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## **Effectiveness of buteyko breathing exercise (BBE) on respiratory outcome among children with bronchial asthma admitted in paediatric unit of mgmcri, Puducherry**

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### **Abstract**

**Introduction:** Chronic respiratory disease especially childhood Bronchial asthma rate in India is increasing significantly compared with rates in other countries. According to report by American Academy of Allergy Asthma & Immunology (AAAAI), In world- wide, asthma accounts for nearly 500,000 hospitalizations per year and it is third ranking cause of hospitalization among children under 15 years old. Respiratory rehabilitation is an effective method in improving the respiratory functions and reducing the episodes of asthma attacks.

Buteyko Breathing Exercise (BBE) was brought into practice in Russia by Dr. Konstantin Buteyko and is based on the belief that asthma is caused by hyperventilation and hypocapnia. Buteyko exercise (BBE) is a breathing exercise that describes a series of breathing retraining as a management for Bronchial asthma as well as other respiratory conditions. Buteyko Breathing Exercise (BBE) is a set of shallow breathing exercises that helps to control symptoms of asthma. The Buteyko Breathing Exercise (BBE) helps to reduce hyper-inflation through nasal breathing known as “slow breathing” or reduced breathing and helps in reducing the symptoms of Bronchial asthma.

**Aim:** This study was aimed to assess the the effectiveness of Buteyko Breathing Exercise (BBE) on respiratory outcome among children with Bronchial asthma admitted in Paediatric Unit of MGMCRI, Puducherry.

**Methodology:** Quasi experimental non-equivalent control group pre-test post-test design and 70 children with Bronchial asthma were selected using purposive sampling technique was adopted for this study.

**Results:** The study results show that Buteyko Breathing Exercise (BBE) was effective in reduction of Bronchial asthma symptoms assessed by Modified Becker's Score and in improving oxygen saturation, Peak Expiratory Flow Rate, Breath Holding Time (BHT). The obtained test value was significant at  $p<0.001$  level. This study reveals that Buteyko Breathing Exercise (BBE) showed a significant improvement in respiratory outcome and promoting a better quality of life among children with Bronchial asthma.

**Keywords:** Effectiveness, buteyko breathing exercise (BBE), bronchial asthma, respiratory outcome, children

### **Introduction**

Respiratory disorders are more stressful for children than adults, and often leads to airway obstruction or respiratory failure. One such acquired chronic respiratory disorder is Bronchial asthma. Asthma (Az-ma) is derived from Greek word, means ‘to breath with open mouth’ or ‘breath rapidly and quickly’.

According to report by World Health Organization (WHO), it is globally estimated that 300 million people including all ages suffer from asthma and 250,000 people in the age group of 5 to 34years die of asthma every year. Over 80% of death due to asthma were reported from all over World. For the past 40 years the prevalence of asthma is increasing in accordance with allergy. The number of people with asthma will grow more than 100 million by 2025 at their lifetime.

Asthma reduces school performance including academic performance and social skills. The report on burden of asthma that was given by Disability-Adjusted Life Years (DALYs) in

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Worldwide, Bronchial asthma ranks 22, is same to that of other chronic disease such as Alzheimer disease and diabetes Mellitus.

According to report by American Academy of Allergy Asthma & Immunology (AAAAI), in world-wide, asthma accounts for nearly 500,000 hospitalizations per year and it is third ranking cause of hospitalization among children under 15 years old. The overall crude asthma incidence in children is 8.2%. Latino, Hispanics had the highest crude asthma incidence of 14.0% compared to 6% of African Americans and 6.7% for Caucasians. (United States Environmental Protection 2012). In India, children with the age of group of 5 to 14 years comprises of about one-fourth of the total population. The prevalence of Bronchial asthma in school going children has been reported as 4 to 20% from various geographic region.

