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The effect of Buteyko breathing technique among patients with bronchial asthma: Comparative study

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Abstract
Background: Asthma is a serious global health problem and there is still lack of awareness regarding Buteyko Breathing Technique to achieve more control over it.
Aim: this study aimed to assess the effect of practicing Buteyko breathing technique on asthma symptoms among patients with bronchial asthma.
Hypothesis: It was hypothesized that practicing Buteyko Breathing Technique will have significant effect on reducing the severity of asthma symptoms among study group of patients with bronchial asthma and will improve their ability to control asthma.
Design: A Quasi-experimental research design was used in this study.
Setting: This study was conducted in Chest Medicine Ward and clinic at Ain Shams University Hospital.
Subjects: A purposive sample of 100 patients with bronchial asthma, 50 were assigned in experimental group and 50 patients in control group.
Tools: Three tools were utilized; the first tool used to collect patients' clinical data, the second tool used to assess bronchial asthma symptoms' severity and the third tool used to assess level of asthma control.
Results: The symptoms severity, which need for treatment were reduced, also control of bronchial asthma were improved in the study group post implementation of the Buteyko Breathing Technique.
Conclusion: There is a positive effect for practicing Buteyko Breathing exercise on reducing asthma symptoms' severity and improve the ability to control asthmatic patients.
Recommendations: Further research studies are needed to study new modalities to reduce asthma symptoms.

Keywords: Bronchial asthma, breathing, Buteyko breathing technique

1. Introduction

Asthma is a serious global health problem with wide differences in prevalence and severity in countries throughout the world [1]. It is a chronic respiratory disease characterized by airflow obstruction, bronchial hyper-responsiveness, and underlying airway inflammation. The interaction of these characteristics varies among susceptible individuals leading to differences in disease progression and symptoms over time. 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 limitations [2, 3].

Asthma is one of the common non-communicable diseases (NCDs). It affects around 339 million people in all regions of the world; younger age group as well as older population. It causes a high global burden of death and disability, with around 1000 people dying each day from asthma, and is in the top 20 causes of years of life lived with disability [4, 1]. The asthma prevalence increasing in the developing countries. The burden of asthma is increasing causing severe socioeconomic strain. Although the greatest healthcare costs are because of hospitalization, the second greatest cost is for medication [5]. 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 [3].

Life is dependent upon the act of breathing. Breathing is considered the most important of all the functions of the body as all other functions depend upon it [1]. It is the process of moving air into and out of the lungs to facilitate gas exchange with the internal environment, mostly by bringing in oxygen and flushing out carbon dioxide [6]. Asthma is currently treated medically. However, non-pharmaceutical innovations such as breathing techniques have been recently introduced. Those techniques stabilize the abnormal breathing patterns, which may be contributory to the difficulty in breathing experienced by asthmatics.

One such technique gaining popularity is the Buteyko Breathing Technique (BBT) [7].

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 [7, 8]. 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 [7, 9].

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. These techniques are very similar to those routinely used by respiratory physiotherapists for patients with hyperventilation symptoms [7, 8]. In Buteyko, they are sometimes accompanied by physical activities to increase the build-up of Co_2. The emphasis is on self-monitoring using the pulse rate and the 'pauses' as objective measures of outcome [9].

BBT also includes advice and training on the benefits of nasal breathing over oral breathing. The nose not only warms filters and humidifies the inspired air, but also produces nitric oxide, which is a potent asthma bronchodilator [7, 10]. Buteyko patients are encouraged to breathe through the nose during the day and to try 'taping' the mouth at night using Micropore TM, to encourage nasal breathing. Another common component of BBT is advice on medication use. This usually involves encouraging patients to minimize their use of agonists and is in line with Buteyko philosophy that 'reliever' inhalers exacerbate the loss of Co_2 [8, 10]. Godfrey K (2010) who also notes that research has demonstrated the Buteyko technique to be a safe technique that it is suitable for the majority of the population [9].

Despite recent advances in pharmacological intervention for asthma, there is worldwide public interest in physical therapies for asthma [11]. There is insufficient evidence to support the recommendation of BBT in asthma; especially in developing countries. Moreover, there is still a need to do further research in this field to increase the awareness regarding BBT to achieve more control over bronchial asthma. Therefore, the present study aims to compare the effect of BBT between study and control groups of patients with Bronchial Asthma.

2. Methodology

2.1 Aim of the Study: this study aimed to assess effect of practicing BBT on asthma symptoms among patients with bronchial asthma through the following:

- Assess the asthma symptoms' severity among patients with bronchial asthma in study and control groups.
- Assess the asthma control in the study and control groups among patients with bronchial asthma.
- Evaluate the effectiveness of practicing BBT on bronchial asthma symptoms and control among patients with bronchial asthma.

