Palestrica of the third millennium – Civilization and Sport
Vol. 16, no. 3, July-September 2015, 269–275

Benefits of rehabilitation programs for the asthmatic patient
Beneficiile programului de reabilitare în astm

Rodica Trăistaru [1], Diana Kamal [1], Mara Bălteanu [2], Taina Avramescu [3]
[1] *University of Medicine and Pharmacy of Craiova*
[2] *University Titu Maiorescu, Bucharest*
[3] *University of Craiova, Faculty of Sport and Kinetotherapy*

Abstract
Asthma is among the most important problems of medicine and is one of the most frequent chronic respiratory diseases. It is characterized by recurrent attacks of shortness of breath and wheezing, which vary from person to person. After a few years of treatment with medication, the patients with asthma have dysfunctions and disabilities. There is a real need of additional, non-drug remedies that can affect the basic clinical manifestations of the disease to improve the efficiency of treatment of such patients and reduce the drug load. The main goal of the rehabilitation treatment of asthma (allergic and non-allergic asthma, but also late onset asthma and asthma with fixed airflow limitation) is to restore the homeostatic self-regulation of the body and consists of many methods such as education, postural drainage, respiratory gymnastics, physical training, climatotherapy, speleotherapy, halotherapy, balneotherapy, and even spa treatment.
Key words: asthma, treatment, rehabilitation.

Rezumat
Astmul reprezintă una dintre cele mai frecvente afecţiuni cronice ale sistemului respirator şi una din provocările lumii medicale curente. Se caracterizează prin atacuri recurente de dispnee, wheezing, variabile de la persoană la persoană. După ani de tratament medicamentos, pacientul astmatic prezintă o disfuncţie/dizabilitate variabilă. Sunt necesare remedii nonfarmacologice (programe de reabilitare), care să controleze manifestările clinice şi să reducă disfuncţia/dizabilitatea pacientului, cu limitarea necesarului de medicamente. Scopul principal al programului de reabilitare la oricare pacient astmatic este de a reface starea de homeostazie a individului, cu capacitatea de self-control şi constă în mai multe metode (program educaţional, drenaj postural, gimnastică respiratorie, antrenament fizic, climatoterapie, balneoterapie, speleoterapie şi terapie inhalatorie, tratament de tip spa).
Cuvinte cheie: astm, tratament, reabilitare.

Introduction

Asthma is among the most important problems of medicine and is one of the most frequent chronic diseases of the respiratory organs. The health and socio-economic relevance of the problem is determined by further growth of the morbidity rate, difficulty in control over the process, increasing mortality, the high material damage to society (***, 2007).

Global Strategy for Asthma Management and Prevention, elaborated by Global Initiative for Asthma (GINA) and updated in 2015, defines asthma as a ”heterogeneous disease with chronic airway inflammation, history of wheeze, shortness of breath, chest tightness and cough that vary over time in intensity and variable expiratory airflow limitation”. These variations are triggered by allergens, irritant exposures, exercises, weather changes, viral respiratory infections (1).

Asthma symptoms can be resolved spontaneously or by medication, and they can also be absent for a long time (weeks or months). Another problem is the recurrent attacks of shortness of breath and wheezing, which vary in severity and frequency from person to person. These conditions are due to the inflammation of the air passages in the lungs and affect the sensitivity of the nerve endings in the airways, so they become easily irritated. During an attack, the lining of the passages swells, causing the airways to narrow and reduce the flow of air in and out of the lungs. The airways become narrow and swell and produce extra mucus. This can make breathing difficult and trigger coughing, wheezing and shortness of breath (***, 2007); (Clark & Rees, 1998).

Asthma affects all age groups but often starts in childhood. For some people, asthma is a minor nuisance. For others, it can be a major problem that interferes with daily activities and may lead to a life-threatening asthma attack. Asthma is a major burden on the individual patient

Received: 2015, June 1; *Accepted for publication:* 2015, June 22;
Address for correspondence: University of Medicine and Pharmacy of Craiova, No 2-4, Petru Rareş Str, Craiova, 200349, Romania
E-mail: rodicatraistru@hotmail.com
Corresponding author: Rodica Trăistaru, rodicatraistru@hotmail.com

and society. People with asthma have been reported to have lower levels of physical fitness, increased levels of psychological distress and reduced health-related quality of life (HRQoL), as well as school and work impairment (Holland et al., 2013).

