

Comparison between The Effect of Buteyko and Pranayama Breathing Techniques on Children with Asthma

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Abstract:

Asthma is a serious global health problem and there is still lack of awareness regarding Buteyko Breathing Technique (BBT) and Pranayama Breathing Technique (PBT) to achieve more control over it. **Aim:** To compare between the effect of Buteyko and Pranayama Breathing Techniques on children with asthma. **Setting:** This study was conducted in chest ward and outpatient clinic at Assiut university children hospital. **Method:** Quasi-experimental design was utilized in this study on simple random sample of (90 children) through pre and post program implementation. **Tools:** Three tools were utilized; the first tool, patient assessment questionnaire, the second tool used to assess bronchial asthma symptoms' severity and the third tool used to assess level of asthma control. **Result:** Showed that all asthma severity and asthma control items were a highly significant improved after applied BBT & PBT at p-value <0.001 but BBT was slightly better. **Conclusion:** This study support the effectiveness of BBT & PBT over the standard treatment in asthmatic children. There was a statistically significant improvement of daily Asthma Control, Asthma severity symptoms, over pre applied it. **Recommendations:** The researchers recommend that BBT & PBT be added as a possible medical and nursing intervention in managing asthmatic children.

Keywords: Asthma, Breathing techniques, Buteyko & Pranayama,

Introduction

Asthma is defined as an inflammatory disease of the airways manifested by coughing, wheezing, shortness of breath and chest tightness. It is a serious global health problem with wide differences in prevalence and severity in countries throughout the world. In fact, approximately 235 million people suffer from asthma and it is the most common chronic disease among children (Karpagam et al., 2017).

Asthma is considered as a chronic illness which affects not only the physiological status of the children but also his over-all functional capacity and productivity. Symptoms can include shortness of breath, cough, wheezing, and chest pain or tightness. When poorly controlled, asthma is associated with increased health care utilization, decreased quality of life, and significant activity limitation (Hassan, 2012).

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 (Prasanna & Dhileeban, 2015). Asthma can be differentiated from chronic obstructive pulmonary disease and other respiratory infectious disease with the help of Spirometry and peak expiratory flow meter. Severe and uncontrolled asthma can be life threatening and its incidence has increased significantly since late 1970s. Many drugs

are used in the management of asthmatic patients. However, they are not found to improve the quality of life adequately. In addition, they also have serious adverse effect which limits their long term use (Ram et al., 2013).

The possible effects of asthma to school-age children are often attributed to restrictions in activity. Considering the fact that these children are in the phase of Industry vs. Inferiority according to Erik Erikson's Psychosocial Theory, this chronic illness in its acute exacerbation can hinder a child's development as it limits his opportunity to perform his role not only in school and at home but also in the community. Thus, failure to feel a sense of accomplishment can result to the development of inferiority (Sakharoff, 2019).

Breathing techniques have been reported as the most frequently used methods among non-pharmacological approaches to asthma. With asthma, excess breathing has four primary effects, according to the Buteyko Institute of Breathing and Health in Australia which include the following: First, carbon dioxide levels decrease, since higher levels of carbon dioxide signal smooth muscle to relax and dilate, low levels can cause the smooth muscle around the bronchioles to spasm, resulting in chest tightness and difficulty in exhaling.

Second, oxygen is released from the blood more slowly, causing breathlessness. Third, mast cells, immune-system components found in connective tissue, become overly sensitive to perceived allergens and release large amounts of histamine, which causes inflammation and finally, airways dry out and become inflamed, encouraging mucus formation (Page et al., 2017).

One such breathing technique gaining popularity is the Buteyko Breathing Technique (BBT) and Pranayama Breathing (PBT). The BBT was originally discovered by Russian clinical physician; Dr. Konstantin Pavlovich Buteyko in the 1962. He demonstrated that the main cause of bronchospasm in bronchial asthma is Co₂ deficiency in alveolar air, resulting from hyperventilation and low metabolic activity. This technique aims to reduce hyperventilation by teaching people how to hold their breath and incorporate “shallow breathing” exercises with relaxation. It always proposes the use of the diaphragm for breathing and discourage from using accessory muscles for breathing (Thomas & Bruton, 2014).

The major component of the Buteyko ‘package’ is to reduce hyperventilation through periods of controlled reduction in breathing, known as ‘slow breathing’ and ‘reduced breathing’, combined with periods of breath holding, known as ‘control pauses’ and ‘extended pauses. In Buteyko, they are sometimes accompanied by physical activities to increase the build-up of Co₂ (Shine, 2016). BBT also includes advice and training on the benefits of nasal breathing over oral breathing. Yoga is an ancient Hindu discipline in which Pranayama deals explicitly with control of breathing. Earlier studies have indicated that a pranayama type of breathing results in reduction of symptoms, less beta-adrenergic use and reduced airway hyperactivity. Nevertheless, studies evaluating the effect on quality of life in children with asthma are limited. A previous study comparing Buteyko and Pranayama on asthma severity and concluded no benefit for Pranayama, but it was practiced with a Pink City Lung Exerciser with no preparatory breathing exercises and nostril breathing, which have been demonstrated to be useful (Nguyen, et al., 2014)

The nasal passages are physiologically healthier at filtering and humidifying inhaled air. Moreover, nitric oxide (NO) is secreted as a result of Buteyko Breathing Technique application causing bronchodilation whereas solely reckoning on nasal respiration. In addition to Buteyko Technique and Pranayama Technique can reduce the dependence and consumption of short acting β ₂-agonists, as a bronchodilator, eventually resulting in overall improvement within the quality of life. (Asher & Ellwood, 2014).

