EFFICIENCY OF COMBINED APPLICATION OF APRICOT OIL AND AEVIT AS A REGULATOR OF LIPASE ACTIVITY OF BLOOD SERUM IN CHILDREN WITH VITAMIN D-DEFICIENCY RICKETS

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Abstract: In children with rickets, significant changes in the composition of higher fatty acids in blood serum have been established by gas-liquid chromatography. The depth of changes in the composition of higher fatty acids depended on the severity of the disease. The violated composition of higher fatty acids was corrected using vegetable (apricot) oil and aevit. Apricot oil helps to normalize the activity of serum lipase and leads to the restoration of the metabolism of higher fatty acids, the absorption of calcium and phosphorus thereby ensures high efficiency of therapy in children with vitamin D-deficient rickets. The effectiveness of this method of treating children before traditional therapy is shown.
Keywords: rickets, lipid metabolism, fatty acids, apricot oil, aevit, traditional therapy, treatment.

Introduction: Rickets continues to occupy a significant place in the structure of morbidity in young children and remains an urgent problem of pediatrics to date [1,3,11]. This problem requires special attention to the problem of rickets, which has a negative effect on the reactivity of the body, the course and outcome of somatic diseases, especially in children of the first year of life [2,4,8].

This is a childhood disease caused by a deficiency of vitamin D in the body, characterized by a violation of calcium-phosphorus metabolism, bone formation and impaired function of the nervous system and internal organs [10].

Despite significant advances in the study of the etiology and pathogenesis of rickets, the presence of vitamin D and its metabolites in the arsenal of practical health care, the treatment of rickets remains an underexplored medical problem and does not always give satisfactory results, which adversely affects the rates of child morbidity and mortality [6,12,14].

Rickets is not a socially dangerous disease, but most diseases in children are much more severe than in healthy ones, with frequent relapses and complications from the respiratory, nervous, cardiovascular and digestive systems, which can be a direct cause of death [5,7,13].

Rickets transferred at an early age can lead to impaired posture, persistent deformations of the chest, legs, pelvis, contribute to the formation of malocclusion and flat feet, cause a delay in psychomotor development. Girls often form a flat rickets pelvis, which subsequently contributes to various birth injuries in children at birth.

With rickets due to a lack of vitamin D, processes of violation of all types of metabolism, including lipid metabolism, occur [9,15,16]. All this determines the relevance and important practical significance of studies aimed at an in-depth study of the pathogenesis of rickets, its clinical manifestations, the development of more advanced methods of complex therapy by including previously inapplicable pharmacological preparations of pathogenetic action.

Currently, mild and moderate-severe forms of the disease are quite common, and severe rarely. This determines the important practical significance of research aimed at an in-depth study of rickets and the development of more advanced methods of complex therapy.

Purpose of the study was to study the effect of apricot oil and Aevit on the course of the disease and on the activity of serum lipase in case of rickets in children.

Material and research methods. To accomplish the tasks we examined 180 children aged 1 to 12 months. Out of them, 132 children with rickets, complicated pneumonia and malnutrition were hospitalized in the children's department of the 2-clinic of Samarkand Medical Institute, and 28 children with rickets and 10 healthy children were observed in the Children's Clinic N1 in Samarkand.

The results of the study. The examined children were divided into IV groups. The distribution of the examined patients by groups and disease is presented in table 1.

Group I consisted of patients receiving traditional treatment (43 children).

Group II - on the background of traditional therapy received apricot oil (41 children).

Group III - against the background of traditional treatment received Aevit (38 children).

Group IV - against the background of traditional treatment, received apricot oil and Aevit (38 children).

As it can be seen from table 1, among the observed children, rickets without concomitant diseases was observed in 34 children, rickets, aggravated by pneumonia in 56 and rickets, aggravated by pneumonia and hypotrophy in 76 children.

Table 1

Distribution of children with rickets by group and disease

Group	Total number of children	Ricket	Rickets weighed	
			Pneumonia	Pneumonia and malnutrition
I	43	11	15	21
II	41	7	15	19
III	38	9	13	18
IV	38	7	13	18
Total	166	34	56	76

The distribution of the examined children depending on the severity, groups and gender are shown in table 2.