Asthma cannot be completely cured, but it can be managed in many ways. Immediately when the child has been diagnosed with asthma, the child should be allowed to participate in daily physical activities as long as much possible. As Bronchial asthma is associated with dyspnoea and chest tightness, shallow breathing exercises are very essential for the children with Bronchial asthma in order to improve respiratory function and reduction of symptoms.<sup>13</sup> Respiratory rehabilitation is an effective method in improving the respiratory functions and reducing the episodes of asthma attacks. Buteyko Breathing Exercise is based on the idea that asthma and other respiratory diseases are caused by breathing that is rapid and deep breathing (over breathing or hyperventilation).

Buteyko Breathing Exercise (BBE) was brought into practice in Russia by Dr. Konstantin Buteyko and is based on the belief that asthma is caused by hyperventilation and hypocapnia. Buteyko exercise (BBE) is a breathing exercise that describes a series of breathing retraining as a management for Bronchial asthma as well as other respiratory conditions. Buteyko Breathing Exercise (BBE) is a set of shallow breathing exercises that helps to control symptoms of asthma. This can be cured in most of the patients using special breathing techniques to reduce the minute ventilation (S Cooper *et al.* 2003).

Buteyko theorized that asthma is made worse by hyperventilation or over breathing. Buteyko Breathing Exercise is based on Bohler's effect where presence of carbon dioxide decreases the affinity of haemoglobin to oxygen and enhances further release of oxygen to the tissue and vital organs. Hence hyperventilation in asthmatics leads to reduction in the blood and alveolar carbon dioxide levels and strengthens the bonds between haemoglobin and oxygen. This causes oxygen deficiency in the tissues and vital organs. Carbon dioxide is bronchodilator of the lung and in asthmatics, body compensates for hypo-capnea with corrective mechanisms to limit the release of carbon dioxide. This is due to tightening of bronchial muscles and production of excess mucus in the airways. These are well-known symptoms of asthma.

The Buteyko Breathing Exercise (BBE) helps to reduce hyper-inflation through the periods of controlled reduction in breathing known as "slow breathing" or "reduced breathing". This combined with periods of breath holding, known as "control pause" and "extended pause". Buteyko breathing exercise also includes advice on benefits of nasal breathing over oral breathing. The children with Bronchial asthma are encouraged to breathe through the nose. This

technique reduces hyperventilation, symptoms of asthma. (Robert *et al.*, 2008).

### **Statement of the problem**

A study to assess the effectiveness of Buteyko Breathing Exercise (BBE) on respiratory outcome among children with Bronchial asthma admitted in Paediatric Unit of MGMCR, Puducherry.

### **Objectives**

- To assess the Respiratory Outcome among children with Bronchial asthma admitted in Paediatric unit of MGMCR, Puducherry.
- To evaluate the effectiveness of Buteyko Breathing Exercise (BBE) on respiratory outcome among children with Bronchial asthma admitted in Paediatric Unit of MGMCR, Puducherry.
- To associate the respiratory outcome with the demographic variables of children with Bronchial asthma in experimental group and control group.

### **Research hypotheses**

H<sub>1</sub>: - There is a difference between pre-and post-test level of Respiratory outcome among children with Bronchial asthma.

H<sub>2</sub>: -There is an association between the Respiratory outcomes with selected demographic variables among children with Bronchial asthma.

### **Methodology**

The research design for this study was Quasi experimental non-equivalent control group pre-test and post-test design. Totally 70 children (6-12 years) with Bronchial asthma admitted in Paediatric unit of Mahatma Gandhi Medical College and Research Institute (MGMCR), Puducherry were selected by using non-probability purposive sampling technique

### **Criteria for sample selection**

#### **Inclusion Criteria**

Children who

- Aged between 6 and 12 years with Bronchial Asthma admitted in Paediatric unit for more than 5 days.
- can able to understand and speak Tamil
- Can able to understand and follow the instruction of exercise.
- Are willing to participate

#### **Exclusion Criteria**

Children with

- Severe Exacerbation of Asthma
- Physical disabilities such as blindness, deaf, dumb and specialized children (MR)
- Head injury, meningitis and with increased intracranial pressure.