2.2 Hypothesis: This study was hypothesized that: Practicing BBT will have significant effect on reducing the severity of asthma symptoms among study group of patients with bronchial asthma and will improve their ability to control asthma.

2.3 Research design: A Quasi-experimental research design was used to conduct this study.

2.4 Study Setting: The study was conducted in Chest Medicine ward and clinic at Ain shams University Hospital, Cairo, Egypt.

2.5 Subjects: A purposive sample of 100 patients suffering from bronchial asthma who fulfills the inclusion criteria of the study and were admitted in Chest Medicine unit or visited the chest clinic at AIN Shams University Hospitals. The subjects were allocated randomly into two groups, 50 were assigned for study group and 50 patients for control group. These subjects were selected according to power analysis test depending on the patient flow through the last year (2017).

2.6 Subjects selection criteria

2.6.1 Inclusion criteria

- Patients who were agreed to participate in the study of both sexes; who have 20-60 years of age suffering from bronchial asthma and admitted into Chest Medicine Ward or clinic at AIN Shams University Hospital in Egypt.
- Patients who were on regular treatment (Medication, Inhalers) for bronchial asthma.

2.6.2 Exclusion criteria

- Patients who were practicing Buteyko Breathing Technique.
- 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.

2.6.3 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 patients as gender, age, marital status, level of education and occupation.

Part 2: Clinical data involved 7 items as body weight, smoking, 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 used to assess asthma severity according to the criteria set by National Heart, Lung and Blood Institute, National Asthma Education and

Prevention Program, 2007 [12]. It included five items: daytime and 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 sever persistent.

Tool III: Asthma control questionnaire: It was used to assess level of asthma control; which adopted from GINA, 2012 [13]. It included five items; day and night symptoms, reliever use and activity limitation. Level of asthma control was estimated according to criteria set as (control, partly control and uncontrolled).

2.6.4 Validity and reliability: Face and content validity of the tools was established by a panel of seven experts in medical surgical nursing and in medicine who reviewed them for relevance, comprehensiveness, understanding and feasibility for administration. No modifications were needed. The reliability of the study tools was measured using Cronbach alpha test (0.913) that indicates a high reliability tool. Cronbach value was.

2.6.5 Pilot study: A pilot study was carried out on ten patients who excluded from the study sample to assess the applicability and clarity of the designed questionnaire as well as detection of any difficult items. The estimated time was ranged from 10-15 minutes to fill the questionnaire sheets.

2.7 Fieldwork

The data collection started from March 2018 to February 2019. The researchers were available two days weekly. The meeting of the patients was in the medicine ward then during follow up at the chest clinic, as the researchers joined with patients after discharge at the clinic through predetermined phone appointments to assure the continuity of BBT application and answer any questions related to the program.

2.7.1 Pre-assessment phase

It was done before implementing the BBT program. The researchers started to select the study subject. A sample of 100 patients suffering from bronchial asthma who meet the inclusion criteria were recruited in the study. This phase applied for both groups (control and study); involving the following steps:

- Document the patients' demographic data and health history using the patient assessment questionnaire.
- Assess the patients' bronchial asthma symptoms using bronchial asthma symptoms severity scale.
- Assess of patients' level of asthma control using asthma control questionnaire (GINA, 2012) [13].

2.7.2 Planning phase

Based on analysis of the collected data and using relevant literatures, the researchers developed a training program for patients that includes handout booklet in simple Arabic language and videos that were used as media for patients' education on BBT, as well as demonstration and re-demonstration was used for patient training.

2.7.3 Implementation phase

The meeting sessions was individually or through groups (2-6 patients maximally) according to patients' circumstances and availability. The BBT was implemented in 10 sessions; 4 sessions for theoretical section and 6 sessions for practical section. Each theoretical session was about 30 minutes, and each practical session was about 50 minutes. This phase was implemented on study group only.

The intervention included group participants' discussions, who met with the researcher for application of BBT and one follow up session every week to assess their asthma symptoms and assure continuity of BBT application.

2.7.4 Theoretical section

Simple explanations about bronchial asthma definition, manifestations, causes, risk factors, complications, importance and steps of BBT were given by the researchers supported with handout booklet and related videos.

2.7.5 Practical section

It included demonstration and re-demonstrations of BBT till the patients adequately practice well was attained.

2.8 Procedures

2.8.1 Study group (Group-1)

The participants of the study group received both designed BBT, and medical treatment. The session time was in the morning at least two hours after meals. Each patient was asked to practice BBT at home twice daily in the morning and in the evening, at least 2 hours after meals for one month after the patient training on BBT.

2.8.2 The Buteyko breathing technique

Step1: The "Control pause" breathing test

It is a test developed by Dr. Buteyko to measure the depth of breathing and consequent retention of carbon dioxide. He named it the "Control Pause" breathing test.