Epidemiology

Asthma affects an estimated 300 million individuals worldwide. Annually, the World Health Organization has estimated that 15 million disability-adjusted life-years are lost and 250000 asthma deaths are reported worldwide (Eder et al., 2006).

The prevalence rate of asthma in industrialized countries ranges between 2-10%, but it depends on the state of the environment and anthropogenic activity. Trends suggest an increase in both the prevalence and morbidity of asthma, especially in children younger than 6 years. Factors that have been implicated include urbanization, air pollution, passive smoking, and change in exposure to environmental allergens (Clark & Rees, 1998; Eder et al., 2006).

Asthma predominantly occurs in boys in childhood, with a male-to-female ratio of 2:1 until puberty, when the male-to-female ratio becomes 1:1. Asthma prevalence is increased in very young and very old persons because of airway responsiveness and lower levels of lung function.

Two thirds of all asthma cases are diagnosed before the patient is aged 18 years. Approximately half of all children diagnosed with asthma have a decrease or disappearance of symptoms by early adulthood (Clark & Rees, 1998).

Etiology

Many asthma phenotypes have been described. The most common are:

- Allergic asthma with onset in childhood; patients have a positive family history and present positive skin tests to common allergens, allergic diseases such as eczema, allergic rhinitis, food or drug allergy. The precipitating factors can be easily detected in these patients (Cohn et al., 2004; Holgate & Polosa, 2006). Eosinophilic airway inflammation has good response to inhaled corticosteroid (ICS) treatment (1). In allergic asthma, the precipitating factors include: infection, house dust mites, pollens, animals, exercise, smoking, dust and pollution, drugs, foods, occupation, psychological factors, pregnancy and menstruation, gastro-oesophageal reflux, thyroid disease (Clark & Rees, 1998; Cohn et al., 2004).

- Non-allergic asthma diagnosed in adulthood, airway inflammation with eosinophils and neutrophils; this phenotype responds less well to ICS treatment (1); it presents persistent symptoms, it has no obvious precipitating factors, except infection, and the patients have negative skin tests (Clark & Rees, 1998; Holgate & Polosa, 2006).

- Late-onset asthma, with onset in adult life, particularly in women, without allergy. These patients require high doses of ICS or they are relatively refractory to corticosteroid treatment (1).

- Asthma with fixed airflow limitation: some patients with long-standing asthma develop fixed airflow limitation, due to the airway wall remodelling process.

- Asthma with obesity (1).

Pathology

The three main factors producing airflow obstruction in asthma are: the retention of bronchial secretions, thickening of the bronchial wall and bronchoconstriction (Clark & Rees, 1998); (***, 2007). Mucus in asthma is abnormally sticky and also has an inhibitory action on the cilia in the airways, both factors predisposing to mucus retention and plugging. The bronchial wall is also abnormal. Inflammatory cells, particularly eosinophils, invade the wall, which becomes oedematous. Between exacerbations these changes are reversible, but in the longer term bronchial mucous glands may enlarge, and bronchial smooth muscles and collagen beneath the basement membrane may become thick (Cohn et al., 2004; (***, 2007); Ohta et al., 2014). There may be an increase in the collagen laid down beneath the basement membrane, inducing sub-basement membrane fibrosis. This causes a remodelling of the airways with irreversible obstruction. The main physiological finding in asthma is airflow obstruction. The immunohistopathological features of asthma include inflammatory cell infiltration: neutrophils, eosinophils, lymphocytes, mast cell activation, epithelial cell injury (Clark & Rees, 1998; Holgate & Polosa, 2006, Ohta et al., 2014).

Treatment

The GINA report established the long term goals of asthma management to be the achievement of good symptom control and minimisation of future risk of exacerbations, fixed airflow limitation and side effects of treatment; also, the patients' own goals regarding their asthma and its treatment should be identified (1). For all the affected patients, the ultimate goal is to prevent functional and psychological morbidity to provide a healthy (or near healthy) lifestyle.