As can be seen from table 2, rickets of I severity was observed in 15 children, II severity of the disease was observed in 19 children. In boys, in comparison with girls, the subacute course of the disease prevailed.

Clinical evaluation of sick children was carried out on the basis of a study of the general condition, musculoskeletal, nervous system and psychomotor development. The criteria for assessing the degree of hypotrophy were indicators of weight and growth, taking into account the severity of the subcutaneous fat layer on the abdomen - at the navel, its sequential decrease, tissue turgor, coloration of the skin and visible mucous membranes, anthropometric data with the calculation of the Chulitskaya's, Erismann and Tour indices.

Table 2

Distribution of examined patients by sex, course and severity of the disease

Degrees	Groups of examined patients	Количество детей	Gender			
			Boys		Girls	
			n	%	n	%
Rickets		34	19	55,8	15	44,1
I	Acute	8	5	14,4	3	8,8
	Subacute	7	4	11,7	3	8,8
	Total	15	9	26,4	6	17,6
II	Acute	3	-	-	3	8,8
	Subacute	16	10	29,4	6	17,6
	Total	19	10	29,4	9	26,4

In addition to the goals and objectives of conducting special laboratory research methods, the indicators used in clinical practice (general analysis of blood, urine, feces, x-ray data) were also studied. It is appropriate to emphasize that the examined contingent of children with rickets was carefully selected at the site and in the clinic, followed by their hospitalization in the hospital.

An analysis of the anamnestic data on the features of childcare and observation revealed that in 77.2% of children with signs of active rickets their motor activity was clearly inadequate, the children were mostly and lying down during the day, and the physical education of the child in the families of these children attention was paid to, in the system of their education, the elements of physical culture were applied irregularly.

Lack of motor activity, their long stay in a lying position, insufficient use of physical culture in the system of raising a healthy child are regarded by us as a very important risk factor for the development of rickets in children in the first year of life.

Irrational, inadequate age of the child in terms of quantity and quality of nutrition was found in 99 children in the group of patients with rickets, i.e. 75% of cases. The main reason for this was the lack of awareness of mothers in the rules of rational feeding of children.

Our observations indicate that rickets develops mainly in children who are burdened in the medical and social aspect with a premorbid hairdryer (the mother has obstetric and extragenital pathology, inadequate motor activity of the child, unsustainable feeding, frequent intercurrent diseases, unfavorable family living conditions, previously artificial and mixed feeding).

During the studying the clinical symptoms of rickets, it was found that the earliest signs of the disease were functional disorders of the nervous system.

Among patients with rickets of the first degree, symptoms of a functional disorder of the central and autonomic nervous system were observed in most children (33.3%). Against the background of general irritability, increased excitability prevailed in their behavior: all children were tearful, restless, their sleep was often interrupted, general hyperesthesia of the skin was noted, in 62.9% of patients there was occipital alopecia. With rickets of the II degree, the general behavior of children testified to a decrease in emotional tone, an increase in the central nervous system inhibition processes: the children were lethargic, inactive, their interest in toys and the environment was significantly reduced.

When assessing the degree of damage to the bones of the skull, we took into account the presence of enlarged large fontanel, craniotabes, flattening of the bones of the skull, the severity of the frontal and parietal tubercles, and deformation of the facial part of the skull. In the observed children with rickets, the shape of the chest was also changed as a result of its expanded lower aperture, the presence of costal “rosaries”.

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Violations of the state of the muscular system are noted in the form of muscle hypotension of varying degrees of severity, depending on the severity and nature of the course of rickets. Mostly affected were those muscle groups that were subjected to functional load at one age or another (hypotension of the muscles of the abdomen, spine, limbs). The weakness of the ligamentous apparatus in sick children was characterized mainly by increased mobility of the joints.

A significant part of children with rickets of the II degree of severity showed weakness of the ligamentous apparatus (66.7%), which caused a delay in the development of statokinetic functions of the observed children.

A group of children with rickets, weighed by pneumonia and hypotrophy, was also examined. The vast majority of mothers of children with rickets, aggravated pneumonia and malnutrition had some factors that aggravated the course of pregnancy: toxicosis of the first half of pregnancy - 28%, and 19% - of the second half of pregnancy, chronic diseases in the mother - 18%, anemia during pregnancy - 39%, threatening miscarriage - 13%, occupational hazards - 17% of mothers.

