Evaluating the Effect of Buteyko Breathing Technique in Enhancing Asthma Control and Life Quality Among Asthma Patients: A Nursing-Led Quasi-Experimental Study

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Abstract

Background: Medication is currently the mainstay of asthma management. Nonetheless, non-pharmacological methods have advanced recently. These methods include breathing exercises, particularly the Buteyko Breathing Technique, which aims to stabilize the irregular breathing patterns that may aggravate asthmatic patients' breathing issues. **Aim:** To Evaluate the effect of of Buteyko Breathing Technique in Enhancing Asthma Control and Life Quality Among Asthma Patients. **Design and setting**: A quasi-experimental research design was utilized, involving 60 male and female patients in the chest diseases department and outpatient clinic of the Main University Hospital, Alexandria, Egypt. **Tools**: Three tools were used for data collection, Biosociodemographic data structured questionnaire, the Asthma Control Test (ACT) and Asthma Quality of Life Questionnaire Standardized Activities. AQLQ (S). **Results:** Most participants in both groups had poorly managed asthma, with 93.3% in the study group and 90% in the control group. However, following the intervention, the study group demonstrated significant improvement, with the percentage of poorly controlled cases decreasing to 56.7%, while the control group saw minimal change at 93.3%. All participants in both groups were categorized as having a low quality of life. However, after the intervention, the study group experienced a notable shift, with none of the participants remaining in the low category. Instead, 76.7% moved to the moderate QoL category, and 23.3% to the high QoL category. This change was statistically significant ($p<0.001$). **Conclusions**, The study's findings indicate that including the Buteyko Breathing Technique in an asthma patient's treatment protocol could improve their control of asthma symptoms and enhance their overall quality of life. As a safe and cost-effective method to alleviate asthma symptoms and enhance quality of life, asthma patients must have access to BBT alongside traditional therapies.

Keywords: Asthma control, Buteyko breathing technique, Quality of life and Quasi-Experimental Study.

Introduction

One of the most prevalent long-term respiratory illnesses in the world, asthma is characterized by varying airflow restriction, bronchial hyperactivity, and persistent airway inflammation**. Yüce et al., (2020), & Vagedes (2021) & Sánchez., (2023)** . Nowadays, the prevalence of asthma is 12.6%, impacting over 339 million patients globally. Age, race, or ethnicity is not exempted from the epidemic; yet, socioeconomic status and ethnicity do have an impact on the prevalence , morbidity, and mortality of asthma in the many nations across the globe. Furthermore, asthma is a major financial, social, and health care burden in many countries. **Enilari & Sinha., (2019) & Almomani et al., (2021).**

The Global Burden of Disease (GBD) collaboration predicted that 461,000 asthma patients worldwide died in 2019, more than 1000 deaths per day, especially in low- and middle-income nations where access to appropriate treatment and early diagnosis is still difficult. The prevalence in Egypt is approximately 6.7% of the total population. **Hosny et al., (2022), The Global Asthma Report (2022)** . According to **Hosny et al. (2022)** asthma is a complicated ailment that is influenced by psychological, allergic, and environmental factors. Different susceptible people have different interfaces between these components, which over time causes changes

in the course of the disease and its symptoms. Coughing , chest pain or tightness, , wheezing, and dyspnea are some of the symptoms. Problems with asthma control are linked to significant activity limitations, poorer quality of life, and increased health care utilization. **Wallace et al.,(2022).**

Quality of life (QoL) is an important endpoint since it represents the impact of the disease as seen by the patient. When asthma is not properly managed, it can significantly impair a patient's QoL, affecting their physical, emotional, social, and vocational well-being., where patients' symptoms vary from one another. (QoL) is defined as how patients perceive their place in life in respect to their goals, standards, expectations, and concerns . Reducing asthma triggers and improving patient quality of life are efficient strategies to lower morbidity and mortality rates **Abouelala et al., (2017) ,Hasan et al., (2020) ,McDowell et al., (2021) & Hosney et al., (2024).**

The Buteyko Institute of Breathing and Health in Australia states that excessive breathing has four primary effects linked to asthma. Here are some of these effects: The first consequence of low carbon dioxide is a reduction in the smooth muscle around the bronchioles, which can contribute to tightness in the chest and trouble breathing. This is due to the fact that elevated carbon dioxide levels induce smooth muscle to relax and expand. Secondly, the blood releases oxygen more slowly, which results in dyspnea. In the end, the airways become dry and inflamed, which encourages the production of mucus. In connective tissue, mast cells and immune system components release copious amounts of histamine, which causes inflammation, and become particularly sensitive to perceived allergens **Villareal, et al (2014) ,Stoodley et al., (2019), Jaakkola et al., (2020)& Mohamed et al., (2022).**

Asthma is currently managed with medication. However, non-pharmacological advancements like breathing exercises have just lately been made available. These methods stabilise the irregular breathing patterns that can be contributing to asthmatics' breathing difficulties. The Buteyko Breathing Technique (BBT) is one such breathing method that is becoming more and more well-known. The BBT was found by clinical physician Dr. Konstantin Pavlovich Buteyko from Russia . He showed how hyperventilation and low metabolic activity lead to hypocapnia, or a shortage of CO2 in the alveolar air, which is the main cause of bronchospasm in bronchial asthma. This method seeks to reduce hyperventilation by teaching patients how to hold their breath and combining relaxing techniques with "shallow breathing" exercises. It consistently advises against using accessory muscles for breathing and instead suggests using the diaphragm. **Mohamed et al., (2022).**

The fundamental idea behind BBT is to reduce hyperventilation by combining controlled breathing reduction phases (also known as slow breathing or reduced breathing) with breath holding periods (also known as control pauses or maximum pauses). In Buteyko, they are occasionally coupled with physical exercises to boost the accumulation of carbon dioxide. The (BBT) also includes guidance and education on the benefits of nose breathing over oral breathing. **Hassan et al ., (2021), Mohamed et al., (2022) .** Inhaled air is physically better filtered and humidified via the nasal passages. In addition, it has recently been demonstrated that nasal inhalation raises nitrous oxide levels in the blood. The nurse must advise patients to keep their mouths shut while they sleep in order to stimulate nasal breathing.This can be done by using medical-grade microporous tape to tape their lips together at night. The Buteyko Method suggests dietary adjustments, allergy avoidance, and stress reduction in addition to breathing exercises **Villareal., et al (2014) ,Abouelala et al., (2017), Singh & Raghavendran (2021).**

The nurse is primarily responsible for teaching patients with asthma how to perform the daily Buteyko exercise. In addition, the nurse must advise patients to maintain their ideal body weight, drink lots of water, and eat a variety of cereals ,vegetables fruits, small amounts of meat, and high-fat foods in order to preserve their ability to breathe **Lourdu., (2018)**. Additionally, the nurse has to educate the patients on the reasons of their illnesses. Typical instances include pollen, pets, smoke household dust, fungi, and specific foods. In order to enhance the patients' health outcomes ,

the nurse should also counsel the patients on stress management **Singh & Raghavendran., (2021).**

Physical therapies are receiving attention from the public all around the world for treating asthma, despite the current advancements in pharmaceutical intervention. The advice of BBT for asthma is not well supported by the available data, particularly in developing nations. Furthermore, more studies in this area are still necessary to raise awareness of BBT and help patients manage their bronchial asthma better **Das et al., (2022).** Consequently, the present study aimed to evaluate the effect of Buteyko breathing technique on asthma control and quality of life among asthmatic patients.