2.8.3 Ask the patient to

- Sit in an upright chair, close his/her mouth and breathe normally through the nose for 30 seconds.
- Do not change his/her breathing before taking CP.
- Take a small breath (in 2 seconds) and a small breath out (in 3 seconds).
- Hold his/her nose on the "out" breath, with empty lungs but not too empty. (Holding nose is necessary to prevent air entering the airways).
- Count how many seconds he/she can last comfortably before need to breathe in again.
- Hold breath until feeling the first need to breathe in.
- Release nose and breathe in through it.
- First intake of breath after the CP should not be greater than his/her breath prior to taking measurement; don't hold breath for too long as this may cause him/her to take a big breath after measuring the CP.

2.8.4 Step 2: Shallow breathing

Ask the patient to

- Sit up straight.
- Monitor the amount of air flowing through nostrils by placing his/her finger under the nose in a horizontal position.
- The patients' finger should lie just above the top lip, close enough to nostrils so that his/her can feel the airflow, but not so close that the airflow is blocked.
- Breathe air slightly into the tip of nostrils. For example, just take enough air to fill the nostrils and no more.

Breathe in a flicker of air with each breath (about 1 cm).
- Breathe out gently onto the finger during exhalation.
- Concentrate on calming his/her breath to reduce the amount of warm air he/she feel on finger when the patient breathes out, because the warmer air felt, the bigger breathing.
- As the patient reduce the amount of warm air onto his/her finger, until begin to feel a need or want for air.
- Try to maintain the need for air for about 4 min.

2.8.5 Step 3: Putting it together
- Take Control pause.
- Reduce breathing for 4 min.
- Wait 2 min and take Control pause.
- Reduce breathing for 4 min.
- Wait 2 min and take Control pause.
- Reduce breathing for 4 min.
- Wait 2 min and take Control pause.
- Reduce breathing for 4 min.
- Wait 2 min and take Control pause.

2.8.6 Control group (Group-2)
The patients of this group did not participate in BBT program during the time of the study, and they received their medical treatment only.

2.8.7 Evaluation phase
The post assessment was made at the end of the BBT program implementation (after one month of application). The evaluation was done through comparison between the study and control groups' assessment of asthma symptoms' severity and asthma control pre and post BBT program implementation.

2.9 Ethical considerations
The researchers were obtained an approval from an authoritative person who is responsible for internal Chest Medicine ward and outpatient clinic, as well as from the Director of the Ain Shams University Hospital after explaining the aim of the study. At the initial meeting with the patients, an oral consent had taken from them after being informed about the nature, purpose, procedures, and benefits of the study, and the participation was voluntary. The participants were reassured that the data collected would be used only for the research purpose with confidentiality and anonymity. The patients were reassured that no harm could be anticipated from the implementation of the study. Additionally, the respondents had the right to withdraw from the study anytime.

3. Results
Table (1) shows the comparison of the demographic characteristics between the study and control groups of patients with bronchial asthma. Regarding study group, 58% were in the age group more than 50 years old with mean age value 48.9 ±14.3, 76% were mainly males, 88.0% were married, 72% were from rural areas, 40% had bachelor's degree, and 48.0% had a manual work. According to control group, 60% were in the age group more than 50 years old with mean age value 49.2 ±14.3, 74% were mainly males, 86% were married, 68% were from rural areas, 42% had bachelor's degree, and 44% had a manual work. The results revealed also that there were no statistically significant differences between two groups in relation to their demographic characteristics.

Table 1: Comparison the demographic characteristics between the study and control groups of patients with bronchial asthma

Demographic Characteristics	Study group (n=50)		Control group (n=50)		Chi square test	
	n	%	n	%	X^2	P
Age (years)						
>40	12	24.0	10	20.0		
40-50	9	18.0	10	20.0		
<50	29	58.0	30	60.0	0.251	0.882
Mean ±SD	48.9 ±14.3		49.2 ±14.3		0.063	0.950
Gender						
Males	38	76.0	37	74.0		
Females	12	26.0	13	27.0	0.053	0.817
Marital status						
Single	6	12.0	7	14.0		
Married	44	88.0	43	86.0	0.088	0.766
Residence						
Urban	14	28	16	32		
Rural	36	72	34	68	0.190	0.663
Level of education						
Illiterate	18	36.0	16	32.0		
Primary	6	12.0	7	14.0		
Secondary	6	12.0	6	12.0		
Bachelor	20	40.0	21	42.0	0.219	0.974
Occupation						
Unemployed	17	34.0	17	34.0		
Manual work	24	48.0	22	44.0		
Sedentary work	9	18.0	11	22.0	0.287	0.866

> 0.05 nonsignificant, ≤ 0.05 significant, ≤ 0.01 highly significant

Figure (1) illustrates the comparison of the health history between the study and control groups of patients with bronchial asthma before implementation of BBT. There were no statistically significant differences between study and control groups in relation to medical history before implementation of BBT. As shown in the table, 42% of the two groups their weights ranged from 75-84 kg, 62% & 60% of study and control groups respectively exposed to smoking as risk factor of asthma.

