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The Importance and Role of Calcium on the Growth and Development of Children and Its Complications

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ABSTRACT

Calcium (Ca) is one of the most important mineral components of food, which is used to build and maintain the skeletal structure of the body. Calcium is the most important mineral in the body. About 99% of the body's calcium is found in bone and teeth, along with phosphorus and the rest in soft tissue and extracellular fluid. Calcium is involved in the human body for activities such as bone and tooth building, blood clotting, muscle contraction, nerve conduction, and cell metabolism.

Calcium deficiency in children leads to physical and mental developmental disorders and the development of osteoporosis called Rashitisme. This condition causes abnormal bones, large joints, and difficulty moving. In adults, calcium deficiency causes osteomalacia, which results in decreased calcium density in the bones, resulting in hollow and brittle bones.

Calcium deficiency is often associated with vitamin D deficiency, which leads to problems with bone mineralization and severe muscle cramps. The aim of this study was that calcium plays an important role in the human body for activities such as bone and tooth building, blood coagulation, muscle contraction, nerve conduction, and cell metabolism.

The results of this study showed that calcium is the cause of bone strength. There should be enough calcium in the diet of children before adulthood so that the bones are properly compacted and adults do not develop osteoporosis. There is the research method in this article is in the style of a library and a new scientific barrier has been written and the importance of the role of calcium in the body and the effects of its deficiency on the growth and development of children have been studied.

Keywords- Rickets, Osteomalacia, Mineralization, Minerals, Collagen, Perichondrium

I. INTRODUCTION

Every living thing needs food to survive. Food is needed to provide the body with the energy it needs, the activity of various organs and systems, growth and development, providing and maintaining body heat, and each of the vital functions. Equipped with nutrition knowledge helps people to pay more attention to what they eat, because food plays an important role in living better and ensuring the full health of the body, because today nutrition is one of the factors affecting public health and economic progress of human societies. It is important. Human food is made up of smaller components called nutrients. In general, six types of nutrients are involved in the construction of food, which are: carbohydrates, fats or lipids and proteins, which are three types of energy and play a structural and biological role. Vitamins, minerals and water are also nutrients, but they are not energizing and are known as protective nutrients and play a key role in biochemical interactions. Minerals that are essential for the human body are divided into two categories. One is micro elements and the other is macro elements. High-consumption elements are small amounts necessary for the body, which include sodium, potassium, sulfur, magnesium, iron, and low-consumption elements include cobalt, tin, selenium, fluorine, and iodine. About 99 percent of calcium is released into the bones and 1 percent into other organs and fluids. Calcium deficiency causes soft bones in children. By absorbing calcium, children's soft bones become hard bones. Bone softening is called rashitisme. Calcium deficiency in adults causes osteoporosis. Calcium is essential for growing children, pregnant and lactating women.

II. IMPORTANCE AND ROLE OF CALCIUM IN THE BODY

Calcium is one of the most important mineral components of food, which is used to build and maintain the skeletal structure of the body. Calcium is the most important mineral in the body. About 99% of the body's calcium is found in bone and teeth, along with phosphorus and the rest in soft tissues and extracellular fluid. Calcium in the body has the following functions:

A) Bone and tooth structure:

The strength and strength of bones depends on the density of minerals inside them. The higher the density of minerals and mineral crystals inside the bone, the dirtier the bone and the stronger it is. Bone crystals contain compounds that are mainly composed of calcium and phosphorus.

If enough calcium and other minerals are not present in a growing bone, the bone becomes interstitial or brittle, and osteoporosis gradually develops.

B) Blood coagulation:

Calcium is necessary for blood to coagulate or clot. Its special role is to help convert prothrombin and fibrin.

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C) Muscle contraction:

Calcium is essential for the synthesis of muscle proteins (actin and myosin) during contraction. If blood calcium is depleted, the muscles will not be able to relax after the contraction, and as a result, general contraction of the body muscles can occur. Adequate calcium intake also regulates vascular wall muscle and blood pressure.

D) Nerve current transmission:

Calcium is essential for the normal transmission of nerve current and the release of nerve piles. Another occurrence of general contraction of body muscles is when there is no neurotransmission due to calcium deficiency.

