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EFFECTS OF BUTEYKO BREATHING TECHNIQUE AND CONVENTIONAL PHYSICAL THERAPY IN ADULT BRONCHIAL ASTHMA: A RANDOMIZED CONTROL TRAIL

ABSTRACT

OBJECTIVE

To assess the effectiveness of Buteyko Breathing Technique (BBT) and Conventional Physical Therapy (Conventional PT) for improving pulmonary functions and Health Related Quality of Life (HRQoL) in the management of chronic bronchial asthma.

STUDY DESIGN & SAMPLING TECHNIQUE

It is a Randomized Control Trial. Patients were selected through Simple Random Sampling.

STUDY SETTING & PARTICIPANTS

24 patients diagnosed as chronic bronchial asthma were recruited from the outpatient department, pulmonary clinics of tertiary care hospital.

INTERVENTION

Subjects were randomly assigned into two groups, BBT (n=12) and conventional PT (n=12). FEV1, FVC and FEV1/FVC ratio were measured at the start and end of the treatment through MIR Spirolab-III. HRQoL was also measured using St George Respiratory Questionnaire (SGRQ) at start and end of treatment session.

RESULTS

No statistically significant changes were observed in FVC, FEV1 and FEV1/FVC ratio in BBT as well as in Conventional PT whereas significant changes in HRQoL through SGRQ is revealed in BBT ($p < 0.05$).

CONCLUSION

BBT is found to be more effective in assessing HRQoL through SGRQ, whereas a larger sample size is required in patients with chronic bronchial asthma to evaluate the effectiveness of BBT as no significant difference was shown in the study.

KEYWORDS

Bronchial Asthma, Buteyko Breathing Technique, Conventional Physical Therapy, FEV1, FVC, St George Respirator Questionnaire

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INTRODUCTION

Asthma is a chronic respiratory disease that affects approximately 334 million people globally belonging to all age groups. Low and middle-income countries are considered to be most affected where the prevalence is increasing day by day [1.] Variation in intensity and frequency of symptoms over period of time including dyspnea, cough, wheezing and tightness of chest among individuals leads to difference in disease progression. When managed poorly, asthma compromises quality of life and increase the health care socioeconomic Burden [2,3].

Apprehension about the side effects and drug dependence due to prolong use of medication, steroids and inhalers have been witnessed in studies conducted on patients with asthma [4-6]. Many studies have advocated the use of alternative therapies in combination with medicines that control the asthma[4-10]. These include relaxation therapy breathing techniques, herbal medication, homeopathy and manual therapy. The breathing exercises are considered as one of the most popular method of these alternative therapies for individual suffering from asthma[11]. Globally recognized respiratory techniques include Pursed lip breathing, Buteyko reduced breathing, Frolov device, Resperate and Strelnikova respiratory gymnastic. All the above mentioned breathing exercises regime have been introduced to benefit asthma but BBT, which support individual to control their breathing rate that increases due to hypocapnia and hyperventilation [11,12].

Buteyko Breathing Technique (BBT) comprises of a set of breathing exercises developed basically for the treatment of Asthma by the Russian doctor, Konstanin Pavlovich Buteyko[13,14]. Multiple clinical
trials have been done internationally and proved its efficacy in reduction of symptoms of asthma, improvement in quality of life and in some cases reduction in frequency of acute exacerbations and
need for reliever medications has also been noticed[13,15,16]. According to the Buteyko Institute of Breathing and Health in Australia, the excessive breathing among the asthmatics has four primary effects including a decrease in carbon dioxide that causing spasm, a decrease in the release of oxygen that causing breathlessness, sensitivity in the mast cells that causing inflammation and formation of mucus due to inflamed airway. The BBT has increased its popularity in past few years with patients suffering with respiratory disorders, especially asthma, aiming to reverse chronic hyperventilation[13]. In a randomized controlled trial, based on the utilization of BBT video has also revealed that use of beta 2 - agonist is effectively reduced[13]. The purpose of BBT is to correct the breathing pattern by improving hyperventilation and maintaining CO2 levels. BBT mainly involves the series of breath holding periods with low paced breathing to improve the CO2 level further[14-16].