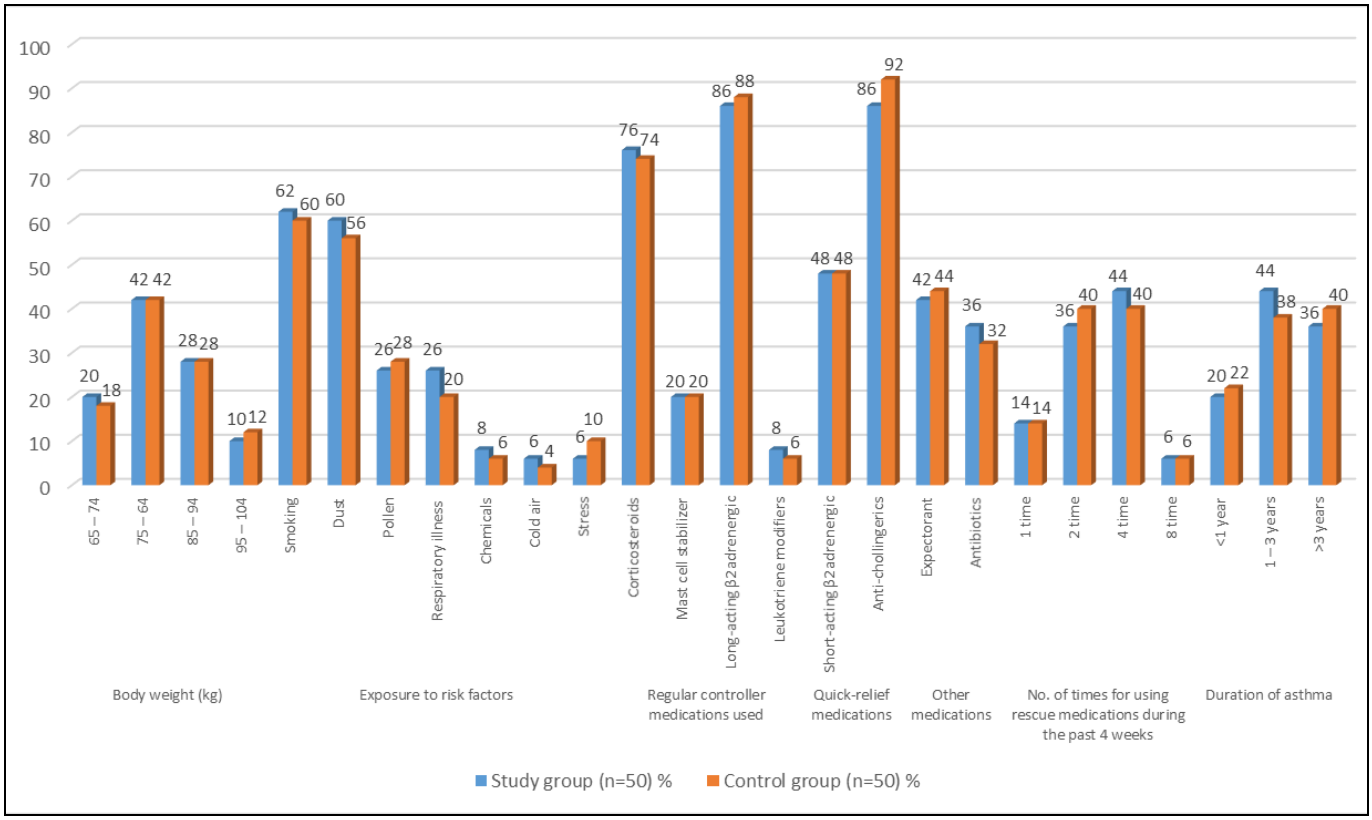


Fig 1: Comparison the percent of health history between the study and control groups of patients with bronchial asthma before implementation of Buteyko breathing technique