Pharmacological treatment of asthma covers *controller medication* (used for regular maintenance treatment to reduce airway inflammation and control symptoms in order to reduce future risks) and *reliever medication* (used during exacerbations). *Add-on therapies* can be considered when patients have persistent symptoms and exacerbations despite correct controller treatment (correct doses and correct administration of medication).

A stepwise approach of asthma in order to control symptoms and minimise future risks assumes the use of control agents such as *inhaled corticosteroids* (budesonide, beclomethasone dipropionate, fluticasone propionate, ciclesonide, mometasone propionate) in all control steps of asthma but in increasing doses, or/plus *leukotriene receptor antagonists* (montelukast, zafirlukast) or/ plus low doses of theophylline for step 2, *long-acting beta agonist bronchodilators* (LABA: formoterol, salbutamol, indacaterol) for steps 3, 4, 5, *ultra-long-acting anticholinergic bronchodilators* (tiotropium) in steps 4 and 5, and more recent strategies such as the use of anti-immunoglobulin E (IgE) antibodies (omalizumab) in step 5 of asthma treatment (***, 2007); (Incorvaia & Ridolo, 2015); (1). Relief medications include short-acting bronchodilators (SABA: salbutamol, ipratropium bromide), systemic corticosteroids (prednisone, methylprednisolone),

and low doses of inhaled corticosteroids/formoterol (Clark & Rees, 1998; Holgate & Polosa, 2006; Bateman et al., 2008); (1).

Despite the wide introduction in practice of documents regulating the principles of treatment and prevention of asthma, more than 80% of persons have a poor or bad disease control, clinical symptoms and a need for β 2-agonists. In addition, there is often a failure in patients that use hormonal drugs (***, 2007); (Lommatzsch & Virchow, 2014). GINA updated the strategies for asthma managment based on the individualization of treatment depending on patient characteristics, modifiable risk factors, patient preferences and practical issues (1).

Treatment of asthma exacerbations with medication is effective in cases of emergency. However, this treatment does not eliminate the cause of the disease: after a temporary physical alleviation, the next acute exacerbation of asthma is still inevitable, becoming more and more severe (Clark & Rees, 1998); (***, 2007); Bateman et al., 2008).

Moreover, each year of treatment of asthma with medication makes recovery difficult, as the use of drugs increases damage to the epithelium of the airways at cellular level, weakens the immune system as a whole and reduces the parenchyma of the lung tissue, that is the area of the lungs which is capable of gas exchange (Holgate & Polosa, 2006); (***, 2007).

After a few years of treatment with medications, patients with asthma have various dysfunctions and disabilities. As such, their quality of life and life expectancy is on average much lower than in healthy people. Comprehensive care involves not only using drugs, but also non-pharmacological treatment (Burianova et al., 2008). There is a real need of additional, in particular non-drug remedies that can affect the basic clinical manifestations of the disease to improve the efficiency of treatment of such patients and reduce the drug load (***, 2007); (Clark & Rees, 1998; Holgate & Polosa, 2006; Bateman et al., 2008). GINA recommends, in addition to pharmacological treatments, a few strategies in the management of asthma; physical activity and breathing exercises are two of these strategies (1).

Rehabilitation program

The holistic approach - In an attempt to develop alternative therapies for asthma, a complex holistic systemic therapy was proposed. This was aimed at the systemic restoration of the immune system, blood microcirculation and treatment of stress. It began with a complex systemic diagnosis of patients with asthma that included: determining the condition of the body homeostatic self-regulation, identifying the type of asthma, identifying the causes of immunologic abnormalities. The ultimate goal was to restore the homeostatic self-regulation of the body without involvement of medications. The algorithm for the treatment of asthma was developed on an individual basis, depending on the type of asthma and accompanying disorders (if any) of other body organs and systems (Solovyev, 2011).

