AMERICAN JOURNALS
Open Access, Peer Reviewed Journals

American Journal of Research in Humanities and Social Sciences
ISSN (E): 2832-8019 Volume 20, | January, 2024

FEATURES OF THE BLOOD HEMOSTASIS SYSTEM IN CHILDREN WITH CHRONIC PNEUMONIA

Sh. M. Ibatova,
O.X. Shakarboyeva
Samarkand State Medical University, Republic of Uzbekistan

ABSTRACT

We examined 100 children with chronic pneumonia, who were divided into two groups: Group I consisted of 30 patients aged 12-14 years (with bronchial deformation - 24 patients; with bronchiectasis - 6), Group II - 70 patients aged 15 - 15 years. 16 years (with bronchial deformation - 46 patients; with bronchiectasis - 24). An analysis of the indicators of the blood hemostasis system in patients with chronic pneumonia was carried out. The presented data emphasize the significant pathogenetic significance of changes in hemostasis in patients with chronic pneumonia, which requires the search for new methods of pathogenetic therapy based on anticoagulant effects.

KEYWORDS

Chronic pneumonia, patients, blood, hemostasis, indicators, shifts.

Introduction

The lungs play a significant role in maintaining the physiological balance of the coagulation, fibrinolytic system and in the regulation of hemostasis [3,4,6,11]. Thus, the lungs are the site of fibrinolysis, the richest source of heparin. In addition, in the reticuloendothelial cells of the connective tissue of the lungs, the possibility of synthesizing fibrinogen, prothrombin, tissue thromboplastin and Ac - globulin is allowed [8,10]. Naturally, the inflammatory process in the lungs can be accompanied by changes in the blood coagulation system. Of particular interest are these changes in chronic lung pathology in children, when emerging hemocoagulation disorders can aggravate hypoxia and determine the course and prognosis of the disease [1,2,5,7,9].

Violation in the hemostasis system in chronic lung pathology determines the severity of the disease, the presence of an exacerbation, the degree of pulmonary heart failure, so monitoring this system is important.

PURPOSE OF THE STUDY

To analyze the parameters of the blood hemostasis system in children with chronic pneumonia.

MATERIALS AND METHODS OF RESEARCH

100 patients with chronic pneumonia were examined, who were divided into two groups: group I consisted of 30 patients aged 12-14 years (with bronchial deformation - 24 patients; with bronchiectasis

- 6), group II - 70 patients aged 15 years. and older -16 years (with bronchial deformation - 46 patients; with bronchiectasis - 24).

Recalcification time according to the method of K. Bergerhoff and Rock. Determination of prothrombin time using the method of A.L. Quick; Plasma fibrinogen concentration was determined by the gravimetric method of R.A. Rutberg; Free heparin level according to E. Simrey's method. Ethanol test according to V.G. Lychev; Lipinski protamine sulfate test; Fibrinolytic activity according to the method of M.A. Kotovshchikova and B.I. Kuznik. Plasma tolerance to heparin according to L. Poller's method.

RESULTS OF THE STUDY AND THEIR DISCUSSION

Studies of the indicators of the hemostasis system were carried out for the first time on the days of admission to the clinic in the acute phase, against the background of heparin therapy (7-8 days of treatment), and after the treatment before discharge. The results of the study of the coagulation system are presented in Table 1.

Table 1. Changes in hemostasis parameters in chronic pneumonia in children upon admission in the acute phase (M±m)

№	Indicators	Healthy children		Children with chronic obstructive pulmonary disease	
		3-7 years	8-15 years	3-7 years n=30	8-15 years n=70
1.	Plasma recalcification time (sec)	90,1±6,8	90,6±7,8	78,2±5,4 P<0,05	74,6±4,7 P<0,05
2.	Plasma tolerance to heparin (min)	8,74±0,69	9,38±0,79	6,94±0,44 P<0,05	6,45±0,76 P<0,001
3.	Free heparin in blood plasma (sec)	6,4±0,54	7,1±1,12	4,2±0,5 P<0,02	3,8±0,52 P<0,001
4.	Plasma fibrinogen (g/l)	2,94±0,12	2,69±0,2	4,81±0,6 P<0,001	5,1±0,47 P<0,001
5.	PDF (g/l)	2,8±0,9	2,91±0,92	3,4±0,76 P>0,05	6,7±0,96 P<0,05
6.	ethanol sample	negative	negative	13,3% positive	20% positive
7.	Protamine sulfate test	negative	negative	10% positive	25,7% positive
8.	Prothrombin index (%)	94,5±0,44	96,0±0,76	94,8±1,2 P>0,1	99,88±1,02 P<0,05
9.	Platelets (1 µl)109 /l	239.0 ±13,6	268±9,76	288,2±17,5 P<0,05	300±22,0 P<0,05
10	Fibrinolytic activity (%)	10,2±0,91	10,7±0,94	7,71±0,92 P<0,05	6,23±0,74 P<0,001

Note: P- reliability of the difference between the indicators of healthy and sick children

As can be seen from Table 1, during the period of exacerbation of chronic pneumonia in the examined children of all age groups, the average value of recalcification time compared with similar indicators in healthy children was accelerated 78.2±5.4 74.6±4.7 (P <0.05), which indicates an increase in overall blood clotting.