28 children showed excessive irritability, the rest, on the contrary, were sharply depressed, lethargic. In most children, sleep was disturbed, there was no lag in neuropsychic development. Mothers complained about the pallor and emaciation of children, loss of appetite or lack thereof. All other patients were restless due to frequent coughing, difficulty breathing.

During an external examination of patients, pallor of the skin was noted, turgor and skin elasticity were reduced.

With a combination of rickets with pneumonia, bloating of the wings of the nose, cyanosis of the lips and nasolabial triangle of varying severity were noted in 73 children. Respiration was rapid from 65 to 80 in 3 patients, in the rest from 40 to 60 per minute. In the examined children, wet rales of various sizes were heard in the lungs and changes in percussion sound were detected. An X-ray examination revealed the corresponding changes in the form of increased pulmonary pattern, expansion of the roots of the lungs or decreased transparency of the pulmonary fields. We examined 47 patients who received traditional therapy. Of these, 11 children with rickets, 15 children with rickets aggravated pneumonia and 21 children with rickets aggravated pneumonia and malnutrition.

We conducted a study of the composition of higher serum fatty acids in children with rickets who are on traditional treatment and when using modified therapy.

We analyzed the initial indicators of biochemical options, which reflect the state of some indicators of lipid metabolism, as well as some features of their dynamics in children against the background of the traditional treatment method. The results are presented in table 3 and in fig. 1.

In the examined children, at the time of admission to the hospital, the indicator of total lipids was higher than the control values (4.61 g / l) and amounted to 6.95 g / l of total lipids ($P < 0.001$).

When analyzing the fatty acid spectrum of the blood serum of the examined children upon admission to the hospital, it was revealed that almost all of its indicators are C (16: 0), C (18: 0), C (18: 1), C (18: 2), C (18: 3), C (20: 4) had no significant differences compared with healthy children ($P > 0.2$), ($P > 0.5$) and only C (16: 1) tended to decrease ($P < 0.05$).

Table 3: **Some indicators of lipid metabolism in children with rickets receiving traditional treatment**

Indicators	Healthy M ± м	On admission M ± м P	In the dynamics (for 5-7 days) M ± м P	At discharge M ± м P
Total lipids, g / l	4.61 ± 0.28	6.95 ± 0.30 < 0.001	6.61 ± 0.30 < 0.001	5.64 ± 0.20 <0.02
Total feces lipids, g / l	0.42 ± 0.05	0.85 ± 0.03 < 0.001	0.79 ± 0.03 < 0.001	0.71 ± 0.02 < 0.001
C(16 : 0)	28.17 ± 1.37	30.87 ± 1.53 > 0.2	29.50 ± 1.43 > 0.5	28.96 ± 0.43 < 0.01
C(16 : 1)	2.70 ± 0.22	1.32 ± 0.62 <0.05	1.45 ± 0.53 <0.05	1.62 ± 0.30 < 0.05
C(18 : 0)	26.13 ± 1.32	28.13 ± 1.04 > 0.2	27.88 ± 0.92 > 0.2	27.67 ± 0.82 > 0.2
C(18 : 1)	0.90 ± 0.13	0.60 ± 0.14 > 0.2	0.66 ± 0.11 > 0.2	1.76 ± 0.10 > 0.2
C(18 : 2)	33.32 ± 2.51	29.73 ± 2.34 > 0.5	30.10 ± 2.12 > 0.5	30.74 ± 2.10 > 0.5
C(18 : 3)	2.41 ± 0.45	2.56 ± 0.50 > 0.2	2.44 ± 0.48 > 0.2	2.11 ± 0.45 < 0.05
C(20 : 4)	3.56 ± 0.60	2.68 ± 0.60 > 0.2	2.32 ± 0.56 > 0.2	2.10 ± 0.51 < 0.05
UFAs	54.30 ± 2.69	59.00 ± 2.57 <0.05	57.38 ± 2.35 > 0.2	56.63 ± 2.10 > 0.2
EFAs	42.89 ± 3.91	36.93 ± 4.20 <0.05	36.98 ± 3.80 <0.05	37.33 ± 3.62 < 0.05
K= UFAs / EFAs	0.80	0.63	0.64	0.65

P – significance of differences between indicators in the group of patients and healthy

The content of total lipids in the feces of healthy children was 0.42 ± 0.05 g / kg, and at the time of admission to the hospital in children this indicator was 0.85 ± 0.03 g / kg, which was higher than in healthy children ($P < 0.001$).

