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BIOCHEMICAL CHANGES IN CHILDREN WITH BRONCHOLUMINAL PATHOLOGY ON THE BACKGROUND OF A DIFFUSIVE EUTYREOID STATE

Forrukh Nodirzhanovich Mukhamedov
Applicant for the Department of Pulmonology of the Republican Specialized Scientific and Practical Medical Center of Pediatrics, Tashkent, Uzbekistan

Furkat Mukhitdinovich Shamsiev
Head of the Department of Pulmonology of the Republican Specialized Scientific and Practical Medical Center of Pediatrics, Tashkent, Uzbekistan

Rano Anvarbekovna Musajanova
Senior researcher Department of Pulmonology of the Republican Specialized Scientific and Practical Medical Center of Pediatrics, Tashkent, Uzbekistan

Nigora Davlyatovna Azizova
Senior researcher Department of Pulmonology of the Republican Specialized Scientific and Practical Medical Center of Pediatrics, Tashkent, Uzbekistan

Nargis Hayrullaevna Mirsalihova
Associate Professor of the Department of Childhood Diseases No. 1, Tashkent Medical Academy, Tashkent, Uzbekistan

Nasiba Saidovna Agzamxodjaeva
Associate Professor of the Department of Childhood Diseases No. 1, Tashkent Medical Academy, Tashkent, Uzbekistan

ABSTRACT

The question of the relationship between the course of diseases of the thyroid gland and the bronchopulmonary system today remains an urgent problem of modern medicine. The influence of thyroid status on the course of bronchopulmonary pathology in children, depending on the age, severity and therapy of the disease, has been little studied. At the same time, insufficient attention to these pathophysiological mechanisms can lead to an increase in the severity of somatic pathology, a decrease in the functionality of the thyroid gland, frequent recurrence of the main pathological process, and reduce the effectiveness of therapy.

The aim of the study was to study the features of the biochemical parameters of bronchopulmonary pathology in children, occurring against the background of diffuse euthyroid goiter. The study of the state of the pituitary-thyroid system made it possible to establish the most

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About the authors：Forrukh Nodirzhanovich Mukhamedov

Corresponding author- *Email:

pronounced changes in patients with bronchopulmonary pathology against the background of diffuse euthyroid goiter, indicating a decrease in the functional activity of the thyroid gland. In case of bronchopulmonary pathology against the background of diffuse euthyroid goiter, an increase in the membrane of lymphocytes of malondialdehyde and diene conjugates and a decrease in superoxide dismutase and catalase are determined, which leads to the destruction of membrane structures and disruption of their functioning.

Examined 120 children with bronchopulmonary pathology at the age from 7 to 14 years. Of these, 45 children - with recurrent bronchitis proceeding against the background of diffuse euthyroid goiter, 45 children - with community-acquired pneumonia of a protracted course, against the background of diffuse euthyroid goiter and 15 children with recurrent bronchitis without thyroid pathology and 15 patients with community-acquired pneumonia without thyroid pathology (comparison group).

Our studies show that in patients with bronchopulmonary pathology against the background of diffuse euthyroid goiter, hyperlipidemia, hypocholesterinemia, and an increase in the level of triglycerides, found by us, can serve as confirmation of a violation of the lipid spectrum of the blood serum of children.

KEY WORDS: protracted community-acquired pneumonia, recurrent bronchitis, thyroid gland, diffuse euthyroid goiter, biochemistry

抽象的

甲状腺疾病病程与支气管肺系统之间的关系问题今天仍然是现代医学的一个紧迫问题。甲状腺状态对儿童支气管肺病理病程的影响（取决于疾病的年龄、严重程度和治疗）的研究很少。同时，对这些病理生理机制的重视不够，会导致躯体病理的严重程度增加，甲状腺功能下降，主要病理过程频繁复发，降低治疗效果。