It was found that in children with bronchiectasis there was an even greater reduction in the time of recalcification of blood plasma compared to the group of healthy children and averaged 76.04±4.68 seconds. (P<0.001), and in children with bronchial deformation without their expansion 79.14±3.46 sec. (P>0.1).

The most significant acceleration in the time of recalcification was observed in children with a serious condition during complications. As can be seen from Table 1, during the period of exacerbation of chronic pneumonia in the examined children in all age groups, the average value of the time of recalcification in comparison with similar indicators in healthy children was accelerated 78.2 ± 5. 4 74.6±4.7 (P<0.05), which indicates an increase in the overall blood clotting ability. When studying the timing of recalcification of blood plasma depending on the form of chronic pneumonia, Fig. 1. It was found that in children with bronchiectasis there was an even greater reduction in the time of recalcification of blood plasma compared to the group of healthy children and averaged 76.04±4.68 seconds. (P<0.001), and in children with bronchial deformation without their expansion 79.14±3.46 sec. (P>0.1).

The most significant acceleration in the timing of recalcification was observed in children with a serious condition when chronic pneumonia was complicated by pulmonary heart failure or the addition of circulatory failure. On average, it was 70.4±3.4 seconds, which was significantly (P<0.05) higher than in patients with an average severity of the disease of 82.68±5.4. According to the Bergerhoff-Rock test, it can be noted that in patients with chronic obstructive pulmonary disease, shifts towards hypercoagulation are observed, and the severity of these shifts depends both on the activity of the inflammatory process in the bronchopulmonary system and on the severity and duration of the disease. Data on the content of free heparin in blood plasma in patients with chronic pneumonia showed significant changes. Thus, in the phase of exacerbation of the disease, a sharp (P<0.001) decrease in the level of free heparin was observed in all age groups to an average of 4.2±0.5 seconds; 3.8±0.52, normal, respectively 6.4±0.54; 7.1±1.12 seconds. Taking into account individual fluctuations, in 18 patients with a recent (2-year) duration of the disease, the level of free heparin was within the normal range, in 6 patients it was higher than the control values.

With pulmonary heart failure, the addition of circulatory failure. On average, it was 70.4±3.4 seconds, which was significantly (P<0.05) higher than in patients with an average severity of the disease of 82.68±5.4. According to the Bergerhof-Rock test, it can be noted that in patients with chronic pneumonia there are shifts towards hypercoagulation, and the severity of these shifts depends both on the activity of the inflammatory process in the bronchopulmonary system and on the severity and

Data on the content of free heparin in blood plasma in patients with chronic pneumonia showed significant changes. Thus, in the phase of exacerbation of the disease, a sharp (P<0.001) decrease in the level of free heparin was observed in all age groups to an average of 4.2±0.5 seconds; 3.8±0.52, normal, respectively 6.4±0.54; 7.1±1.12 seconds. Taking into account individual fluctuations, in 18 patients with a recent (2-year) duration of the disease, the level of free heparin was within the normal range, in 6 patients it was higher than the control values.

So, in the first days of admission to the clinic, the level of free heparin in these patients slightly exceeds the general indicators and averages 5.75±0.95; 4.84±0.64 sec. (P>0.05). Based on the data obtained, it can be noted that the level of free heparin in the blood of children with chronic pneumonia in the acute phase of the disease tends to decrease. A decrease in the content of free heparin indicates an increased readiness of the blood to clot due to an exacerbation of the inflammatory process in the lungs. The

higher content of free heparin in the blood that we have established in the bronchiectasis variant and in severe cases of the disease is apparently a consequence of an increase in the number of mast cells in the focus of inflammation and the manifestation of one of the mechanisms of compensatory and adaptive reactions of the body to the constant hypoxic state of patients in this group, since Heparin increases tissue tolerance to oxygen and adapts them to oxygen deficiency.

Analysis of our results revealed an increase in fibrinogen content in the blood plasma in children with this pathology aged 13 to 16 years, 4.81±0.6, while in the control group it was 2.94±0.12; 2.69±0.2 ($P<0.001$). Severe hyperfibrinogenemia in our studies occurs due to an increase in inflammatory fibrinogen A, which is an indicator of inflammation (caused by the inflammatory process) and is aimed at limiting the focus of inflammation.

