EFFICIENCY OF PSYCHOPHYSICAL REHABILITATION OF PATIENTS WITH MILD PERSISTENT BRONCHIAL ASTHMA

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Abstract

This article deals with psychophysical rehabilitation of patients with mild persistent bronchial asthma. Results of such patients’ rehabilitation depend on personal peculiarities of patients: some of them need only medical (including physical) rehabilitation, others – medical and psychological. The paper describes implementation of complex physical rehabilitation programme (therapeutic exercise, massage, physiotherapy) in the treatment of patients suffering from mild persistent bronchial asthma. The research was held at the Rivne Regional Hospital. The accumulation of the results of the experiment was performed progressively along the admission of patients to Pulmonology Department. There were 70 persistent bronchial asthma patients under the supervision. Efficiency assessment of the psychophysical rehabilitation programme was held according to the Clinical indicators, Changes in functional condition of cardior espiratory system and externa breathing. The research showed that the efficiency of psychophysical rehabilitation of patients with mild persistent bronchial asthma is proved. It is very important that asthma became controlled which is proved by significant improvement of the average functional condition of cardiorespiratory system and external breathing in comparison.

Keywords: mild persistent bronchial asthma, airway hyperresponsiveness, physical rehabilitation programme, therapeutic exercise, forced expiratory volume, peak expiratory flow rate.

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Relevance

Respiratory diseases are taking the first place in the prevalence because of bad social and economic situation, declining of living standards, negative environmental effects which lead to a weak stress resistance. Among these diseases, bronchial asthma is the most widespread and the most complicated. Being a heterogeneous disease, asthma is usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary in intensity and over time together with variable expiratory airflow limitation. This definition was reached by consensus, based on consideration of the typical asthma characteristics and those ones that distinguish it from other respiratory conditions. Asthma is a common, chronic respiratory disease affecting 1–18% of the population in different countries. Asthma is characterized by variable symptoms of wheeze, shortness of breath, chest tightness and/or cough, and by variable expiratory airflow limitation. Both the symptoms and airflow limitation characteristically vary over time and in intensity. These variations are often triggered by factors such as exercise, allergens or irritant exposure, change in weather, or viral respiratory infections. The symptoms and airflow limitation may resolve spontaneously or in response to medications, and sometimes may be absent for weeks or months at a time. On the other hand, patients can experience episodic flare-ups (exacerbations) of asthma that may be life-threatening and carry a significant burden to patients and community. Asthma is usually associated with airway hyperresponsiveness to direct or indirect stimuli, and with chronic airway inflammation. These features usually persist, even when symptoms are absent or lung function is normal, but may also normalize in the treatment (Sodhi, Singh, & Bery, 2014; Demko, Sobko, & Ishenko, 2010; Sobko, Bolshakova, Demko, Ishenko, & Kraposhina, 2012).

Despite numerous studies, asthma is not still completely studied. The etiological factors can be divided into a few groups: non-infectious allergens, infectious allergens, physical and weather factors and neuropsychiatric influences. In most cases asthma is preceded by respiratory infections, which occur multiple times, such as respiratory diseases, bronchitis, pneumonia and others, they cause a breach of barrier function of the bronchi and
facilitate the penetration of the allergens through the wall of the bronchi (Tsureva, Demeev, Skachkov, & Sheverdina, 2015; Van’t Hul, Frouws, Van Den Akker, VanLummel, Starrenburg-Razenberg, VanBruggen; László, 2016; Grünig, Ehlken, Schultz, & Glöckl, 2015).

The relevance of the issue is caused by a significant increase of the bronchial asthma incidence during the last decade, its shift towards onset at a younger age, increasing of complications and quick developing of disability caused by polluted environment, increasing of allergization of the population and deterioration of the nation’s gene pool.

Psychosomatic factors also take part in the pathogenesis of allergic bronchial asthma. Neurotic reactions play an important role in bronchial asthma patients. Emotional conflicts often become a reason of a regular exacerbation of asthma. In clinical practice there are patients who get their first asthma attack as a result of stress. So, among all the factors important for its development 30 % are psychological, 40 % are infectious and 30% are allergic. Nowadays the scientists pay more and more attention to the fact that “as a result of a continual stress… patients become emotionally, mentally and physically exhausted”.

