Subjects with mental retardation.
3. Subject with recent abdominal, thoracic surgery.
4. Subject who has cardiac or neurological problem

5. Chronic lung disease patient with infection like tuberculosis
6. carcinoma of lung.
7. Childhood asthma
8. Subjects with Restrictive lung diseases

The following hypotheses are framed for this study

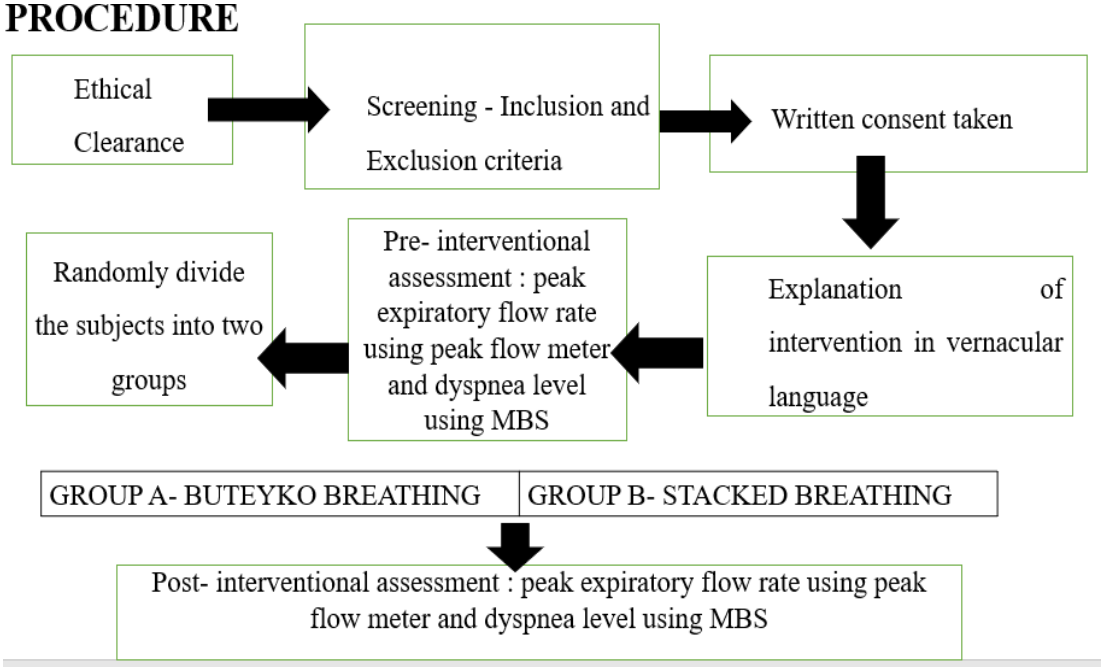
NULL HYPOTHESIS

There will be no significant difference in the PEFR and Dyspnoea Level in subjects with asthma who will receive Buteyko breathing technique vs those who will receive stacked breathing technique

ALTERNATIVE HYPOTHESIS

There will be significant difference in PEFR and Dyspnoea Level in subjects with asthma who will receive Buteyko breathing technique vs those who will receive stacked breathing technique

PROCEDURE



GROUP A
BUTEYKO BREATHING

- Position the patient in sitting position
- Ask the participant to take breathe in and out normally (2-3 times)
- Take a small breath in (2 s) and a small breath out (3 s).
- Pinch your nose on the ‘‘out’’ breath,
- Hold your breath as the therapist counts one, two, three
- Release the breath
- Repeat the procedure while the therapist increases hold count up to 5 and then gradually decreases it with each repeat (total-5)

GROUP B
STACKED BREATHING

- Position the patient in sitting position
- Ask the participant to breath in and breathe out normally (2-3times)
- Ask the participant to take 3-4 breaths one after another and hold the breath for 10 seconds up to his or her capacity
- Ask patient to expire by pursed lip breathing
- Wait for 15-30 seconds
- Repeat the procedure for 5 times

Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Sciences [SPSS] software 23.0. The level of significance for Pre and Post peak flow rate and modified Borg scale was performed using Mann Whitney test.