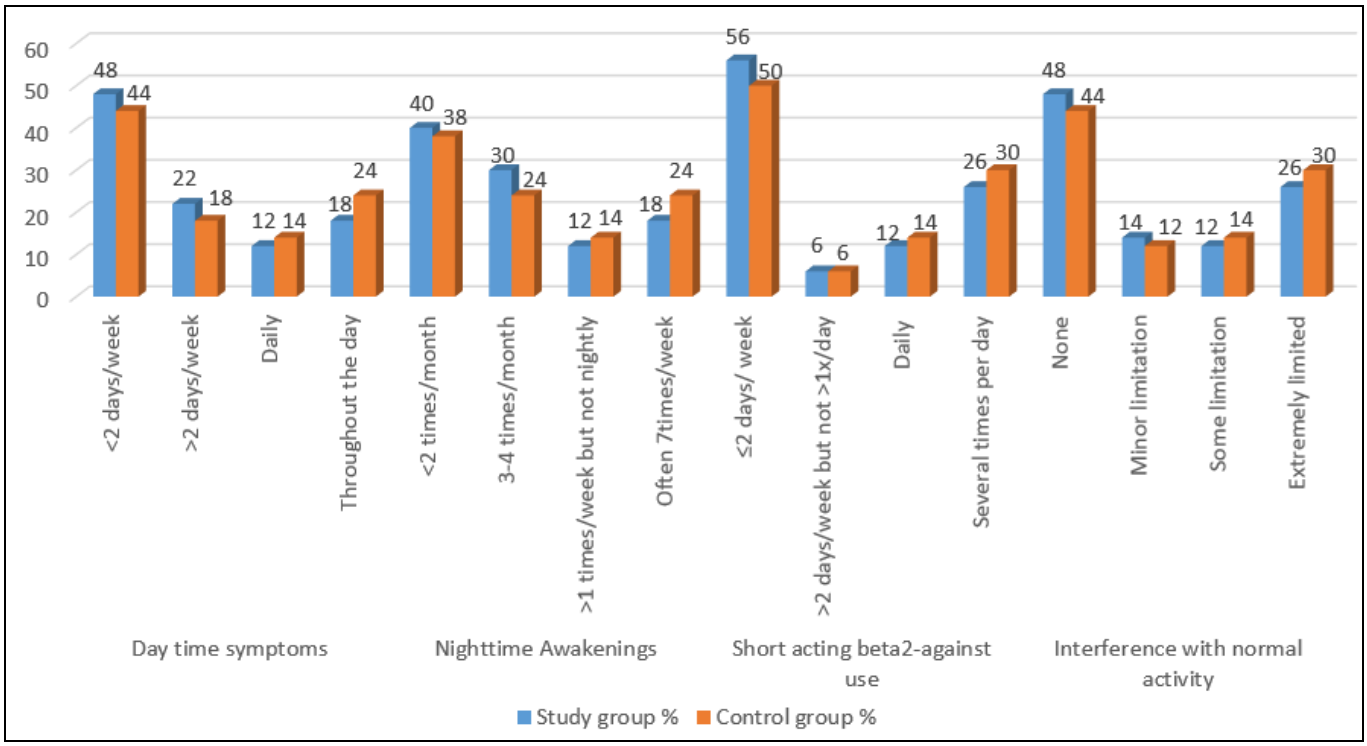


Fig 2: Comparison the percent of severity symptoms of bronchial asthma between the study and control groups before implementation of Buteyko breathing techniques

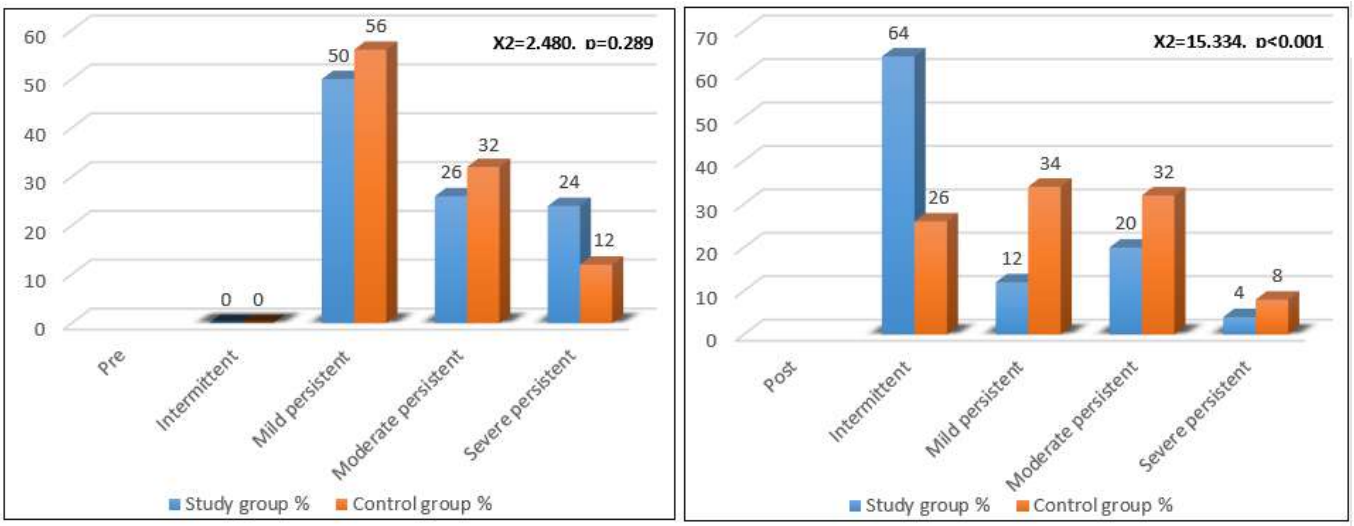
Figure 2. Displays the comparison for the symptoms' severity of bronchial asthma between the study and control groups before implementation of BBT. There were no statistically significant differences between two groups in relation to bronchial asthma severity before implementation of the BBT.