Pulmonary functions abnormalities were frequently observed in Asthmatics patients where reduced ventilatory functions were observed during exacerbations and post exacerbations as well. Reduction of Forced Expiratory Volume in 1 second (FEV1) and Forced Vital Capacity (FVC) are common findings[17]. Marked improvement in ventilatory function has been reported in group treated with respiratory training[18]. BBT focuses on normalizing breathing patterns, reducing breathing rate and accessory muscle work[9-10]. As per Global Initiative of Asthma (GINA) guidelines there is level B evidence in support of breathing exercises and can be recommended as management strategy for asthma[11]. Renata André Laurino et al, in 2012, reported improvement of respiratory symptoms and anxiety in groups being treated with the breathing techniques18.

In Pakistan, conventional therapies are more in trend for the management of asthma. Conventional PT may include Active Cycle of Breathing Technique (ACBT), pursed lip breathing, tissue blowing exercises, interdigital technique, relaxation therapies and manual techniques. The aim of all these exercises is to improve pattern of breathing and functional

residual capacity, relieve the symptoms of wheezing and clear sputum from the airways[19]. ACBT comprises of breathing control followed by thoracic expansion exercises and huffing (forced expiratory techniques), the integral phases of this technique. Inter digital technique is at times combined with ACBT to increase the rib cage expansion during active exhalation phase[20]. Pursed lip breathing is another effective method of controlling shortness of breath by asking patient to relax neck and shoulders followed by breathing in through the nose and count till 2 keeping mouth closed. Pursed or pucker lips can be performed by blowing a candle, breath out slowly through pursed lips and count till four[21]. Deep breathing and prolong exhalation exercise are taught by tissue or balloon[22] blowing in order to improve the breathing pattern and to train respiratory muscles. Combination of certain positioning and exercises, diaphragmatic breathing and breathing through nose have proved to relax patients suffering from mild to moderate asthma, by providing beneficial effects especially in reduction of symptoms arising from hypocapnia and anxiety. Percussion, vibration, chest tapping and shaking in different postural drainage positions are commonly used manual techniques by physical therapists in both outpatient clinics and admitted patients for the clearance of sputum from air way passage[23].

Approximately 7.5 million adults and 15 million children were suffering from asthma in 2011. Its increasing unfortunately around 5% annually and among them 20-30% are children and most of them are from urban areas[11]. The traditional treatment given to asthmatic patients also increases the economic burden on the suffering families[19]. The BBT has received substantial devotion but still there is a need of rigorous research evidence to support the use of different breathing techniques. BBT has been debated in a number of studies but still the use of this technique in Asian countries is limited and no significant research work has been found in Pakistan. This aim of the study is to determine the efficacy of BBT and conventional PT for improving pulmonary functions and Health related Quality of Life (HRQoL) in asthmatic patients.

METHODS

Target Population

Patients were recruited from out-patient pulmonary clinic of tertiary care hospital, diagnosed as Chronic Bronchial Asthma by Physician.

Study Setting

The study was conducted at Physical Therapy Department of tertiary care hospital.

Sample Size

A sample size of 24 individuals has been selected.

Study Duration

Data has been collected, compiled and analyzed in the period of eight months.

Selection of Sample

A two-arm randomized control trail was conducted on 24 adult asthmatic patients visiting at the pulmonary clinic that were equally randomized into 2 groups, Group A as BBT group (n=12) and Group B as Conventional PT group (n=12). This randomization was undertaken through the card placed in an envelope having treatment technique and picked for each patient.

Inclusion and Exclusion Criteria

Patients aged between 16-60 years, known case of Chronic Asthma, with no serious co-morbidities and willing to give their written informed consent were
included in the study.

Patients with an acute exacerbation of asthma, any other respiratory illness and history of taking breathing training were excluded from the study. Pregnant women and smokers were also excluded from the study.