Significant of the Study

Asthma could be a serious public health challenge, affecting millions worldwide, putting an increasing burden on governments, healthcare infrastructure, families, patients and caregivers. Statistics from the 2013 Global Burden of Disease (GBD) study estimates that worldwide about 269,000 children died from bronchial asthma in 2018. Pharmacologic management of bronchial asthma is incredibly helpful within the event of an asthma attack. The disadvantage of using long-term pharmacological therapy is that it has side effects especially if it does not control treatment (Renolleau et al., 2014). Also a Cochrane review of breathing exercises for asthma concluded that there were trends to improvement in outcomes, but the current evidence is inadequate and variety of clinical trials indicate that BBT and PBT could be a successful treatment for bronchial asthma.

Aim of study

This study aimed to compare between the effect of Buteyko and Pranayama Breathing Techniques on children with asthma.

Research hypothesis

- Children who practicing BBT are significant effect on reducing the severity of asthma symptoms and improve their ability to control asthma.
- There are a difference in reducing the severity of asthma symptoms among children who practicing Buteyko and Pranayama Breathing Techniques.

Operational definitions

Buteyko Breathing Techniques: Is one of breathing exercise that can use for children with asthma to reduce hyperventilation as well as improvement in symptoms and quality of life. The four cardinal rules of Buteyko Breathing Techniques methods are as follows: (1) Keeping the mouth closed, (2) Keeping the back straight, (3) Breathing softly and quietly and (4) Eating only when hungry.

Pranayama Breathing Techniques: It is yoga breathing technique that regulate inhalation and exhalation, it accomplished by eliminating the pause between inhalation and exhalation or expending it by retention.

Subjects and Method

Research design

A quasi-experimental design was used to conduct this study.

Setting

The study was conducted in chest ward and outpatient clinic at Assiut University Children Hospital.

Subjects:

simple random sample was used in this study. The Current study was conducted on 90 asthmatic school children. That was divided into three equal groups (each on contained 30 asthmatic children). Group I:

Buteyko Breathing Techniques group, Group II: Pranayama Breathing Techniques group. Group III: Control group receiving routine hospital care. Complete randomization was done by using closed envelope method which done as the following technique, the researcher using 90 pieces of paper, Buteyko Breathing was written in 30 pieces, Pranayama Breathing group was written in 30 pieces and finally control group was written in last 30 pieces where pieces were placed in a box and then one piece of paper is randomly chosen by every child in the study, eventually, 30 children practice BBT, 30 children practice PBT and other 30 children received routine hospital care.

Sample size:-

The sample was calculated according to the following equation:

$$n = \frac{[DEFF * NP(1-p)]}{[d^2/Z^2(1-\alpha/2) - \alpha/2 * (N-1) + p*(1-p)]}$$

$$n = \frac{[DEFF * Np(1-p)]}{[(d^2/Z^2_{1-\alpha/2} * (N-1) + p*(1-p)]}$$

DEFF (Design effect) = 1

N (population) = 250

p (Hypothesized %) = 10% +/-5

d (tolerated margin of error) = 0.05

Z (level of confidence) = 1.96

α (Alpha) = 0.05

$$n = \frac{[1 * 250 * 10\% +/- 5 (1 - 10\% +/- 5)]}{[(0.05)^2 / (1.96)^2 - 0.05 * (250 - 1) + 10\% +/- 5 (1 - 10\% +/- 5)]}$$

n= 90 asthmatic children

Inclusion criteria included:-

- School children (6-12y) of both sexes; who have suffering from bronchial asthma and admitted into chest ward or outpatient clinic at Assiut University Children Hospital.
- Patients who were on regular treatment (Medication, Inhalers) for bronchial asthma.

The exclusion criteria:

- Patients with mental illness.
- Patients with acute health problems as cardio-pulmonary problem or any co-morbid conditions.
- Seriously ill patients who cannot participate in the Buteyko breathing technique.

Tools of data collection:

Three tools were used for data collection: patients' assessment sheet, assessment of bronchial asthma symptoms severity and assessment of asthma control.

Tool I: Patient assessment questionnaire: It was developed by the researchers in simple Arabic language based on the review of relevant and recent literature. It included two parts:

Part 1: Demographic characteristics of the studied children as gender, age, level of education.

Part 2: Clinical data involved 7 items as exposure to risk factors, regular controller medications used, quick-relief medications used, and number of rescue

medications used in the past four weeks and duration of asthma.

Tool II: Severity of bronchial asthma symptoms assessment questionnaire: It was adopted from (National Asthma Education and Prevention Program, 2007). It included the following items: daytime symptoms, nocturnal symptoms, short acting beta-agonist used, and interference with normal activities. Assessment of the severity of bronchial asthma rated as intermittent, mild persistent, moderate persistent, and severe persistent.

Tool III: Asthma control questionnaire: It was used to assess level of asthma control; which adopted from (GINA, 2012). It included five items; day and night symptoms, reliever use and activity limitation. asking children about daytime and nighttime symptoms of asthma, activity limitation, and reliever needed for symptoms more than twice/week. This category divided children into the levels of asthma control to; uncontrolled, partly controlled, and well controlled asthma this depending on the appearance of the previous four mentioned symptoms as: (No symptoms means asthma well controlled, 1 - 2 symptoms = asthma partly controlled and 3 - 4 symptoms = asthma uncontrolled).

Validity and Reliability

For validity purposes, the researchers conducted an extensive literature review and developed the questionnaires from the previously used tools and reviewing the pertinent reviews. Tools I, was designed by the researchers and revised by five experts in the field of in both pediatrics and pediatric nursing. its content validity index results was 96%. Reliability of study tools II & III was measured using α cronback test that indicate high reability tool and its result was R= 0.731.

Pilot Study

A pilot study was conducted to assess the applicability of the Tools, the feasibility of the study and to estimate the time needed for data collection. It was conducted on 10 % (9) of the total participants according to the selection criteria. All patients participated in the pilot study were excluded from the study sample. Based on the results of the pilot study and expert's opinion, modifications and omissions of some details were done and then set the final fieldwork schedule.