Table 2: Comparison of the symptom's severity of bronchial asthma between the study and control groups post implementation of Buteyko breathing techniques

Items	Study group		Control group		Chi square test	
	n	%	n	%	X^2	P
Day time symptoms						
z<2 days/week	35	70.0	23	46.0	13.766	0.003*
>2 days/week	12	24.0	9	18.0		
Daily	2	4.0	9	18.0		
Throughout the day	1	2.0	9	18.0		
Nighttime Awakenings						
<2 times/month	34	68.0	20	40.0	8.944	0.030*
3-4 times/month	9	18.0	13	26.0		
>1 times/week but not nightly	4	8.0	7	14.0		
Often 7times/week	3	6.0	10	20.0		
Short acting beta2-agonist use						
≤2 days/ week	38	76.0	25	50.0	8.491	0.037*
>2 days/week but not >1x/day	4	8.0	3	6.0		
Daily	4	8.0	8	16.0		
Several times per day	**4**	**8.0**	13	26.0		
Interference with normal activity						
None	36	72.0	23	46.0	9.238	0.026*
Minor limitation	4	8.0	7	14.0		
Some limitation	6	12.0	6	12.0		
Extremely limited	4	8.0	14	28.0		

> 0.05 nonsignificant, ≤ 0.05 significant, ≤ 0.01 highly significant

Table 2 reveals statistically significant differences between study and control groups in relation to all items of severity symptoms of bronchial asthma post implementation of the Buteyko breathing techniques at the significant level *P*< 0.05. The results show reduced symptoms and need for treatment post implementation of the BBT.



> 0.05 nonsignificant, ≤ 0.05 significant, ≤ 0.01 highly significant

Fig 3: Comparison of asthma severity between the study and control groups (pre & post program)

Figure 3 illustrates that there was a significant difference between study and control groups according to the severity level of asthma post implementation of BB exercise (*P*≤ 0.001) compared to pre-implementation, as the asthma severity were reduced in the study group.

Table 3: Comparison between the study and control groups regarding bronchial asthma control post implementation of Buteyko breathing techniques

	Study group		Control group		Chi square test	
	n	%	n	%	X^2	P
In the past 4 weeks,						
1. Does the patient has daytime symptoms more than twice /week?						
No	36	72.0	22	44.0	8.046	0.005*
Yes	14	28.0	28	56.0		
2. Does the patient has any night waking due to asthma?						
No	28	56.0	18	36.0	4.026	0.045*
Yes	22	44.0	32	64.0		
3. Does the patient has needed reliever for symptoms more than twice/ week?						
No	28	56.0	18	36.0	4.026	0.045*
Yes	22	44.0	32	64.0		
4. Does the patient has any activities limitation due to asthma?						
No	40	80.0	29	58.0	5.657	0.017*
Yes	10	20.0	21	42.0		
5. What is the level of asthma control						
Well-controlled (None of these)	28	56.0	18	36.0	8.174	0.017*
Partly controlled (1-2 of these)	8	16.0	4	8.0		
Uncontrolled (3-4 of these)	14	28.0	28	56.0		

> 0.05 nonsignificant, ≤ 0.05 significant, ≤ 0.01 highly significant

Table 3 describes statistically significant differences between study and control groups in relation to all control items of bronchial asthma post implementation of the BBT at the significant level $P< 0.05$.