Therefore, rehabilitation of the bronchial asthma patients include a complex of mental and physical recovery measures directed to the achievement of stable disease restoration, recovery, normalization and improving of the indicators of the external breathing function, cardiovascular system and physical capacity. The main aim of these recovery measures is to relieve a bronchospasm, to consolidate the effect maximally for a long period or improve the indicators of cardiorespiratory system and to prepare the patient to normal life activities by means of stress resistance development. Results of the rehabilitation depend on personal peculiarities of patients: some of them need only medical (including physical) rehabilitation, others – medical and psychological. To achieve positive results of the whole rehabilitation process, the main principles of restorative medicine should be complied (early beginning, a complex of measures, a personal approach, persistence, succession, registration of functional, mental and physical condition of the patient, his social position and doctor’s professional skills). Physical rehabilitation is an essential step in treating of the bronchial asthma patients. In fact, a stable cessation of suffocation because of medical rehabilitation does not guarantee a complete restoration of pulmonary breathing function, functions of myocardium and
central hemodynamics. The recovery processes of these organs and systems, immunologic reactivity of the organism are slow and are often late with dynamics of bronchospasm clinical manifestations.

At the same time, analysis of special scientific literature proves that there is an objective necessity in deeper study, clarification, adjustment and improvement of the process of the mental (psychological) and physical rehabilitation of patients with bronchial asthma and a system analysis of its usage for patients of young and older age as the most economically active population in view of the disease severity which manifests only partly.

Objective was to check effectiveness of influence of the psychical and physical rehabilitation programme on functional condition of cardiorespiratory system in patients with mild persistent bronchial asthma.

**Materials and methods**

The paper is based on the scientific work of the Department of Health and Physical Rehabilitation of the National University of Water and Environmental Engineering “Rehabilitation and physical-recreating aspects of human development” dated back to 2014-2016 (state registration № 0114U001366).

The research was held at the Rivne Regional Hospital. The accumulation of the results of the experiment was performed progressively as admission of patients to Pulmonology Department. There were 70 persistent bronchial asthma patients under the supervision. The level of severity was assessed based on a complete examination of the patients. The mild persistent bronchial asthma patients had asthma attacks once a week or more but not every day, the exacerbation of the disease could disturb physical activity and sleeping, night symptoms of asthma took place more than twice a month; they suffered from breathlessness while going upstairs at a quick pace or during jogging. They had pulmonary ventilation disorders of the first degree.

The patients of the control group were treated by usual methods, the patients of the core group received psychological and physical rehabilitation including psychological trainings, therapeutic exercise, massage and physiotherapy in addition to the usual methods. The main psychological work was directed to reducing fear concerning a possible attack,
learning of self-regulation methods of emotional condition. Many works are devoted to this issue. It is noteworthy that the patients were divided in groups according to the indicators of their personal scale of anxiety manifestations, the level of the scale was determined with the help of special technique based on usual tests and there was a personal “key” for improving stress resistance for each of them.

Psycho-emotional techniques of three types were used (imaginative, verbal-imaging and visual imaging psycho-emotional techniques), dominating types with the most effective influence that individualize psycho-emotional condition of the target person.

Emotional breathing techniques (relaxation techniques and restorative breathing techniques) were also used. Efficiency assessment of the treatment and physical rehabilitation was given according to the clinical indicators such as difficulty breathing attacks, coughing, wheezing during auscultation, flexibility of lower pulmonary edges, frequency of bronchodilators usage, functional changes of external breathing based on the indicators of the forced expiratory volume during the first second, peak expiratory flow and functional condition of the cardiorespiratory system (Stange and Ghencea tests)

Results and their discussion

The main aim of the developed programme of psychophysical rehabilitation is accelerating and reaching of the most complete recovery of the organism functions, increasing of its defensive capacities and providing conditions for more intensive physical activity compared with the activity they had before. The first step of the rehabilitation is very important as it is a stationary step of treating the disease, restoration of the structure of the affected organs and systems, the basis for restoration of the functions and prevention of recurrent attacks of breathlessness performed during this period. Influence of therapeutic exercise, massage, physiotherapy, auto trainings (according to I. Schultz, V.L. Levi, and Y.L. Pokrovsky), miorelaxation and others are important for the system of mental and physical rehabilitation in patients of this type. These techniques allow improving working efficiency, normalizing pulmonary gas exchange, improving the cardiovascular system activity, relieving severity of the disease, optimizing treatment to reduce its duration, achieving prolonged remission, improving immunity and reactivity of the organism. Due to the above mentioned
to achieve optimization and efficiency of the treatment a complex approach was used. It included combining of medical treatment and psychological and physical rehabilitation. In its turn, the complex approach improves the recovery process and makes the disease milder in general.