Pulmonary rehabilitation programs are aimed at recovering and improving the respiratory function through a mechanical action on the more distal bronchial and pharmacological branches. Each pulmonary rehabilitation program is supposed to be a very important part of a comprehensive treatment and can help to improve breathing and decrease the incidence of musculoskeletal system dysfunctions (Slader et al., 2006). In 2013, Carson et al. published an analysis of 21 studies including 772 patients with asthma, who were randomised to undertake physical training or not. Physical training had to be undertaken for at least 20 minutes, two times a week, over a minimum period of four weeks. The authors' conclusions were that physical training can improve cardiopulmonary function and may have positive effects on the health-related quality of life in patients with asthma, benefits unrelated to the effects on lung function. There was no evidence of adverse effects caused by physical training on asthma symptoms. The same review shows that physical training is well tolerated by these patients. The intervention programmes that produced these benefits included aerobic conditioning using a treadmill, other aerobic exercises and swimming (Carson et al., 2013). Another strategy used in improving asthma symptoms was the association between physical activity and the education program and breathing exercises (Carson et al., 2013).

GINA mentions that there is little evidence to recommend one form of physical activity over another, but breathing exercises are useful supplements to asthma pharmacotherapy (evidence B) (1). Also, regular physical activity is recommended because of its general health benefits (evidence A) and the improvement of cardiopulmonary fitness, without a specific benefit on lung function or asthma symptoms, except for swimming in young people with asthma (evidence B). Information on the patient is important in order to provide advice about the prevention and management of exercise-induced bronchoconstriction (evidence A) (1). Therefore, the approach to the treatment of asthma was holistic and was chosen for each patient individually in accordance with the chosen strategic asthma treatment plan.

The components of holistic systemic therapy of asthma comprised the regulated and officially approved pulmonary rehabilitation methods and techniques, which included:

- education;
- chest physiotherapy;
- respiratory gymnastics;
- physical training;
- balneotherapy;
- climatotherapy;
- speleotherapy;
- sylvinite speleotherapy and chest cryomassage;
- halotherapy;
- spa therapy;
- others (acupuncture, with or without use of resonance on biologically active points, homeopathy).

Education means the individual recommendations on the way of life, diet, and nutrition (Milan et al., 2013). Each education lesson should include the pathophysiology of asthma, the importance of breathing exercises and physical training, all possibilities of treatment. The physical therapist offers materials about asthma and materials describing exercises.

Chest physiotherapy focused on breathing exercises and *respiratory gymnastics* (control breathing, thoracic

expansion exercises, forced expiratory technique, autogenic drainage, pursed lip breathing, diaphragmatic breathing, effective cough training and elimination of upper chest breathing) (Burianova et al., 2008). Buteyko is a specific form of breathing therapy (actually breathing restraint) that has been used in the management of asthma. Professor Konstantin Pavlovich Buteyko (Russia) developed it about 50 years ago. His theory was that many "civilisation-induced diseases" are caused by deep breathing. Buteyko therapy was developed as a way to reduce the depth of respiration. Many studies have shown that the Buteyko technique used in patients with asthma decreased the use of medication and improved their clinical status (Hassan et al., 2012; Cowie et al., 2008). A systematic review and meta-analysis showed improvements in HRQoL from trials of the Buteyko breathing technique or physiotherapist-led breathing retraining. In asthma, breathing retraining typically aims to eliminate over-breathing by developing a slow, shallow, controlled breathing pattern (Holland et al., 2012; Prem et al., 2013). Postural drainage consists of making the patient assume a certain position in order to facilitate the outflow of secretions from the different areas of the lungs. The drainage is accompanied by shaking vibrators, with compression of the chest wall and on exhalation by the percussion of the chest wall by means of the hand composed in the shape of cup, in order to obtain the detachment of the bronchial secretions from the walls, especially in chronic asthma (Slader et al., 2006). Moreover, expanding the excursions of the diaphragm allows to improve the mobility of the thoracic cage, gaining elasticity through relaxation and lengthening of the respiratory muscles intervening in breathing and thereby promoting drainage of bronchial secretions (Slader et al., 2006; Freitas et al., 2013).