### **Development and description of tool**

The tool was developed based on review of literature, opinion from experts in the field of medical and nursing. The following steps were undertaken to prepare the final tool

The tool consists of two sections:

#### **Section A: Demographic variable**

It consists of demographic variables of mother and child, that includes date of birth of the child, gender education of the child, education of the parents, occupation of the parents, monthly income of the family, residence, religion, primary care taker of the child, order of child birth, family history of smoking, family history of Bronchial asthma, pet animals in home, type of allergy to the child, frequency of

Score	Respiratory rate	Wheezing	Use of accessory muscle
0- Normal	<30	None	None
1-Mild distress	30-40	Terminal expiration	One site
2-Moderate distress	41-50	Entire expiration	Two sites
3- Severe distress	>50	Inspiration and entire expiration	Three sites or neck strap use

#### Score interpretation

- 0-Normal
- 1-3 Mild distress
- 4-6Moderate distress
- 7-9 Severe distress

#### (ii) Oxygen saturation

It consists of oxygen saturation ratings to measure oxygen level by using pulse oxy-meter.

- 99-100% Normal oxygen saturation
- 96-98% Mild Desaturation
- 93-95% Moderate Desaturation
- < 95% Hypoxic

#### (iii) Peak Expiratory Flow Rate (PEFR)

It consists of Peak flow zones namely green, high yellow zone, low yellow zone and red zone.

- 80-100% Normal Peak flow reading
- 50-79% Minimal airway narrowing
- <50% severe airway narrowing.

#### (iv) Breath Holding Time

It is the time duration that a child can comfortably hold breath after a normal exhalation measured with stop watch in seconds. (>25 s/min is considered to be normal)

#### Validity and reliability

Reliability as “the consistency with which an instrument measures the attribute”. An instrument is said to be reliable if its measures accurately reflect the true score of the attribute under investigation. Reliability coefficients higher than 0.70 are often considered satisfactory, but coefficients greater than 0.80 are far preferable. Polit *et al.* (2007)

#### Reliability of the tool

The researcher used to test retest method (Karl Pearson Reliability Formula) to assess the reliability of the tool. The overall reliability score obtained was  $r=0.87$ .

#### Ethical consideration

Ethical considerations are vital to any research study because of the influence on the researcher's ability to acquire and retain participants.

The researcher has done Buteyko Breathing Exercise (BBE) on children with Bronchial asthma at Paediatric unit of Mahatma Gandhi Medical College Research Institute & Hospital, Puducherry. The proposed study was conducted after the approval of the Institutional Human Ethical Committee. Permission were obtained from the concerned authorities. Informed consent (Assent) from the parents

Bronchial asthma in last year, duration of illness, use of regular medication, weather on the day of illness.

#### Section B: Assessment of respiratory outcome by using

1. Modified Becker's score
2. Oxygen saturation
3. Peak Expiratory Flow Rate (PEFR) and
4. Breathe holding time.

were obtained from the parents of children participating in study. Subjects had given the right to withdraw from the study at any time they want and assurance was given to the study subjects and parents that, the privacy and anonymity of the individual will be maintained confidentially

#### Data collection procedure

##### Phase 1: Pre-test assessment

After self-introduction, the study procedure was explained to the parent and informed written consent was obtained from those parents who are willing to involve their children with Bronchial Asthma in this study. The children with Bronchial asthma who are admitted in Paediatric unit of MGMCRI between 11<sup>th</sup> October -30<sup>th</sup> November 2017 was taken as samples for the study. The pre-test assessment of respiratory outcome was assessed by using modified Becker's score, Oxygen saturation, Peak expiratory flow rate and breathe holding time for both control and experiment group on the first day of data collection.

##### Phase 2: Intervention

The researcher made the subjects in experimental group to practice Buteyko Breathing Exercise (BBE) for two times a day, i.e., at 8.00-am and 4.00pm. This was continued for 5 consecutive days. The subjects in the control group received routine nursing care for 5 days.