该研究的目的是研究儿童支气管肺病理生化参数的特征，发生在弥漫性甲状腺肿的背景下。对垂体 - **甲状腺系**统状态的研究使得在弥漫性甲状腺功能正常的背景下，支气管肺病理学患者的最明显变化成为可能，表明甲状腺功能活动下降。在弥漫性甲状腺肿背**景下的支气管肺病理学情况下，确定了丙二**醛和二烯结合物淋巴细胞膜的增加以及超氧化物歧化酶和过氧化氢酶的减少，这会导致膜结构的破坏和功能的破坏。

检查了 120 **名** 7 **至** 14 岁患有支气管肺病理学的儿童。其中，45 **名儿童 - 以弥漫性甲状腺功能正常**为背景的复发性支气管炎，45 **名儿童 - 患有社区**获得性持续性肺炎，以弥漫性甲状腺肿为背景，15 **名患有复**发性支气管炎但无甲状腺病理的儿童和 15 **名患者患有无甲状腺病理学的社区**获得性肺炎（对照组）。

我们的研究表明，在弥漫性甲状腺肿大、高脂血症、低胆固醇血症和甘油三酯水平升高背景下的支气管肺病理患者中，我们发现，可以作为对违反血清脂质谱的确认孩子们。

关键词: 慢性社区获得性肺炎, 复发性支气管炎, 甲状腺, 弥漫性甲状腺肿, 生化

INTRODUCTION

Bronchopulmonary pathology of childhood is diverse and includes acute and chronic, infectious-inflammatory and allergic diseases, congenital and hereditary lung diseases [3]. Diseases of the respiratory system have occupied and continue to occupy a leading position in the structure of morbidity in children of all ages [1, 10].

It is possible to identify the most relevant nosological forms that form the general structure of bronchopulmonary diseases, these include pneumonia and recurrent bronchitis [2,8]. Community-acquired pneumonia has been and remains one of the pressing health problems due to the continuing high morbidity and mortality. In recent years, an increase in the number of patients with a severe, complicated and protracted course of community-acquired pneumonia has attracted attention [4].

In recent years, the physiology and pathology of the thyroid gland has been separated into an independent discipline - thyrodology, which is an important section of endocrinology, due to the wide spread of diseases of this organ and the development of serious complications [5].

Diseases of the thyroid gland are widespread in the population, often their main symptoms resemble other diseases, and the main method for verifying dysfunctions of the gland is laboratory determination of the level of thyroid-stimulating and thyroid hormones. Iodine plays a major role in the biosynthesis of thyroid hormones [6,7]. Diffuse or nodular enlargements are the most common thyroid disorders.

Oxidative stress plays an important role in the pathogenesis of thyroid diseases. Oxidative stress is defined as an imbalance between the production of prooxidative substances and the protective antioxidant system. At present, oxidative substrates obtained as a result of exposure to free radicals, namely, lipid peroxidation products, are used as markers of oxidative stress [9].

The question of the relationship between the course of diseases of the thyroid gland and the bronchopulmonary system today remains an urgent problem of modern medicine. The influence of thyroid status on the course of bronchopulmonary pathology in children, depending on the age, severity and therapy of the disease, has been little studied. At the same time, insufficient attention to these pathophysiological mechanisms can lead to an increase in the severity of somatic pathology, a decrease in the functionality of the thyroid gland, frequent recurrence of the main pathological process, and reduce the effectiveness of therapy.

Purpose of the study: to study the features of biochemical parameters of bronchopulmonary pathology in children, occurring against the background of diffuse euthyroid goiter.

MATERIALS AND METHODS

Examined 120 children with bronchopulmonary pathology at the age from 7 to 14 years. Of these, 45 children - with recurrent bronchitis proceeding against the background of diffuse euthyroid goiter, 45 children - with community-acquired pneumonia of a protracted

course, against the background of diffuse euthyroid goiter and 15 children with recurrent bronchitis without thyroid pathology and 15 patients with community-acquired pneumonia without thyroid pathology (comparison group). To make a diagnosis, anamnestic data, the results of clinical, laboratory, functional and biochemical research methods were taken into account.

