Dynamics of the respiratory function change among children of a high school age observed at a health center in the Arctic

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Изменение функции внешнего дыхания у детей старшего школьного возраста в динамике нахождения в оздоровительном центре в условиях Заполярья

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Abstract: *the results of the study of respiratory function among children of a high school age, the natives of the Murmansk region, before and after their stay in the health center located in the Arctic*
Аннотация: *в статье представлены результаты исследования функции внешнего дыхания у детей старшего школьного возраста, уроженцев Мурманской области, до и после их нахождения в оздоровительном центре, расположенном в Заполярье.*

Keywords: *children, the Arctic, external respiration, health center.*
Ключевые слова: *дети, Заполярье, внешнее дыхание, оздоровительный центр.*

Most of the regions of Russia, particularly intensively developing territory of the North, are areas with severe climatic and geographical conditions uncomfortable for residence [1] and work [2].

It is necessary to allocate specific and non-specific climatic factors of the North [3]. Non-specific are: cold, high relative humidity, heavy aerodynamic mode -factors that can be found in other regions of the Earth. Factors specific to the northern latitudes may include a change of photoperiodism, atmospheric pressure fluctuations and factors of electromagnetic nature. The negative impact of this group of factors almost can't be helped by measures of social and other support.

According to many researchers [4, 5], cold air is the main factor affecting the respiratory system in humans in the North and determining its adaptive changes. Studies of the Lung functional morphology' Laboratory of the Institute of Physiology of the Academy of Medical Sciences of the USSR showed that with the decrease of temperature in the range from 0 to -35 degrees Celsius respiratory system responses with the three protective physiological reactions: a reflex restriction of the inhalation depth, increasing functional residual capacity of the lungs and exemption from the ventilation process of the most cooled alveoli, mainly in the proximal areas [6].

According to M. S. Lisihin [7] the temperature of the environment affects the respiratory rate. So in the warm season respiratory rate decreases and increases in the cold season. Local effect of cold air on the mucous membrane of the upper respiratory tract, trachea, bronchial apparatus causes considerable loss of heat and moisture needed for heating and moisturizing of inhaled air.

Saving children's health is a priority for the government. Adverse climatic conditions of the Arctic have an impact on the child's body [9, 10], but to a greater extent on the system of external respiration [8], which is in a state of functional stress.

Therefore the study of changes in the respiratory system in the process of rehabilitation of children is of great scientific and practical importance.

A dynamic observation of 20 children of school age (15-17 years old) born and residing in the Arctic (Murmansk region) has been carried out. For one month children were placed in the health center located in the Kandalaksha area of Murmansk region.

A spirographic examination of children was done before and after their stay in the health center.

For the purpose of the study the following lung volumes and capacities were determined: vital capacity (VC), inspiratory and expiratory reserve volume (IRV and ERV), breathing capacity (BC); ventilation performance: volume of respiration per minute (VRM), respiratory rate (RR), the maximum pulmonary ventilation (MPV); bronchial crossability: forced vital capacity (FVC), forced expiratory volume in the first second of the sample FVC (FEV1), peak volume rate (PVR) and the maximum volume rate at 25, 50 and 75% of FVC (MVR25, MVR50 and MVR75) respectively. Also Gensler index (GI) was calculated.

The analysis of the results demonstrated statistically insignificant ($p = 0,43\text{-}0,08$) increase of the static lung volumes and capacities (VC, BC) by the end of the children's residence at the health centre, and significant increase in the bronchial croccability.

Thus the monthly children's holidays, natives of the Arctic, in the same climate zone did not cause significant changes in terms of lung volumes and capacities, however, caused the increase of the bronchial crossability.

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