##### Phase 3: Post-test assessment

On the fifth day, Post-test assessment of respiratory outcome based on Modified Becker's score, Oxygen saturation, Peak expiratory flow rate and breath holding time was assessed after finishing the intervention for 5 days in both control and experimental group

#### Plan for data analysis

The Researcher used Descriptive statistics which include frequency, percentage and mean, medium and standard deviation to assess the demographic variables of children with Bronchial asthma. Inferential statistics such as Cochran's test and Wilcoxon Signed Rank test and Mann-Whitney test was used to compare the effectiveness of pre and post-test assessment. Chi-square test and Mann-Whitney and Kruskal Wallis test was done to find out the association between the respiratory outcome and demographic variables.

#### Study results

##### Section A: socio demographic data:

- Among 35 children with Bronchial asthma in experimental group, 51.4%(18) of them belonged to the age between 8 and 10years, 54.4%(19) were males,

31.4%(11) were studying fourth standard, 97.1%(34) were Hindu, 97.1%(34) of children were taken care by their mother, 74.3%(26) children were the first child, 68.6%(24) had no history of smoking, 48.6%(17) had a family history of Bronchial asthma, 82.9%(29) had no pet animals, 45.7%(16) had dust allergy, 71.4%(25) had Bronchial asthma between 1 to 3 times and 91.4%(32) had no use of regular medications. In control Group, In control group, 40%(14) of them belonged to the age group 6-8 years, 60%(21) males, 28.6%(10) were studying fourth standard, 71.4%(25) were Hindu, 68.6%(24) were taken care by their mother and

65.7%(23) were the first child, 60%(21) had no history of smoking, 57%(20) had family history of Bronchial asthma, 71.4%(25) had not kept animals in home, 37%(13) had dust allergy. 74.3% (26) had 1 to 3 times and 68.6% (24) had no use of regular medication.

### Section B: assessment of respiratory outcome by

- 1) Modified Becker's Score
- 2) Oxygen saturation
- 3) Peak Expiratory Flow Rate (PEFR) and
- 4) Breath holding Time (BHT)

**Table 1:** Pre and Post- test level of Modified Becker's Score among children with Bronchial asthma. (N=70)

Modified Becker's Score	Pretest				Post test			
	Experimental Group		Control group		Experimental Group		Control group	
	n	%	n	%	n	%	N	%
No distress	0	0	0	0	20	57.1	3	8.6
Mild Distress	10	28.6	7	20	15	42.9	32	91.4
Moderate distress	25	71.4	28	80	0	0	0	0
Severe distress	0	0	0	0	0	0	0	0

**Table 2:** Pre and post-test level of Oxygen saturation among children with Bronchial asthma. (N=70)

Oxygen saturation	Pretest				Post test			
	Experimental Group		Control group		Experimental Group		Control group	
	n	%	n	%	n	%	N	%
Normal (99-100%)	0	0	0	0	35	100	27	8.6
Mild Desaturation (96-98%)	30	85.7	31	88.6	0	0	8	91.4
Moderate Desaturation (93-95%)	5	14.3	4	11.4	0	0	0	0
Hypoxic (<93%)	0	0	0	0	0	0	0	0

**Table 3:** Pre and post-test level of Peak Expiratory Flow Rate (PEFR) among children with Bronchial asthma. (N=70)

Peak Expiratory Flow Rate (PEFR)	Pretest				Post test			
	Experimental Group		Control group		Experimental Group		Control group	
	n	%	n	%	n	%	n	%
Normal peak flow reading (80-100%)	0	0	0	0	35	100	27	77.1
Minimal airway narrowing (50-79%)	30	85.7	31	88.6	0	0	8	22.9
Severe airway narrowing (<50%)	5	14.3	4	11.4	0	0	0	0