Respiratory gymnastics represents a sequence of operations performed to improve the breathing mode of the lungs, which allows the exchange between oxygen and carbon dioxide in the blood. Just breathing properly provides a fair contribution of blood oxygen. Breathing exercises give many benefits such as the increase of the quantity of air blown into the lungs and the complete re-expansion of the same. It allows to recover gradually the tone of respiratory muscles and it facilitates the removal of phlegm from the bronchial tubes. Simple rhythmic breathing exercises may help agitated patients to stop hyperventilating and to use their inhaled therapy more effectively (Slader et al., 2006).

Physical training - Exercise training remains a cornerstone of pulmonary rehabilitation in patients with asthma, because physical training programs improve physical fitness, neuromuscular coordination and self confidence, without deleterious effects on asthma control (Chandratilleke et al., 2012). Although there were insufficient data to pool results due to diverse reporting tools, there was some evidence to suggest that physical training may have positive effects on the health-related quality of life (Pereira, 2014). Importantly, more recent randomised controlled trials have also shown positive effects of exercise training on asthma symptoms and quality of life in adults with moderate-to-severe persistent asthma (Mendes et al., 2010; Turner et al., 2011). The choice of the type of exercise training depends on the physiological requirements and goals of the individual patient, as well as on the available equipment at the rehabilitation centre where it is performed. Current evidence suggests that ground walking exercise training, Nordic walking exercise training, resistance training, water-based exercise training, tai chi, and nonlinear periodized exercise are all feasible and effective in patients with asthma. These exercise training modalities can be considered as part of a comprehensive, interdisciplinary rehabilitation program (Andrianopoulos et al., 2014). Physical training showed significant improvement in maximum oxygen uptake, though no effects were observed in other measures of pulmonary function. More research is needed to understand the mechanisms by which physical activity impacts asthma management (Pereira, 2014). The multidisciplinary inpatient rehabilitation program proved a significant short and long-term improvement in asthma control, physical fitness and HRQoL in adult asthmatic patients (Lingner et al., 2015). Exercise can be an important trigger of symptoms in some individuals, even when their asthma is otherwise well controlled. Exercise-induced bronchospasm typically occurs 5-10 min after exercise, with symptoms including breathlessness, wheeze, chest tightness or cough. For individuals with exercise-induced bronchospasm, GINA guidelines recommend pre-treatment with a rapid-acting inhaled b2-agonist prior to exercise. A gradual warm-up may also minimise exercise-induced bronchospasm. Cardiopulmonary exercise testing may be useful to detect exercise-induced bronchoconstriction prior to commencing an exercise program (Holland et al., 2012). The British Thoracic Society (BTS)/Scottish Intercollegiate Guidelines Network (SIGN) asthma guideline draws attention to exercise-induced asthma and precautions to prevent this should be followed if appropriate (Bolton et al., 2013).

Balneotherapy uses mineral waters that have special properties in an attempt to treat patients with asthma. Each water source has its own unique mineral properties which is suited to treat this disorder. These waters contain varying amounts of minerals that have proven health benefits (Rassulova et al., 2007; McNamara et al., 2013). In balneotherapy, mineral waters can be used internally or externally. Balneotherapy uses subterranean products, such as hot spring water, gases, muds, and climatic factors, as therapeutic elements. Therapy is conducted by combinations of hot spring water bathing, various thermotherapies and hydrotherapies, exercises, drinking waters, as a complex treatment. Hot spring water bathing as a "bath cure" is the most fundamental modality of balneotherapy, with repeated hyperthermic whole-body immersion at a water temperature that is quite hot. In this therapy, the direct effects of the physical factors of bathing, such as hydrostatic pressure, buoyancy, and water temperature, and the pharmacological properties of the hot spring water constituents exert important actions on the body. The complex therapeutic stimulation is repeatedly applied during a long-term period of 2-4 weeks. These therapeutic factors work to alter physiological functions comprehensively and non-specifically (Rassulova et al., 2007). The process of alteration is considered to

be mediated by the autonomic nervous, endocrine, and immune systems, resulting in normalisation of pathological functions and enhancement of the functional capacities and self-healing potential of the organism. Most physiological functions exhibit a circaseptan (about 7 days) rhythm during the course of adaptation to the therapeutic environment. The beneficial usefulness of balneotherapy has been well demonstrated in patients with asthma. In most cases, clinical symptoms were improved. Moreover, basic studies showed immune and antioxidative defence systems were ameliorated or enhanced (Andrianopoulos et al., 2014). The significance of modern balneotherapy has been increasingly emphasized, especially for the purposes of preventive medicine and health promotion (Cowie et al., 2008).