Aim of the Study

The present study aimed to:

- Evaluate the effect of Buteyko breathing technique on asthma control and quality of life among asthmatic patients.

Research hypothesis :

H_1: Asthmatic patients who practice the Buteyko breathing technique (BBT) would have a higher scores of asthma control than the control group.

H_2: Asthmatic patients who practice the Buteyko breathing technique (BBT) would have a higher scores of quality of life than the control group .

Materials and Method

Materials

Research design: For the purpose of the study, a quasi-experimental research design was employed.

Setting: The study was carried out in the Chest Diseases Department and Outpatient Clinic of the Main University Hospital, Alexandria, Egypt.

Subjects:

A convenient sample of sixty adult patients suffering from bronchial asthma who fulfills the inclusion criteria of the study and were admitted in the Chest department and visited the chest clinic at Alexandria Main University Hospital, were divided randomly by using (computer generated randomization) into two equal groups (control and study), thirty patients each . The control group was given only standard hospital medical care, while the study group was given both standard medical care and BBT. The following criteria were used to select all of the patients in the study:

- Patients aged 20 to 60 years old, both male and female, who were receiving regular medication (such as beta 2 agonists and inhaled corticosteroids for six months)
- Suitable for phone communication

- **Exclusion criteria included:** Having prior knowledge of the Buteyko breathing technique; having a mental illness; having an urgent medical condition, such as epilepsy or cardiovascular concerns; and being too seriously unwell to engage in the Buteyko breathing technique.

Sample size estimation :

To estimate the participants, the G*Power Windows 3.1.9.7A application was utilized with the following settings: Power (1-β err prob) = 0.95, effect size = 0.25, α err prob = 0.05, two groups that were analyzed, two measurements, and a 20% dropout rate. Thirty in the BBT group and thirty in the control group were determined to be the minimal sample size by the software.**Kang., (2021**).

Tools of the study: In order to fulfill the objective of the study, three tools were used for data collection.

Tool I: Biosociodemographic data structured questionnaire:

This questionnaire was developed by the researchers based on review of the literature to obtain information about Biosociodemographic data of the studied patients **Stoodley et al., (2019) , Jaakkola et al., (2020) & Mohamed et al., (2022)** .It consisted of two parts as the following:

Part 1: Socio-demographic data such as age, gender, marital status, level of education, occupation.

Part 2: patients' clinical data, this part was utilized to obtain data about the clinical

history of the patients and their families such as previous hospitalization, duration of asthma, environmental risk factors, regular controller medications used, Quick-relief medications used, family history.

Tool II: The Asthma Control Test (ACT)

This tool was adopted from **American Thoracic Society.,(2023)** It is a self-administered tool used by patients to identify those with poorly controlled asthma. It consisted of 5set of questions with 4week recall to assess (the frequency of shortness of breath and general asthma symptoms, use of rescue medications, the effect of asthma on daily functioning, and overall self-assessment of asthma control). Each question is rated on 5-point Likert scale and scored from one to five on a response scale, (for symptoms and activities: 1=all the time , 2= most of the time ,3= some of the time , 4= a little of the time 5= none of the time , while for asthma control rating: 1=not controlled at all , 2= poorly controlled , 3= somewhat controlled , 4-well controlled , 5=completely controlled). The scores ranged from 5 (poor asthma control) to 25 (full asthma control), where higher scores indicated better asthma control.Well-controlled asthma is represented by a score of 20 to 25, moderately-controlled asthma by a score of 19 or below, and very poorly-controlled asthma by a score of less than 16.

Tool III: Asthma Quality of Life Questionnaire Standardized Activities. AQLQ (S):

This tool was adopted from **American Thoracic Society ., (2023)** to measure how much asthma disease affected the patient's quality of life. It consisted of 32 set of questions with 2 week recall, it covered questions related to symptoms, activity limitation, emotional function, and environmental stimuli. Each question is rated on a seven point Likert scale and scored from one to seven on a response scale (1 = severely impaired to 7 = not impaired at all) . The study participants' responses were recorded, scored and then summed together. The total score was categorized into three levels as follows:

- High quality of life: more than or equal 75%.
- Moderate quality of life: 50% to less than 75 %.
- Poor quality of life: less than 50%.

Method:

The study was conducted through the following steps:

1. An approval from the Research Ethics Committee and the Dean of the Faculty of Nursing and the Head of the respiratory Department at Alexandria University after explaining the study's purpose and assuring the privacy, anonymity, and confidentiality of the collected data.
2. After explaining the purpose of the study, the directors of the nursing services department and hospital administrative staff in the selected location provided formal written consent to perform the study.
3. Tool (I) was developed by the researchers after review of recent relevant literature. Tool II & tool (III) were adopted from American Thoracic Society ., (2023).
4. A panel of five experts in the domains of respiratory diseases and medical surgical nursing determined the study tools' construct and content validity. The appropriate adjustments were made.
5. The Cronbach's Alpha Coefficient Test (= 0.94) was used to determine the tool's reliability, and the results supported this conclusion.

Ethical Considerations:

- The Research Ethics Committee of the Alexandria University Faculty of Nursing officially approved the study's conduct. Before they participated, all of the patients who were being studied were informed of the study's goal and asked if they were ready to be included. Every patient who wanted to take part in the study was given assurances regarding their privacy and the confidentiality of their data. The patients who were enrolled were made aware that they might leave the study at any moment and that participation is completely voluntary.

- The Buteyko Breathing Technique booklet was created and translated into simple Arabic language by the researchers based on review of the recent related literature and supplied by clear and descriptive pictures.

- Before the actual data collection, the researchers conducted a pilot study on six patients to evaluate the tools' applicability and clarity and to identify potential challenges. These patients were not included in the study's sample.

Data collection

- Data collection began and lasted for eight months, from the end of December 2023 to the end of August 2024 . The study was carried out through the following four phases:

I. Assessment phase:

- During this phase, the researchers explained the study's aim, the components of the tools, and the steps of BBT. They used the ACT and AQLQ (S) study tools to assess the control and study groups before conducting BBT through face-to-face interviews, which lasted about 20-30 minutes. The researchers prepared the environment to be as free from external stimuli as possible and calm. They provided a chair with back support to promote patients' relaxation, a stopwatch, a mouthpiece, and a pen.