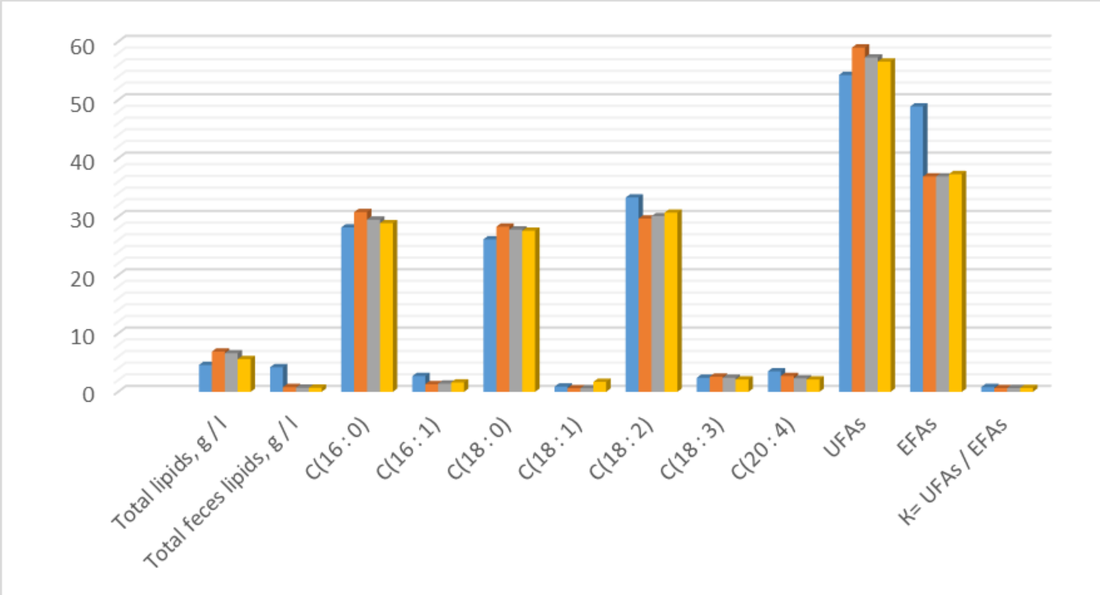

Figure 1. The dynamics of some indicators of lipid metabolism (spectrum of high fatty acids) in children with rickets, against the background of traditional therapy

The content of C (16: 0) tended to decrease and amounted to 27.50 ± 1.43% (P> 0.5), while the C (16: 1) increase turned out to be equal to 1.45 ± 0.53% (P <0.05) . Serum C level (18: 0) decreased and averaged 27.88 ± 0.92% (P> 0.2), while C (18: 1) tended to increase and amounted to 0.66 ± 0.11% (P> 0.2). The content of C (18: 2) also tended to increase 30.10 ± 2.12% (P> 0.5), and C (18: 3) decreased, averaging 2.44 ± 0.48% (P> 0.2) . The level C (20: 4) on average was 2.32 ± 0.56% (P> 0.2) i.e. tended to decrease.

Further studies were conducted at the time of discharge of the children. As a result, by the time of discharge in children of this group, the studied parameters were: the content of LA was 5.64 ± 0.3% (P <0.02), which was higher than in the control group. CLA decreased, the indicator corresponded to 0.71 ± 0.02% (P <0.001).

The concentration of C (16: 0) at the time of discharge was 28.96 ± 1.28% (P <0.001). C (16: 1) was 1.62 ± 0.43% (P <0.01) and remained below the standard values. C content (18: 1) 0.76 ± 0.10% (P> 0.2), i.e. lower than healthy children. The level C (18: 2) at discharge was 30.74 ± 2.10% (P> 0.5), which also tended to decrease, and C (18: 3) 2.11 ± 0.45% (P <0.05) i.e. lower than healthy children.