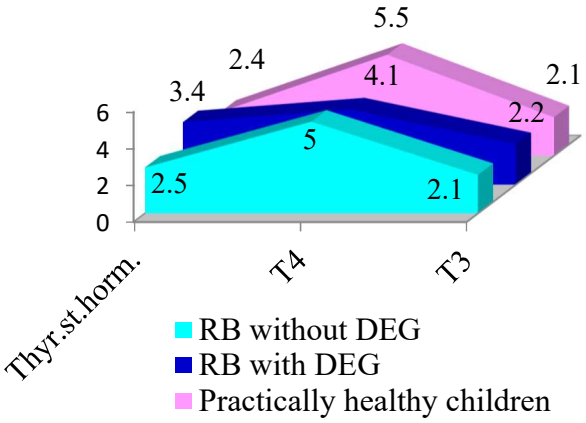
Special research methods: 1. Palpation of the thyroid gland was assessed according to the WHO classification (1994). An ultrasound examination of the thyroid gland was carried out according to the following parameters: location of the gland; the form; contours. 2. Biochemical studies - determination of total triiodothyronine (T3), thyroxine (T4) and thyroid-stimulating hormone by enzyme immunoassay using commercial kits from Hema-Medica (Moscow); lipid peroxidation products - diene conjugates and malondialdehyde in blood serum on a Beckman DU 650 spectrophotometer (USA). The activity of the antioxidant system of catalase and superoxide dismutase was determined in blood serum using an EOS Bravo Forte biochemical analyzer (Italy). Determination of the lipid spectrum: total lipids, triglycerides, cholesterol was carried out by unified methods on a biochemical analyzer "FP-901" using kits "HUMEN" (Germany).

Statistical processing of the obtained results was carried out by a program developed in the Microsoft Office Excel-2010 package. Methods of variation statistics were used with the calculation of arithmetic mean values (M), their standard errors (m) and significant differences according to the Fisher – Student test.

RESULTS AND DISCUSSION

The data obtained by us made it possible to establish that the content of hormones of the pituitary-thyroid system in each individual case varied within the normative values. However, the generalized data of the studied parameters, depending on the volume of the thyroid gland, revealed some features of the functioning of the system.

The results of the study in children with recurrent bronchitis and community-acquired pneumonia of a protracted course against the background of diffuse euthyroid goiter (Fig. 1) as a whole made it possible to establish an insignificantly increased T3 level to 2.2 ± 0.2 nmol / l; 2.3 ± 0.2 nmol / L, respectively, with a control value of 2.1 ± 0.1 nmol / L (P> 0.05), compared with the data of children without diffuse euthyroid goiter (2.1 ± 0.3 nmol / l and 2.0 ± 0.2 nmol / l, respectively, P> 0.05), which indicates the tension of the functional activity of the thyroid system.



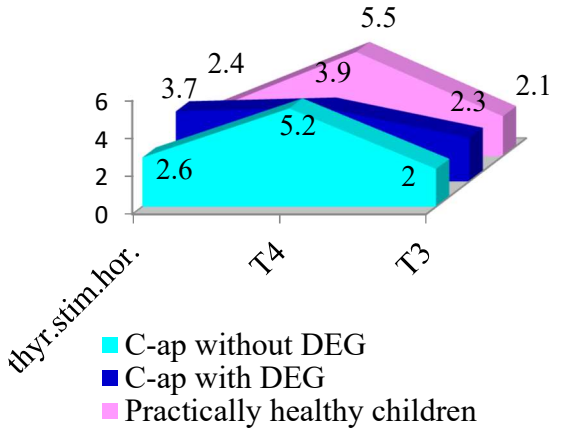


Fig. 1. Results of studies of thyroid function in the examined children, (M ± m)

This is, in all likelihood, a consequence of the adaptive-compensatory reaction of the whole organism and the thyroid gland to the increased need for thyreglobulin to support metabolic processes in tissues and is provided by an increase in the conversion of T4 to T3, as well as an increase in the synthesis of T3 in the thyroid gland.