II. Planning phase:

- The researchers developed a training program for the study group patients based on recent relevant literature **lala et al ., (2017) & Hassan et al ., (2021)& Singh et al.,(2021) & Hosny et al., (2022)** The program includes an educational booklet in simple Arabic, supplemented by photos and videos to educate patients on the Buteyko breathing technique. Additionally, demonstration and re-demonstration were used for patient training.

III. Implementation phase

The interview sessions were scheduled individually over four sessions: one session (theoretical part) for health education about asthma & BBT and three sessions for the practical part over four weeks. The first session lasted approximately 30 minutes, and each practical session lasted around 60 minutes. This phase was implemented on the study group only.

- **The theoretical part:** The researchers provided clear and concise information about asthma, including its definition, symptoms, causes, risk factors, complications, importance, and the steps of BBT. They were supported by an educational booklet and related videos.

- **Practical part:** The researcher repeatedly demonstrated BBT until the participants had practiced it sufficiently. The interview of the study group was in the Chest Diseases Department then during follow up at the Chest Clinic, as the researchers joined with participants after discharge at the clinic through predetermined phone appointments to assure the continuity of BBT application and answer any questions related to the program.

Procedures

<u>Buteyko group (study group)</u>

- Both medical care and the Buteyko breathing technique were administered to the study group patients. The session took place in the morning, at least two hours after meals. Each patient was instructed to practice BBT at home for 15 minutes, twice daily in the morning just after waking and in the evening, usually before meals or two hours after meals, for a month following their BBT training. Also the researchers reminded the patients through an automated SMS two times daily.

(The Buteyko breathing technique)

Ask the patient to:

- **Preparation**

1. Should be sitting in an upright posture.
2. Relax the respiratory muscles.
3. For a few minutes, close his or her mouth and breathe normally via the nose.
4. Do not alter his/her breathing before taking the control pause (CP).
5. In two seconds, take a little breath, and in three seconds, exhale a small breath.

- **The control pause,** which is a suitable holding time between breaths.

1. After a relaxed exhale, should be hold the breath.
2. The nostril should then be closed using the thumb and index finger. Holding the nose is required to keep air from getting into the airways.
3. Determine how many comfortable seconds he or she can hold before having to take another breath.
4. Hold the breath until feeling the urge to breathe, which may involve the non-engaging movement of the diaphragm, and then exhale.
5. At least ten seconds of regular breathing should be maintained.
6. Be repeated multiple times.

- **The Maximum Pause**

1. After a relaxed exhale, should be hold the breath.
2. The nostril should then be closed using the thumb and index finger.
3. Maintain the air for as long as possible , usually twice as long as the Control pause.
4. Take a breath once you've reached a considerable level of discomfort.
5. At least ten seconds of regular breathing should be maintained.
6. Repeat a number of times.

For control group

During the time of the study , the patients in this group did not take part in the BBT program. and they continued with regular care, primarily using the standard asthma medications prescribed by their attending physicians. Also patients of the control group were met by the researchers regularly at outpatient clinic or through phone and advised to continue their usual treatment for asthma as instructed by their physicians to ensure good compliance with their medication.

Evaluation phase:

After one month of program implementation (post-test), both participants in the BBT and control groups were reassessed using the ACT and AQLQ (S) tools.Comparison between study and control groups findings was done to evaluate the effect of BBT on asthma control and quality of life among those patients.

Statistical analysis of the data

IBM SPSS software package version 20.0 was used to examine the data that was fed into the computer .Numbers and percentages were used to describe the qualitative data. The normality of the distribution was confirmed using the Kolmogorov-Smirnov test. Range (minimum and maximum), mean, and standard deviation were used to characterize quantitative data. At the 5% level, the results' significance was assessed **Di Leo & Sardanelli ., (2020).**

The used tests were

1 - Chi-square test
For categorical variables, to compare between different groups

2 - Fisher's Exact or Monte Carlo correction
Correction for chi-square when more than 20% of the cells have expected count less than 5

3 - Marginal Homogeneity Test
Used to analyze the significance between the different stages

4 - Student t-test
For normally distributed quantitative variables, to compare between two studied groups

5 - Paired t-test
For normally distributed quantitative variables, to compare between two periods

6 - Pearson coefficient
To correlate between two normally distributed quantitative variables

Results

Table (1): Presents Comparison Between the Two Studied Groups According to their Socio-demographic Characteristics. It was found that more than one third of the patients in the study and control group (43.3%, 36.7%) were in the age group of 45 and more with a mean age of (44.0 ± 10.45& 42.13±9.04) years old respectively. More than one half of both study and control group were males (53.3 % &56.7) respectively and most of them were married and illiterate (63.3%) respectively. Moreover, (46.7%) of patients of study group compared to (53.3%) of patients of control group were unemployed and the majority of them where from urban area (70.0 %, 80.0 %) respectively. Totally there is no statistical significance difference between both studied groups in relation to socio-demographic characteristic.

Table (2): Shows Comparison Between the Two Studied Groups According To Their Clinical data. It was found that all studied patients (100 %) in the study and control group had environmental risk factors as smoking which represent (46.7% & 53.3%) and (53.3 & 46.7%) had associated diseases respectively. Moreover, more than half of both study and control group patients (76.7%, 73.3%) had Previous hospitalization and the majority of them had family history (86.7% & 80.0%) respectively. Additionally more than half of the study group patients (56.7 %) had duration of asthma more than 3 years compared to (43.3%) of the control group patients. (90.0%, 93.3%) of both study and control group had Regular controller medications and used Corticosteroids and more than three quarter of them (76.7% & 83.3%) used Quick-relief medications as short acting inhaled B . generally, there is no statistical significance difference between both studied groups in relation to their clinical data.

Table (3): Illustrates Comparison Between the Two Studied Groups According to Overall Asthma Control Test (ACT) Pre and Post Buteyko Breathing Technique Application. This table displays there is statistically significant difference in study group pre and post Buteyko breathing technique application (MH =0.0* , p= 0.005*). There is also statistically significant difference between study and control group post Buteyko breathing technique application ($\chi 2$=10.756 , ^{MC}p<0.001*)

Table (4): Depicts Comparison between The two studied groups according to Overall Asthma Quality of Life Questionnaire Standardized Activities AQLQ (S) Pre and Post Buteyko Breathing Technique Application. This table shows that more than three quarter (76.7 %) of study group patients where had moderate quality of life after Buteyko breathing technique application whereas this percentage was (10.0%) in control group with statistically significant difference ($\chi 2$= 57.588* , ^{MC}p<0.001*)

Table (5) & fig (1) : Correlation between Asthma Control Test (ACT) and Asthma Quality of life questionnaire Standardized Activities AQLQ (S). This table shows there is appositive correlation on study group patients between Asthma Control Test (ACT) and Asthma Quality of life after Buteyko breathing technique application (R= 0.454* P= 0.012*)

Table (6): Shows The Relation Between Socio-Demographic Characteristics and Levels of Asthma Control in Both Studied Group patients. This table displays there is statistically significant relation in study group between levels of asthma control with socio-demographic characteristics in relation to age (Years), marital status and residence as ($\chi 2$ =7.024* , ^{MC}p=0.038*) , ($\chi 2$ =10.308* , ^{MC}p=0.006*), ($\chi 2$ =10.866* , ^{FE}p=0.002*) respectively. Whereas, there is no statistically significant relation was found in control group between levels of asthma control and their socio-demographic characteristics.