E) Cell metabolism:

Calcium is essential for regulating cellular metabolism and the formation of special proteins in the cell that facilitate the action of enzymes. Calcium is essential for the production of glycogen in the body (3: 67-68)

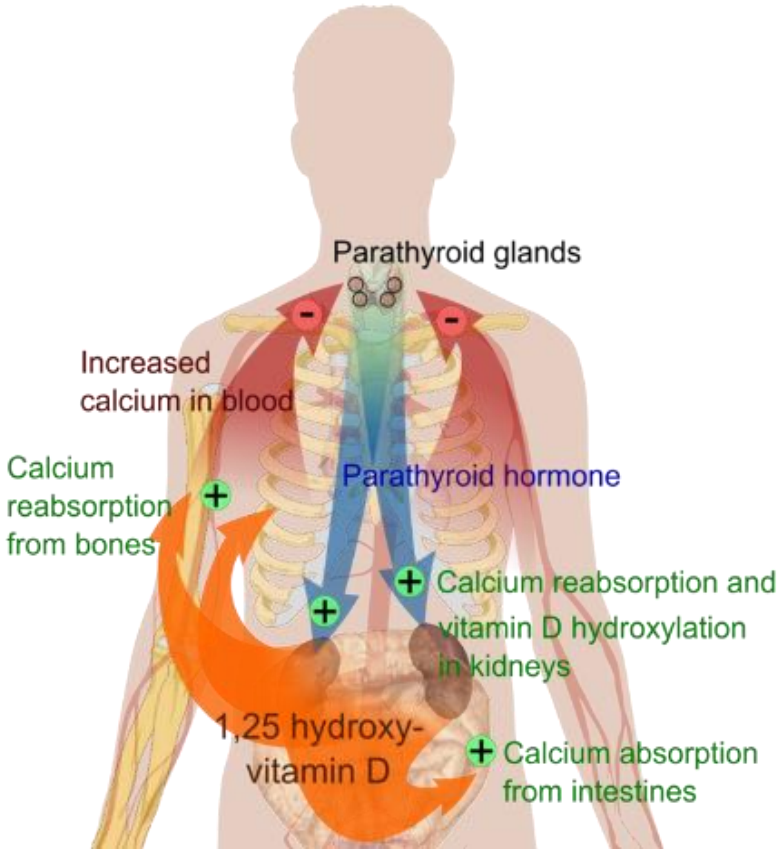

Figure 1: Calcium regulation

III. CALCIUM ABSORPTION

The main place of calcium absorption is in the upper part of the small intestine, because the lower the pH of this part is more suitable for calcium absorption. The body's need is the first and best factor that helps absorb calcium. 20 to 40 percent of the amount of calcium consumed in food can be absorbed by the body and used. When the body needs more calcium; As you grow, become pregnant, and breastfeed, your calcium intake increases.

There are several factors that contribute to better calcium absorption, including:

1. There is a sufficient amount of vitamin D in the intestines
2. Existence of sufficient amount of vitamin C and some amino acids
3. The presence of lactose or milk sugar in the intestines, which causes the growth of some microscopic organisms in the intestines. This action also changes the pH of the intestines and increases calcium absorption.

Therefore, in order to get enough calcium from food, it is not enough to eat enough calcium-rich foods, but you also need to have vitamin D, vitamin C, and some carbohydrates in your body to make better use of calcium. For this reason, the reduction of any of the above factors or the presence of some acids such as oxalic acid in the pelvis due to its combination with calcium, reduce its absorption. Or, with age, calcium absorption decreases as stomach acid levels decrease (6: 149).

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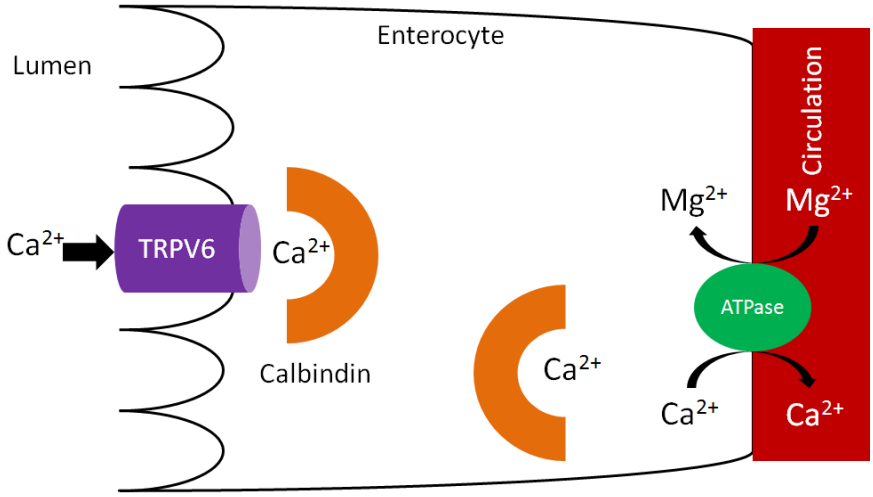