Somewhat different results were obtained in the study of the content of fibrinogen in patients with bronchiectasis and with a severe course of the disease, so these patients showed the greatest increase in the content of fibrinogen in the blood plasma compared with patients with bronchial deformity, with moderate severity of the disease ($P<0.05$) and was 5.8±0.35; 6.8±0.52, which indicates the highest activity of the inflammatory process in these patients. Data on the prothrombin index in patients with chronic pneumonia are subject to fairly minor fluctuations (Table 1). In the phase of exacerbation of chronic pneumonia, a significant increase in the average indicator was observed in patients from 8 to 15 years old and amounted to 99.88±1.02 ($P<0.05$). In sick children aged 3 to 7 years, there was a slight increase in prothrombin activity 94.8±1.2 ($P>0.1$), while in the group of healthy children this figure averaged 94.5±0.44; 96.0±0.76%.

As can be seen from the above data, the prothrombin index in sick children with chronic pneumonia has a deviation from the norm. At the same time, the most significant deviation from the level of control figures was observed in the phase of exacerbation of the disease.

A study of the platelet link of hemostasis showed that during the period of exacerbation of chronic pneumonia, an increase in the number of platelets was observed in all age groups (288.2±17.5; 300±22.0). Of these, in some children of patients with bronchiectasis and a serious condition, hyperthrombocytosis was observed (329.8±13.1; 342.4±18.7), which we assessed as a thrombophilic condition.

An analysis of blood fibrinolytic activity (FAK) showed that in children with this disease at the age of 13-16 years, an insignificant decrease in the average level of 7.71 ± 0.92% was observed at admission, with a norm of 10.2 ± 0.91%. The most pronounced decrease in fibrinolytic activity was observed in patients aged 8-15 years (6.23±0.74 $P<0.001$).

FAK blood was detected in 3% of sick children with a serious condition with pulmonary heart failure. So, in the phase of exacerbation of the disease, FAC in these patients was 11.48±0.96 $P<0.05$ compared with the control group 10.20±0.91. In children with a moderately severe condition, the index of fibrinolytic activity of the blood was significantly reduced ($P<0.001$). An increase in FAC is explained by significant hypoxia of organs and tissues, a compensatory response of the body to increased blood clotting, and a factor preventing thrombosis. Summarizing the above data, it should be noted a clear dependence of the state of the blood coagulation system on the phase of the course, the clinical form, the duration of the disease, and the severity of the patients' condition.

As can be seen from the above data, the prothrombin index in sick children with chronic pneumonia has a deviation from the norm. At the same time, the most significant deviation from the level of control figures was observed in the phase of exacerbation of the disease.

A study of the platelet link of hemostasis showed that during the period of exacerbation of chronic pneumonia, an increase in the number of platelets was observed in all age groups (288.2±17.5; 300±22.0). Of these, in some children of patients with bronchiectasis and a serious condition, hyperthrombocytosis was observed (329.8±13.1; 342.4±18.7), which we assessed as a thrombophilic condition.

When studying the hemostasis system in patients with chronic pneumonia
depending on the clinical form, age and severity of the patients' condition, we encountered large fluctuations of these indicators. In this regard, we identified the following types of changes in the functional state of the hemostasis system in chronic pneumonia in children.

We regarded the increase or decrease in hemostasis indicators from the initial level of healthy children by 50-60% as a compensatory type, 60-90% subcompensatory type, 100% or more decompensatory type I and below 40% decompensatory type II hemostasis disorders Table 2.

A compensatory type of disorder was observed in 60% of patients aged 3-7 years and 44.3% at the age of 8-15 years. When assessed from the clinical form, a compensatory type of disorder was observed in 34.3% of patients with bronchial deformity without their expansion. And in patients with moderate severity, a compensatory type of hemostasis disorder was observed in 28.6%.