Procedure

Patients were randomly allocated to two treatment groups, BBT (Group A) and Conventional PT (Group B). Participant information sheet were provided to the patients. Consent was taken

before the start of the treatment session. Patient assessment and treatment was undertaken by the assigned physical therapist. Standardized protocols of performing spirometry was ensured and explained to all participants. Participant information was recorded on assessment forms. Both the groups continued their regular asthmatics medications. It was ensured that conventional treatment group may not include any advice about their breathing exercises regarding BBT.

All patients have to perform 40-60 minutes exercises twice a day. All patients came to the physical therapy department for 5 consecutive days to learn and perform the treatment technique under supervision of the assigned physical therapist. Patients were instructed to perform 2nd session at home. After performing 5 days treatment at physical therapy department, they were instructed to performthat exercises twice at home for 3 months. After 15 days, they came for follow up and perform a session in front of Physical Therapist. Reinforcement was given to patients where required. The assessments were undertaken at baseline and end of treatment.

Buteyko Breathing Technique (Group A)

Each patient performed the standard protocols of BBT13, 24 as mentioned in Table 1.

Table 1: Buteyko Breathing Technique[13,14]
Step 1: Control Pause/Breath Holding Test/Reduced Breathing
• Be seated in an upright chair with good posture, keeping shoulder and lower back relaxed • Take small breath in two seconds and breathe out three seconds • Clasp your nose on the out breath • Count till you need to breathe in again • Release your breath and inhale. **Caution** • First intake of breath after control pause should not be greater than prior breath. Don't do it for longer period of time as this will cause prolong inhalation
Step 2: Shallow Breathing
• Be seated in an upright chair • Monitor amount of air flow by keeping finger under the nostrils in horizontal direction • Inhale sufficiently to fill your nostrils • Exhale gently on your finger. • During exhalation, the more warm air you feel, the bigger you are breathing. • Focuses on breathing relax, to decrease amount of warm air • Try to maintain the need for air for about 4 minutes.
Step 3: Putting all Together
• Perform breath hold test • Now reduced breathing for about 4 minutes • Wait for 2 minutes and perform breath hold test • Reduce breathing for 4 minutes • Wait for 2 minutes and perform breath hold • Reduce breathing for 4 minutes • Wait for 2 minutes and perform breath hold • Reduce breathing for 4 minutes • Wait for 2 minutes and perform breath hold

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Conventional Physical Therapy (Group B) Patients in the conventional PT group follow the routine protocols as instructed by their physical therapist, consisting of two cycles of ACBT, interdigital technique, pursed lip breathing and relaxation technique. Steps of Active cycle of breathing technique[25] are shown in table2.

Table 2: Active Cycle of Breathing Technique[25]
• Breathing control
• Deep breaths
• Breathing control
• 2-3 small – long huffs
• Breathing control
• Cough (If phlegm is present. If not, begin cycle again)

Data Collection Tools

• Demographic Details

Demographic details including age, height, weight, profession and co-morbid were recorded.

• St George's Respiratory Questionnaire (SGRQ)

One of the prime outcome measures is the standardized St George's Respiratory Questionnaire (SGRQ). This questionnaire is used to assess the impaired respiratory symptoms and quality of life. Three sub-scales are also defined in the questionnaire relating to the experience of symptoms, their impact and the level of impairment to find the total score. Score ranges from 0-100 with higher scores indicating more limitations. The questionnaire is divided into 2 parts where part 1 is the symptoms comprise of question 1-8 and part 2 consists of the activity and impact. Activity component comprise of question no 11-15 whereas impact comprises of question no 9, 10, 12-14 and 16-17. The scores of the symptoms revealed the perception of the patients towards their respiratory problem and scores of activity and impact were revealed the current health status. Total scores were calculated by summing all positive responses in the questionnaire. SGRQ reliability coefficient Cronbach's alpha was >0.7 for symptoms, activity and impact score. It was > 0.9 for overall total scores[26].