Figure 2: Calcium absorption

IV. FOOD SOURCES AND DAILY REQUIREMENT

Milk and its products are rich sources of calcium. Fruits and vegetables, grains and legumes, fish or poultry meat, eggs, turnips and almonds are the best sources of calcium after milk and its products.

The recommended amount of calcium is about 800 mg per day, to which 400 mg should be added for growth, puberty, pregnancy and lactation.

Complications of calcium deficiency

Calcium deficiency leads to osteoporosis in children and osteoporosis in adults. Calcium deficiency is often associated with vitamin D deficiency, which leads to problems with bone mineralization and severe muscle cramps. Cramps that do not respond to calcium may be due to a decrease in magnesium, which can sometimes lead to heart failure.

About 99 percent of calcium is released in the bones and 10 percent in other organs and internal body fluids. Calcium deficiency causes soft bones in children. By absorbing calcium, children's soft bones become hard bones. Bone softening is called Rashitisme. Calcium deficiency in adults causes osteoporosis. Calcium is more necessary for growing children, pregnant and lactating women.

The use of complete intravenous nutrition in patients with previous digestive problems has led to the development of calcium and trace element deficiency syndromes. Due to calcium deficiency, changes in the bones of children are common and there is normal growth of cartilage; Because mineralization occurs in the cartilaginous matrix (2: 78-79).

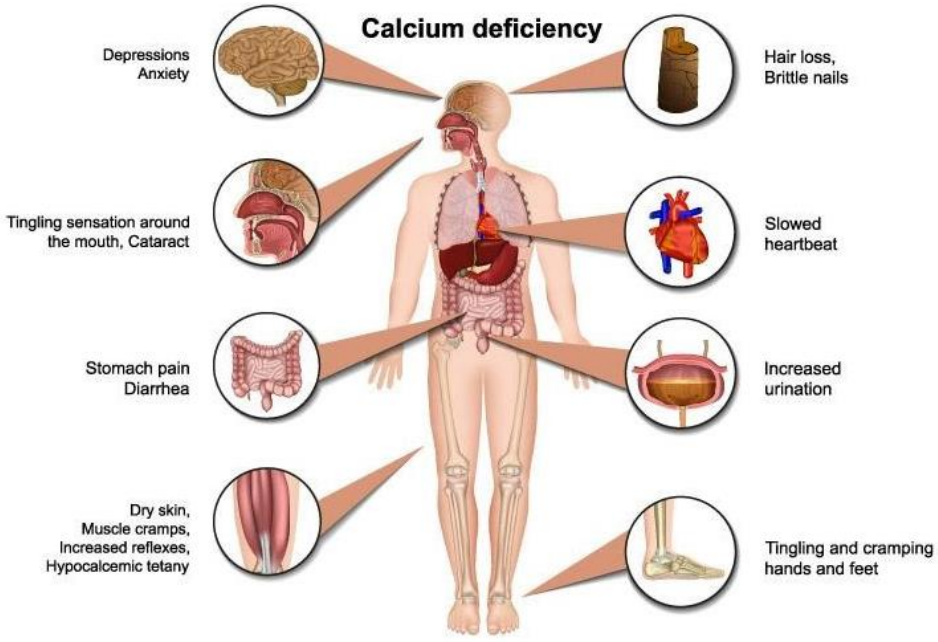

Figure 3: Calcium deficiency

Vitamin D

Vitamin D is one of the vitamins dissolved in the uterus. This vitamin is found in milk, egg yolks, animal livers, especially aquatic animals, and fish oil.

Keep in mind that vitamin D is made in the human body. This vitamin, called Cholicalciferol, is made from the cholesterol molecules in the human skin as a result of the sun's ultraviolet rays.

Complications of vitamin D deficiency

Vitamin D deficiency in children causes rashitisme, which results in bones, especially long bones, becoming crooked and crooked.

