IJIMM, Volume 2, Issue 6, 2024 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3

INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Calcium Deficiency and Treatment in Children

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Annotation: Calcium deficiency is common in children of different ages, which can primarily be due to insufficient intake of calcium with food, a high need for calcium due to a rapid increase in bone mass, as well as a violation of congenital or acquired mineral metabolism and the development of secondary hypocalcemia. Calcium is an element that is important for the growth and healthy development of a child. Its deficiency causes various diseases in the child's body, with early detection and elimination of calcium deficiency being important in shaping a healthy society.

Keywords: Calcium deficiency, vitamin D, rachitis, osteoporosis, treatment, prevention.

In order for the child to grow up healthy, develop physically and mentally, all metabolic processes in balance, it is important to provide the body with an adequate supply of organic (proteins, lipids, carbohydrates, vitamins) and inorganic (water, mineral elements) substances. There is a complex multilateral interaction between macro - and microelements, which, even with a deficiency of one substance, causes an imbalance of elementary homeostasis, which becomes the starting point for the development of many pathological processes in children and adults. Calcium is an important element, and among chemicals, calcium occupies one of the main places due to the breadth of its biological functions. In the human body, it accounts for about 1.4% of body weight. In the body, calcium is distributed unevenly, 98-99% of which is in bone tissue, and only 1-2% in other tissues (1 g in blood plasma, 6-8 g in soft tissues. is found). The concentration of calcium in the blood is in the range of 2.25–2.75 mmol/l, about 45% of which is in the form of a free ion with plasma proteins, 8-10% in combination with other ions, 45-50%. First of all, calcium phosphate, in the form of calcium carbonate and organic salts, is present in the bones, teeth, ensuring the function of the bones and their strength. Bone tissue acts as a storehouse of calcium and, if it is not received sufficiently externally, or the body's needs increase for certain reasons, the necessary amount for metabolic processes is spent from bones. Ca serves to regulate cellular and intracellular processes: to activate all stages of cell cycle and gene transcription. Ca is also important for regulating the processes of nerve conduction and muscle contraction. It is also actively involved in blood clotting processes, regulating the permeability of cell membranes, maintaining stable cardiac activity, regulating the synthesis and release of a number of hormones, regulating mineral homeostasis, protein, lipid and carbohydrate metabolism, and in the processes of intercellular adhesion and formation of connective tissue structure. Calcium is among the main structural elements that ensure the normal and stable development of a growing organism. Also in the human body, calcium is involved in the performance of several important functions. It is involved in the control and regulation of anti-stress , neuromuscular and nerve conduction (calcium plays an important role in ensuring the transmission of nerve excitation based on brain activity, short-term memory activity and learning of various skills, muscle performance). Provides stable and normal functioning of the visual and auditory systems. It is also involved in the control and regulation of vascular tone, the rhythm of contraction of the heart muscle, and in the reduction of the permeability of the vascular walls. Enhances the activation and functioning of various enzymes, as well as the activity of a number of endocrine glands. Normalizes the activity of the separation system. Ensures the normal formation of bones and teeth. Regulates the state of various tissues in the body. Fully controls the

blood clotting process. Strengthens the immune system and also reduces the body's sensitivity to allergens and bacteria. Calcium accumulates in the human body mainly in the bones from birth until the age of 25. If Ca is lacking, the body absorbs it from the bones. For this reason, a constant process of reconstruction takes place in the bone tissue. In other words, the old bone tissue is replaced with a new one. Lack of vitamins and calcium in the body of children can lead to thinning of bone tissue and a decrease in quality. Lack of calcium in the body can be triggered by a number of factors. First, it is a lack of vitamin D, which can also be affected by the simultaneous intake of certain foods that interfere with the absorption of calcium. 1. Oxalates are compounds found in beets, sorrel and a number of mineral waters. 2. Phytates-are present in legumes, so they need to be soaked in water before cooking. 3. Phosphates are a popular preservative, so it is found in many foods.