• Pulmonary Functions Measurement

Pulmonary functions were measured by Medical International Research (MIR) Spirolab III[27]. Spirometer facilitates the evaluation of lung functions, severity of respiratory disease and the response to therapy[13]. Forced Expiratory Volumes in 1 second (FEV1), forced vital capacity (FVC) and FEV1/FVC ratio were measured.

An automatic analysis of spirometry test for each patient was carried out to compare with the Normal or Predicted values, based on the anthropometric pometric details of the patients[27]. This was helpful in identifying the severity of disease. Pulmonary functions parameters including FEV1, FVC and FEV1/FVC ratio were measured and recorded in the assessment form.

Data Analysis Strategies

Data was analyzed in SPSS (Statistical Software for Social Sciences) version 20. Gender distribution was measured in term of frequency and percentages. Mean ± Standard Deviation (SD) were used for quantitative variables including height, weight, age, FVC, FEV1, FEV1/FVC ratio and SGRQ scores. To find out the mean differences of FVC, FEV1, FEV1/FVC ratio and scores of SGRQ of before and after treatments, paired T test was run after getting significant result for normality assumptions over data. Normality of data was assessed by using Kolmogorov-Smirnov and Shapiro-Wilk Tests. Wilcoxon signed-rank test was applied, in case of violation of normality assumption. P-value of less than 0.05 was considered statistically significant. Mann-Whitney Test was applied

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individually on all post variables of all the parameter to assess significant difference in the dependent variable by a single dichotomous independent variable.

Ethical Consideration

Ethical issues considered in this study are as followed:

1-Privacy and confidentiality statement were issued to all participants because confidentiality and privacy of identity was an important aspect of personal security.

2-Consent form was obtained from participants to ensure that the patient knows all of the risks and costs regarding the treatment.

3- Participants had the right to withdraw from study at any time.

4- Data collection and intervention in the hospital were done after taking permission from HOD of Physiotherapy.

RESULTS

In this study 24 adults with primary diagnosis of Chronic Asthma were recruited. 4 patients from both the groups were withdrawn at the start of study due to exacerbation of asthma. Demographic

data is presented in Table 3. Age, height and weight are presented in Mean with SD. Results revealed that average age, height and weight of patients were nearly similar between the two groups.

Table 3: Demographic Information

	BBT	Conventional PT
Age (years)	36.3 ± 16.1	36.0 ± 15.2
Height (cm)	165 ± 9.3	166.3 ± 13.9
Weight (kg)	62.4 ± 8.2	61.6 ± 7.9

Table 4 shows the result for checking the normality of data set and the results of tests of normality reveal that data was not symmetric, so Wilcoxson Signed-Rank test is also applied.

Table 4: Tests of Normality

		Kolmogorov-Smirnov (Sig.)	Shapiro-Wilk (Sig.)
Lung Functions			
FVC	Pre Treatment	0.20	0.51
	Post Treatment	0.20	0.76
FEV1	Pre Treatment	0.05	0.26
	Post Treatment	0.20	0.89
FEV1/FVC Ratio	Pre Treatment	0.20	0.30
	Post Treatment	0.20	0.60
SGRQ			
Symptom	Pre Treatment	0.20	0.58
	Post Treatment	0.20	0.35
Activity	Pre Treatment	0.10	0.26
	Post Treatment	0.01	0.07
Impact	Pre Treatment	0.20	0.38
	Post Treatment	0.20	0.34
Total Score	Pre Treatment	0.20	0.88
	Post Treatment	0.20	0.46

Result of Wilcoxson signed-rank test showed that treatment of 3 months did not elicit statistically significant changes in both groups, as shown in Table 5 and 6. Indeed, the median of all variables were found similar in both pre and post treatments of both groups.Slight improvement has been observed in patients of both treatment techniques. On the basis of the results of lung function as shown in table 5, it was observed that p-value of FVC in the BBT group was 0.85 and in Conventional PT group it was 0.73. It showed that Conventional PT is slightly better than BBT. Similarly p-value of FEV1 showed that results of BBT group (0.10) was better than Conventional PT group (0.49). Results of FEV1/FVC ratio was better to some extent in BBT group (p-value = 0.23) as compared to Conventional PT group (p-value = 0.67).