As the disease progresses, some calcium is released from the bone tissue and its amount in the bone decreases, resulting in softening and deformation of the bones. This condition is more severe in young children. Research has shown that 54.5% of children with vitamin D deficiency develop tooth decay within eight months. When such children were treated with vitamin D, only 7% of them were not treated, the rest all recovered. Vitamin D deficiency in children causes the spine to curve and break bones on its own, making the body susceptible to microbial infections. These children get chest diseases, tuberculosis and pertussis. Vitamin D deficiency in adults causes osteomalacia. This disease causes fractures of the bones and weakness of the pelvic floor muscles. Symptoms of this disease include enlarged skulls, stunted growth, and enlarged joints. It should be added that breastfeeding women and children with this disease need more vitamin D.

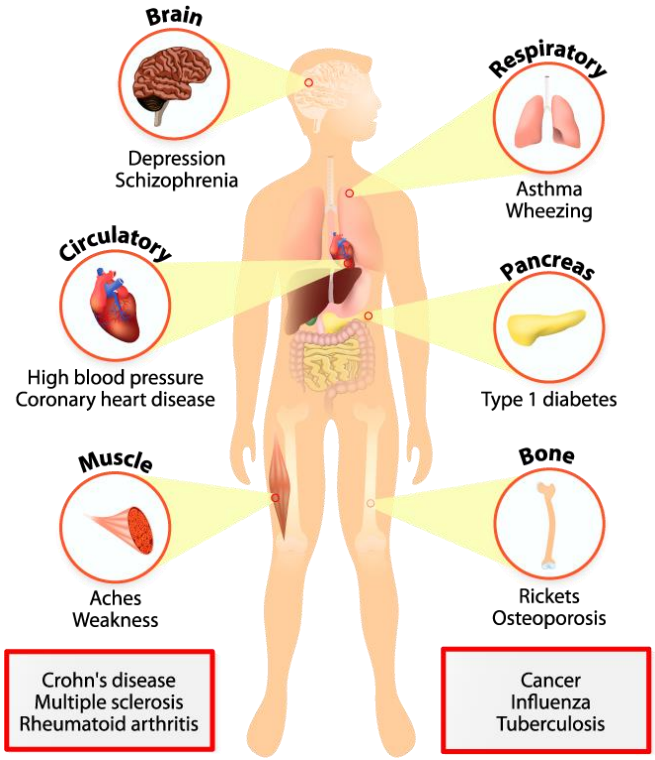

Figure 4: Vitamin D deficiency

Side effects of increased vitamin D in the body

When vitamin D is consumed more than a thousand units per day, a person experiences side effects caused by excessive use of vitamin D, which include excessive brotherhood, distaste, extreme fatigue, the presence of albumin in the urine, increased calcium and phosphorus in the blood. Itchy skin, muscle weakness, anorexia, weight loss and anger (4: 77-78).

Vitamin C

Vitamin C or ascorbic acid is one of the water-soluble vitamins and the daily requirement of the body is 3 to 5 milligrams per kilogram of normal weight. In children, this amount increases greatly. Vitamin C is not only a factor in the growth and nutrition of capillaries, but also has the following functions in the body:

1. Collagen Making: Collagen is a protein that binds epithelial tissue cells together like cement and is necessary for the formation of interstitial substance in teeth, bones, cartilage, skin and capillary walls. Therefore, vitamin C is needed for tooth and bone formation, bone bonding, wound healing, and wound health.
2. Helping the immune system function: Vitamin C increases the body's resistance to damage and toxins from bacteria.
3. Helps absorb iron: Vitamin C helps the intestines absorb iron by converting ferric iron to make it more absorbable.

Important food sources of vitamin C

Vegetables (berries, clover, lettuce) Fruits, especially sour-tasting fruits (oranges, sour lemons, pomegranates), animal organs and products (adrenal glands, brain, pituitary gland and milk) are among the sources of vitamin C. (3: 140-141).

V. THE HUMAN SKELETAL SYSTEM

Humans need the skeletal system to sit, stand, lift weights, and breathe. In fact, without the skeleton, it is impossible to rely on the body, shape the body, protect the tissues and internal organs, create the ability to move, store minerals, and make blood.