Field of the work

This study was carried out through three consecutive phases: interviewing & assessment phase, implementation phase and evaluation phase. The data collection period was done for seven months from the beginning of July (2021) to the end of January(2022). The researchers was available two days weekly. The meeting of the children was in the ward then during follow up at the chest clinic, as the researchers joined

with parents' children after discharge at the clinic through predetermined phone appointments to assure the continuity of BBT & PBT application and answer any questions related to the program.

The Interviewing and Assessment Phase

During this phase, the researchers explained the aim of the study, Tools components, and steps of BBT & PBT. The time needed for completing the questionnaire was ranged from 15 - 20 minutes for each child.

The Implementation Phase

The first interview was carried out by the researchers for each participant for collecting baseline data concerning their demographic, clinical data, asthma severity level and asthma control level. The interview carried out at their departments in the hospital then followed in outpatient clinics. It took about 15 - 20 minutes using tool (I, II & III).

Buteyko group

Researchers developed a training program for children that includes handout booklet in simple Arabic language and videos that were used as media children' education on BBT. Children were taught the Buteyko Technique for 3–5 days with a session of 60 minutes each day and instructed that the technique best performed either before eating or at least two hours after eating.. They was follow up for three months and was instructed to practice the exercise for 15 minutes twice daily. The aim of the Buteyko method was to correct the children's breathing pattern by reducing hyperventilation and thereby resetting CO₂ levels.

The Buteyko breathing technique

Step 1:- The "Control pause (CP)" breathing test (The control pause time is simply the length of time can the children hold your breath).

- Ask the child to sit in an upright chair and adopt a good posture. Relax the shoulders and rest lower back against the back of the chair.
- Ask the child not to change breathing before taking his CP. Take a small breath in (2 s) and a small breath out (3 s). Hold his nose on the "out" breath, with empty lungs but not too empty. Holding his nose is necessary to prevent air entering into the airways.
- Count how many seconds that he can comfortably last before the need to breathe in again. Hold his breath until feeling the first need to breathe in. Release the nose and breathe in through it.
- Inform the child that his first intake of breath after the CP should be no greater than his breath prior to taking measurement; the children should not hold his breath for too long as this may cause him to take a big breath after measuring the CP

Step 2: Shallow breathing Sit up straight:

- Monitor the amount of air flowing through nostrils by placing finger under children 's nose in a horizontal position. finger should lie just above top lip, close enough to nostrils so that the children can feel the airflow, but not so close that the air-flow is blocked. Now, breathe air slightly into the tip of the nostrils.
- Breathe in a flicker of air (may be 1 cm) with each breath. As the child exhale, pretend that finger is a feather. Breathe out gently onto the child finger so that the feather does not move. When child breathes out, the more warm air he feel, the bigger he is breathing.
- Concentrate on calming his breath to reduce the amount of warm air he feel on his finger. As the child reduces the amount of warm air onto his finger, he will begin to feel a need or want for air. Try to maintain the need for air for about 4 min.

Step 3: Putting it together Take Control pause:

- Reduced breathing for 4 min. Wait 2 min and take Control pause. Reduced breathing for 4 min. Wait 2 min and take control pause.
- Then the child received the designed BBT, and they were on their medical treatment.

Pranayama group

Children was trained to perform diaphragmatic breathing, thoracic breathing, upper lobe breathing and full yogic breathing progressing to right nostril breathing, left nostril breathing and alternate nostril breathing for 3–5 days with a session of 60 minutes each day. They were followed up for three months and were instructed to practice the exercise for 15 minutes twice daily.

After that children in both groups was contacted every two weeks by telephone regarding performance of the exercise. They were taking medications in accordance with the physician's instructions. Diary cards to record daily performance of exercise were given. Compliance to exercise was assessed at the end of the study period. children who recorded non-compliance with the exercise for more than 15% of the study period were excluded from the analysis

Control group

The children of this group did not participate in Buteyko and Pranayama programs during the time of the study, and they received their medical treatment only.

The Evaluation Phase

After 3 months of the session, the researcher interviewed again with the child involved in the session to perform a post test that had the same pretest questions.

Ethical Considerations:

Written informed consent was taken from parents of each child participating in the study and they are secured that data will be confidential and used only for the research purpose. The parents had the right to withdraw their children from the study at any time without any effect on the care provided for their children

Statistical analysis:

Data entry and data analysis were done using statistical package for the social science (SPSS) version 26. Data were presented as number, percentage means and standard deviation. One way anova, Tukey and Chi-square test were used to show relation between variables. P-value considered statistically significant when $p < 0.05$

Results**Table (1): Personal data of the studied children (n=90)**

Personal characteristics	Buteyko group		Pranayama group		Control group		p-value
	N (30)	%	N (30)	%	N (30)	%	
Age (years)							
6-8 years	12	40	15	50	13	43.3	0.464
8-10 years	10	33.3	11	36.7	11	36.7	
10-12 years	8	26.7	4	13.3	6	20.0	
Mean age	8.6±1.57		8.2±1.24		8.17±1.66		
Gender							
Male	15	50.0	15	50.0	16	53.3	0.864
Female	15	50.0	15	50.0	14	46.7	
Residence							
Rural	20	66.7	20	66.7	18	60.0	0.829
Urban	10	33.3	10	33.3	12	40.0	
Level of education							
Illiterate	2	6.7	2	6.7	2	6.7	0.206
Primary	28	93.3	28	93.3	28	93.1	