The content of C (20: 4) was 2.10 ± 0.51 (P <0.05) also below normal. As can be seen from the table. 1 data, in children who received conventional treatment, along with a decrease in the clinical manifestations of the disease, there was a tendency to decrease disorders of some indicators of lipid metabolism, which is retained in sick children, despite the treatment.

Discussion. Studies have shown that the stability of lipid dysmetabolism under the influence of the generally accepted treatment complex is probably due to the fact that the action of specific therapy in the body is primarily aimed at correcting calcium-phosphorus metabolism. It can be assumed that the absence of noticeable positive dynamics of the fatty acid spectrum under the influence of conventional complex therapy makes it difficult to realize the effect of vitamin D in the body, since it is proved that under the influence of lipid dysmetabolism, a decrease in the level of 1,25-dioxycholecalceferol in plasma is observed, which is one of the most active metabolites of vitamin D [10]. This is probably due to a violation of its renal metabolism under conditions of lipid dysmetabolism.

The next group of examined children with rickets (38) received apricot oil and aevit against the background of the traditional method of treatment. The results of the study are presented in table 4 and Fig. 2 and 3. Apricot oil was used as a substance correcting impaired

lipid metabolism. Apricot oil has a light brown color, transparent, without impurities, precipitation, rich in polyunsaturated fatty acids, has a pleasant smell and taste, has a high biological activity and has a beneficial effect on metabolic processes in the child's body [4].
Table 4

Some indicators of lipid metabolism in children with rickets, receiving apricot oil and aevit against the background of traditional therapy

Indicators	Healthy M ± м	On admission M ± м	In the dynamics (for 5-7 days) M ± м	At discharge M ± м
Total lipids, g / l	4.61 ± 0.28	6.95 ± 0.30	5.21 ± 0.30	4.81 ± 0.20
Total feces lipids, g / l	0.42 ± 0.05	0.75 ± 0.30	0.63 ± 0.20	0.49 ± 0.30
C(16 : 0)	28.17 ± 1.37	30.87 ± 1.51	29.50 ± 1.50	28.21 ± 1.31
C(16 : 1)	2.70 ± 0.22	1.38 ± 0.64	1.98 ± 0.50	2.55 ± 0.30
C(18 : 0)	26.13 ± 1.32	28.03 ± 1.04	27.95 ± 0.90	26.75 ± 0.80
C(18 : 1)	0.90 ± 0.13	0.66 ± 0.16	0.79 ± 0.10	0.92 ± 0.10
C(18 : 2)	33.32 ± 2.51	29.13 ± 2.28	32.15 ± 1.90	33.12 ± 1.80
C(18 : 3)	2.41 ± 0.45	2.69 ± 0.51	2.83 ± 0.50	2.73 ± 0.45
C(20 : 4)	3.56 ± 0.60	2.58 ± 0.60	2.99 ± 0.52	3.26 ± 0.40
UFAs	54.30 ± 2.69	58.90 ± 2.55	57.45 ± 2.30	54.96 ± 2.11
EFAs	42.89 ± 3.91	36.44 ± 4.19	40.74 ± 3.52	42.60 ± 3.05
K= UFAs / EFAs	0.78	0.61	0.71	0.77

P – significance of differences between indicators in the group of patients and healthy

Under the influence of the modified treatment, the indicators of the fatty acid composition returned to normal in most patients. The treatment method showed its high efficiency, which is confirmed by the data obtained: C (16: 0) -28.21 ± 1.31%, C (16: 1) -2.55 ± 0.30%, C (18: 0) - 26.75 ± 0.80%, C (18: 1) - 0.92 ± 0.10%, C (18: 2) - 33.12 ± 1.80%; C (18: 3) -2.73 ± 0.45%; C (20: 4) - 3.26 ± 0.40%.