The term Skeleton in Greek means dry; In contrast, bone is a living tissue that can grow and repair itself after injury. The skeletal system consists of bones and auxiliary connective tissue such as cartilage, ligaments, and tendons. Although cartilage is hard in some parts of the body, it is more resilient than bone and performs the following tasks:

Provides model cartilage for building bones during pregnancy and childhood. During puberty, it covers the bones and provides a smooth surface to prevent bone friction. Also in some buildings such as nose, outer ear, domes and town hall, frames Provides citation and feedback. Cartilage, with its excellent matrix, is the best elastic and shock-absorbing structure of the human body.

The extracellular matrix of ligaments and tendons contains large amounts of collagen filaments that make them stiff like wire ropes. The extracellular matrix of bone contains collagen and minerals such as calcium and phosphite, which are similar to hard concrete. Rope-like strands of collagen, like iron rods inside concrete, strengthen bone. The minerals in the matrix give the bone strength and density. Most of the minerals in the bone are in the form of calcium phosphate crystals called hydroxyapatite (1: 168-169).

Cartilage

The growth and development of cartilage takes place in two ways: a) Interstitial growth and development in which in this type of growth, cartilage cells within the voids separate the intercellular material. First, new cells are located at the same time as emptiness, then cartilage increases in size due to the separation of interstitial matter, and b) Appositional Growth, in which cartilage cells from the Perichondrium class of new cartilage cells. They bring it up.

VI. CARTILAGE NUTRITION

There are no blood vessels, lymph, and nerve fibres in the cartilage, and it is nourished by diffusion. The required materials are brought by the liquid to the intercellular passages and from there penetrate into the cells. This fluid comes from the arteries in the perichondrium. It is clear; Cells adjacent to the pericardium use nutrients easily, but it is more difficult to feed cells farther away from the pericardium, especially if calcium cartilage has deposited in the matrix. Chondrocytes) do not reach and they die. It should be noted that approximately 75% of water in cartilage is associated with Proteoglycans and plays an important role in the transport of fluids, electrolytes and nutrients through cartilage matrix.

Cartilage repair

If cartilage tissue is destroyed, it will not be repaired by cartilage cells; Because mature cartilage cells lose their ability to divide. Restoration is due to the activity of the perichondrium. That is, the perichondrium proliferates and repairs the damaged area, so that a number of fibroblasts are rounded, the chondrocytes are deformed, and its interstitial substance is cartilaginous interstitial. It changes.

In cases where a large part of the cartilage has been destroyed, it is not possible to compensate for all the cartilage, the damaged area will be filled with attached tissue (131: 8-132).

Cartilage transformations

These are the changes that occur in cartilage:

A. The transparency of cartilage is lost.
B. The number of cartilage cells is reduced.
C. Bina al-Hajravi loses its blue colour.

Sometimes it contains thin strands of silk such as cartilage. this event; It softens the matrix and may even cause cartilage perforation.

Under normal circumstances, cartilage contains some calcium. In some cases, citrus cells, especially calcium-phosphate and calcium-carbonate, condense in the space between the cartilage cells. These reserves start from the vicinity of the cell and gradually cover the entire distance between the cells. When the space between cells is completely occupied by calcium, the diffusion and penetration of nutrients into the chondrocytes is disrupted, resulting in cell death (2: 170-172).

Effects of nutrients on cartilage growth

Dietary disorders, especially the lack of protein, minerals and vitamins, cause obvious changes in cartilage. For example, when an experimental animal is exposed to a protein-free or vitamin A-free diet for a long time, the thickness of the pineal cartilage decreases rapidly. Also, if vitamin C is removed from the animal's diet, the matrix material is reduced and changes occur in its cells. Lack of vitamin D impairs the absorption of calcium and phosphorus. In this case, the cartilage cells continue to multiply, but calcium does not precipitate. As a result, the developing bones bend under the weight of the body and take on abnormal shapes.

VII. THE ROLE AND IMPORTANCE OF CARTILAGE IN BONE FORMATION

One of the most important functions of cartilage is to participate in ossification. Cartilage designs the initial model of the future bone near the fetus, in such a way that the cartilage form is first produced and then destroyed and replaced by bone tissue. In fact, cartilage determines the size and shape of bones.

In the spine, the cartilaginous plates occupy the space between the vertebrae and act as a shock absorber, reducing the intensity of the beat (5: 22-23).

