



STUDY OF THE EFFECT OF THE COMBINATION OF HALOTHERAPY AND BREATHING GYMNASTICS IN CHILDREN WITH BRONCHIAL ASTHMA

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ABSTRACT

Purpose. To date, there is no developed program and in-depth analysis of the complex impact of the effect of the combination of halotherapy and respiratory gymnastics in children with bronchial asthma, and the effect of its application on the disease has not been tracked. For this reason, referring to the successful results of the combined application of physiotherapeutic techniques, natural and reshaped physical factors in the recovery process in bronchial asthma in childhood, the following research goal was set: to implement the combined application of respiratory gymnastics and halotherapy for more effective rehabilitation program and optimal functional recovery in children with bronchial asthma and to track the effect of its impact.

Material/Methods. The study was conducted from October 2018 to March 2020 in the city of Razgrad, Bulgaria, in the Resonance after-school training center.

Results. The results show that properly conducted respiratory rehabilitation, combining the application of respiratory gymnastics and aerosol therapy, can contribute to the improvement of clinical indicators, reducing the frequency and severity of paroxysmal conditions, improving ventilation indicators, some gas parameters, physical capacity and quality of life.

Conclusions. There are objective grounds for asserting that the tested physiotherapy program with an emphasis on respiratory gymnastics and halotherapy has a positive effect on the functional status of children with bronchial asthma and contributes to achieving independence in daily activities and improving their quality of life.

Keywords: physiotherapy, halotherapy, respiratory gymnastics, children with bronchial asthma,

INTRODUCTION

In terms of the frequency of morbidity, diseases of the respiratory system occur first - 39%. Leading among them are asthmatic conditions. [1] Asthma is a common pathology affecting about 15% to 20% of people in developed countries and about 2% to 4% in less developed countries. [2, 3] Asthma has varying degrees of severity, from very mild occasional wheezing to acute, life-threatening airway closure. [4] According to the WHO, the number of people suffering from bronchial asthma in the world is 300

million people. Over the last two decades of the 20th century, the incidence of the disorder has doubled in most countries in Europe and America and is greater in urbanized areas. With an expected increase in the world's urban population to 59% in 2025, the increase in the number of asthma sufferers is estimated at 100 million new people. The seriousness of the problem is emphasized by the frequency of the disease. In recent years, research has shown asthma to be the most common chronic disease in childhood and a leading cause of school absences, emergency department visits, and hospitalizations. [5, 6] Allergen-specific sensitization is one of the most important risk factors for the development of asthma. In Europe, 10% to 20% of adolescents between the ages of 13 and 14 suffer from severe allergic rhinitis. Although asthma is a reversible disorder, poor lifestyle and lack of management can lead to airway remodeling leading to chronic debilitating symptoms. [7]

Bronchial asthma is also associated with frequent development of complications, such as pneumothorax, pneumonia, respiratory failure, chronic obstructive pulmonary disease, chronic pulmonary heart disease. In this regard, respiratory rehabilitation in patients with bronchial asthma should be complex and include physiotherapy, reshaped physical factors, climate therapy [8]. Prolonged and painful inhalations have a negative effect on the growth and development of the child's organism. The resorption of some essential vitamins and minerals is reduced. There is a danger of forming chest deformities, permanent inability to maintain the correct posture, reduction of respiratory functional parameters and, last but not least, shortening of the auxiliary upper respiratory muscles. Regular physical activity not only improves general health but can also positively affect asthma outcomes such as control and quality of life [9]. Medical treatment includes bronchodilators such as beta-2 agonists and muscarinic antagonists and anti-inflammatory agents such as inhaled steroids [10].

Numerous clinical studies have been published in refereed scientific publications, revealing the importance of aerosol therapy for improving functional indicators in acute conditions. Halotherapy is a type of aerosol therapy and an alternative method for the treatment of many diseases, including bronchial asthma, has a significant positive effect on obstructive bronchial conditions caused by inflammation

and harmful accumulations in the respiratory system [11]. Salt in halotherapy is a more ecological, non-pharmacological substance, which makes it preferable to pharmacological agents such as histamine, methacholine, etc. This substance is cheap easy to prepare and use [12]. Salt therapy in respiratory medicine began to be used in the 19th century because of its practical benefits in respiratory patients. This observation laid the foundation for speleotherapy (aerosol therapy provided in a natural salt environment such as salt caves) [13]. In recent decades, halotherapy has shown increasing effectiveness in the world, being associated with numerous benefits in the treatment and prevention of asthma [14]. Sodium chloride particles are distributed naturally and have an antibacterial and anti-inflammatory effect even in the deepest parts of the bronchial system, an effect that is due to the unique dispersion of aerosols and micro-particles. A series of procedures for inhalation of dry saline aerosol leads to improvement of mucociliary clearance and reduction of bronchial inflammation, reduction or complete elimination of pathogenic microorganisms and bronchial hyperreactivity. As a result, lung function improves, fewer spastic attacks occur, and a patent airway is achieved with less use of medication to control symptoms. Salt has been used for its healing properties and therapeutic effects for millennia in different geographical regions and different cultures. The scientific literature is scarce regarding the physiotherapeutic means used and their combination with aerosol therapy in the general complex of treatment measures [13]. Two studies evaluated the credibility of the therapeutic benefits of halotherapy in acute asthma. In a double-blind, randomized clinical trial of 340 adult patients with acute asthma attacks, treatment with 3% hypersaline aerosolized salbutamol resulted in a significant increase compared with salbutamol alone in both peak expiratory flow rate after treatment [15].