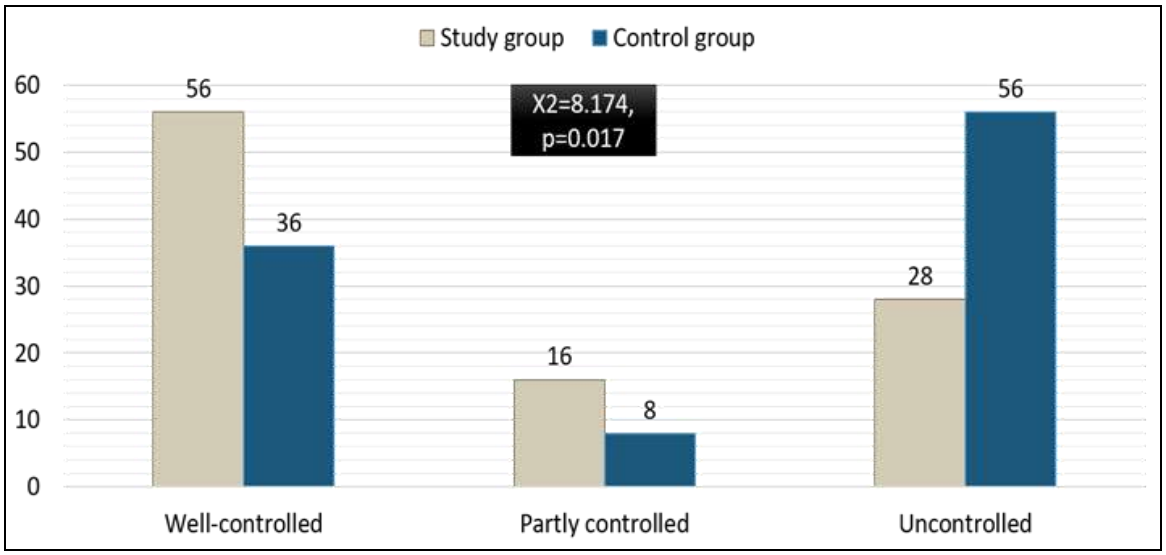


Fig 4: Comparison of the percentage distribution of total asthma control levels between study and control groups post implementation of the Buteyko breathing techniques

Table 4: The relation between the study group's age, sex and risk factors with asthmatic control levels post implementation of the Buteyko breathing techniques

	Well controlled (n=28)		Partly controlled (n=8)		Uncontrolled (n=14)		Chi square test	
	n	%	n	%	n	%	X^2	P
Age (years)								
>40	8	28.6	1	12.5	3	21.4	2.922	0.571
40-50	4	14.3	3	37.5	2	14.3		
<50	16	57.1	4	50.0	9	64.3		
Gender								
Males	21	75.0	5	62.5	12	85.7	1.539	0.463
Females	7	25.0	3	37.5	2	14.3		
Exposure to risk factors								
Smoking								
No	10	35.7	4	50.0	5	35.7	0.582	0.747
Yes	18	64.3	4	50.0	9	64.3		
Dust								
No	12	42.9	2	25.0	6	42.9	0.893	0.640
Yes	16	57.1	6	75.0	8	57.1		

Pollen								
No	23	82.1	4	50.0	10	71.4	3.408	0.182
Yes	5	17.9	4	50.0	4	28.6		
Respiratory illness								
No	19	67.9	6	75.0	12	85.7	1.552	0.460
Yes	9	32.1	2	25.0	2	14.3		
Chemicals								
No	24	85.7	8	100.0	14	100.0	3.416	0.181
Yes	4	14.3	0	0.0	0	0.0		
Cold air								
No	28	100.0	7	87.5	12	85.7	4.091	0.129
Yes	0	0.0	1	12.5	2	14.3		
Stress								
No	28	100.0	7	87.5	12	85.7	4.091	0.129
Yes	0	0.0	1	12.5	2	14.3		

> 0.05 nonsignificant, ≤ 0.05 significant, ≤ 0.01 highly significant

Figure 4. This figure shows a statistically significant difference between study and control groups regarding levels of total asthma control post implementation of the Buteyko breathing techniques, as the study group seems to be more controlled than another.

> 0.05 non significant, ≤ 0.05 significant, ≤ 0.01 highly significant

Table 4 illustrates the relation between the study group's age, sex and risk factors with asthma control levels post implementation of the Buteyko breathing techniques. There were no statistically significant relations among patients' study group with asthmatic control levels and their age, sex and risk factors.

Table 5: The relation between the study group's demographic characteristics and asthmatic severity levels post implementation of Buteyko breathing techniques

	Intermittent (n=32)		**Mild persistent (n=6)**		**Moderate persistent (n=10)**		**Severe persistent (n=2)**		**Chi square test**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**X2**	**p**
Age (years)										
<40	12	37.5	0	0.0	0	0.0	0	0.0	15.354	0.018*
40-50	7	21.9	2	33.3	0	0.0	0	0.0		
>50	13	40.6	4	66.7	10	100.0	2	100.0		
Gender										
Males	25	78.1	4	66.7	8	80.0	1	50.0	1.195	0.754
Females	7	21.9	2	33.3	2	20.0	1	50.0		
Marital status										
Single	4	12.5	1	16.7	1	10.0	0	0.0	0.442	0.931
Married	28	87.2	5	83.3	9	60.0	2	100.0		
Residence										
Urban	9	28.1	2	33.3	3	30.0	0	0.0	0.883	0.830
Rural	23	71.9	4	66.7	7	70.0	2	100.0		
Level of education										
Illiterate	11	34.4	4	66.7	2	20.0	1	50.0	6.678	0.671
Primary	4	12.5	1	16.7	1	10.0	0	0.0		
Secondary	3	9.4	1	16.7	2	20.0	0	0.0		
Bachelor	14	43.8	0	0.0	5	50.0	1	50.0		
Occupation										
Unemployed	10	31.3	2	33.3	3	30.0	1	50.0	0.622	0.966
Manual work	16	50.0	3	50.0	5	50.0	1	50.0		
Sedentary work	6	18.8	1	16.7	2	20.0	0	0.0		

> 0.05 non significant, ≤ 0.05 significant, ≤ 0.01 highly significant

Table (5) represents the relation between the study group's demographic characteristics and asthma severity levels post implementation of Buteyko breathing techniques. By investigating the table, there was only a statistically significant relation between study group asthma severity and their age (at $p < 0.05$), while there were no relations between asthma severity and other demographic characteristics.