RESULT

Gender & Group Cross tabulation

Particular		Group		Total	p-value
		Buteyko	Stacked		
Gender	Male	16	16	32	0.999
	Female	14	14	28	
Total		30	30	60	

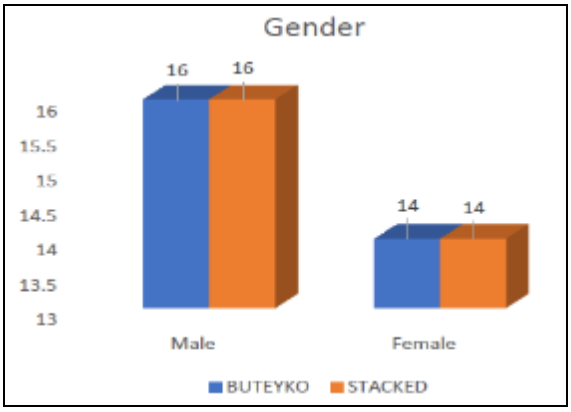


Table and Graph No. 1 shows Cross Tabulation between group and gender with p value 0.9

Particular	Group	Mean	SD	p-value
AGE	BUTEYKO	30.47	5.90	0.911
	STACKED	30.63	5.59	

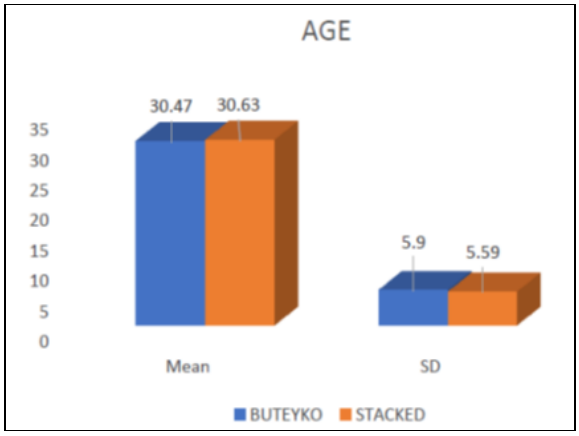


Table and Graph No. 2 shows mean and standard deviation value of baseline data [age] of Group A [30.47] and [5.97] respectively, while of group B is [30.63] and [5.59] respectively

Within group Pre and post Wilcoxon test for Group BUTEYKO

Table No. 3: Difference between Mean and SD of Pre and Post session of Group A

Variable	Pre		Post		Diff		Effect size	z –value	p –value
	Mean	SD	Mean	SD	Mean	SD			
Peak Flow Meter	203.73	60.64	142.90	55.33	60.83	36.69	1.66	9.083	0.001*
Modified BORG Scale	2.10	0.71	1.23	0.54	0.87	0.51	1.71	9.355	0.001*

* Significant at 5% level

From the above within groups' analysis using Wilcoxon test, it is observed that Peak Flow Meter mean value indicated changes post treatment and lower mean values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.

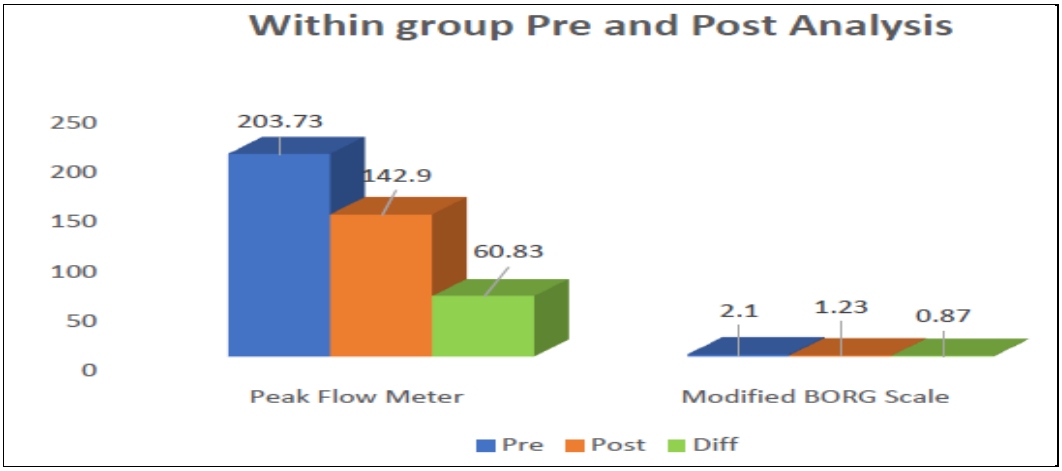
The effect size Cohen's D indicates 1.66 value which is assumed to be very high in effect size as per the standard parameters of reference.