Bone remodelling

Bone regeneration becomes apparent in response to changes in blood calcium levels, muscle pressure on the skeleton, and gravity. Bone regeneration occurs in all bones, including the removal of old bone by osteoclasts, and the deposition of new bone by osteoblasts. Bone regeneration is responsible for changes in bone shape, adaptation to stress, bone regeneration, and the regulation of calcium ions in body fluids. The length and diameter of a long bone increases as new bone is eaten by osteoblasts on the inner surface of the bone in the central region. Therefore, as the diameter of the bone increases, the thickness of the dense bone that surrounds the central cavity decreases. If the size of the central cavity did not increase with the general increase in bone size, the bone would become very thick and heavy. Bone is the body's main source of calcium. To perform the normal function of many physiological functions of the body, it is essential that blood calcium levels are within a narrow range. When blood calcium levels fall, calcium leaves the bone marrow, and when enough calcium is absorbed through nutrition, it builds up in the bones. This calcium exchange takes place under hormonal control.

If too much calcium builds up, the bones will thicken and have prickly bumps that prevent it from performing its normal functions. Building too little bone or getting too much calcium out of the body weakens the bones, making them more prone to breakage. In bone repair, when the bones break, the blood vessels in the bone are also damaged. Blood flows and a clot forms at the site of the injury, and by three days after the blood vessels have ruptured, adjacent cells and tissues begin to enter the clot. Some of these cells produce a network of connective tissue between the broken bone that holds the broken bone pieces together and fills the seam between the pieces. Other cells form cartilage islands in the retina. The area of tissue regeneration between two broken bones is called the callus. Osteoblasts enter the callus and begin to build spongy bones. The formation of cancellous bone is completed approximately four to six weeks after fracture. It is dangerous to move the bones during this time; Because motion can break or thin the new matrix. Subsequently, the spongy bone gradually changes position and gives way to dense bone, thus completing bone regeneration. The full space of a broken bone may take several months. If the healing is complete, the fractured area will be stronger than the rest of the bones (7: 116-117).

VIII. CONCLUSION

Calcium is one of the most important mineral components of food that is used for building and maintaining skeletal and skeletal bones and is the most important mineral element in the human and animal bodies. About 99 percent of the body's calcium is found in bones and teeth, along with phosphorus, and the rest is found in soft tissues and foreign cell fluids.

In the human body, calcium is involved in activities such as bone and tooth building, blood clotting, muscle contraction, nerve conduction, and cell metabolism. Calcium deficiency in children leads to physical and mental developmental disorders and the development of osteoporosis called Rashitisme. This condition causes abnormal bones, large joints, and difficulty moving.

In adults, calcium deficiency causes osteomalacia, which results in decreased calcium density in the bones, resulting in hollow and brittle bones.

Factors such as the presence of sufficient vitamin D in the intestines, the presence of sufficient amounts of vitamin C and some amino acids in the diet, and the presence of lactose or milk sugar, which causes some microscopic organisms to grow and change the pH of the intestines, help better absorb calcium through the intestines. They help. Milk and its products are rich sources of calcium. Fruits and vegetables, grains and legumes, fish or poultry meat, eggs, turnips and almonds are the best sources of calcium after milk and its products.

The recommended amount of calcium is about 800 mg per day, to which 400 mg should be added for growth, puberty, pregnancy and lactation.

REFERENCES

[1] Anwar, Mohammad Afzal (1391). *General histology.* Kabul: Departing Publications.

[2] Khaghani, Shahnaz. (1388). *Biochemistry of nutrition and diet.* Iran: University of Tehran Press.

[3] Khaleqi, Kazem. (2014). *Nutrition knowledg*e. Tehran: Zarqalam Publications.

[4] Khavarin, arrested slave. (1390). *Human Anatomy and Physiology*. Afghanistan: Kabul University of Education Press.

[5] Knowledge, guidance of God (1394). *Anatomy and physiology*. Kabul: Eastern Civilization Publications.

[6] Agriculture, Ali. (1390). *Principles of nutrition*. Iran. Tehran University of Medical Sciences Publications.

[7] Nasimi, Mohammad Taher. 1391). *Human Anatomy and Physiology*. Afghanistan: Balkh University Faculty of Medicine Publications.

[8] Akbarzadeh Pasha, Hojjatullah. (1385). *Basic and applied anatomy and physiology*. Tehran: Pasha Publishing Center Publications.