In such a way, a complex approach of psychophysical rehabilitation was suggested to improve the efficiency of the recovery treatment in the bronchial asthma patients during the hospital treatment. While planning personal programmes a whole complex of changes (morphological, physiological and psychical) was taken into account. It is important that rules of partnership, defining psychophysical patients’ possibilities and their flexibility, versatility of the influence, complexity and graduality of the treatment were also taken into consideration.

The patients trained a lot. While undergoing treatment patients from the core group (bronchial asthma II, persistent, mild) received individually chosen complex programme of psychophysical rehabilitation. The patients from the control group with the same diagnosis were treated by usual methods.

The comparative analysis of the research results of 70 patients with mild persistent bronchial asthma showed that the control group (consisted of males \((n=35)\) and the core group (consisted of males \((n=35)\)) revealed the following:

Patients of the core group were treated by means of therapeutic exercise, massage, inhalations, psycho-musical therapy, auto trainings, psycho-emotional technologies, aerosol therapy, halotherapy and aeroionotherapy. During the introduction period they breathed through closed lips using passive exhalation; during the main period the main attention was paid to manipulations directed to dilution and removal of phlegm from the respiratory tract (therapeutic percussion, vibration, postural drainage). Positions of the drainage were combined with manipulations. In case there was phlegm it was removed by means of slow pressing on the chest synchronously with cough without deep inhales. Counteraction to the inhale strengthened the respiratory muscles. During the final period therapeutic percussion and vibration were used as well. The sessions began and ended with gentle face massage and massage of arms and chest, psycho-emotional techniques
(“pendulum muscle relaxation” according to V.L. Levi) which were also used for relaxing muscles of shoulder girdle and chest. Morning remedial gymnastics and therapeutic exercises, individual exercises and exercises in small groups were also used. In case of motion activity of level III the morning remedial gymnastics consisting of 20-25 exercises lasted 15-20 minutes. The therapeutic exercises consisting of 35-40 exercises were done in medium or accelerated tempo. Two forms of gymnastics and cyclic exercises were used continuously. Correlation of breathing (lungs relaxing, lungs restoration) and generally developing exercises was 1:3-4. The exercise lasted for 30-35 minutes. During the training dumbbells weighing 3-5kg and medicine balls weighing 3-4 kg were used. Overloading was not allowed during the exercise. The exercises were stopped in case of the first signs of asthma attack: uneven breathing, spasm or cough.

One of generally available kinds of training for inpatients and outpatients is walking up and down the stairs. A pace of walking up the stairs in the core group patients was 30-35 stair-steps per minute, and a pace of walking down the stairs was 80-90 stair-steps per minute, each training lasted up to 30 minutes. In the core group air-ion therapy was also applied and it was dosed by the number of ions a patient inhaled during the procedure. The procedures of speleotherapy combined with music therapy were held in a special room called a halochamber, the course consisted of 20-22 procedures with halo-aerosol of 22-24°C.

It is interesting to note that after using the aforementioned psychological “instruments” the patients of the core group had a better emotional condition and resistance to stress, their workability and self-belief became higher as well.

While describing the results of physical rehabilitation it is necessary to mention that the improvements of the breathing function and the cardiovascular system were found after the results of the Stange and Ghencea tests during comparing (Table 1 and Table 2).

Table 1.