Table (7): Revealed the Relation Between clinical data and levels of asthma control in both studied group patients. It was noticed that statistically significant relation was found in the study group patients between levels of asthma control and their clinical data in relation to associated diseases and family history as ($\chi 2$ =9.020* , p= 0.003*) , ($\chi 2$ =6.036* ^{FE}p=0.026*) respectively. While no statistically significant relation was found in the control group between levels of asthma control and their clinical data.

Table (8): Depicts the Relation Between Socio-Demographic Characteristics and levels Asthma Quality of Life Standardized Activities AQLQ (S) in both studied group patients. This table demonstrates there is no statistically significant relation was found either in study or control group between their socio-demographic characteristics and levels of asthma quality of life.

Table (9): Reveals the Relation Between Clinical data and levels of Asthma Quality of Life Standardized Activities AQLQ (S) in both studied group patients. This table shows there is no statistically significant relation was found either in study or control group between their clinical data and levels of asthma quality of life.

Table (1): Comparison between the Two Studied Groups According to their Socio-demographic Characteristics

Socio-demographic characteristics	Study (n = 30)		Control (n = 30)		Test of Sig.	P
	No.	%	No.	%		
Age (Years)						
<35	7	23.3	8	26.7		
35 - 45	10	33.3	11	36.7	χ^2= 0.281	0.869
>45	13	43.3	11	36.7		
Min. – Max.	30.0 – 60.0		30.0 – 57.0		t=	0.462
Mean ± SD.	44.0 ± 10.45		42.13 ± 9.04		0.740	
Gender						
Male	16	53.3	17	56.7	χ^2=	0.438
Female	14	46.7	13	43.3	0.601	
Education						
Illiterate	19	63.3	19	63.3		
Primary	6	20.0	4	13.3	χ^2=	^{MC}p=
Secondary	2	6.7	2	6.7	1.052	0.870
Bachelor	3	10.0	5	16.7		
Occupation						
Unemployed	14	46.7	16	53.3		
Manual work	10	33.3	8	26.7	χ^2= 0.356	0.837
Sedentary work	6	20.0	6	20.0		
Marital status						
Single	2	6.7	2	6.7		
Married	19	63.3	19	63.3	χ^2=	^{MC}p=
Divorced	3	10.0	5	16.7	1.052	0.873
Widow	6	20.0	4	13.3		
Residence						
Rural	9	30.0	6	20.0	χ^2=	0.371
Urban	21	70.0	24	80.0	0.800	

SD: Standard deviation **t: Student t-test**
χ^2: Chi square test **MC: Monte Carlo**
p: p value for comparing between the studied groups

Table (2): Comparison Between the Two Studied Groups According To Their Clinical data.

Clinical data	Study (n = 30)		Control (n = 30)		χ^2	p
	No.	%	No.	%		
Environmental risk factors						
Yes	**30**	**100.0**	**30**	**100.0**	-	-
No	0	0.0	0	0.0		
If Yes , what factor?	**(n = 30)**		**(n = 30)**			
Smoking	14	46.7	16	53.3		
Dust	6	20.0	9	30.0	2.535	$^{MC}p=$
Cold air	3	10.0	2	6.7		0.460
Stress	7	23.3	3	10.0		
Associated diseases						
Yes	16	53.3	14	46.7	0.267	0.606
No	14	46.7	16	53.3		
Previous hospitalization						
Yes	23	76.7	22	73.3	0.089	0.766
No	7	23.3	8	26.7		
Family history						
Yes	26	86.7	24	80.0	0.480	0.488
No	4	13.3	6	20.0		
Duration of asthma						
Less than 1 year	4	13.3	6	20.0		
1 – 3 year	9	30.0	11	36.7	1.133	0.567
More than 3 year	17	56.7	13	43.3		
Regular controller medications used						
Corticosteroids	27	90.0	28	93.3		
Mast cell stabilizer	1	3.3	1	3.3	0.672	$^{MC}p=$
Long acting beta agonist	2	6.7	1	3.3		1.000
Leukotriene modifier	0	0.0	0	0.0		
Quick-relief medications used						
Short acting inhaled B agonists	23	76.7	25	83.3	0.417	0.519
Inhaled anticholinergic	7	23.3	5	16.7		

SD: Standard deviation **t: Student t-test**
χ^2: Chi square test **MC: Monte Carlo**
p: p value for comparing between the studied groups

Table (3): Comparison Between the Two Studied Groups According to Overall Asthma Control Test (ACT) Pre and Post Buteyko Breathing Technique Application.

Over all Asthma Control Test (ACT)	Study (n = 30)				Control (n = 30)				Test Of Sig. (p_1)	Test Of Sig. (p_2)
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
Very Poor controlled (<16)	28	93.3	17	56.7	27	90.0	28	93.3	χ^2=0.218 (1.000)	χ^2=10.756* (^{MC}p <0.001*)
Moderate Controlled (16 - 19)	2	6.7	13	43.3	3	10.0	2	6.7		
Well Controlled (20 - 25)	0	0.0	0	0.0	0	0.0	0	0.0		
MH (p_0)	0.0* (0.005*)				0.0 (0.317)					
Total score (5 - 25)									t=0.552 (0.583)	t=5.912* (<0.001*)
Min. – Max.	11.0 – 19.0		14.0 – 19.0		11.0 – 19.0		8.0 – 19.0			
Mean ± SD.	12.63 ± 1.90		16.0 ± 2.35		12.93 ± 2.29		12.57 ± 2.14			
Average score (1 - 5) (Mean ± SD.)	2.53 ± 0.38		3.20 ± 0.47		2.59 ± 0.46		2.51 ± 0.43			
% Score (Mean ± SD.)	38.17 ± 9.51		55.0 ± 11.74		39.67 ± 11.44		37.83 ± 10.72			
t_0 (p_0)	5.883* (<0.001*)				1.690 (0.102)					

SD: **Standard deviation** **t: Student t-test** **t_0: Paired t-test**
χ^2: **Chi square test** MC: **Monte Carlo** MH**: Marginal Homogeneity Test**
p_0: p value for comparing between **pre** and **post** in each group
p_1: p value for comparing between the studied groups in **pre**
p_2: p value for comparing between the studied groups in **post**
*: Statistically significant at $p \leq 0.05$

Table (4): Comparison Between The Two Studied Groups According to Overall Asthma Quality of Life Questionnaire Standardized Activities AQLQ (S) Pre and Post Buteyko Breathing Technique Application.

