UDC 616.71-007.151-053.2

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A PERSONALIZED APPROACH TO THE TREATMENT OF RICKETIS IN CHILDREN

ABSTRACT

The lipid metabolism disorder observed in rickets affects calcium and phosphorus metabolism, as well as the ratio of these minerals in bones. Therefore, it is important to study lipid metabolism in children. Gas chromatography is a key method for analyzing metabolic markers, including fatty acids, in the human body. To evaluate the therapeutic efficacy of treating rickets in children with apricot oil and Aevit using gas chromatography analysis. For effective correction of these metabolic disorders, administration of apricot oil and Aevit is recommended in addition to conventional therapy.

Keywords: rickets, metabolic disorder, fatty acids, apricot oil, Aevit, standard treatment, improved therapy.

УДК 616.71-007.151-053.2

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АННОТАЦИЯ

Нарушение липидного обмена, наблюдаемое при рахите, влияет на обмен кальция и фосфора, а также соотношение этих минералов в костях. Поэтому важно изучать липидный обмен у детей.Газовая хроматография служит важнейшим методом анализа маркеров метаболизма, в том числе жирных кислот, в организме человека. Оценка терапевтической эффективности лечения рахита у детей применением абрикосового масла и Аевита с помощью газожидкостного хроматографического анализа**.** Для эффективной коррекции этих метаболических нарушений рекомендуется прием абрикосового масла и Аевита наряду с традиционной терапией.

Ключевые слова: рахит, нарушение обмена веществ, жирные кислоты, абрикосовое масло, Аевит, стандартное лечение, улучшенная терапия.

INTRODUCTION

In this disease, vitamin D deficiency leads to metabolic disorders at all levels of metabolism, including lipid metabolism. Lipid imbalance observed in rickets affects calcium and phosphorus metabolism, as well as the ratio of these minerals in bones [1,2, 4]. Therefore, it is important to study lipid metabolism in children with rickets.

Currently, the study of the physiological role of unsaturated fatty acids in lipid metabolism, including rickets, is of great importance. As a result of a lack of unsaturated fatty acids, the child's body becomes more susceptible to diseases, kidney function deteriorates, and

platelet aggregation increases. This condition is associated with an increase in the amount of saturated fatty acids in the body [1, 5].

It is known that nutrients, including lipids, affect the process of phosphorus-calcium metabolism, and the transport of these salts in the body directly depends on the structure and functional activity of lipids in biological membranes. With this disease, the absorption of these minerals is impaired. Insufficient consumption of unsaturated fatty acids negatively affects the level of skeletal mineralization and the absorption of phosphorus-calcium salts [3,6].

Based on the above, the study and correction of lipid process disorders in rickets is relevant.

In recent years, gas chromatography has become a valuable tool for determining metabolic markers in the human body. Among these markers, fatty acids are of particular importance, since their detection is effectively carried out using gas-liquid chromatography.

We have developed a specialized approach to the analysis of fatty acids in various pathological conditions, including the selection of a suitable stationary phase and optimization of separation parameters.

STUDY OBJECTIVE

To assess the effectiveness of treating rickets in children with apricot oil and Aevit through gas-liquid chromatography.

MATERIALS AND METHODS

To achieve the goal, 87 children with rickets were examined. Of these, 42 patients were under observation at the Children's Polyclinic No. 1 in Samarkand, and 45 children, whose rickets was complicated by pneumonia and malnutrition, were undergoing inpatient treatment at the regional multidisciplinary children's hospital in Samarkand. The control group consisted of 20 healthy children.

The composition of the main fatty acids in the blood serum of children with rickets was analyzed using gas-liquid chromatography. To identify the separated methyl esters of fatty acids, both the "witness" method and the structural-group "sorbent-sorbate" approach were used. This process allowed us to identify the following fatty acids in the blood serum: C(16:0) - palmitic, C(16:1) - palmitoleic, C(18:0) - stearic, C(18:1) - oleic, C(18:2) - linoleic, C(18:3) - linolenic and C(20:4) - arachidonic. The fatty acid content was determined by the internal normalization method.

RESULTS

The patients were divided into two groups. Group I consisted of 38 children with rickets who received conventional therapy. The results for this group are presented in Table 2.

Group II included 49 children with rickets who underwent a combined treatment regimen, integrating apricot oil and Aevit alongside traditional therapy (Table 1).

Table 1: Fatty Acid Composition and Content in Blood Serum of Children with Rickets

Fatty Acids	Control	During Examination	P-value
C (16:0)	28.17±1.37	30.87±1.53	0.01
C (16:1)	2.70±0.22	1.38±0.64	0.05
C (18:0)	26.13±1.32	28.03±1.04	0.01
C (18:1)	0.90±0.13	0.66±0.6	0.01
C (18:2)	33.32±2.51	29.73±2.34	0.05
C (18:3)	2.41±0.45	2.58±0.50	0.01

Fatty Acids	Control	During Examination	P-value
C (20:4)	3.56±0.60	2.68±0.60	0.01

(*P-value indicates the significance of differences between patients and healthy individuals.*)

The analysis of fatty acid composition in blood serum was conducted among children from Group I (38 patients) receiving standard treatment and Group II (49 patients) undergoing a modified therapy regimen. The comparative results of fatty acid content in rickets patients versus healthy children are summarized in Table 2.