Thus reference to the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.

From the above within groups' analysis using Wilcoxon test, it is observed that Modified BORG Scale mean value indicated changes post treatment and lower mean values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.

The effect size Cohen's D indicates 1.71 value which is assumed to be very high in effect size as per the standard parameters of reference.

Thus reference to the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.



Graph No.3: Shows Mean Pre and Post Test of Group A

Within group Pre and post Wilcoxon test for Group STACKED

Table No. 4: Difference between Mean and SD of Pre and Post session of Group B

Variable	Pre		Post		Diff		Effect size	z –value	p –value
	Mean	SD	Mean	SD	Mean	SD			
Peak Flow Meter	169.93	61.83	179.40	47.91	9.47	60.96	0.16	0.851	0.402
Modified BORG Scale	1.67	0.71	1.70	0.60	0.03	0.89	0.04	0.205	0.839

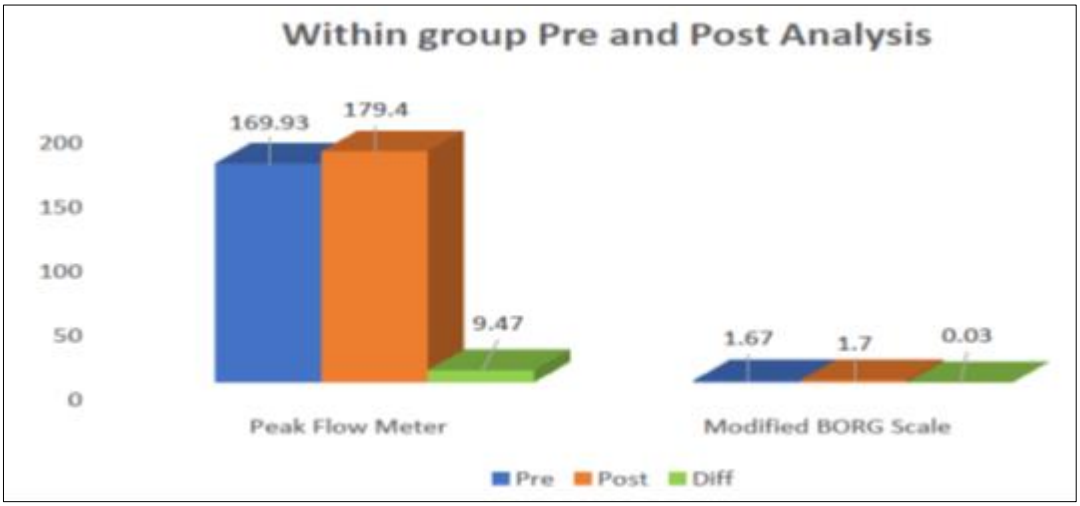
* Significant at 5% level

From the above within groups' analysis using Wilcoxon test, it is observed that Peak Flow Meter mean value indicated changes post treatment and higher mean values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.

The effect size Cohen's D indicates 0.16 value which is assumed to be very low in effect size as per the standard parameters of reference.

Thus reference to the results of the test analysis at 5% significance level, there is a non-significant statistical reliable difference between the pre & post treatment values with p-value is more than the 5% significance level (i.e. 0.402 > 0.05) in the study and therefore it justifies the non-improvements in health outcome post intervention.