**Table 4:** Pre and post-test level of Breath Holding Time (BHT) among children with Bronchial asthma. (N=70)

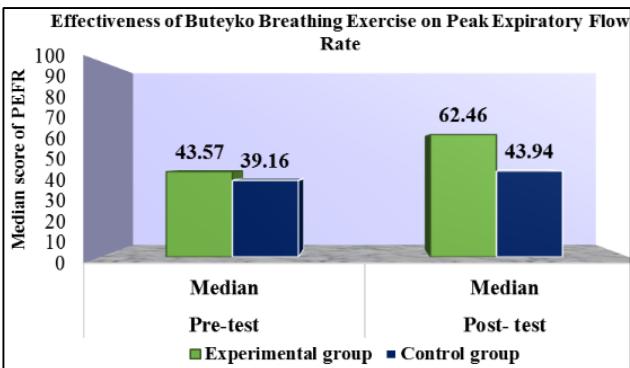
Breath Holding Time (BHT)	Pretest				Post test			
	Experimental Group		Control group		Experimental Group		Control group	
	n	%	n	%	n	%	N	%
1-10 Sec/min	29	82.9	35	100	0	0	0	8.6
11-20 Sec/min	6	17.1	0	0	0	0	0	91.4
21-30 Sec/min	0	0	0	0	35	100	21	0
31-40 Sec/min	0	0	0	0	0	0	14	0

### Section C: analysis of Effectiveness of Buteyko Breathing Exercise (BBE) on respiratory outcome among children with Bronchial asthma

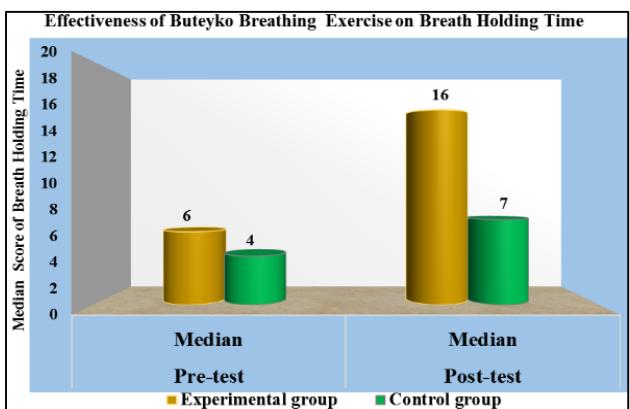
1. Findings related to effectiveness of Buteyko Breathing Exercise (BBE) on Modified Becker's score. The result shows that, the Cochrane's test value in experimental group and control was 3.025 and 0.365 respectively and obtained p-value was 0.041. It was significant at  $p<0.05\%$
2. Findings related to effectiveness of Buteyko Breathing Exercise (BBE) on Oxygen saturation shows that, the pre-test median oxygen saturation in experimental group and control group was 97 and 96, Post-test median score was 99 and 99 respectively. The obtained Wilcoxon 't' test value for experimental group was

5.247 and control group was 5.266 and indicates that Buteyko Breathing exercise (BBE) was significantly effective in improving oxygen saturation at  $p$ -value  $<0.001$

3. Findings related to effectiveness of Buteyko Breathing Exercise (BBE) on Peak Expiratory Flow Rate (PEFR) shows that the pre and post- test median score in experimental group was 43.57 and 62.46 and in control group was 39.16 and 43.94 respectively. The obtained Wilcoxon Signed rank test for experimental group was 5.159 and control group was 5.16 and indicates that Buteyko Breathing Exercise (BBE) was significantly effective in improving Peak Expiratory Flow rate at  $p<0.001$ .



**Findings related to effectiveness of Buteyko Breathing Exercise (BBE) on Breath Holding Time (BHT) shows that,** the pre-test median score in experimental group and control group was 6 and 4, and post-test median score was 16 and 7 respectively. The obtained 't' test for experimental group was 7.173 and control group was 2.937 and indicates that Buteyko breathing Exercise (BBE) was significantly effective in improving Breath Holding time at  $p<0.001$



#### Section D: findings related to association between respiratory outcomes with selected demographic Variables

With regard to association between Modified Becker's score level, age of the children with Bronchial asthma in experimental group and Control group were associated.