Functional condition of the breathing and cardiovascular systems (according to Stange test and Ghencea test) of the patients of both groups on the beginning stage of the research

<table>
<thead>
<tr>
<th>Patients</th>
<th>Stange test ($\bar{D} \pm m$, s)</th>
<th>Ghencea test ($\bar{D} \pm m$, s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=35)</td>
<td>33.29±1.19</td>
<td>16.17±0.27</td>
</tr>
<tr>
<td>Core group (n=35)</td>
<td>36.31±1.33</td>
<td>16.54±0.34</td>
</tr>
</tbody>
</table>
Table 2.
Functional condition of the breathing and cardiovascular systems (according to Stange test and Ghencea test) of the patients of both groups on the final stage of the research.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Stange test ((\bar{d} \pm m)), s</th>
<th>Ghencea test ((\bar{d} \pm m)), s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=35)</td>
<td>34.23±1.22</td>
<td>17.20±0.30*</td>
</tr>
<tr>
<td>Core group (n=35)</td>
<td>45.29±1.08**</td>
<td>26.51±0.48***</td>
</tr>
</tbody>
</table>

Notes: * – probability of difference index \(p<0.05\) between the indices in the beginning and in the end of the research within the group;  
** – probability of difference index \(p<0.05\) between the indices of the core and the control group.

In the beginning of the research breathholding during inhale (patients of the control group – 33.29±1.19 s; patients of the core group – 36.31±1.33 s) and during exhalation (control group – 16.17±0.27 s; core group – 16.54±0.34 s) was almost the same for the patients of both groups. In the end of the research it was much better for the patients of the core group.

In the end of the research patients from the control group showed results of the Stange test as follows: 34.23±1.22 s, while the results of the Ghencea test composed – 17.20±0.30 s, which proves improvement of some functional possibilities of the cardiorespiratory system. In contrast, test results of the patients in the core group were much better. Breath holding during inhale became 45.29±1.08 s (\(p<0.05\)) and during exhalation – 26.51±0.48 s (\(p<0.05\)) which corresponds to the possibilities of healthy untrained people. In such a way, it was possible to restore the functions of the cardiorespiratory system of the patients from the core group with the help of psychophysical rehabilitation.

Measuring of the external breathing function gives the possibility to determine the presence, the severity of bronchial obstruction, its reversibility, variability (improving or decline of the external breathing functions during a certain period of time) and also to confirm the bronchial asthma diagnosis. The indicators of the external breathing functions not always correlate with the symptoms or other criteria of bronchial asthma control though this research gives additional information about different aspects of bronchial asthma control.

In the beginning of the research the average indicators of the forced expiratory volume (FEV1) in the bronchial asthma patients from control group were 76.05±0.84%, while the
patients of the core group had – 75.35±1.31%; in the end of the research – 79.31±1.11% and 91.16±1.32% (p < 0.05) respectively. The average indicators of the forced expiratory volume (FEV₁) of bronchial asthma patients of the core group who were treated according to the special developed programme were higher than those of the patients of the control group (Table 3).

Table 3.

Summative dynamics of the indicators of the forced expiratory volume (FEV₁) (% from appropriate volumes) of mild persistent bronchial asthma patients of both groups at the beginning and at the end of the research

<table>
<thead>
<tr>
<th>Patients: bronchial asthma II, persistent; groups, number of patients</th>
<th>beginning of the research</th>
<th>end of the research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group n=35</td>
<td>76.05±0.84</td>
<td>79.31±1.11</td>
</tr>
<tr>
<td>Core group n=35</td>
<td>75.35±1.31</td>
<td>91.16±1.32*,**</td>
</tr>
</tbody>
</table>

Notes: * – probability of difference index p<0.05 between the indices in the beginning and in the end of the research within the group;

** – probability of difference index p<0.05 between the indices of the core and control group

The analysis showed that in the beginning of the research indicators of the peak expiratory flow rate were 72.37±1.22% in the control group, 72.63±1.46% - in the core group, in the end of the research they were 78.27±1.37% and 91.59±1.58% (p < 0.05) respectively (Table 4).

Table 4.