Table (2): Distribution of the studied children regarding their clinical data

Clinical data		Buteyko group		Pranayama group		Control group		p-value
		N (30)	%	N (30)	%	N (30)	%	
Exposure to risk factors	• Yes	24	80.0	22	73.3	20	66.7	0.190
	• No	6	20.0	8	26.7	10	33.3	
If yes, what factor?								
Smoking	• Yes	8	26.7	6	20.0	6	20.0	0.390
	• No	22	73.3	24	80.0	24	80.0	
Dust	• Yes	1	3.3	2	6.7	2	6.7	0.359
	• No	29	96.7	28	93.3	28	93.3	
Pollen	• Yes	6	20.0	3	10	6	20.0	0.265
	• No	24	80.0	27	90.0	24	80.0	
Respiratory illness	• Yes	14	46.7	10	33.3	10	33.3	0.478
	• No	16	53.3	20	66.7	20	66.7	
Chemicals	• Yes	1	3.3	1	3.3	3	10	0.057
	• No	29	96.7	29	96.7	27	90.0	
Cold air	• Yes	4	13.3	7	23.3	5	16.7	0.170
	• No	26	86.7	23	76.7	25	83.3	
Stress	• Yes	6	20.0	4	13.3	4	13.3	0.083
	• No	24	80.0	26	86.7	26	86.7	
Regular controller medications used:								
Corticosteroid	• Yes	18	60.0	18	60.0	14	46.7	0.496
	• No	12	40.0	12	40.0	16	53.3	
Mast cell stabilizer	• Yes	2	6.7	2	6.7	4	13.3	0.167
	• No	28	93.3	28	93.3	26	86.7	
Long acting Beta agonist (LABA)	• Yes	24	80.0	20	66.7	20	66.7	0.430
	• No	6	20.0	10	33.3	10	33.3	
Leukotriene modifier	• Yes	20	66.7	22	73.3	24	80.0	0.068
	• No	10	33.3	8	26.7	6	20.0	

Clinical data		Buteyko group		Pranayama group		Control group		p-value
		N (30)	%	N (30)	%	N (30)	%	
Quick-relief medications used:								
Short acting inhaled B agonists	• Yes	26	86.7	24	80.0	26	86.7	0.319
	• No	4	13.3	6	20.0	4	13.3	
Inhaled anticholinergic	• Yes	10	33.3	8	26.7	8	26.7	0.811
	• No	20	66.7	22	73.3	22	73.3	
Number of rescue medications used in the past four weeks:-	• 1 time	8	26.7	10	33.3	6	20.0	0.580
	• 2 time	14	46.6	13	43.4	18	60.0	
	• 4 time	8	26.7	7	23.3	6	20.0	
Duration of asthma	• <1 year	4	13.3	8	26.7	8	26.7	0.562
	• 1-3 yrs	16	53.4	12	40.0	14	46.6	
	• <3yrs	10	33.3	10	33.3	8	26.7	

Table (3): Distribution of the studied children regarding their severity of bronchial asthma symptoms before and after the intervention

Items	Before intervention						After intervention					
	Buteyko group (30)	Pranayama group (30)	Control group (30)	p-value1	p-value2	p-value3	Buteyko group (30)	Pranayama group (30)	Control group (30)	p-value1	p-value2	p-value3
	N (%)	N (%)	N (%)				N (%)	N (%)	N (%)			
Day time symptoms												
• <2 per week	0(0.0)	0(0.0)	0(0.0)	0.728	0.817	0.825	12(40.0)	8(26.7)	1(3.3)	0.001**	0.045*	0.225
• >2 per week but > 1 time / day	7(23.3)	8(26.7)	6(20.0)				12(40.0)	10(33.3)	11(36.7)			
• Daily symptoms	15(50.0)	16(53.3)	18(60.0)				6(20.0)	12(40.0)	16(53.3)			
• Continuous symptoms	8(26.7)	6(20.0)	6(20.0)				0(0.0)	0(0.0)	2(6.7)			
Nighttime with symptoms												
• <2 times/month	0(0.0)	0(0.0)	0(0.0)	0.604	0.795	0.825	12(40.0)	8(26.7)	0(0.0)	0.001**	0.003**	0.225
• >2 times/month	8(26.7)	7(23.3)	5(16.6)				12(40.0)	10(33.3)	14(46.7)			
• >1 times/week	16(53.3)	15(50.0)	17(56.7)				6(20.0)	12(40.0)	11(36.7)			
• Frequent	6(20.0)	8(26.7)	8(26.7)				0(0.0)	0(0.0)	5(16.6)			
Short acting beta-agonist used												
• <2 day/ week	0(0.0)	0(0.0)	0(0.0)	0.549	0.817	0.262	10(33.3)	8(26.7)	0(0.0)	0.001**	0.009**	0.236
• >2 day/ week	4(13.3)	8(26.7)	6(20.0)				14(46.7)	10(33.3)	11(36.7)			
• Daily	22(73.4)	16(53.3)	18(60.0)				6(20.0)	12(40.0)	16(53.3)			
• Several times per day	4(13.3)	6(20.0)	6(20.0)				0(0.0)	0(0.0)	3(10.0)			
Interference with normal activities												
• None	0(0.0)	0(0.0)	0(0.0)	0.292	0.766	0.486	8(26.7)	6(20.0)	0(0.0)	0.001**	0.015**	0.420
• Minor limitation	6(20.0)	10(33.3)	10(33.3)				18(60.0)	16(53.3)	15(50.0)			
• Some limitation	20(66.7)	16(53.3)	14(46.7)				4(13.3)	8(26.7)	11(36.7)			
• Extremely	4(13.3)	4(13.3)	6(20.0)				0(0.0)	0(0.0)	4(13.3)			

(**) highly statistical significant difference

P-value1 (between buteyko group and control group)

P-value2 (between pranayama group and control group)

P-value3 (between buteyko group and pranayama group)