From the above within groups' analysis using Wilcoxon test, it is observed that Modified BORG Scale mean value indicated changes post treatment and higher mean values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.



Graph No. 4: Shows Mean Pre and Post Test of Group B

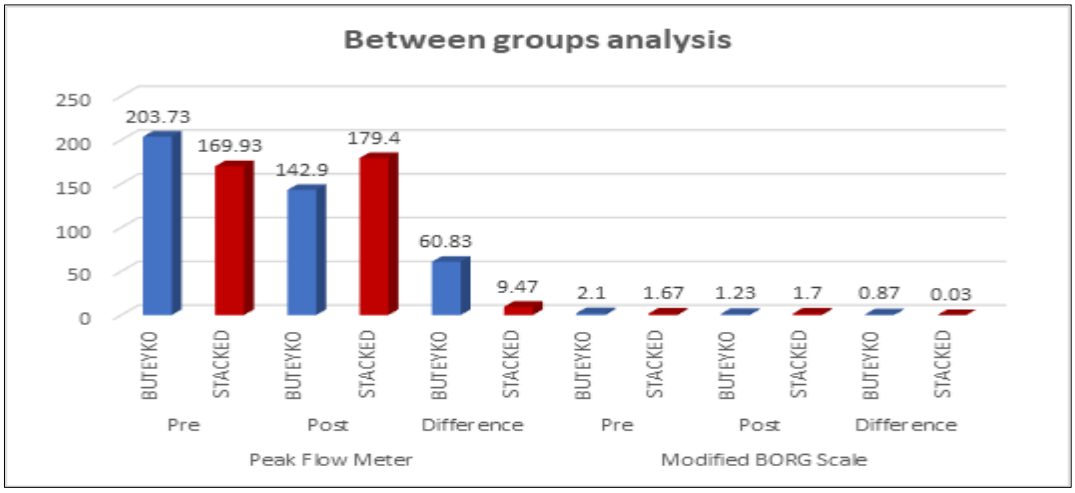
The effect size Cohen's D indicates 0.04 value which is assumed to be very low in effect size as per the standard parameters of reference.

Thus reference to the results of the test analysis at 5% significance level, there is a non-significant statistical reliable difference between the pre & post treatment values with p-value is more than the 5% significance level (i.e. 0.839 > 0.05) in the study and therefore it justifies the non-improvements in health outcome post intervention.

Between groups analysis using Mann Whitney test

Table No. 5: Difference between Mean and SD of Pre and Post session of Group A and Group B

Variable	Time frame	GROUP	Mean	SD	z-value	p-value
Peak Flow Meter	Pre	BUTEYKO	203.73	60.64	2.138	0.037*
		STACKED	169.93	61.83		
	Post	BUTEYKO	142.90	55.33	2.732	0.008*
		STACKED	179.40	47.91		
	Difference	BUTEYKO	60.83	36.69	5.412	0.001*
		STACKED	9.47	60.96		
Modified BORG Scale	Pre	BUTEYKO	2.10	0.71	2.359	0.022*
		STACKED	1.67	0.71		
	Post	BUTEYKO	1.23	0.54	3.186	0.002*
		STACKED	1.70	0.60		
	Difference	BUTEYKO	0.87	0.51	4.812	0.001*
		STACKED	0.03	0.89		



- On an average, pre and post PEFR and MBS has increased in patients with mild to moderate asthma using Buteyko breathing.
- The statistical analysis using Mann Whitney test proved that the between group effects for both Group A was statistically significant with p value of 0.001.
- P-value is zero, which is less than 5% level of significance. So we may reject H0. In other words, we can accept alternative hypotheses H1.
- Further from the post and difference mean values; it is observed that group BUTEYKO is better as compared to group STACKED after the medical intervention.