Hypocalcemia is manifested by harmless signs, but this is observed only at the beginning, that is, calcium deficiency can manifest itself in the form of muscle spasms, joint pain, insomnia, slow heart rhythm. Irritability and sleep disorders can also occur. If the deficiency increases, frequent nosebleeds, dental defects, and unreasonable malaise may occur. With a strong lack of calcium, it is accompanied by frequent breakage of bones, the observation of fragility. Calcium metabolism is a complex multi-stage process that is inextricably linked with the exchange of phosphates and vitamin D, in which the digestive tract kidneys, bone and blood system also function. It is controlled by the endocrine system by the hormones parathyroid glands (parathyroid hormone), thyroid gland (calcitonin). A violation of calcium metabolism can be assessed by a decrease or increase in the amount of ionized calcium in the plasma. In practice, children are more likely to experience calcipenia than excess calcium. The causes of this deficiency can be exogenous, endogenous factors, as well as combinations of them, as well as genetically determined cases. In addition, the frequency of hypocalcemia in children is significantly associated with the age aspect-coinciding with periods of increased maximum bone metabolism. Insufficient calcium supply is one of the most common alimentary shortages in children and adults in the world, which then leads to serious metabolic disorders and the formation of pathologies of various organs and systems (rickets, osteoporosis, increased risk of bone fractures). In addition hypocalcemia can cause hypertension, diabetes mellitus, obesity and metabolic syndrome, in addition to other micronutrient deficiencies. When drawing up a child's diet, parents should be explained about the peculiarities of the absorption of calcium from food, about the factors that stimulate and weaken its absorption in the intestine. Its absorption in the small intestine improves with vitamin D, the optimal amount of phosphates (Ca/P ratio 1:1 or 1:1.5) and fats (0.04–0.08 calcium per 1 g of lipid), lactose. The high content of phosphates, sulfates, oxalates, fats in food slows down this process. Despite the fact that calcium is the most important in physiological processes, the symptoms of its deficiency are not felt in the early stages, gradually increasing. Therefore, preventive measures are not carried out, calcium deficiency is prescribed several months or even years late. In pediatrics, it is worth paying attention to the main preventive measures, taking into account the prevalence of calcium deficiency in children and adult populations and the extremely serious health consequences with long-term irreparable hypocalcemia. This is especially important during critical periods of accumulation of bone mass, since attempts to correct the deficiency later do not fully affect the restoration of the structure and mineral density of bone tissue. Symptoms of calcium deficiency include: 1. Rubbing of the hands and toes, pain in muscles, bones and joints. 2. Neurological disorders: irritability, weakness, impaired cognitive ability, insomnia, dizziness, paroxysmal conditions, weakness, fatigue. 3. Signs of changes in the skin: decreased skin elasticity, brittle nails, hair loss, hair growth, disorders in the formation of tooth growth and tooth enamel, followed by caries, periodontal diseases. Changes in the cardiovascular system: tachycardia, arrhythmia, disorders of excitability and permeability in the myocardium. Dyspeptic changes: abdominal pain, constipation, flatulence. In order to maintain adequate levels of calcium in the body, it is necessary to pay attention to the following:

1.To ' grain nutrition, that is, the consumption of foods rich in calcium: dairy products, nuts, cauliflower, fish products. The child should drink at least two glasses of milk a day. Dairy products for children are the most important source of calcium, therefore, the restriction and exclusion of their consumption should be strictly justified (allergy to cow's milk proteins, lactase deficiency, etc.). An