Table 2. Comparative assessment of hemostasis indicators in relation to the number of patients (%)

Indicators	Compensatory type	Subcompensatory type	Decompensatory type I	Decompensatory type II
In children aged 3 to 7 years n=30	60	26,6	13,4	-
For children 8 to 15 years old n=70	44,3	38,6	12,8	4,3
With bronchial deformity n=70 With bronchiectasis n=30	34,3	65,7	-	-
With moderate condition n=84 With serious condition n=16	-	33,4	56,6	10

In patients with a compensatory type of hemostasis disorder during exacerbation of chronic pneumonia, a moderate activation of the procoagulant link of the hemostasis system occurs. The activation of the procoagulative link was evidenced by a moderate increase in plasma fibrinogen content, a shortening of the plasma recalcification time, an increase in plasma tolerance to heparin, a slight decrease in blood fibrinolytic activity (P> 0.05) and a negative ethanol and protamine sulfate test. We regarded the compensatory type of hemostasis impairment as a state of moderate hypercoagulability and considered it an adequate response of the body to inflammation. A subcompensatory type of hemostatic disorder was observed in 26.6% of patients aged 3-7 years, in 38.6% of patients aged 8-15 years, in children with bronchial deformity, a subcompensatory type of disorder was observed in 65.7%, with bronchiectasis in 33, 4% of patients, which was associated with the duration of the disease and the incidence of bronchiectasis.

When studying the severity of the condition of patients, the subcompensatory type of disorder was found in 71.4% of patients with moderate severity. In patients with a subcompensatory type of hemostasis disorder, there was a higher activation of the procoagulant link of the hemostasis system. These patients had an even more significant increase in fibrinogen content.
In decompensatory type I hemostasis disorders, the level of prothrombin activity began to decrease, the level of fibrinogen significantly increased (P<0.001), and more noticeably than in the subcompensatory type of disorder, the most significant acceleration of recalcification time was observed, the content of heparin in the blood was significantly reduced, inhibition was noted. fibrinolytic activity of the blood, in 25% of children all paracoagulation tests - fibrinogen B, ethanol, protamine sulfate test were positive.

CONCLUSIONS

Thus, the presented data indicate a significant pathogenetic significance of changes in hemostasis in patients with chronic pneumonia, which requires the search for new methods of pathogenetic therapy based on the anticoagulant effect.

REFERENCES

1. Kostin A.S., Tereshchenko L.V. The state of the blood coagulation and anticoagulation system in chronic pneumonia in children. - Moscow. 2010. -60 p.
2. Working classification of the main forms of bronchopulmonary diseases in children / Geppe N.A., Rozinova N.N., Volkova I.K. [and etc.]. - Moscow: Russian Respiratory Society, 2009. - 18 p.
3. Strukov S.M., Umarova B.A. Violation of the interaction of thrombin and fibrinogen by heparin and receptors of the anticoagulant system // Vopr. Honey. Chemistry. 1996. Issue. 3. p. 132-135.
4. Ibatova Sh. M., Mamatkulova F. Kh., Ruzikulov N.Y. The Clinical Picture of Acute Obstructive Bronchitis in Children and the Rationale for Immunomodulatory Therapy. International Journal of Current Research and Review. Vol 12 Issue 17. September 2020. - P.152-155.
5. Ibatova Sh. M., F. Kh. Mamatkulova, N. B. Abdukadirova, Yu. A. Rakhmonov, M. M. Kodirova. Risk Factors for Development of Broncho-Ostructive Syndrome in Children. International Journal of Current Research and Review. Vol 12. Issue 23 December 2020.-P. 3-6.
6. Ibatova Sh.M., Baratova R.Sh., Mamatkulova F.Kh., Ergashev A.Kh. State of immunity in chronic obstructive pulmonary disease in children. Asian Journal of Multidimensional Research (AJMR). Vol 10, Issue 3, March, 2021. P. 132-136.
7. Ibatova Sh.M., Baratova R.Sh., Mamatkulova F.Kh., Ergashev A.Kh. State of immunity in chronic obstructive pulmonary disease in children. Asian Journal of Multidimensional Research (AJMR). Vol.10, Issue 3, March, 2021. P. 132-136.
8. Sh.M. Ibatova, F.Kh. Mamatkulova, N.Y. Ruzikulov, Yu.A. Rakhmonov. Bronchoo structive syndrome in children: prevalence and difficulties of differential diagnostics. ACADEMICIA: An International Multidisciplinary Research Journal 2021, P. 87-92.
9. Ibatova Sh. M., Abdurasulov F.P., Mamutova E.S. Some aspects of diagnostics of out-of-social pneumonia in children indications for hospitalization. EPRA International Journal of Research and Development (IJRD) Volume: 6 | Issue: 4 | April 2021. P. 242-244.

10. Ibatova Sh.M., Mamatkulova F.Kh., Mukhamadiev N.K.State of immunity in chronic obstructive pulmonary disease in children. CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES Volume: 02 Issue: 05 | Sep-Oct 2021 ISSN: 2660-4159. P. 103-107.
11. Ibatova Sh.M., Muhamadiev N.Q. Efficiency of immunomodulating therapy in acute obstructive bronchitis in children. Central Asian Journal of Medical and Natural Sciences. Volume: 02 Issue: 02 | March-April 2021 ISSN: 2660-4159. P. 210-213.