Climatotherapy - Alpine climatotherapy improves the general status; patients with asthma manifest an amelioration of ventilation and decreased responsiveness of the bronchial tree by the end of alpine climatotherapy. Favourable alterations in the immune parameters together with appreciable stimulation of steroidogenesis in the adrenals are discovered. Alpine climatotherapy produces a favourable effect on the main mechanisms of disease development and can be used on a wider basis for the treatment of patients suffering from asthma. Maritime climate also improves the clinical status of patients with asthma (Schuh & Nowak, 2011; Massimo et al., 2014).

Speleotherapy in salt mines and caves - Speleotherapy and halotherapy are used in the treatment of asthma with different degrees of control. Long-time exposure to salt therapy helps to strengthen the respiratory mucosa against allergens and maintains proper hygiene over the whole respiratory system. Home salt therapy is also available for long term exposure in chronic respiratory diseases. Through aerosol salt therapy and salty baths, the anti-inflammatory and healing effects of salt therapy are highlighted. Rock-salt aerosol therapy is considered one of the most effective methods of treatment of asthma (Beamon et al., 2006; Rassulova et al., 2007; Munteanu et al., 2011; Lazarescu et al., 2014a; Levchenko et al., 2014).

Sylvinite speleotherapy and chest cryomassage - This combined method has shown its utility in the rehabilitation of patients with asthma. It consists of the application of microclimate sylvinite speleotherapy, the main active factor of which is sylvinite - a rock formed by the mutual germination of halite (sodium chloride) and Silvina (potassium chloride), total average content in salt layers 97-98%, a small percentage consisting of magnesium salts (Aĭrapetova et al., 2011; Irapetova et al., 2011). The distinctive feature of this method of treatment is the possibility of integrated and consistent impact on the patient's organism of a sylvinite speleotherapy microclimate, providing multivariate effects due to stable temperature and humidity conditions, high air ionization, temporary isolation of the patient from aggressive external environment, elimination of allergens, and impact of cryomassage, based on the abstraction of heat from the body tissues with the aim of achieving a muscle relaxant, anti-oedematous and, as a consequence, increased anti-inflammatory, analgesic potency. The patient, on the background of basic and symptomatic medication, spends the first half of the day under the impact of climate sylvinite speleotherapy, for 60-90 minutes daily; in the second half of the day, the patient consistently undergoes the chest cryomassage method: bags with the volume of 300 to 500 ml, which are cooled in the freezer at a temperature of -21 degrees to -23 degrees. The technical results of this proposed method are anti-inflammatory, broncholytic, immune-correction effects that slow the progression of the disease and improve the results of treatment, leading to an improvement of the quality of life of patients with longer remission of the disease, reducing the frequency of relapses and decreasing drug load on the organism, as well as the possibility of application of the method in patients with concomitant diseases. The goal of the cryo treatment is the achievement of a muscle relaxant, analgesic effect, and the strengthening of the anti-inflammatory action. The effect of cold on the organism is similar to the action of glucocorticoids, which is accompanied by a decrease of the content and activity of fat and biogenic amines, reducing capillary permeability. The method of treatment was applied with good results to patients with exogenous allergic asthma as well as patients suffering from endogenous non-allergic asthma (it reduced coughing and shortness of breath, the need for inhaled bronchial spasmolytics, it improved mucus discharge and normalised respiratory function, with an immunomodulatory effect). The improvement of the clinical status was paralleled by changes in the psycho-emotional status of the patients. The combined method of sylvinite speleotherapy and cryomassage improves the well-being of patients, their activity and mood. It also increases tolerance to physical activity according to the 6-minute walking test (Aĭrapetova et al., 2011; Irapetova et al., 2011).