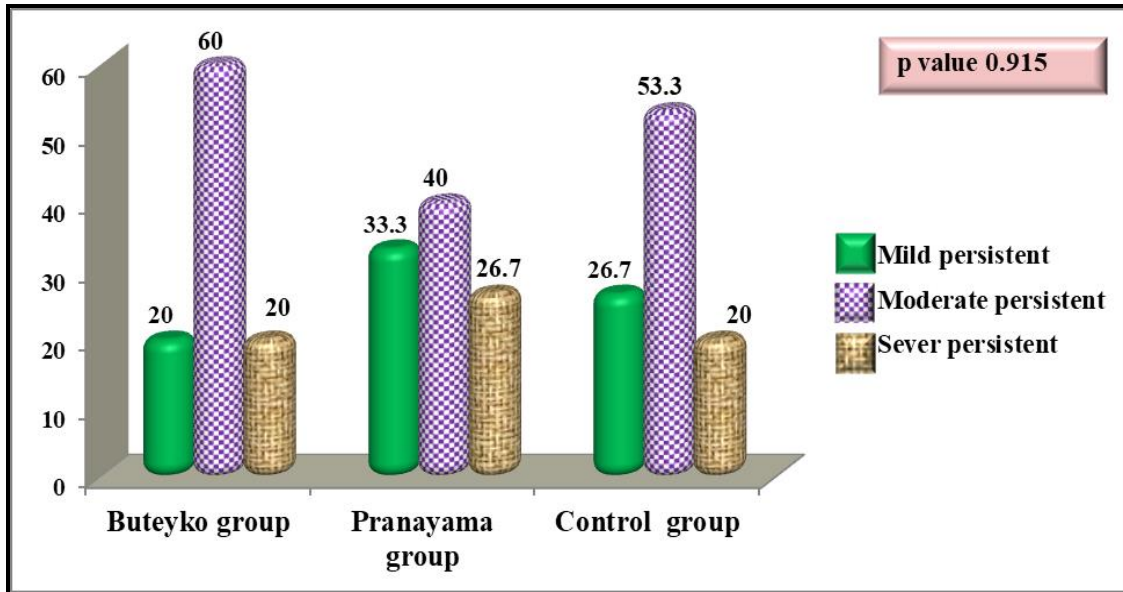
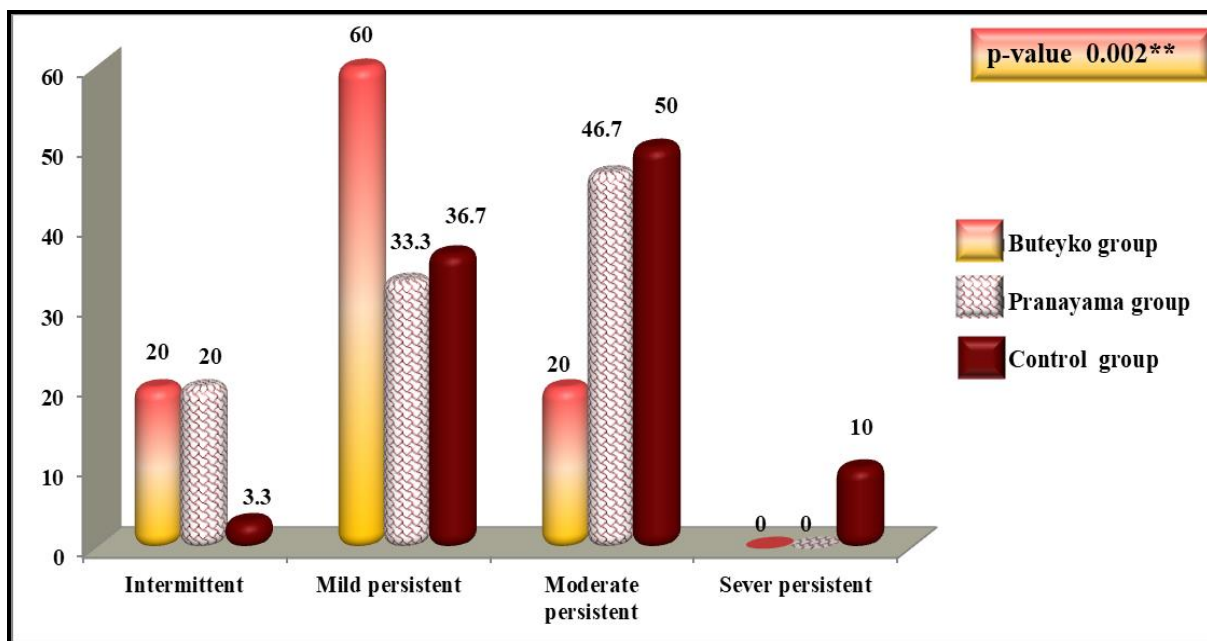


Figure (1): Comparison the degree of severity of bronchial asthma symptoms among the study (Buteyko & Pranayama) and the control groups before the intervention



(**) highly statistical significant difference

Figure (2): Comparison the degree of severity of bronchial asthma symptoms among the study (Buteyko & Pranayama) and the control groups after the intervention

Table (4): Distribution of studied children regarding their severity of bronchial asthma symptoms before and after the intervention in the same group