Asthma Quality of Life Questionnaire Standardized Activities. AQLQ (S)	**Study (n = 30)**				**Control (n = 30)**				**Test of Sig. (p_1)**	**Test of Sig. (p_2)**
	Pre		**Post**		**Pre**		**Post**			
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
Low (<50%)	30	100.0	0	0.0	30	100.0	27	90.0	–	χ^2= 57.588* (^{MC}p <0.001*)
Moderate (50 - <75%)	0	0.0	23	76.7	0	0.0	3	10.0		
High (≥75%)	0	0.0	7	23.3	0	0.0	0	0.0		
Test of Sig. (p_0)	48.500* (<0.001*)				Mc=3.158 (0.250)					
Total score (32 - 224)										
Min. – Max.	54.0 – 72.0		135.0 – 185.0		39.0 – 116.0		52.0 – 147.0			
Mean ± SD.	60.63 ± 5.97		154.1 ± 15.35		66.03 ± 14.35		70.93 ± 22.95			
Average score (1 - 7) (Mean ± SD.)	1.89 ± 0.19		4.82 ± 0.48		2.06 ± 0.45		2.22 ± 0.72		t=1.903 (0.064)	t= 16.501* (<0.001*)
% Score (Mean ± SD.)	14.91 ± 3.11		63.59 ± 7.99		17.73 ± 7.47		20.28 ± 11.95			
t_0 (p_0)	30.774* (<0.001*)				1.836 (0.077)					

SD: **Standard deviation** **t: Student t-test** **t_0: Paired t-test**
χ^2: **Chi square test** MC: **Monte Carlo** MH**: Marginal Homogeneity Test**
p_0: p value for comparing between **pre** and **post** in each group
p_1: p value for comparing between the studied groups in **pre**
p_2: p value for comparing between the studied groups in **post**
*: Statistically significant at $p \leq 0.05$

Table (5): Correlation between Asthma Control Test (ACT) and Asthma Quality of Life Questionnaire Standardized Activities. AQLQ (S) Pre and Post Buteyko Breathing Technique Application in both studied groups

Asthma Control Test (ACT) and Asthma Quality of Life Questionnaire Standardized Activities. AQLQ (S)	Study (n = 30)		Control (n = 30)	
	Pre	Post	Pre	Post
r	-0.188	0.454*	0.071	0.167
p	0.319	0.012*	0.707	0.378

r: Pearson coefficient

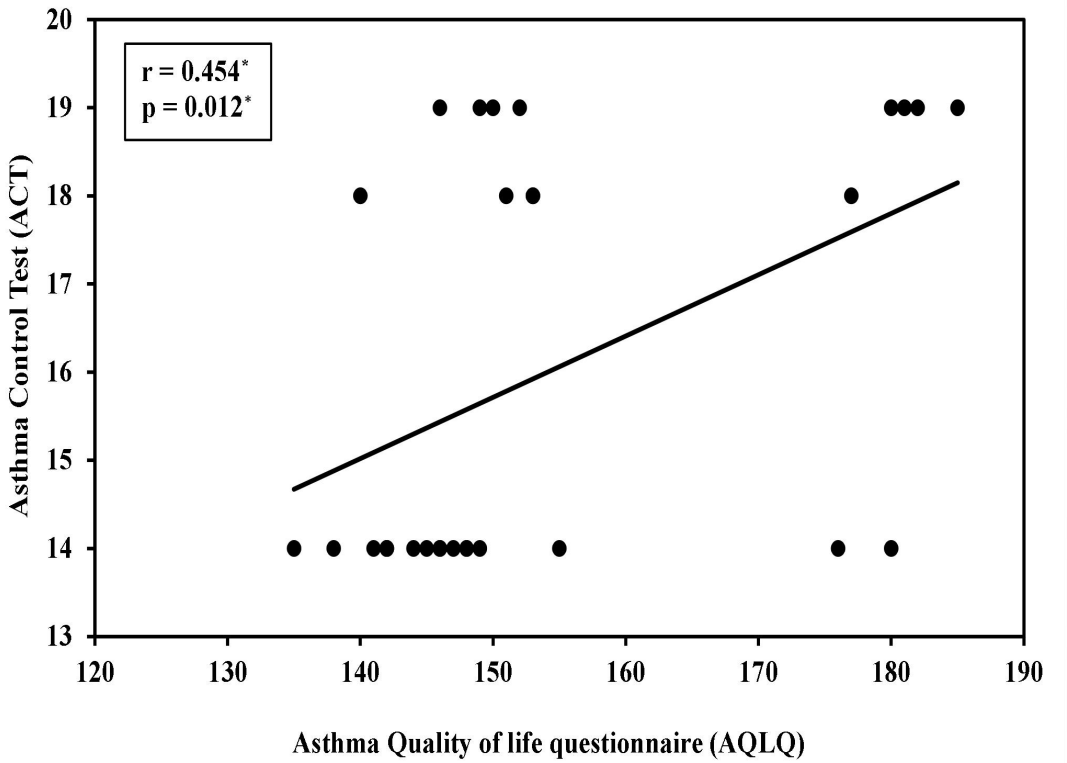

Figure (1): Correlation between Asthma Control Test (ACT) and Asthma Quality of Life Questionnaire Standardized Activities. AQLQ (S) in Post Study Group

Table (6): The Relation Between Socio-Demographic characteristics and levels of asthma control in both studied group patients.

Socio-demographic characteristics	Levels of asthma control											
	Study (n = 30)						Control (n = 30)					
	Very poor controlled (n = 17)		Moderate Controlled (n = 13)		Well Controlled (n = 0)		Very Poor Controlled (n = 28)		Moderate Controlled (n = 2)		Well Controlled (n = 0)	
	No	%	No	%	No	%	No	%	No	%	No	%
Age (Years)												
<35	1	14.3	6	85.7	–	–	7	87.5	1	12.5	–	–
35 – 45	6	60.0	4	40.0	–	–	10	90.9	1	9.1	–	–
>45	10	76.9	3	23.1	–	–	11	100.0	0	0.0	–	–
χ^2 (p)	7.024* (^{MC}p=0.038*)						1.600 (^{MC}p=0.718)					
Gender												
Male	8	50.0	8	50.0	–	–	16	94.1	1	7.7	–	–
Female	9	64.3	5	35.7	–	–	12	92.3	1	5.9	–	–
χ^2 (p)	0.621 (0.431)						0.039 (^{FE}p=1.000)					
Education												
Illiterate	13	68.4	6	31.6	–	–	19	100.0	0	0.0	–	–
Primary	2	33.3	4	66.7	–	–	4	100.0	0	0.0	–	–
Secondary	1	50.0	1	50.0	–	–	1	50.0	1	50.0	–	–
Bachelor	1	33.3	2	66.7	–	–	4	80.0	1	20.0	–	–
χ^2 (p)	3.358 (^{MC}p=0.363)						7.131 (^{MC}p=0.081)					
Occupation												
Unemployed	9	64.3	5	35.7	–	–	15	93.8	1	6.3	–	–
Manual work	6	60.0	4	40.0	–	–	8	100.0	0	0.0	–	–
Sedentary work	2	33.3	4	66.7	–	–	5	83.3	1	16.7	–	–
χ^2 (p)	1.688 (^{MC}p=0.560)						1.658 (^{MC}p=0.421)					
Marital status												
Single	0	0.0	2	100.0	–	–	2	100.0	0	0.0	–	–
Married	11	57.9	8	42.1	–	–	17	89.5	2	10.5	–	–
Divorced	3	100.0	0	0.0	–	–	4	100.0	0	0.0	–	–
Widow	0	0.0	6	100.0	–	–	5	100.0	0	0.0	–	–
χ^2 (p)	10.308* (^{MC}p=0.006*)						1.453 (^{MC}p=1.000)					
Residence												
Rural	1	11.1	8	88.9	–	–	6	100.0	0	0.0	–	–
Urban	16	76.2	5	23.8	–	–	22	91.7	2	8.3	–	–
χ^2 (p)	10.866* (^{FE}p=0.002*)						0.536 (^{FE}p=1.000)					

χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**
p: p value for comparing between different categories
*: Statistically significant at $p \leq 0.05$

Table (7): The Relation Between clinical data and levels of asthma control in both studied group patients .

Clinical data	Levels of asthma control											
	Study (n = 30)						Control (n = 30)					
	Very poor controlled (n = 17)		Moderate Controlled (n = 13)		Well Controlled (n = 0)		Very Poor controlled (n = 28)		Moderate Controlled (n = 2)		Well Controlled (n = 0)	
	No	%	No	%	No	%	No	%	No	%	No	%
If Yes , what factor?												
Smoking	8	57.1	6	42.9	–	–	15	93.8	1	6.3	–	–
Dust	3	50.0	3	50.0	–	–	8	88.9	1	11.1	–	–
Cold air	3	100.0	0	0.0	–	–	2	100.0	0	0.0	–	–
Stress	3	42.9	4	57.1	–	–	3	100.0	0	0.0	–	–
χ^2 (p)	2.710 (^{MC}p=0.499)						1.668 (^{MC}p=1.000)					
Associated diseases												
Yes	12		4		–	–	12	85.7	2	14.3	–	–
No	5		9		–	–	16	100.0	0	0.0	–	–
χ^2 (p)	9.020* (0.003*)						2.449 (^{FE}p=0.209)					
Previous hospitalization												
Yes	15	65.2	8	34.8	–	–	20	909	2	9.1	–	–
No	2	28.6	5	71.4	–	–	8	100.0	0	0.0	–	–
χ^2 (p)	2.935 (^{FE}p=0.190)						0.779 (^{FE}p=1.000)					
Family history												
Yes	17	65.4	9	34.6	–	–	22	91.7	2	8.3	–	–
No	0	0.0	4	100.0	–	–	6	100.0	0	0.0	–	–
χ^2 (p)	6.036* (^{FE}p=0.026*)						0.536 (^{FE}p=1.000)					
Duration of asthma												
Less than 1 year	2	50.0	2	50.0	–	–	6	100.0	0	0.0	–	–
1 – 3 year	5	55.6	4	44.4	–	–	10	90.9	1	9.1	–	–
More than 3 year	10	58.8	7	41.2	–	–	12	92.3	1	7.7	–	–
χ^2 (p)	0.312 (^{MC}p=1.000)						0.750 (^{MC}p=1.000)					
Regular controller medications used												
Corticosteroids	15	55.6	12	44.4	–	–	26	92.9	2	7.1	–	–
Mast cell stabilizer	1	100.0	0	0.0	–	–	1	100.0	0	0.0	–	–
Long acting beta agonist	1	50.0	1	50.0	–	–	1	100.0	0	0.0	–	–
Leukotriene modifier	0	0.0	0	0.0	–	–	0	0.0	0	0.0	–	–
χ^2 (p)	1.019 (^{MC}p=1.00)						2.228 (^{MC}p=1.000)					
Quick-relief medications used												
Short acting inhaled B agonists	12	52.2	11	47.8	–	–	23	92.0	2	8.0	–	–
Inhaled anticholinergic	5	71.4	2	28.6	–	–	5	100.0	0	0.0	–	–
χ^2 (p)	0.810 (^{FE}p=0.427)						0.429 (^{FE}p=1.000)					

χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**

p: p value for comparing between different categories *: Statistically significant at $p \leq 0.05$

Table (8): The Relation Between Socio-Demographic Characteristics and levels Asthma Quality of Life Standardized Activities AQLQ (S) in both studied group patients

Socio-demographic characteristics	Levels of asthma quality of life											
	Study (n = 30)						Control (n = 30)					
	Low (n = 0)		Moderate (n = 23)		High (n = 7)		Low (n = 27)		Moderate (n = 3)		High (n = 0)	
	No	%	No	%	No	%	No	%	No	%	No	%
Age (Years)												
<35	–	–	4	57.1	3	42.9	7	87.5	1	12.5	–	–
35 – 45	–	–	9	90.0	1	10.0	10	90.9	1	9.1	–	–
>45	–	–	10	76.9	3	23.1	10	90.9	1	9.1	–	–
χ^2 (p)	2.379 (^{MC}p=0.353)						0.534 (^{MC}p=1.000)					
Gender												
Male	–	–	10	62.5	6	37.5	15	88.2	2	11.8	–	–
Female	–	–	13	92.9	1	7.1	12	92.3	1	7.7	–	–
χ^2 (p)	3.846 (^{FE}p=0.086)						0.136 (^{FE}p=1.000)					
Education												
Illiterate	–	–	14	73.7	5	26.3	17	89.5	2	10.5	–	–
Primary	–	–	4	66.7	2	33.3	3	75.0	1	25.0	–	–
Secondary	–	–	2	100.0	0	0.0	2	100.0	0	0.0	–	–
Bachelor	–	–	3	100.0	0	0.0	5	100.0	0	0.0	–	–
χ^2 (p)	1.437 (^{MC}p=0.898)						2.040 (^{MC}p=0.545)					
Occupation												
Unemployed	–	–	13	92.9	1	7.1	14	87.5	2	12.5	–	–
Manual work	–	–	6	6.0	4	40.0	8	100.0	0	0.0	–	–
Sedentary work	–	–	4	66.7	2	33.3	5	83.3	1	16.7	–	–
χ^2 (p)	4.098 (^{MC}p=0.135)						1.357 (^{MC}p=0.569)					
Marital status												
Single	–	–	1	50.0	1	50.0	2	100.0	0	0.0	–	–
Married	–	–	14	73.7	5	26.3	17	89.5	2	10.5	–	–
Widow	–	–	6	100.0	0	0.0	4	100.0	0	0.0	–	–
Divorced	–	–	2	66.7	1	33.3	4	80.0	1	20.0	–	–
χ^2 (p)	3.270 (^{MC}p=0.329)						1.594 (^{MC}p=0.753)					
Residence												
Rural	–	–	5	55.6	4	44.4	6	100.0	0	0.0	–	–
Urban	–	–	18	85.7	3	14.3	21	87.5	3	12.5	–	–
χ^2 (p)	3.203 (^{FE}p=0.153)						0.833 (^{FE}p=1.000)					

χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**
p: p value for comparing between different categories

Table (9): The Relation Between Clinical data and levels of Asthma Quality of Life Standardized Activities AQLQ (S) in both studied group patients

Clinical data	Levels of asthma quality of life											
	Study (n = 30)						Control (n = 30)					
	Low (n = 0)		Moderate (n = 23)		High (n = 7)		Low (n = 27)		Moderate (n = 3)		High (n = 0)	
	No	%	No	%	No	%	No	%	No	%	No	%
If Yes , what factor?												
Smoking	–	–	9	64.3	5	35.7	14	87.5	2	12.5	–	–
Dust	–	–	6	100.0	0	0.0	8	88.9	1	11.1	–	–
Cold air	–	–	3	100.0	0	0.0	2	100.0	0	0.0	–	–
Stress	–	–	5	71.4	2	28.6	3	100.0	0	0.0	–	–
χ^2 (p)	3.335 (^{MC}p=0.368)						0.998 (^{MC}p=1.000)					
Associated diseases												
Yes	–	–	11	68.8	5	31.3	13	92.9	1	7.1	–	–
No	–	–	12	85.7	2	14.3	14	87.5	2	12.5	–	–
χ^2 (p)	1.201 (^{FE}p=0.399)						0.238 (^{FE}p=1.000)					
Previous hospitalization												
Yes	–	–	18	78.3	5	21.7	19	86.4	3	13.6	–	–
No	–	–	5	71.4	2	28.6	8	100.0	0	0.0	–	–
χ^2 (p)	0.140 (^{FE}p=1.000)						1.212 (^{FE}p=0.545)					
Family history												
Yes	–	–	21	80.8	5	19.2	23	95.8	1	4.2	–	–
No	–	–	2	50.0	2	50.0	4	66.7	2	33.3	–	–
χ^2 (p)	1.835 (^{FE}p=0.225)						4.537 (^{FE}p=0.094)					
Duration of asthma												
Less than 1 year	–	–	4	100.0	0	0.0	5	83.3	1	16.7	–	–
1 – 3 year	–	–	5	55.6	4	44.4	10	90.9	1	9.1	–	–
More than 3 year	–	–	14	82.4	3	17.6	12	92.3	1	7.7	–	–
χ^2 (p)	3.087 (^{MC}p=0.207)						0.895 (^{MC}p=1.000)					
Regular controller medications used												
Corticosteroids	–	–	21	77.8	6	22.2	25	89.3	3	10.7	–	–
Mast cell stabilzer	–	–	1	100.0	0	0.0	1	100.0	0	0.0	–	–
Long acting beta agonist	–	–	1	50.0	1	50.0	1	100.0	0	0.0	–	–
Leukotriene modifier	–	–	0	0.0	0	0.0	0	0.0	0	0.0	–	–
χ^2 (p)	1.649 ^{MC}p=0.552)						1.638 (^{MC}p=1.000)					
Quick-relief medications used												
Shrt acting inhaled B agonists	–	–	19	82.6	4	17.4	23	92.0	2	8.0	–	–
Inhaled anticholinergic	–	–	4	57.1	3	42.9	4	80.0	1	20.0	–	–
χ^2 (p)	1.946 (^{FE}p=0.306)						0.667 (^{FE}p=0.433)					

χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**
p: p value for comparing between different categories

Discussion

One of the most prevalent chronic diseases affecting the lungs, asthma results in recurrent bouts of coughing, chest tightness, and wheezing. Chronic obstructive pulmonary disease (COPD), which ranks third globally and causes 6% of all fatalities, was listed among the top 10 dangerous diseases by the World Health Organization (WHO) in 2020

Xiong et al., (2023). According to the CDC's National Asthma Control Program, assisting asthmatic patients in improving their quality of life and overall health is a basic goal. Inhaled drugs can help manage asthma, and preventing the triggers that can cause an attack making it easier for patients with asthma to have a normal and active life. Nonetheless, a variety of non-pharmacological treatment modalities can help controlling asthmatic patients' symptoms. Asthma is incurable; however it is mainly preventable and controllable. Asthma breathing exercises can improve a patient's general breathing control, which can assist in managing asthma symptoms **Clemente-Suárez et al., (2023).**

In that context, **Grznár et al., (2022)** highlighted in their study that adding breathing exercises to pharmacological treatment would improve control over asthma symptoms. Among these breathing techniques is the Buteyko Breathing Technique, which has been shown to reduce blood pressure and pulse after two weeks of training and has been tested in the management of symptoms of a number of illnesses, including severe respiratory conditions and hypertension **Arora., (2020)** & **Burge et al., (2024).**The current study aimed to assess its effect on asthma control and QoL among asthmatic patients.

Regarding patients' socio-demographic characteristics and clinical data. The main results of the current study revealed that the majority of the studied patients in the studied both groups were males and in the age group more than 45 years old. This finding was supported by **AbdElmawla et al., (2023)** who found that nearly half of their studied patients with asthma were men aged more than 50 years. However, this finding was in disagreement with **Quirt et al., (2018)** who mentioned that the higher increase in prevalence of asthma was among adolescence and young adulthood and lower among older ages.

In this context, **Khosa et al., (2023)** age-related physiological changes have an impact on asthma in the older adult population, compared to younger asthma patients, older asthmatics had higher rates of airway blockage and hyperresponsiveness. Furthermore, the decline in lung function associated with aging may be caused by a number of factors, including decreased respiratory muscle strength, increased central airway thickness, decreased lung compliance, and decreased lung elastic recoil. Additionally, the current study findings showed that largest proportion of the studied patients in both groups were illiterate, unemployed, married and from urban residence. This finding was in same line with **Rahi et al., (2019) , AbdElmawla et al., (2023**) in their similar studies. On the other hand, this results were not in the same line with **Mohamed & Ibrahim, (2018)** who found that the majority of their studied asthmatic patients were highly educated and had governmental occupation.

Regarding clinical data, The current study demonstrated that the most prevalent environmental risk factors among patients in both groups were smoking, dust, and stress. This result was in line with that of a study conducted by **Clemente-Suárez et al., (2023)**, which was comparable in that study noted that exposure to tobacco smoking and other air pollution sources, as well as psychological stress, have all been linked to asthma symptoms. Lung irritation from cigarette smoke results in redness, edema, and increased mucus output. It erodes the lung's defenses and damages lung tissue, so causing asthma episodes and symptoms to occur. Additionally, smoking cigarettes increases the risk of developing lung cancer. **American Lung Association (2022).** As a matter of fact, this result could be attributed to that the majority of the studied asthmatic patients in both groups were males & smokers. Additionally, the majority of them were urban residents and so have increased risk of exposure to air pollutants and to environmental allergens which could lead to greater risk of suffering from symptoms of asthma.