The T4 level in the group of children with recurrent bronchitis against the background of diffuse euthyroid goiter decreased to 4.1 ± 0.3 μg% relative to the control value by 1.3 times (P <0.05), in the group of children with community-acquired pneumonia of a protracted course against the background diffuse euthyroid goiter up to 3.9 ± 0.4 μg% - by 1.4 times and compared with data without diffuse euthyroid goiter (5.0 ± 0.2 μg% and 5.2 ± 0.4 μg%, respectively P <0.05). A decrease in T4 indicates depletion of the main reserve for T3 synthesis and is a prognostically unfavorable sign of the course of bronchopulmonary pathology in children with euthyroidism. An increase in the T3 / T4 ratio (0.5 ± 0.04% and 0.6 ± 0.03%, respectively) is characteristic, which, with an increased content of thyroid-stimulating hormone (up to 3.4 ± 0.3 mU / L, 3.7 ± 0.5 mU / l, respectively, P <0.05 and increased 1.4 times compared to the data without DEZ) and low T4 confirms the diagnosis of diffuse euthyroid goiter in children with bronchopulmonary pathology.

Thus, the study of the state of the pituitary-thyroid system made it possible to establish the most pronounced changes in patients with bronchopulmonary pathology against the background of diffuse euthyroid goiter, indicating a decrease in the functional activity of the thyroid gland.

Analysis of the disturbance of free radical oxidation processes in the examined children with bronchopulmonary pathology against the background of diffuse euthyroid goiter in terms of disturbed metabolism - malondialdehyde and diene conjugates, revealed a statistically significant increase in lipid peroxidation products. The research results are presented in Figure 2.

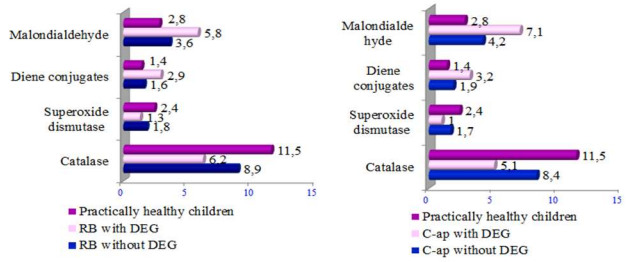


Fig. 2. The state of the lipid peroxidation-antioxidant system in the examined children, (M ± m)

As can be seen from the data presented in children with recurrent bronchitis against the background of diffuse euthyroid goiter, there was a significant increase in malondialdehyde to 5.8 ± 0.2 nmol / ml, P <0.001 and diene conjugates to 2.9 ± 0.2 nmol / ml, P <0.001 relative to the control value and compared with the indicators of children without diffuse euthyroid goiter (3.6 ± 0.4 nmol / ml, P <0.01 and 1.6 ± 0.1 nmol / ml, P <0.01) ...

In the main group, the activity of peroxide processes in terms of malondialdehyde was more pronounced in comparison with the group of children with recurrent bronchitis, but without diffuse euthyroid goiter.

In children with a protracted community-acquired pneumonia against the background of diffuse euthyroid goiter, an increase in the intensity of peroxidation processes is determined, as evidenced by an increase in the content of lymphocytes - diene conjugates in the

membrane up to 3.2± 0.3 nmol / ml relative to the control value (P <0.001) by compared with children without diffuse euthyroid goiter was increased by 1.7 times (1.9± 0.2 nmol / ml P <0.01), and the final metabolites - malondialdehyde to 7.1± 0.3 nmol / ml relative to the control value (P <0.001), compared with children without diffuse euthyroid goiter, it was increased 1.7 times (4.2± 0.5 nmol / ml P <0.01). An increase in lipid peroxidation products in the lymphocyte membrane in patients with protracted community-acquired pneumonia against the background of diffuse euthyroid goiter indicates the activation of free radical oxidation in this pathology.

The indicators of the antioxidant system in children with recurrent bronchitis against the background of diffuse euthyroid goiter were characterized by a significant decrease in superoxide dismutase to 1.3 ± 0.1 U / mg protein and catalase 6.2 ± 1.0 μmol / mg protein, compared with the indicators of practically healthy children (2.4 ± 0.09 U / mg protein and 11.5 ± 0.8 U / mg protein, respectively, P <0.001), compared with children without diffuse euthyroid goiter, it was reduced by 1.4 times (1.8 ± 0.1 U mg protein, P <0.01 and 8.9 ± 0.9 μmol / mg protein, P <0.01).