Items	Buteyko group before intervention		Buteyko group after intervention		P-value1	Pranayama group before intervention		Pranayama group after intervention		P-value2	Control group before routine care		Control group after routine care		P-value3
	N (30)	%	N (30)	%		N (30)	%	N (30)	%		N (30)	%	N (30)	%	
Day time symptoms															
<2 / week	0	0.0	12	40.0	0.001**	0	0.0	8	26.7	0.001**	0	0.0	1	3.3	0.119
>2 / week but < 1 time / day	7	23.3	12	40.0		8	26.7	10	33.3		6	20.0	7	23.3	
Daily symptoms	15	50.0	6	20.0		16	53.3	12	40.0		18	60.0	17	56.7	
Continuous symptoms	8	26.7	0	0.0		6	20.0	0	0.0		6	20.0	5	16.7	
Nighttime with symptoms															
<2 times/month	0	0.0	12	40.0	0.001**	0	0.0	8	26.7	0.004**	0	0.0	0	0.0	0.063
>2 times/month	8	26.7	12	40.0		7	23.3	10	33.3		5	16.6	6	20.0	
>1 times/week	16	53.3	6	20.0		15	50.0	12	40.0		17	56.7	16	53.3	
Frequent	6	20.0	0	0.0		8	26.7	0	0.0		8	26.7	8	16.7	
Short acting beta-agonist used															
<2 day/ week	0	0.0	10	33.3	0.001**	0	0.0	8	26.7	0.001**	0	0.0	0	0.0	0.760
>2 day/ week	4	13.3	14	46.7		8	26.7	10	33.3		6	20.0	7	23.3	
Daily	22	73.3	6	20.0		16	53.3	12	40.0		18	60.0	18	60.0	
Several times per day	4	13.3	0	0.0		6	20.0	0	0.0		6	20.0	5	16.7	
Interference with normal activities															
None	0	0.0	8	26.7	0.001**	0	0.0	6	20.0	0.109	0	0.0	0	0.0	0.429
Minor limitation	6	20.0	18	60.0		10	33.3	16	53.3		10	33.3	12	40.0	
Some limitation	20	66.7	4	13.3		16	53.6	8	26.7		14	46.7	13	43.4	
Extremely	4	13.3	0	0.0		4	13.3	0	0.0		6	20.0	5	16.6	

(**) *highly statistical significant difference*

(P-value1 (between buteyko group before and after intervention)

P-value2 (between pranayama group before and after intervention)

P-value3 (between control group before and after routine care)

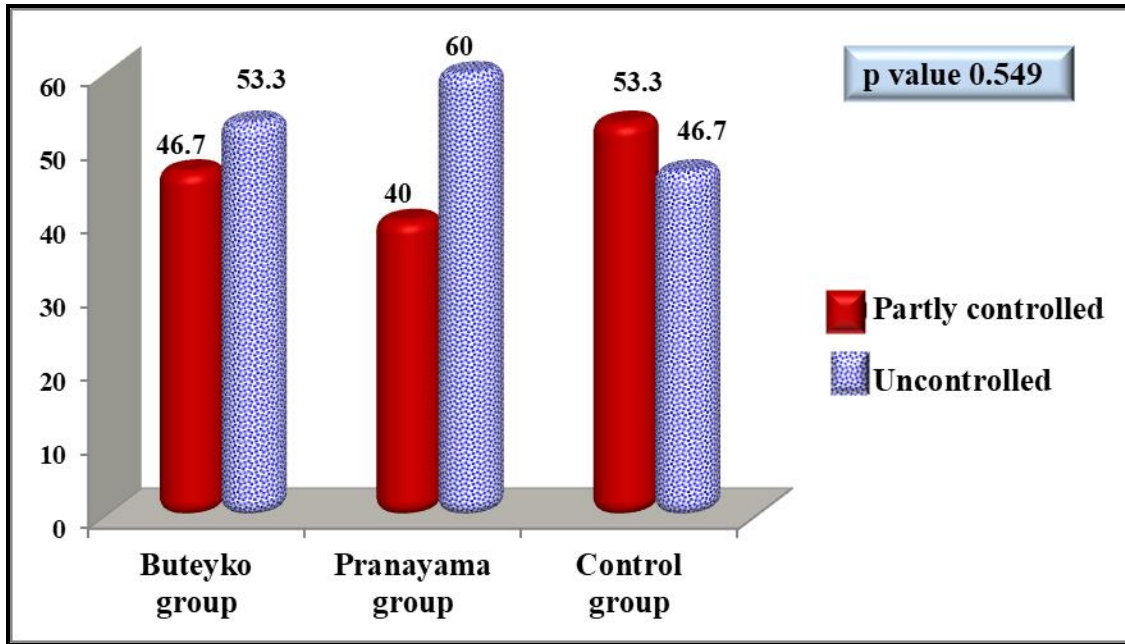
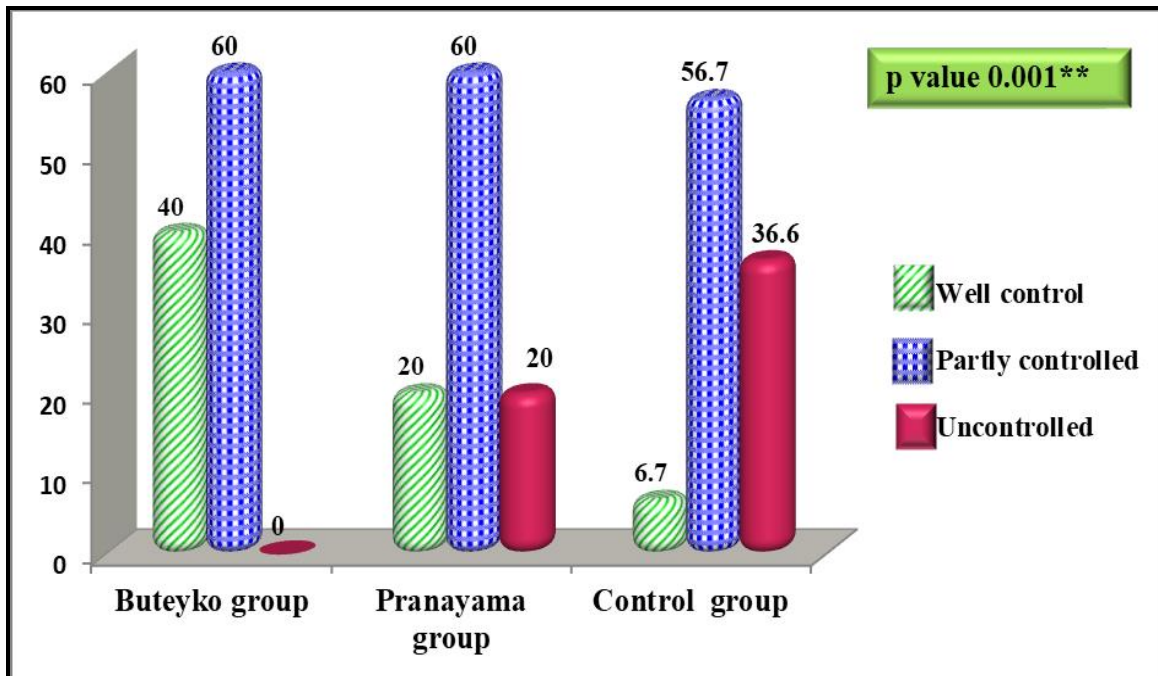