Summative dynamics of the indicators of peak expiratory flow rate(% from appropriate volumes) of mild persistent bronchial asthma patients of both groups at the beginning and at the end of the research

<table>
<thead>
<tr>
<th>Patients: bronchial asthma II, persistent; groups, number of patients</th>
<th>beginning of the research</th>
<th>end of the research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group n=35</td>
<td>72.37±1.22</td>
<td>78.27±1.37</td>
</tr>
<tr>
<td>Core group n=35</td>
<td>72.63±1.46</td>
<td>91.59±1.58*,**</td>
</tr>
</tbody>
</table>

Notes: * – probability of difference index p<0.05 between the indices in the beginning and in the end of the research within the group;

** – probability of difference index p<0.05 between the indices of the core and control group
Efficiency assessment of the treatment and psychophysical rehabilitation was done in accordance with the level of the mental condition, feeling, level of physical health, physical workability, level of life, functional condition of the cardiorespiratory system and indicators of the external breathing functions. Analysis of the average indicators of the forced expiratory volume (FEV1) and the peak expiratory flow rate in patients of both groups with mild persistent bronchial asthma revealed that in the beginning of the research the difference between the indicators was not large. As for the indicators of the patients from the core group they appeared higher (close to the appropriate indicators) in the end of the research and this proves improvement of the small bronchi patency which is of great importance for the bronchial asthma patients.

Improving of the average indicators of the external breathing functions in the patients from the core group after the experiment is connected with the specific influence of the psychophysical rehabilitation measures. The results of the psychophysical rehabilitation were considered in dynamics which allowed determining objective effectiveness of the rehabilitation programme. Comparative analysis of the examination results determined that the patients of the core group had positive dynamics. It showed reduction of clinical symptoms of asthma: the asthma attacks became less intensive and less expressed, they appeared less often, there was less cough, removal of phlegm improved, the wheezing in the lungs disappeared, flexibility of the lungs' borders improved, the patients slept and felt better, they were able to use less bronchodilators.

It is very important that asthma became controlled which is proved by statistically reliable indicators of the external breathing functions in comparison. Examination of the internal breathing function of the bronchial asthma patients is obligatory and it gives a possibility to evaluate a level of bronchial obstruction, its reversibility and variability (daily and weekly changes), as well as the treatment and rehabilitation efficiency.

Improving functional condition of the breathing system of the core group patients who took part in the research proved the positive influence of physical rehabilitation according to the suggested methods on the motion abilities of the patients with mild persistent bronchial asthma. While discussing the research it is necessary to pay attention to the most important
result of using medical and psychological rehabilitation methods: at the end of the treatment course, it became possible to control bronchial asthma in the patients of the core group. It is also important to note improving functional condition of the cardiorespiratory system according to the results of the Stange test and the Ghencea test, the forced expiratory volume (FEV1) and the peak expiratory flow rate of these patients: the target indicators reached a normal level after using the rehabilitation programme. At the same time treatment of bronchial asthma peaks only with medicines did not allow reaching a noticeable improvement of physical abilities of the patients, but adding the therapeutic exercises, especially modified ones within the programme allows improving functional condition and setting the patients to the motion mode with more physical activity.

It is necessary to take into account that correct and timely usage of certain methods of psychophysical rehabilitation with a recovery aim allows shortening the duration of attacks and rehabilitation measures during exacerbation. It allows starting the training mode of physical exercises earlier. It can be proved that the distance the patients walked daily after the gymnastic period became longer. Doing the exercises during the training mode was not accompanied by asthma attacks excluding a few cases in the beginning period which were removed using special physical exercises. When the patients can control asthma they can lead an active lifestyle and they are not limited in their normal physical activity and exercises.

**Conclusion**

Using all the parts of the elaborated programme of psychophysical rehabilitation at the beginning of its realization allows the patients to improve their life tone and motion abilities and do more intensive physical exercises during the training mode. Training with a psychologist allowed improving social adaptation of the patients from the core group; all the participants of the programme learnt how to keep to the treatment and rehabilitation mode and self-control.

Using this psychophysical rehabilitation programme for patients with mild persistent bronchial asthma of the core group allows improving functional condition of the cardiorespiratory system. This reflects through improving results of Stange test with 8.98 s, the results of the Ghencea test with 9.97 s, the forced expiratory volume (FEV1) with
15.81% and the peak expiratory flow rate with 18.96% and makes it possible to reach mental
stability, improve resistance to stress, give belief in the future and exercise full control
over the disease. Reliable \( (p < 0.05) \) recovery and improving of the functional condition of
the cardiorespiratory system was noticed as a result of using the suggested programme of
psychophysical rehabilitation of the patients with mild persistent bronchial asthma.

Further research should be undertaken after a longer period after stationary treatment
during the out-patient treatment.

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