In children with protracted community-acquired pneumonia against the background of diffuse euthyroid goiter, there was a significant decrease in superoxide dismutase 1.0 ± 0.2 U / mg protein and catalase 5.1 ± 1.0 μmol / mg protein, compared with the indicators of practically healthy children (2 , 4 ± 0.09 U / mg protein and 11.5 ± 0.8 U / mg protein, respectively, P <0.001), compared with children without diffuse euthyroid goiter was reduced by 1.7 times (1.7 ± 0, 08 U mg protein, P <0.01 and 8.4 ± 0.9 μmol / mg protein, P <0.05). Consequently, in children with recurrent bronchitis and community-acquired pneumonia of a protracted course, proceeding against the background of diffuse euthyroid goiter, a higher content of lipid peroxidation products and suppression of the antioxidant system are observed, which indicates an increase in "oxidative stress".

Thus, these data indicate that in bronchopulmonary pathology against the background of diffuse euthyroid goiter, significant changes in the products of lipid peroxidation and the antioxidant system are determined, which leads to the destruction of membrane structures and disruption of their functioning.

Activation of lipid peroxidation leads to significant rearrangements of the lipid bilayer and changes in the physical properties of membranes.

In the group of children with recurrent bronchitis proceeding against the background of diffuse euthyroid goiter, the content of total lipids in the blood tends to increase to 5.3±0.2 g / l versus 3.6±0.3 g / l in the control, P <0 01, compared with children without diffuse euthyroid goiter was increased by 1.2 times (4.5±0.3 g / l, P <0.05), there was an increase in cholesterol content to 3.4±0.2 mmol / L versus 2.2±0.1 mmol / L in the control P <0.01, compared with children without diffuse euthyroid goiter was increased by 1.2 times (2.8±0.2 mmol / L, P < 0.05). There was an increase in triglycerides up to 1.5 - 0.1 mmol / L versus 0.9 - 0.05 mmol / L in the control P <0.01, compared with children without diffuse euthyroid goiter it was increased 1.3 times (1 , 2±0.09 mmol / L, P <0.05). In the group of children with protracted community-acquired pneumonia against the background of diffuse

euthyroid goiter, there was an increase in total lipids to 5.6±0.3 g / l versus 3.6±0.3 g / l in the control, P <0.01, compared with children without diffuse euthyroid goiter was increased by 1.3 times (4.2±0.2 g / l, P <0.05), there was an increase in cholesterol content to 3.8□0.3 mmol / l versus 2, 2±0.1 mmol / L in the control (P <0.01), compared with children without diffuse euthyroid goiter, it was increased 1.3 times (2.9±0.1 mmol / L, P <0.05). There was an increase in triglycerides up to 1.8 - 0.1 mmol / L versus 1.1 - 0.08 mmol / L in the control (P <0.01), compared with children without without a DIFFUS EUTYREOID STATE, it was increased 1.6 times. (1.1 - 0.08 mmol / L, P <0.05).

Thus, we have confirmed the high importance of the functional state of the thyroid gland in the development of diseases of the bronchopulmonary system, while determining the direction of biochemical changes. It is necessary to diagnose and begin to treat recurrent bronchitis and protracted course of community-acquired pneumonia in combination with diffuse euthyroid goiter on time, in childhood and adolescence, when there are still no gross changes in the thyroid gland and deep metabolic changes.

CONCLUSION

1. In bronchopulmonary pathology, a diffuse increase in the thyroid gland, characterized by the presence of iodine deficiency (an increase in thyroid-stimulating hormone and a decrease in T4), is observed, membrane-destructive processes are observed associated with a violation of lipid peroxidation, the antioxidant system, which indicates the need to ensure dynamic control over the condition of patients and an integrated approach to treatment and rehabilitation measures.

2. In patients with bronchopulmonary pathology against the background of diffuse euthyroid goiter, the hyperlipidemia, hypocholesterinemia, and an increase in the level of triglycerides discovered by us, can serve as confirmation of the violation of the lipid spectrum of the blood serum of children.

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