Normalization of the fatty acid composition of blood serum in most patients is confirmed by the data: C(16:0)- 28,21±1,31%, (P<0,05), C(16:1)-2,55±0,30%, C(18:0)-26,75±0,80%, C(18:1)-0,92±0,10%, C(18:2)-33,12±1,80%; C(18:3)-2,73±0,45%; C(20:4)-3,26±0,40%.

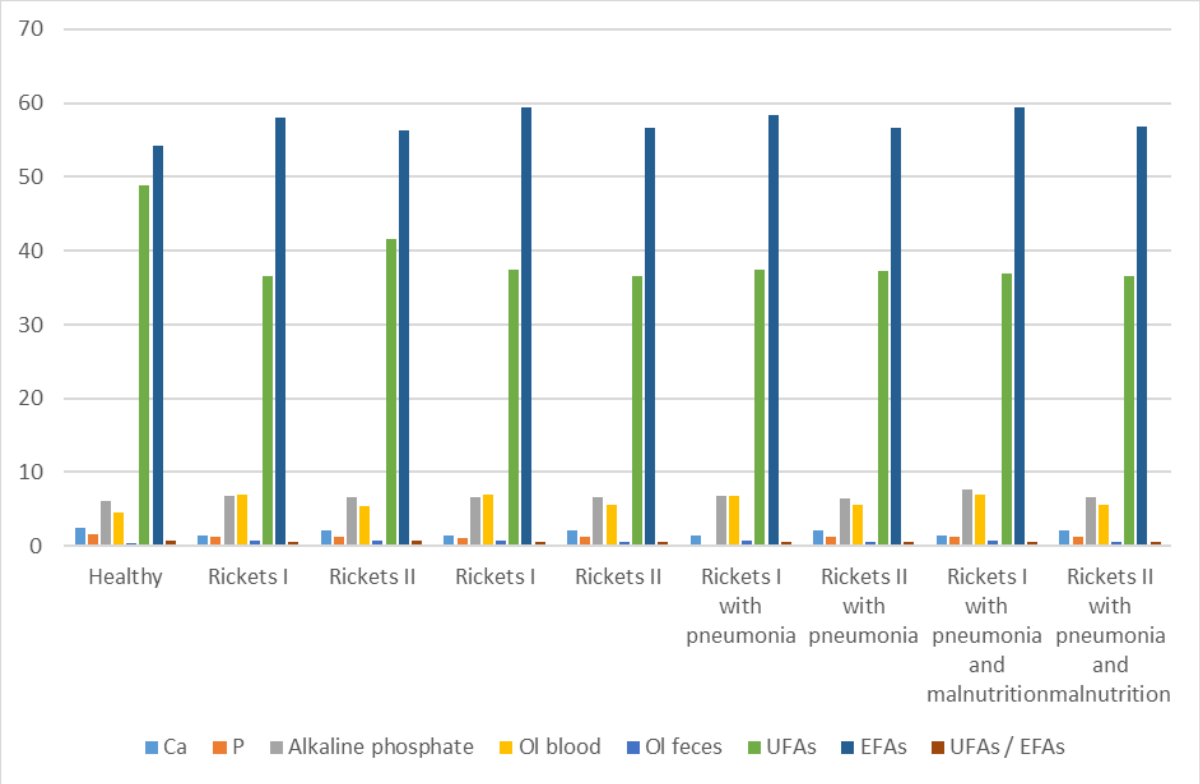

Fig. 2. Dynamics of indicators of phosphorus-calcium metabolism, total blood lipids and feces in the examined patients who were on the III variant of corrective therapy (B3)