With regard to oxygen saturation, there is no significant association with the selected demographic variables at  $p<0.05$ .

With regard to Peak Expiratory Flow Rate (PEFR) there was a significant association with pet animals and type of allergy to the child among children with Bronchial asthma in experimental and control group, there was statistically significant association between Breath Holding Time (BHT) with type of allergy to the child and frequency of Bronchial asthma in last year among children with Bronchial asthma in experimental and control group.

#### Discussion

In this present study, majority of Children with Bronchial asthma in experimental and control group, 71. 4% (25) had moderate distress, 28. 6% (10) had mild distress and none of them had no distress and severe distress in experimental group. In control group, 80% (28) had moderate distress, 20% (7) had mild distress and none of them had no distress and severe distress.

The above results were supported by, Kimita Huidrom *et al.* (2016) conducted a study to assess the effectiveness of

Buteyko Breathing exercise (BBE) on respiratory parameters among 60 children (6-12 years) with Bronchial asthma, Pune. Modified observational tool such as Becker's score, Peak Expiratory Flow Rate, was used to assess the respiratory physiological parameters. During pre-test, majority of the subjects, 52(86.6%) in experimental group, 42 (70%) in control group had moderate distress. In post-test, 36 (60%) had mild distress 24(40%) had moderate distress in experimental group, and 58(96.7%) had moderate distress and 2 (3.3%) had severe respiratory distress in control group. The study showed that Buteyko Breathing Exercise (BBE) was effective in improving the respiratory physiological parameters among children with Bronchial asthma and there is significant difference between experimental pre-test and post-test ( $t29=16.6$ ,  $p<0.05$ ) and there is significant difference between experimental and control group ( $t58= 17.4$ ,  $p<0.05$ ).

The study results show that Buteyko Breathing Exercise (BBE) was effective in reduction of Bronchial asthma symptoms assessed by Modified Becker's Score and in improving oxygen saturation, Peak Expiratory Flow Rate, Breath Holding Time (BHT). The obtained test value was significant at  $p<0.001$  level.

The above results were supported by the study, Seema Pukhrambam (2015) conducted to assess the effectiveness of Buteyko breathing Exercise (BBE) on physiological parameters among children (6 to 12 years) with Bronchial asthma in selected hospital, Bangalore. 60 children were selected using non-probability purposive sampling method and children in experimental group received Buteyko breathing exercise (BBE) for 3 times for 5 days. Respiratory parameters such as respiratory rate, Oxygen Saturation, Breath sound, Peak Expiratory Flow rate and pulse rate were assessed. The study findings show that significant( $p<0.001$ ) improvement in oxygen saturation from 96% to 99%, Peak Expiratory Flow rate from 35% to 60%, reduction of respiratory rate, breath sounds and pulse rate

There was an association between the Respiratory outcome with age, birth order of the children, pet animals, and type of allergy and frequency of Bronchial asthma in last year among children with Bronchial asthma

Lalu (2017)<sup>[17]</sup> conducted a study to estimate the prevalence of Bronchial asthma and various factors associated with it among 629 School children (6-18 years) in Ernakulam district, Kerala. The results of the study show that the prevalence of Bronchial asthma was estimated to be 9.9% and children residing in a rural area, having dust allergy, family history of Bronchial asthma and passive smoking were significantly associated with Bronchial asthma

#### Recommendations

- The study can be replicated with larger sample for better generalization.
- The study can be done by comparison with other breathing exercises for Bronchial asthma.
- The study can be replicated in comparisons with nebulization and without nebulization.
- The study can be done by extending the duration of exercise to 3 months for better improvement and reduction of symptoms.