The current study revealed that most of the studied patients in both groups had a family history of asthma and its duration was more than 3 years. This finding was in agreement with **Hassan et al., (2022)** who indicated that almost two thirds of the patients they evaluated had a family history of asthma. This conclusion could be explained by the discovery that a family history of allergies has been linked to an increased risk of developing asthma, as proposed by **Quirt et al., (2018)** in a prior

study. He clarified that a genetic predisposition can cause asthma to develop through a number of chromosomal areas, including those that are involved in the generation of IgE antibodies.

Moreover , The results of the current study showed that the vast majority of the patients in both groups underwent regular asthma controller therapy with prescribed corticosteroids. Additionally, around three quarters of the patients in both groups under study required the use of short-acting inhaled B agonists to quickly stop asthma attacks. That was in congruent with **de Lima et al., (2023)** who described the significance of starting asthma medication as soon as possible after diagnosis in order to control symptoms and reduce the likelihood of an aggravation. They also highlighted that prescription of drugs including long-acting bronchodilators and inhaled corticosteroids should be part of the treatment. However, these findings were not in agreement with **Quirt et al.,(2018)** who discovered in a related study that using fast acting inhaled beta2-agonists is favored over short acting forms of these drugs for a prompt treatment of asthma symptoms. As regard to significant difference between patients in both groups regarding sociodemographic characteristics and clinical data, no significant difference was observed.

Concerning asthma control , The current study findings showed that after applying Buteyko breathing exercises, the moderate asthma control of around half of patients in the study group had considerably improved. Furthermore, the results of this study demonstrated a highly statistically significant difference in the mean asthma control test (ACT) scores of patients in the study group before and after the use of Buteyko breathing exercises. Also, the results of this study demonstrated a highly statistically significant difference between the control and study groups following the intervention.

Similarly to this , **Bacon, & Platts-Mills., (2020) , AbdElmawla et al., (2023) & Urroz et al., (2023)** observed a higher increase in the mean score of asthma control test post-intervention and concluded that the Buteyko breathing training is effective in improving patients' lung function and lowering their body's sensitivity to CO2 levels in the blood, both of which lessen bronchospasm and symptoms of asthma. In addition **Mohamed & Ibrahim., (2019)** who reported that the Buteyko breathing technique is helpful in reducing the severity of asthma attacks.

Concerning studied asthmatic patients' quality of life. The current study findings presented a statistically significant improvement in the quality of life of most studied patients in the study group post-Buteyko breathing exercise application with significant increase in the mean total score of quality of life which was increased post-Buteyko breathing exercise application. Furthermore, the finding of the current study illustrated that there was a highly statistically significant difference between the control and study group post intervention in the level of quality of life as well as the mean total score. These results were in agreement with **Xiong et al., (2023)** who stated in a similar study that Buteyko breathing techniques can significantly enhance life quality and asthma management.

This improvement in the study group patients' quality of life might be attributed to that Buteyko breathing technique has been proved to be effective in enhancing lung function, which is linked to an improvement in airflow into and out of the lung, hence reducing the frequency of symptoms related to asthma without compromising one's capacity to do daily tasks. Furthermore, BBT aims to diminish hyperventilation and causing bronchodilation as well as the use and dependence on short-acting β2-agonists as a bronchodilator. Ultimately, this will enhance quality of life overall.

Concerning correlation between asthma control test (ACT) and asthma Quality of Life (AQOL): The current study found that there was a strong positive correlation between ACT post-application of Buteyko breathing and the quality of life of patients in the study group. This could be explained by the fact that asthmatic breathing dysfunction can lead to inadequate asthma control, and Beutyko breathing aims to treat this impairment, reduce hyperventilation, and ultimately enhance patients' quality of life. This opinion was supported by **de Lima et al., (2023)** who

illustrated that breathing exercise training programs have been utilized as a non-pharmacological intervention to help attain optimal lung ventilation, which improves quality of life and lessens the intensity of asthma episodes. They found that compared to patients with uncontrolled asthma, those with well-controlled asthma had superior QoL scores and better airway epithelial integrity. Moreover, **Marker., (2024)** in a prior similar study found that patients' quality of life increases if they are able to breathe more easily, and that the more their asthma is controlled, the better they can manage their symptoms.

Regarding the relation between levels of (ACT) and (AQOL) with patients' sociodemographic characteristic and clinical data: The results of the current study demonstrated a statistically significant correlation between the age of the study group's patients and their ACT level. It is evident that patients in the age group under 35 exhibited a reasonable level of control, while patients over 45 exhibited poor control. Moreover, significant association was noted between level of ACT and marital status as well as residence where poor level of asthma control was observed among married patients and who had urban residence. Ageing is a common risk factor for the majority of uncontrolled diseases, which could support our findings. Because they have stronger respiratory muscles and greater coping mechanisms, younger asthmatic patients may be able to better regulate their asthma symptoms than older ones. Further factors that may impact asthmatic patients' capacity to control their asthma include higher stressors linked to marriage and more exposure to air pollution in urban rather than rural locations, which could account for the current study's findings.

Furthermore, a statistically significant relationship was found between ACT levels and associated diseases as well as family history. Patients with a moderate level of asthma control did not have any associated diseases, in contrast to those with a poor level of control who did have associated diseases. Additionally, the level of asthma control was low in patients with a family history of asthma. These findings might be attributed to the difficulty and suffering which are usually encountered by patients with chronic diseases in dealing and coping with their diseases and ability to have control over asthma symptoms along with other diseases. They always have no encouragement to self-care or enough knowledge about their disease's care plan. In addition, patients with family history of asthma might have poor control over asthma symptoms due to having negative background about the disease from feedback of their family members who had asthma which might lead to asthmatic patients' disappointment and poor control of symptoms. Regarding relation between patients' sociodemographic characteristics , their clinical data and levels of quality of life, the current study results revealed that there were no significant relations.

Conclusion

In light of the current study's findings, it can be said that, when compared to the control group, the majority of asthmatic patients in the study group had a significant improvement in their overall asthma control and overall quality of life mean scores after applying Buteyko Breathing Technique. Moreover, the study's findings indicate that including the Buteyko Breathing Technique in an asthma patient's treatment protocol could improve their control of asthma symptoms and boost their overall QOL.

Recommendations

The study's findings lead to the following recommendations being proposed:

- Training nurses who treat asthmatic patients about BBT for use in inpatient treatment.
- As a safe and affordable way to reduce the symptoms of asthma and, thus, enhance life quality, patients with asthma should have access to BBT in addition to conventional therapy modalities.
- Simplified BBT pamphlets and posters ought to be available to patients with asthma. Healthcare settings ought to have access to these resources.
- Further studies are necessary to explore innovative methods for reducing asthma

symptoms, reducing the necessity for asthma prescription drugs, and enhancing quality of life.

- To enable results to be more broadly applied, the current study should be replicated using a bigger probability sample.

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