Other studies have shown the effect of combined therapy - speleotherapy and recreational winter exercise in patients with high-functioning asthma with reasonable disease control [16]. According to the relative effect of treatment, a reduction in fractional exhaled nitric oxide was reported in the exercise group compared to the speleotherapy-only group. No participant had adverse effects during the winter sports and speleotherapy treatment. However, the impact of the study is limited by the small sample size and the fact that the included population showed good baseline spirometry [17].

Until now, no developed program or in-depth analysis has been conducted for the complex impact of the combination of halotherapy and respiratory gymnastics in children with bronchial asthma, and the effect of its application on the severity of the disease has not been tracked. The established findings necessitate the development and application of a complex scientifically based kinesitherapeutic methodology for the prevention and treatment of bronchial asthma in children. For this reason, referring to the successful results of the combined application of physiotherapeutic techniques, natural and reshaped physical factors in the recovery process in bronchial asthma in childhood, the following research goal was set:

to implement the combined application of respiratory gymnastics and halotherapy for more effective rehabilitation program and optimal functional recovery in children with bronchial asthma and to track the effect of its impact.

MATERIALS AND METHODS

The study was conducted from October 2018 to March 2020 in the city of Razgrad, Bulgaria, at the "Resonance" out-of-school training center. The impact of the developed physiotherapy program on 30 children, divided into two groups: 15 - control and 15 - experimental group with a diagnosis of bronchial asthma, was monitored. The children from the studied groups have had chronic bronchial asthma for an average of three years and are receiving outpatient treatment. All children are between 7 and 12 years old on average. Part of the contingent has bronchial asthma of unknown etiology, and others are sensitive to allergens from the environment. All of them have frequent asthma attacks related to environmental factors that can provoke the appearance of an acute attack of bronchial asthma in children, such as: aggressive physical effort, inhalation of very cold air, strong emotion, sudden change in climate and irritants such as sulfur dioxide, cigarette smoke and car exhaust.

The experimental group was given its own physiotherapy program - halotherapy and breathing exercises and the control group received routine physiotherapy, which included only breathing exercises. In the process of researching cardiovascular and respiratory dysfunctions, attention is paid not only to the patients but also to their parents and relatives, as well as to the people who take care of them. The examination requires an anamnesis of the children's medical and social condition, a review of the medical documentation, and tests conducted to establish their individual physical condition. Not only the physical but also the social and psychological parameters of suffering are considered. The examination requires an anamnesis of the children's medical and social condition, a review of the medical documentation, and tests conducted to establish their individual physical condition. Not only the physical but also the social and psychological parameters of suffering are considered. The following tests were conducted: Labor, domestic and recreational activities; Aerobic capacity and endurance; Ventilation and breathing; Anthropometric data; Muscular strength and endurance; Pose; Traffic volume.

A questionnaire was used on children who have asthma to discover any possible asthma triggers. The response to dosed physical exercise was investigated using a 3-minute step test for children. It may be an indicator of exercise-induced asthma. Children between 6 and 12 years of age would find it difficult to overcome the strain of the treadmill. During the bicycle ergometric test, the child is in a flexed position, which to some extent, improves the functional indicators. During the step test, verbal commands are used to guide the child in adjusting the intensity of the load. This gives better, more understandable information to the child. The duration of the step test is 3 minutes, the height of the step is 30 cm. A metronome is used,