DISCUSSION

This study was conducted to find out the immediate effect of Buteyko breathing versus stacked breathing technique in mild to moderate asthma patients. World Health Organization has said asthma to be a major chronic health problem. [(1)] Asthma is a condition characterized by an increased responsiveness of bronchial smooth muscle to various stimuli and is manifested by widespread narrowing of the airways that

changes in severity either spontaneously or as a result of treatment (Hogg, 1984; Rees, 1984). [(2)] Current estimates suggest that asthma affects 300 million people world-wide and an additional 100 million persons will be diagnosed by 2025. [(3)] The airway obstruction in Asthma is recurrent and reversible. [(4)]

Accordingly, Cowie (2008) [12] stated that the Buteyko breathing intervention led to increase disease control among asthmatic patients' study group. These findings are disagreeing with Thomas and Bruton (2014) [13] who reported that no evidence that breathing training programs including BBT alone can improve patients' experience of their control on disease and reduce their use of rescue medication. Even though no study has stated exactly why Buteyko is so effective at controlling asthma, if a drug could show these results, then it is likely that it would be used widely in asthma control. [(1)] According to a study by Arora RD et al in the year 2019, the Buteyko breathing technique was proved to be beneficial in breathing control and improving resting heart rate depending on a 4 week protocol along with conventional physiotherapy in COPD patients

Stacked breathing exercise is a breathing technique which helps to improve and maintain the volume of breath you take and can be used regularly to clear mucus from airway (secretion clearance), It helps in rib cage mobility and felicity of respiratory muscles. It also improves cough strength and effectiveness. Studies have also showed that stacked breathing exercise can improve peak cough flow or peak expiratory flow rate in various neuromuscular conditions and also post cardiac surgery. [(9)]

The main objective of physical therapy for asthma is dyspnea control and these can be achieved by either Buteyko or stacked breathing technique because of the benefits they provide as mentioned above.

There have been no studies to prove the efficacy of stacked breathing exercise on PEFR in asthmatic patients. Hence, in the study we compared the immediate effect between Buteyko breathing and stacked breathing on peak expiratory flow rate using peak flow meter in asthmatic patients.

From the statistical analysis it is clear that Buteyko breathing technique is effective in asthmatics Thus we found that most of our patients represented an improvement in the PEFR and Dyspnea level at the end of the protocol by Buteyko Technique rather than Stacked breathing technique. According to various studies and certain theories suggest that the goal of Buteyko breathing technique is to gradually reset or readjust the breathing centre of higher aCo_2 values and reduced minute ventilation. Control pause increases aCo_2 concentration which penetrates the blood brain barrier. This penetration resets the respiratory centre located in medulla.

Another biochemical mechanism of Buteyko is through its influence on nitric oxide (NO). NO is involved in a large number of physiological responses including bronchodilation, Practitioner's insistence on nasal breathing as a large percentage of the body's NO levels are made in the paranasal sinuses. Thirdly Buteyko Method teaches to reduce volume of breathing by using a combination of increased abdominal muscle and relaxation of accessory muscles of breathing. This reduces the effort of breathing, leads to relaxation of respiratory muscles, and improves the function of the diaphragm, thus reducing the amount of hyperinflation or trapping of air in the lungs

The PEFR and MBS have advantage of being a standardized questionnaire, allowing comparison between studies and different interventions and hence it may be helpful for future research studies

CONCLUSION

This study highlights the effect of Buteyko breathing on PEFR and MBS among mild to moderate asthmatics in Miraj. P-value is zero, which is less than 5% level of significance. So we may reject H0. In other words, we can accept alternative hypotheses H1. The Buteyko breathing technique has significant effects on patients. From the mean difference values, it is visible

that Buteyko breathing on PEFR and MBS (60.83 and 0.8) is more effective than Stacked breathing on PEFR and MBS (9.47 and 0.3) and significance is also seen, thus stating that immediate effect of Buteyko breathing to be more effective and beneficial in mild to moderate asthmatics.

Limitations of Study:

- This study can be conducted on different age groups.
- Larger sample size can be taken.

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Conflict of Interest: None
Source of Funding: None
Ethical Approval: Approved

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