Table 2. Fatty Acid Composition and Content (%) in Blood Serum Based on Treatment Method

Fatty Acids	Control	Traditional Treatment (Mean ± SD)	P-value	Modified Treatment (Mean ± SD)	P-value
C (16:0)	28.17±1.37	28.96±1.28	0.01	28.21±1.31	0.1
C (16:1)	2.70±0.22	1.62±0.43	0.01	2.55±0.30	0.1
C (18:0)	26.13±1.32	27.67±0.82	0.20	26.75±0.80	0.1
C (18:1)	0.90±0.13	0.76±0.10	0.20	0.92±0.10	0.1
C (18:2)	33.32±2.51	30.74±2.10	0.50	33.12±1.80	0.1
C (18:3)	2.41±0.45	2.11±0.45	0.05	2.73±0.45	0.1
C (20:4)	3.56±0.60	2.10±0.51	0.05	3.26±0.40	0.1

(*P-value indicates statistical significance compared to the control group.*)

Children with rickets who received only conventional treatment demonstrated considerable variability in lipid metabolism parameters.

DISCUSSION

The persistence of lipid metabolism disorders despite conventional treatment is likely due to the fact that standard therapy primarily focuses on restoring calcium-phosphorus balance. This suggests that the lack of significant improvement in the fatty acid profile during traditional treatment may hinder the full effect of vitamin D in the body. Research indicates that lipid metabolism disturbances can lead to a reduction in plasma levels of 1,25-dihydroxycholecalciferol, one of the most biologically active forms of vitamin D. This reduction is likely associated with impaired renal metabolism under conditions of lipid dysregulation.

A separate group of children with rickets (n=49) received an enhanced treatment protocol, incorporating apricot oil and Aevit alongside conventional therapy. The results of this approach are reflected in Table 2. Apricot oil was selected as a metabolic modulator to address lipid imbalances. This oil, characterized by its transparent, light brown appearance, absence of impurities, and rich polyunsaturated fatty acid content, possesses high biological activity. Its beneficial influence on metabolic processes in the pediatric population has been well-documented.

The prescribed duration of apricot oil administration depended on disease severity:

- For mild (Grade 1) rickets, treatment lasted 12–14 days.
- For moderate (Grade 2) rickets, therapy extended to 24 days, with a dosage of 0.5 ml/kg of body weight.

Aevit, a vitamin-based antioxidant therapy, was also integrated into the regimen:

- For Grade 1 rickets, Aevit was administered intramuscularly at 0.3 ml per day for 4–6 days.
- For Grade 2 cases, the dosage was increased, with administration continuing for 7–10 days, once per day.

As shown in Table 2, the modified treatment protocol demonstrated notable efficacy. The obtained data indicate that key fatty acid levels significantly improved:

- Palmitic acid (C16:0) – 28.21 ± 1.31%
- Palmitoleic acid (C16:1) – 2.55 ± 0.30%
- Stearic acid (C18:0) – 26.75 ± 0.80%
- Oleic acid (C18:1) – 0.92 ± 0.10%
- Linoleic acid (C18:2) – 33.12 ± 1.80%
- Linolenic acid (C18:3) – 2.73 ± 0.45%
- Arachidonic acid (C20:4) – 3.26 ± 0.40%

This data confirms that, under the influence of the modified therapy, the fatty acid composition in most children returned to normal levels.

Dyslipidemia and calcium-phosphorus metabolism imbalances play a significant role not only in the onset of rickets but also in determining disease severity. The findings support the hypothesis that lipid imbalance and phosphorus-calcium dysregulation are key elements in rickets pathogenesis. Several theoretical conclusions can be drawn:

1. Lipid dysregulation is a crucial factor in rickets pathogenesis, contributing to the overall metabolic disturbances associated with the disease.
2. The severity of fatty acid imbalance and antioxidant deficiency directly influences disease progression, impacting the mechanisms behind disease severity.

The results of this study provide strong biochemical evidence supporting the effectiveness of apricot oil and Aevit as adjuncts to conventional therapy. Their use significantly improves lipid metabolism and enhances treatment outcomes in children with rickets.

CONCLUSION

Children with rickets have severe fatty acid metabolism disorders. For effective correction of these metabolic disorders, it is recommended to take apricot oil and Aevit along with traditional therapy.

Recommended treatment guidelines:

- Apricot oil:

  Mild rickets (Grade 1): 12–14 days at 0.5 ml/kg body weight.
  Moderate rickets (Grade 2): 24 days at the same dosage.

- Aevit:

  Mild rickets (Grade 1): 0.3 ml intramuscularly for 4–6 days.
  Moderate rickets (Grade 2): 1 injection per day for 7–10 days.

By incorporating this modified approach, the overall effectiveness of rickets treatment can be significantly improved, restoring metabolic balance in affected children.

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