#### References

1. Milwaukee Asthma Statistics, American Academy of Allergy, Asthma & Immunology, 2002. Available

- from:www.aaaai.org/about-aaaai /newsroom/ asthma-statistics.
2. Cooper S, Oborne J, Newton S, Thompson Coon J, Lewis S. *et al.* Effect of two breathing Exercises (Buteyko and Pranayama) in children with asthma; a randomized controlled trial. *Thorax*. 2011; 58(18):674-679.
  3. Murthy KJR, Sastry JG. Burden of Asthma adapted from WHO Global Burden of Disease. *Indian J Med Res*. 2015; 141(4):380-82.
  4. Courtney Rosalba, Strengths, Weakness and possibilities of the Buteyko Breathing exercise, *Biofeedback* 36(2):59-63. Available from: [www.buteyko.co.nz/asthma/facts](http://www.buteyko.co.nz/asthma/facts).
  5. George Julian B. *Nursing Theories the Base for Professional Nursing Practice*. 6th Edition New Delhi: Dorling Kindersley India Pvt Ltd, 2011, 234-240.
  6. Jibin V Varkey, Yesodha K, Effectiveness of Breathing exercise in improving the Breathing pattern of Asthmatic children, *JNHS e- ISSN: 2320-1959*. 2017; 6(2):31-34. Available from: [www.iosr-journals.org/Doi:10.9790/1959-0602043134](http://www.iosr-journals.org/Doi:10.9790/1959-0602043134)
  7. Al Shima Ramadhan Azab, Samah A. Moaud, RAdwa S Abdul -Rahman, The effect of Buteyko Breathing exercise Vs yoga training on pulmonary functions and functional capacity in children with Bronchial asthma, *Ine J Therapies Reh. Res*. 2017; 6(1):148-153.
  8. Megha V Chavda, Hetshi M Shah. to compare the efficacy of pursed lip breathing and Buteyko Breathing Exercise to reduce the symptoms of exercise induced asthma in obese children. *Int J Curr Research*. 2016; 8(07):35-64
  9. GladisKamalam S. An experimental study to assess the effect of relaxed postures and Buteyko Breathing Exercise on Peak Expiratory Flow Rate (PEFR) in school children with Bronchial asthma. *IJTPR*. 2017; 6(1):148-62.
  10. Romella C. *et al.*, Effectiveness of Buteyko Breathing Exercise in improving asthma control and quality of life of 14 school-age children with the age group of. 7 to 11 years, 2014.
  11. Ritz T, Meurets AE, Wilhelm FH, Roth WT. Effect of Buteyko Breathing Exercise among twelve asthmatic children of age group 6-12 years in Southern Methodist University, USA. 2009; 34(1):1-6
  12. Upadhyay Dhungel K, Malhotra V, Sarkar D, Prajapati Effectiveness of Buteyko Breathing Exercise (BBE) on respiratory function among 50 asthmatic children with the age group of 6-18 years. *Nepal Med Coll J*. 2008; 10(1):25-27.
  13. Patrick McHugh *et al.* Effect of Buteyko Breathing Exercise among children with asthma, *N Z Med J* 2008; 119(1243):Ui1988.
  14. Sechenov's Medical Institute, USSR list of Studies on Buteyko Breathing Education among children with Bronchial asthma. Moscow. Available from URL: <http://www.buteyko.education./resources/trail-on-Buteyko-and-related-exercise.pdf>.
  15. Kimita Huidrom, Effectiveness of Buteyko Breathing Exercise (BBE) on respiratory parameters among children with Bronchial asthma. *Int J Recent Scientific Res*. 2017; 7(5):328-31.
  16. Seema Pukhrambam, Effectiveness of Buteyko Breathing Exercise (BBE) on Physiological parameters among children (6-12 years) with Bronchial asthma in selected hospital, Bangalore, (unpublished data), 2017.
  17. Lalu JS, Rakesh PS, Leelamoni K. Prevalence of bronchial asthma and factors associated with it among higher secondary school children in Ernakulam district, Kerala, Southern India. *J Family Med Prim Care*. 2017; 6:311-5.