Halotherapy is a mode of treatment in a controlled air environment which simulates a natural salt cave microclimate. The main curative factor is dry sodium chloride aerosol with particles 2 to 5 mkm in size. Particle density (0.5-9 mg/m3) varies with the type of the disease. Other factors are the comfortable temperature-humidity regime, the hypobacterial and allergen-free air environment saturated with aeroions. It is used in the treatment of various types of respiratory diseases, but it mainly improves the clinical state of most of the patients with asthma. The positive dynamics of flow-volume loop parameters and the decrease in bronchial resistance measured by body plethysmography are observed. The specificity of this method is the low concentration and gradual administration of dry sodium chloride aerosol (Chervinskaya, 2003; Rassulova et al., 2007). In our country, this mode of treatment was applied to patients with chronic allergic asthma and infectious-inflammatory pathologies. The data acquired also proved the halo-therapeutic effect causing a reduction of body sensitiveness in patients with asthma (Lazarescu et al., 2014 b).

Spa treatment is commonly used for people who have chronic respiratory diseases, with acute remitting process, and mostly if the disease is in remission. The main factors are resort balneotherapy, climatotherapy, mud and physiotherapy. Spa treatment is especially useful when administered in a health facility (Tanizaki, 2007; Ochiuz & Popovici, 2014). One of the spa treatment methods that

has shown its utility in the treatment of asthma patients (especially for patients with allergic asthma) uses the effects of *radon and thermal therapy*. The sanatorium in which treatment is performed must be in a forest-steppe climate, dominated by coniferous trees, combined with healing radon springs. Radon increases the blood levels of the absolute and relative numbers of T-lymphocytes, reducing the number of eosinophils, which increases immune-competent body defense. Radon baths and inhalation are also useful in case of inflammation of the respiratory tract. Radon and thermal therapy are performed once a week. All subjects enter a hot bathroom with a high concentration of radon, and nasal inhalation of vapours from a hot spring is performed for 40 min once a day under conditions of high humidity. Radon and thermal therapy improves the pulmonary function of asthmatics by increasing the reduced activities of antioxidant enzymes. Spa therapy methods are effective in asthma by improving the ventilator function, subjective and objective symptoms, and the suppressed function of adrenocortical glands. Spa treatment also decreases airway inflammation, especially in patients who present a large number of inflammatory cells such as lymphocytes, neutrophils and eosinophils. Spa treatment has also shown its utility in uncontrolled asthma patients (Sokolova et al., 2007; Kamimura, 2014). Complex spa therapy (swimming training in a hot spring pool, fango therapy and inhalation of iodine salt solution) also has a beneficial effect on psychological factors in patients with asthma (Sokolova et al., 2007). During the spa and resort-based treatment of asthma therapy, hypoxic interval training and enteral oxygen therapy are performed. This combined application of hypoxytherapy and oxygen therapy can also be used. During spa treatment, an improvement of oxygen supply to various organs at all stages of mass transfer and an enhancement of oxygen consumption by the tissues occur. These effects promote the normalisation of the respiratory system function, improve the characteristics of the exhaled air condensate and the state of pro-oxidant and anti-oxidant systems. This confirms the high efficacy of the combined therapeutic modality for the treatment of patients with asthma (Sokolova et al., 2007).

Conclusions

1. The pharmacological management of asthma does not eliminate the cause of the disease; after a temporary physical alleviation, the next acute exacerbation of asthma is inevitable, becoming more and more severe with each episode. In a few years of treatment with medications, patients with asthma become disabled to different degrees.

2. There is a real need for additional non-drug remedies that can influence the basic clinical manifestations of the disease, to improve the efficiency of treatment. The main goals of the rehabilitation treatment are to restore the homeostatic self-regulation of the body without the involvement of too many medications, to improve the clinical as well as the psycho-emotional status of patients, and to promote self-management.

3. Guided self-management for asthma that requires important aspects (education, joint goal setting, a personalized written action plan, self-monitoring of key symptoms, and regular review of asthma control, treatment and skills by a healthcare professional) is highly effective and considered a cornerstone of modern asthma care.

4. All clinicians and healthcare professionals involved in complex asthma care should make sure that any self-management training provided meets the guideline requirements for people with this complex respiratory disorder.

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