alimentary source for vitamin D can be provided by introducing fatty fish species (herring, salmon), egg yolk, beef liver. Nuts (pistachios, almonds), sesame seeds, sunflower, pumpkin oil (soybeans, beans), spring herbs (basil, celery), dried fruits (dried apricots), mineral water, confectionery product - chocolate-also contain calcium. Especially in young children, it is important to exclude or limit as much as possible foods containing saturated fatty acids, phosphates, simple carbohydrates and industrial food additives (sausages, chips, sugary carbonated drinks, etc.). Specific measures to help prevent the development of hypocalcemia in children include timely diagnosis and treatment of somatic diseases that disrupt mineral metabolism, and taking vitamin D in age-related preventive doses. If it is not possible to ensure adequate nutrition of calcium and other macro - and microelements, as well as the presence of risk factors, it is compensated for by calcium, which is lacking in biologically active additives, vitamin and mineral complexes. 2.Maintaining physical activity. To maintain the balance of calcium in the body, the child must be physically active. Proper and regular physical education serves as an important factor in the process of developing and maintaining a child's bone mass. Additional intake of such complexes is especially important for children who are developing very quickly. The growth of a child from 1 to 3 years old is 8-10 cm, from 3 to 7 years old – 5-8 cm, at this age the teeth grow, so it is very important to provide the body with sufficient calcium. Failure to overcome calcium deficiency at an early age can then lead to decreased bone mass and rapidly developing osteoporosis. When taking calcium prophylactically, it is recommended to adhere to the following rules::

1.Calcium preparations should be taken in combination with vitamin D. 2. The daily dose should be taken with a sufficient amount of liquid during or after meals. 3.Basically, calcium preparations should be taken in the afternoon, since the processes of growth and osteomodulation occur during the night hours. 4.The preventive course consists of 1-3 months, repeated 2-3 times a year. It is also important to use drugs that contain other osteotropic agents (vitamins Zn, Cu, Mg, K, C, Group B, etc.) in addition to calcium and vitamin D to prevent osteoporosis during critical periods of skeletal growth and bone mass formation in children. However, it should be remembered that the effectiveness of the use of monopreparations of calcium salts for the prevention or treatment of hypocalcemia is low. Currently, it is noted due to a decrease in the quality of food, as well as their nutritional value (a decrease in the content of vitamins, macro - and microelements), so even a balanced age - related diet can be 20-30% less in terms of important macro-and microelements. Taking into account these data, it is mandatory to combine calcium preparations with osteoprotective nutrients (vitamins D, K, etc.) to prevent and treat hypocalcemic conditions. Thus, vitamin D in its active form (Calcitriol) is one of the main regulators of phosphorus-calcium metabolism, starting with the absorption processes in the intestine, which ensures the mineralization of the bone and is excreted by the kidneys. Vitamin K bone protein promotes carboxylation of osteocalcin, reduces calcium loss in the urine, and is involved in the regulation of vitamin D metabolism. Pharmacological compounds of calcium for oral administration are represented by Salts of inorganic (phosphate, carbonate) and organic (lactate, gluconate, citrate) acids, both types are successfully used in clinical practice. If the advantage of inorganic salts can be called a high content of 1 g of elemental calcium, then organic salts are well absorbed in the gastrointestinal tract at different pH values and have greater bioactivity. The choice should be made individually, taking into account the age and health of the child, its purpose (prevention or treatment), features of nutrition and the functioning of the gastrointestinal tract.

Tablets, dragees, capsules, lozenges, syrups are very common for children containing calcium. D-calcine granules consist of calcium and vitamin D, The Daily Dose in children is 1000-4000 XB (1/4-1 measuring cup).

The tablet Supravit CaMgZnD3 + C (calcium carbonate, magnesium sulfate, zinc sulfate, ascorbic acid, cholecalciferol) is consumed with 200 ml of water along with 1 tablet to 1 meal. Dora calcine (for all ages) is taken for children under 7 years of age at the time of feeding 1 sachet, for 4-6 weeks. Calisid suspension (calcium, zinc, lysine, vit D) is given from the age of 1 month, adults are also given 2 times in 1 day, the duration is determined individually. Calcium D3 Nika kids tablet (after 3 years) is taken from 3 to 12 years with 1 tablet 2 times, chewing, sucking, eating. Detrimax (baby) can be given

from the birth of a child. Detrimax active-from 3 years old, 1 drop is given along with food. Too much calcium (hypercalcemia) can also lead to side effects on the body, especially on the growing body, or even death. Most often, such an event occurs with improper intake of food additives. Signs of excess calcium: nausea, constipation, lack of appetite. An excess of calcium can lead to the appearance of kidney stones.

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