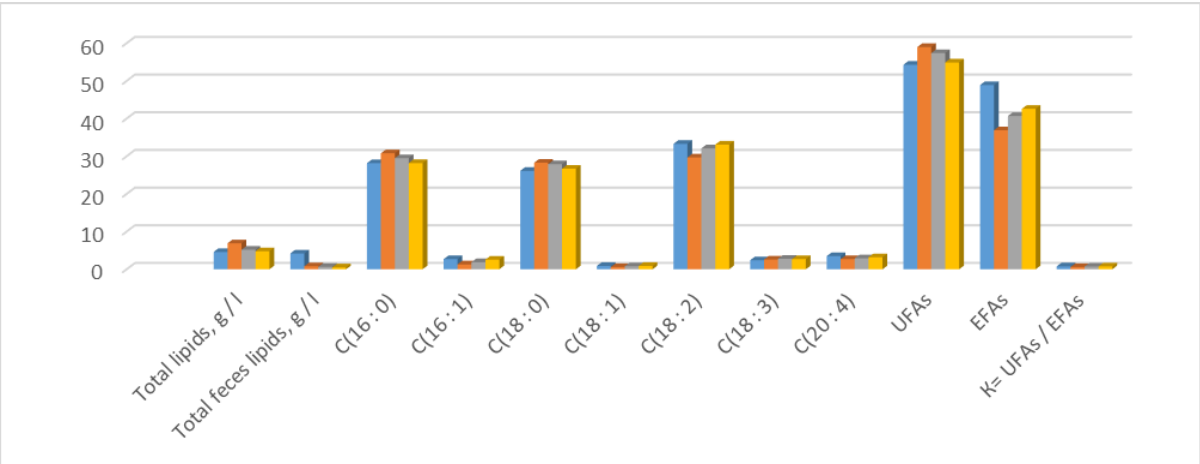

Fig. 3. Some indicators of lipid metabolism in children with rickets, receiving apricot oil and Aevit against the background of traditional therapy.

The digestibility of oils by the body was evaluated by serum lipase activity (LA). Studies have shown that the serum LA in the children examined by us before apricot oil was 10.2 ± 1.6 µmol / (l * min), when using cotton oil in the diet, it was 10.5 ± 1, 1 µmol / (l * min), (n = 9), i.e. no noticeable change was observed, when giving zigir oil was 16.8 ± 1.2 µmol / (l * min), (n = 9), sea buckthorn - 18.9 ± 1.7 µmol / (l * min) n = 10), and when children received apricot oil, the lipase activity of blood serum increased significantly and amounted to - 20.7 ± 1.8 µmol / (l * min), (n = 9), and in the case of cumin oil - 19.7 ± 1.9 µmol / (l * min), (n = 8).

In the above results of analyzes of our own studies, it was specially emphasized that the main scientific and applied goal of the work was to search, register and discuss the most common patterns inherent in the functional state of the studied units of lipid, phosphorus-calcium metabolism in children with rickets. This was the primary task for explaining theoretical conclusions and developing practical recommendations. Based on this, a leading place was given to the study of this aspect of the problem.

Dyslipidemic shifts and impaired phosphorus-calcium metabolism play a role not only in the genesis of the development of rickets, but also in very specific mechanisms for the formation of severity of rickets.

The data presented above confirm the idea of the pathogenetic role of lipid imbalance and disorders of phosphorus-calcium metabolism in the mechanisms of pathogenesis of rickets in the examined children, the following theoretical premises follow from this:

a) the very essence of dyslipidemic changes is an important link in the general mechanisms of the pathogenesis of rickets;

b) the degree of imbalance in the spectrum of higher fatty acids, the presence of a deficiency of antioxidants largely determines the mechanism for the formation of the severity of the disease.

Obviously, the results obtained allow us to conclude that the positive “biochemical” effect of the treatment option using apricot oil and Aevit in children with rickets is highly reliable along with traditional therapy.

Conclusions

1. It has been established that with rickets there are significant disturbances in the metabolism of higher fatty acids, which are manifested by an increase in the amount of saturated fatty acids, total blood lipids and feces and a decrease in the coefficient of unsaturation of fatty acids, indicating a violation of lipid metabolism.
2. Pneumonia and hypotrophy against rickets aggravate the clinical course of rickets, impaired lipid and phosphorus-calcium metabolism.
3. The traditional method of treating children with rickets does not lead to the restoration of the metabolism of higher fatty acids, total blood lipids and feces, calcium and phosphorus.
4. The use of apricot oil and Aevit for the correction of the spectrum of higher fatty acids helps to normalize the activity of serum lipase and leads to the restoration of the metabolism of higher fatty acids, the absorption of calcium and phosphorus and ensures high efficiency of therapy in children with vitamin D-deficient rickets.
5. The use of apricot oil leads to an improvement in lipid absorption by more than 2 times by increasing the activity of blood serum lipase and thereby improves lipid metabolism.

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