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Table 5: Lung Functions

	Pre Treatment Mean ± SD	Post Treatment Mean ± SD	P value
FVC (L)			
BBT	3.51± 1.05	3.52± 1.05	0.85
Conventional PT	3.45± 0.91	3.46± 0.92	0.73
FEV1 (L)			
BBT	2.8 ± 0.78	2.9 ± 0.81	0.10
Conventional PT	2.7 ± 0.68	2.7 ± 0.77	0.49
FEV1/FVC Ratio (%)			
BBT	79.7 ± 6.8	82.6 ± 5.4	0.23
Conventional PT	78.8 ± 2.2	79.6 ± 5.8	0.67

Table 6: ST GEORGE ESPIRATORY QUESSTIONARE (SGRQ)

	Pre Treatment Mean ± SD	Post Treatment Mean ± SD	P value
Symptom score			
BBT	57.1 ± 16.5	51.3 ± 17.2	0.007
Conventional PT	53.7 ± 17.7	46.4 ± 18.8	0.037
Activity Score			
BBT	44.1 ± 27.6	31.0 ± 26.9	0.009
Conventional PT	31.0±24.3	30.8±23.5	0.97
Impact Score			
BBT	45.9±26.3	24.5±16.7	0.002
Conventional PT	37.3±19.1	23.8±14.2	0.027
Total Score			
BBT	47.3±23.6	31.05±18.4	0.001
Conventional PT	38.2±18.9	29.8±15.9	0.06

Results of assessing health related quality of life through SGRQ are as shown in Table 6. Result of BBT group (p value = 0.001) was found significant with total scores of SGRQ as compared to Conventional PT (p value = 0.06). Improvement in Symptoms, Activity and Impact scores of patients have been observed with both the techniques. Indeed the median pain score rating in all variables are same in both pre and post treatments of both group. On the basis of the results it was observed that Symptoms score were significant in the BBT group (0.007) and in conventional PT group (0.037). It showed that BBT is better than Con PT. Results of activity Scores were found significant in BBT group (0.009), whereas it was found insignificant in Conventional PT group (0.97). Impact scores of both groups shows significant improvement that is p value is less than 0.05.

Mann-Whitney Test was applied on post treatment variables of all the parameter to find which group was showing better improvement, although above result shows insignificant improvement in some variables. Results of Mann-Whitney Test for lung functions and SGRQ are shown in table 7. Result shows that the BBT received the higher rank with most of the variables as compared to Conventional physical therapy techniques. However, data shows statistically insignificant improvement in parameters (p-value > 0.05). Rank of impact score was similar in

both groups, whereas, Conventional PT received the higher rank in total score of SGRQ as compared to BBT.

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Table 7: Mann-Whitney Test on Lung Function and SGRQ

Post Treatment Variables	Group	Mean Rank	P value
FVC	BBT	10.85	0.79
	Conventional PT	10.15	
FEV1	BBT	11.2	0.60
	Conventional PT	9.8	
FEV1/FVC Ratio	BBT	11.75	0.34
	Conventional PT	9.25	
Symptoms Score	BBT	11.4	0.50
	Conventional PT	9.60	
Activity Score	BBT	10.65	0.91
	Conventional PT	10.35	
Impact score	BBT	10.5	1
	Conventional PT	10.5	
Total score	BBT	10.3	0.88
	Conventional PT	10.7	

DISCUSSION

This study was conducted to analyze the effects of BBT in patients of chronic asthma as compared to convention PT. The results of our study shows slight improvement in terms of FVC, FEV1, FEV1/FVC ratio and scores of SGRQ among patients of both treatment techniques.