which is set to 30 beats per minute. Verbal commands are “up, up, down, down.” A nose clip is placed to ensure mouth-only breathing. Pulse rate and oxygen saturation were periodically monitored using a Beurer 30 pulse oximeter. The American Lung Association offers annual asthma control tests with the “Childhood Asthma Control Test for children 4 to 11 years old”. This control test includes 4 questions for the child, with the parent explaining them and three questions that only the parent answers. Each of the first four questions is awarded from 0 to 3 points. The patient answers how he feels his illness assesses the manifestation of symptoms during exercise, night awakenings and coughing. The parent alone, without the intervention of the child, responds by reporting the frequency of symptoms, wheezing, and night waking. Ultimately, all the scores are added up, and if the total number of points is 19 or less, asthma is not well controlled. An asthma control test was used in children aged 5 to 7 years. Children were also shown a visual-analog scale for differentiating chest tightness and dyspnea due to throat closure again on a scale of 1 to 7 [18]. All special physiotherapeutic means are applied in combination with general developing exercises, the selection of which depends on the period of the disease, the individual characteristics of the child and tolerance to physical exertion. The means applied to the experimental group differed from those of the control group. In the control group, only respiratory gymnastics was applied, and in the experimental group, a combination of the halotherapy and breathing gymnastics methods was used. At the beginning of the rehabilitation program, halotherapy was first applied for 20 minutes, and then the respiratory gymnastics complex. The developed author’s scheme of the rehabilitation complex is implemented every other day, and the days of application are determined by the health condition of the child and the manifestation of asthma attacks. The training dosage was gradually increased. All international studies show that in order to achieve the necessary long-term results, training lasts from 3 to 6 months. This is a long time that requires a free, non-working parent. In the current conditions, this is impossible. Therefore, the children and their parents were trained in a complex therapeutic program and were introduced to an algorithm for hardening procedures, physical therapy, and the prevention of asthma triggers. They continued to perform the exercises in a home environment with the acquisition of the necessary equipment, which is mandatory for every asthmatic. In addition, the children and their parents were trained in postures to relieve the attack, as well as drainage postures to improve and increase expectoration. Basic emotions were trained with the children to achieve self-control. Positive feelings were elicited by referring the child to times in the past when he had felt happy. The assimilation of the therapeutic gymnastics complex is carried out in stages. After mastering the static breathing patterns, move on to performing dynamic breathing exercises [19]. Elements of mobile games were perceived with partial interest by children. Outside the performance of the complex, the children were trained in maintaining correct posture. Particularly effective results are observed in the pediatric contingent of pa-

tients.

When considering the data from the Functional Breathing Study in the control group and in the experimental group, there is a significant difference between the two groups due to the effect of halotherapy in the experimental group.

RESULTS

The results show that properly conducted respiratory rehabilitation, combining the application of respiratory gymnastics and aerosol therapy, can contribute to the improvement of clinical indicators, reducing the frequency and severity of paroxysmal conditions, improving ventilation indicators, some gas parameters, physical capacity and quality of life. Higher peak inspiratory pressure values are seen compared to forced expiratory volume. The static breathing exercise “Traffic light technique” with emphasis on controlled prolonged exhalation has a good effect on the results of the forced expiratory volume. To interpret the results of FID, we compared FEV1 with FVC and observed approximately the same values, which confirms that with adequate treatment in most of the children, the obstruction is reversible after the attacks subside. Functional disturbances subside. The three-minute step-test during exercise provides data on improved adaptation to physical effort. Children are able to respond better to aerobic exercise. A decrease in pulse rate and time period is observed. The pulse rate after exercise in the control and experimental groups recovered to reference values faster. Lower baseline values are seen compared to the step test performed before the procedures. Aerobic exercises included in the rehabilitation program improve the results of the step test.

DISCUSSION

Halotherapy is an aerosol therapy and alternative treatment method for many diseases. In recent decades, it has enjoyed the trust of more and more people suffering from respiratory diseases and, in particular, bronchial asthma. The effectiveness of salt treatment is mainly due to two reasons - antibacterial, anti-mycotic and anti-inflammatory effects (it has been found that the environment in salt rooms is 3 times more sterile than even the cleanest surgical room) and the natural ability to emit negative ions thus neutralizing the positive charge. The complex physiotherapy program implemented in both groups has a positive effect on the health of the children’s body. There are objective grounds for asserting that the tested physiotherapy program with an emphasis on respiratory gymnastics and halotherapy has a positive effect on the functional status of children with bronchial asthma and contributes to achieving independence in daily activities and improving their quality of life. The rehabilitation complex of exercises and prevention through halotherapy is the key to successfully solving the problems and complications caused by the disease. Observations of the results show changes in the mobility of the cervical-thoracic section of the spine and oxygen saturation, and a particularly large change in the indicators of the Functional Examination of Breathing is also found.

CONCLUSION

Halotherapy reduces the frequency of attacks and improves the child's tolerance and sensation during an attack. Applied elements of aerobic training increase adaptation to physical exertion, and dynamic breathing exercises positively affect the general mobility of the chest and are the only prevention of chest deformities. As recommen-

dations for the prevention and reduction of asthma symptoms and attacks, the children were directed to continue the physiotherapy program to maintain correct posture, preventing the development of asymmetry and the acquisition of functional spinal curvature. Tempering procedures help to reduce the reactivity of the child's organism to allergens, building healthy immunity.

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