Figure (3): Distribution of total asthma control level among the studied children before intervention



(**) highly statistical significant difference

Figure (4): Distribution of total asthma control level among the studied children after intervention

Table (5): Comparison the level of asthma control among the study (buteyko & pranayama) and the control groups before and after the intervention in the same group

level of asthma control	Buteyko group before intervention		Buteyko group after intervention		P-value1	Pranayama group before intervention		Pranayama group after intervention		P-value2	Control group before routine care		Control group after routine care		P-value3
	N (30)	%	N (30)	%		N (30)	%	N (30)	%		N (30)	%	N (30)	%	
Well control	0	0.0	12	40.0	0.001 _{***}	0	0.0	6	20.0	0.001 _{***}	0	0.0	2	6.7	0.059
partlycontrolled	14	46.7	18	60.0		12	40.0	18	60.0		16	53.3	17	56.7	
uncontrolled	16	53.3	0	0.0		18	60.0	6	20.0		14	46.7	11	36.6	

(**) highly statistical significant difference

Table (6): The relation between severity of bronchial asthma symptoms and personal characteristics of the studied sample before the intervention

Personal characteristics	Mild persistent		Moderate persistent		Sever persistent		p-value
	N (24)	%	N (46)	%	N(20)	%	
Age in years							
< 10 years	20	83.3	36	78.3	16	80.0	0.881
10 years or more	4	16.7	10	21.7	4	20.0	
Gender							
Male	12	50.0	22	47.8	12	60.0	0.656
Female	12	50.0	24	52.2	8	40.0	
Residence							
Rural	18	75.0	30	65.2	10	50.0	0.223
Urban	6	25.0	16	34.8	10	50.0	
Level of education							
Illiterate	0	0.0	6	13.0	0	0.0	0.180
Primary	22	91.7	37	80.4	18	90.0	
Preparatory	2	8.3	3	6.5	2	10.0	

Table (1): Shows personal data of studied children. Regarding Buteyko group, 40% of children were in the age group 6-8 years with mean age value 8.6±1.57, 50% & 66.7% of them male and from rural area respectively while Pranayama group, 50% of children were in the age group 6-8 years with mean age value 8.2±1.24, 50% & 66.7% of them male and from rural area respectively. According to control group 43.3% of children were in the age group 6-8 years with mean age value 8.17±1.66, 53.3% & 60% of them male and from rural area respectively

Table (2): Indicates distribution of the studied children regarding their clinical data There were no statistically significant differences among the study (Buteyko & Pranayama) and the control groups in relation to clinical data before intervention regarding to (exposure to risk factors, regular controller medication used, quick relief medication used and number of rescue medications used in the past four weeks).

Table (3): Displays distribution of the studied children regarding their severity of bronchial asthma symptoms before and after the intervention and finds that there were no statistically significant differences among the study (Buteyko & Pranayama) and the control groups before implementation of Buteyko Breathing Technique and Pranayama Breathing Technique regarding to (day time symptoms, night with symptoms, short acting beta agonist used and interference with normal activity. While there were statistically significant differences among study (Buteyko & Pranayama) and the control groups after implementation of Buteyko Breathing Technique and Pranayama Breathing Technique.

Figure (1) : Demonstrate that there no statistically significant differences among the study (Buteyko & Pranayama) and the control groups according to the severity level of asthma before the intervention (**p-value 0.915**).

Figure (2): Displays that there were highly statistically significant differences among the study

(Buteyko & Pranayama) and the control groups according to the severity level of asthma after the intervention (**p-value 0.002**) compared to pre intervention (**p-value 0.915**).

Table (4): Clarifies distribution of the studied children regarding their severity of bronchial asthma symptoms before and after the intervention in the same group. Regarding Buteyko group, there were highly statistical significance difference between the studied children before and after the implementation of Buteyko Breathing Technique. Also there were highly statistical significance difference between the studied children before and after the implementation of Pranayama Breathing Technique. According to control group, there were no statistical significance difference between the studied children before and after receiving routine hospital care.

Figure (3): Displays that there no statistically significant differences among the study (Buteyko & Pranayama) and the control groups regarding level of asthma control before intervention P-value 0.549..

Figure (4): Clarifies that there were highly statistically significant differences among the study (Buteyko & Pranayama) and the control groups regarding level of asthma control after intervention P-value 0.001 compared to pre intervention P-value 0.549.

Table (5): Shows the level of asthma control among the study (Buteyko & Pranayama) and the control groups before and after the intervention in the same group and reports that there were statistically significant differences between Buteyko group before and after implementation of Buteyko Breathing Technique. Also there were statistically significant differences between Pranayama group before and after implementation of Pranayama Breathing Technique. According to the control group, there were no statistical significance difference between the studied children before and after receiving routine hospital care

Table (6): Represents the relation between severity of bronchial asthma symptoms and personal characteristics of the studied children before the intervention. By investigating the table, there were no relation between asthma severity and personal characteristic of children.