4. Discussion

Some studies suggested that the effect of Buteyko 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 among asthmatic patients. Therefore, the current study aimed to assess effect of practicing BBT on asthma symptoms among patients with bronchial asthma.

Regarding demographic characteristics, this study results showed that more than half of study group were in the age group more than fifty years old with mean age value 48.9 ±14.3, the highest percent of them were mainly males, and married. In relation to residence, more than two thirds of the studied patients were from rural areas, more than one third had bachelor's degree, and had a manual work.

According to control group demographic characteristics, less than two thirds of them were in the age group more than fifty years old with mean age value 49.2 ±14.3, about three

quarters of them were mainly males, most of them were married. According to residence of the control group, more than two thirds of them were from rural areas and more than one third of them had bachelor's degree and had a manual work. The residence of the highest percent in a rural area explain exposure to some types of asthma triggering agents as pollens and dust due to increasing plants in these areas, also manual work which can expose to allergens causing asthma in many manual crafts.

The mean ages of the studied patients in this study is similar to Hassan., *et al*. [1] who stated that the studied patients' mean age was (42.2±7.12) years, and Karpagam, Mangalagowri & Aruna [14] mentioned that less than two thirds of the studied patients were males. While the study of Prasanna, Sowmiya, and Dhileeban (2015) [9] was inconsistent with the current study results which, indicated that the highest percent of the studied patients were females.

Regarding medical history, less than two thirds of participants were exposed to smoking and dust, as well as, more than half of them exposed to pollen or respiratory illness. The exposure to risk factors as smoking, dust, pollen and recurrent respiratory tract illness are usually associated with asthma, which explaining increase asthma prevalence in the developing countries as reported by GINA, (2019) [15].

These study findings illustrate 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, which reflects the similarity of the two groups before BBT implementation.

Pertaining to severity of bronchial asthma symptoms, the findings found that there were significant differences between study and control groups regarding all items and total score of bronchial asthma symptoms severity post implementation of BBT. The symptoms' severity and need for treatment were reduced in the study group post implementation of the BBT compared to pre-implementation. These results could be explained due to practicing BBT. Similarly, Hassan, *et al* [1] found that the BBT significantly reduced asthma daily symptoms. Moreover, Austin (2013) [16] mentioned that BBT can be used to empower clients to self-manage their asthma.

Concerning bronchial asthma control, the study results indicated statistically significant improvement in the study rather than control group in relation to all items and total score levels of bronchial asthma control post implementation of the BBT, as the study group seems to be more controlled. This result is consistent with GINA, (2015) [17] who supported the importance of patient education about non pharmacological measures for asthma control, including different types of breathing exercises. Accordingly, Cowie (2008) [18] 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) [8] 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 findings illustrate that there were no statistically significant relations between asthma control levels and age, sex and risk factors among study group patients. While there was only a statistically significant relation between study group asthma severity and their age which might be related to increased risk of exposing to respiratory problem with aging. This result was explained by GINA, (2019) [15] that comorbidities associated with old age complicate asthma management and control.

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) [13] and Ruth (2014) [19, 20] who noted that integrating the Buteyko technique into respiratory care can promote patient improvement and reduce the need for drugs. Additionally, Sakharoff (2019) [21] and Adelola *et al*. (2013) [22] suggested that the Buteyko practical implementation had the future perspectives. El-Nahas *et al*. (2019) [23] Narwal *et al*. (2012) and [24] results also revealed beneficial impact of BBT in reducing the recurrence of asthma attacks and its symptoms the severity.

5. Conclusion

The current study concluded that there is a positive effect for practicing BBT on reducing asthma symptoms' severity and improve the ability to control the disease among patients with bronchial asthma.

6. Recommendations

The current study recommends the following

- Further research studies are needed to focus on studying new modalities to reduce symptoms of asthma and decrease use of asthma medications as possible.
- Replication of the current study on a larger probability sample to achieve generalization of the results.
- Training nurses caring for patients with asthma about BBT to be used in-patient care.
- Application of BBT beside traditional treatment modalities should be provided for patients with asthma as a safe and cost less method of improving symptoms of asthma.

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