Results of FEV1 in our study were not significant (Table 5 and 6) for BBT as per the study conducted by McHugh[28] whereas out of 38 patients 4 patients were withdrawn from the study in 6 months of duration. The sample size was found to be higher with twice the duration. Cooper et al[29] found no difference in FEV1 when compared between the groups. In the study sample of ninety patients were taken and divided into three groups BBT, Pink City Lung Exercise (PCLE) and PCLE placebo group. Out of 90 samples, 69 patients completed the study. Researcher found no significant difference in-between these groups but BBT group showed reduction in the symptoms. The study was conducted for the period of 6 months and found no significant difference in lung functions that is similar to our study.

Gudjonsdottir and Monique van Oosten reported no change in FEV1 and FVC in both groups on 18 asthmatic patients30. The sample size was small as per our study and we found slight changes in lung
functions that are not significant statistically. McGowan J conducted a study on a larger sample size with 384 patients and divided then into three groups, Buteyko, Placebo and Control. Researcher found significant improvement in symptoms, medication
and quality of life31. Moreover, the study
showed 98% reduction in reliever medication, 92% reduction in preventer medications and 98% reduction in asthma symptoms. Slight improvement was found in lung functions as appeared in this study. Elnanaggar RK and Shendy MA conducted another study on children of age group 8-14 years. It comprised of three treatment techniques, BBT, ACBT and Thoracic Lymphatic Pump Technique (TLPT). They found significant results with post treatment differences in FVC, FEV1 and FEV1/FVC ratio in BBT group as compared to ACBT. When comparing BBT with TLPT no significant post treatment difference was found in FVC and FEV1/FVC ratio but significant difference was found in FEV1 of BBT group[32].

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Alfe GM and Grover SK[33] in 2014 reported significant improvement in FEV1, FEV1/FVC and PEFR in group treated with BBT in comparison with diaphragmatic breathing. Statistical analysis of our study shows insignificant result for FVC, FEV1 and FEV1 /FVC ratio in patients of both treatments techniques. The result of the study conducted by Prasanna KB et al 2016, reported that significant difference was found in asthma control questionnaire among BBT group. This study was conducted for 2 months and effectively reduced the symptoms of patients and also improved the lung compliance in patients irrespective of age and sex distribution among acute asthmatic population in Tagore Medical College and Hospital[34]. The study also provided significant evidences in support of results of our study regarding SGRQ as they also assessed quality of life through Asthma control questionnaire.

Studies conducted by Hassan et al[13], Prem et al[15] and Bruton A & Thomas M35 found improvement in symptoms of asthma or reduction of medications by using BBT. We also found slight improvement in asthma symptoms of our patients with BBT and Conventional PT group. Weiner et al also found that sixteen weeks of conventional physical therapy intervention is found to be effective not only in plummeting the asthmatic attack intensity but also in intake of asthmatic medication by 50%36. Similar result has also been obtained by Weiner et al (2002)
in another study in which 4-6 months of training with conventional physical therapy approach improved FEV1, FVC and Borg Dyspnoea Score with reduction
in the use of bronchodilators[37]. Cowie RL in a conclusion of a randomized controlled trial established that Buteyko technique is widely recognized intervention strategy for the management of asthma in adult patients and stated that Buteyko techniques can be used as an adjunct to conventional management of asthma[38].

According to the result obtained from this research where 3 months sessions provide a significant result in improving SGRQ in BBT group. However BBT are markedly more beneficial in terms of St George respiratory questionnaire in comparison to conventional PT. In previous researches breathing techniques
are found to be effective in the management of asthma. Since Buteyko is cheap, safe and effective method to control asthma symptoms so awareness programs and special trainings should be started among the physical therapy students and clinical therapist to ensure that all such techniques are only be included as a part of interventional strategies once it fulfills the criterion of ethical decision making as forwarded in Belmont report[39].

CONCLUSION

BBT is found to be clinically as well as statistically effective in assessing HRQoL in patients with chronic bronchial asthma. More researchers are required in future to evaluate the effectiveness of BBT on larger scale in order to be generalized to the asthmatic population. The young researchers as well as clinicians should be appreciated to teach Buyteko in their routine practice as being cost effective.

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