Discussion

Some studies suggested that the effect of Buteyko and Pranayama Breathing improves the lung functions, alleviates symptoms of bronchial asthma attack and promote the quality of life. However, there are still underestimation for using of BBT and PBT among asthmatic children. Therefore, the current study aimed to comparison of the effects of Buteyko

and Pranayama Breathing techniques on children with asthma (**El-Mashad , et al, 2018**)

The results of the current study revealed that there were highly statistically significant differences among the study (Buteyko & Pranayama) and control groups regarding all items and total level of bronchial asthma severity' symptoms post implementation of Buteyko Breathing Technique and Pranayama Breathing Technique compared to pre implementation. This might be due to, asthmatic children suffered from hyperventilation which cause a decrease in the amount of blood gases (called carbon dioxide, or CO₂). This decrease leads to children's bronchospasm and accumulation of secretion. BBT aims to decrease hyperventilation by teaching people how to hold their breath and incorporate "shallow breathing" exercises with relaxation. That allow improving normal gas exchange which relieves bronchospasm that lead to improve asthma severity symptoms.

This was on the same line with (**Venkatesan, et al., 2016**) who applied their study in Bangalore to comparison of the effects of Buteyko and Pranayama Breathing Techniques on quality of life in patients with asthma and found that there was a significance difference among the study (Buteyko & Pranayama) and control groups.

Pertaining to severity of bronchial asthma symptoms before and after the intervention in the same group, the finding found that there were highly statistical significance difference between the studied children before and after implementation of BBT. Also there were highly statistical significance difference between the studied children before and after implementation of PBT. According to the control group, there were no statistical significance difference between the studied children before and after receiving routine hospital care. This may be due to the Buteyko and Pranayama Techniques both advise nasal breathing over oral breathing as part of the breathing technique. The advantages of nasal breathing include the filtration of air for allergens and polluting dust, humidification and production of nitric oxide, which results in brochodilatation of airways. Thus nose breathing could have played a role in reducing the symptoms of asthma and thereby improving the quality of life for the asthmatic children.

This finding was in parallel with (**Mohamed & Ibrahim, 2019**) who conducted a similar study related to the effect of Buteyko Breathing Technique among patients with bronchial asthma and found that there was a significance difference between study and control groups. Also similarly, (**Hassan, et al, 2012**) found that the BBT significantly reduced asthma daily symptoms.

Concerning level of asthma control, the study results indicated statistically significant improvement in the study (Buteyko & Pranayama) rather than the control groups post implementation of the BBT and PBT compared to pre-implementation., as the study group seems to be more controlled. These results concur with the finding of the study conducted by (GINA, 2012) who supported the importance of patient education about non pharmacological measures for asthma control, including different types of breathing exercises. Accordingly, (Cowie, et al, 2016) stated that the Buteyko Breathing intervention led to increase disease control among asthmatic patients' study group. These findings are disagreeing with (Thomas & Bruton, 2014) 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.

The present study results revealed that there were statistically significant differences between Buteyko group regarding to the level of asthma control before and after implementation of BBT. Also there were statistically significant differences between Pranayama group before and after implementation of PBT. According to control group, there were no statistical significance difference between studied children before and after receiving routine hospital care. This was similar to (Romella et al., 2015), who showed that there was statistical significance difference between pre & posttest regarding level of asthma control.

The study results demonstrated better trends of improvement in the Buteyko group on asthma control than in the Pranayama group. The difference could be because breathing practices were combined with physical activity in the Buteyko group and a series of breathing practices in the Pranayama group compared to diaphragmatic breathing alone. Hence the Buteyko and the Pranayama groups show significant improvement compared to the control group in total score (Hassan, et al., 2012) who showed that the Buteyko and the pranayama groups show significant improvement compared to the control group. (El-Nahas et al., 2019) results also revealed beneficial impact of BBT in reducing the recurrence of asthma attacks and its symptoms the severity.

This study approved that the hypothesis of practicing BBT had a positive effect on improving patient disease control and reducing symptom severity. These results are in the similar line with (Hambleton, 2013) who noted that integrating the Buteyko Technique into respiratory care can promote patient improvement and reduce the need for drugs.

The present findings illustrate that there were no statistically significant relations between severity of

bronchial asthma symptoms and age, sex, residence and level of education before intervention. This result was explained by (GINA, 2012) that found there were no statistically significant relations between asthma control levels and age, sex and risk factors among study group patients.

Regarding demographic characteristics, this study results showed that, more than one third of children were in the age group 6-8 years and more than half of them of them male and from rural area in Buteyko group while Pranayama group, half of children were in the age group 6-8 years, more than half of them of them male and from rural area. According to control group more than one third of children in the age group 6-8 years, more than half of them male and from rural area respectively. The study of (Prasanna & Dhileeban, 2015) was inconsistent with the current study results which, indicated that the highest percent of the studied patients were females.

Regarding to clinical data, There were no statistically significant differences among the study (Buteyko & Pranayama) and control groups in relation to clinical data before intervention as reported by (GINA, 2012) that, there were no statistically significant differences between study and control groups in relation to medical history and demographic characteristics, and bronchial asthma severity before implementation of the Buteyko breathing techniques.

Conclusion

The current study concluded that practicing BBT & PBT had effect in reducing asthma symptoms' severity and improve the ability to control the disease among children with bronchial asthma.

Recommendations

The current study recommends the following

- Replication of the current study on a larger probability sample to achieve generalization of the results.
- Training nurses caring for children with asthma about BBT & PBT to be used in children care.
- Application of BBT & PBT beside traditional treatment modalities should be provided for children with asthma as a safe and cost less method of improving symptoms of asthma

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