Sciental Journal of Education Humanities and Social Sciences, Vol. 3. 3, (2025)
ISSN Online: 2961-0389
Website: https://scientaljournals.com/index.php/SJEHSS/index

Submitted: January 19, 2025/ Accepted March 03, 2025/ Published March 11, 2025

THE ROLE OF MAGNESIUM IN HUMAN LIFE AND HEALTH

Inoyatova Firuza Xidoyatovna,
Fayziyeva Nodira Alishervna
Tashkent Medical Academy

Abstract
The work shows that, with a deficiency of Mg2+ ions, their exchange on the cell membrane is disrupted, the electrical excitability of cells increases and the cell becomes over excitable. Magnesium deficiency is accompanied by increased fatigue under normal loads, inadequate heat exchange. Methods with dye binding for magnesium studied.

Keywords: Cell, deficiency, magnesium, dye, method, adenosine triphosphate, membrane, transmembrane, writer's cramp, calcification.

Introduction

Magnesium (Mg2+) was first isolated by the English chemist Humphry Davy in 1808. In terms of content in the body, it is the fourth element after sodium, potassium and calcium, and in terms of content in the cell, the second (after potassium).

Up to 80–90% of intracellular magnesium is found in mitochondria in a complex with ATP (adenosine triphosphate – the main high-energy product in all living cells). Given this attachment of the microelement to mitochondria, most (about 40%) Mg2+ is found in the placenta and brain, especially in the gray matter, as well as in the heart, muscles, liver, and kidneys.

The remaining 50–60% of the mineral is concentrated in dentin and enamel of teeth, the skeleton. In case of deficiency, Mg2+ can be released from bones, preventing a decrease in its concentration in the blood serum, which is normally 0.8–1.2 mmol /l.

Magnesium is involved in the regulation of the state of the cell membrane and the transmembrane transfer of calcium and sodium ions, and independently participates in many metabolic reactions for the formation, accumulation, transfer and utilization of energy, free radicals and their oxidation products.

Therefore, the microelement primarily determines the normal functioning of the nervous system, the function of which is to control the body's activities, coordinate the processes occurring in it, establish relationships between the body and the external environment, and form adequate adaptive reactions and stress resistance.

Microelement deficiency manifests itself in various clinical manifestations, which can be grouped by disorders of the main functions of magnesium. The first group of diseases is associated with a violation of the electrical excitability of the cell.

Sciental Journal of Education Humanities and Social Sciences, Vol. 3. 3, (2025)
ISSN Online: 2961-0389
***Website**: https://scientaljournals.com/index.php/SJEHSS/index*

Submitted: January 19, 2025/ Accepted March 03, 2025/ Published March 11, 2025

When there is a deficiency of Mg2+ ions, their exchange on the cell membrane is disrupted, the electrical excitability of the cells increases, and the cell becomes overexcitable:

• hyperexcitability of nerve cells is manifested by the patient becoming emotional, tearful, irritable, anxious, depressed, and sleeping poorly;
•increased excitability of cardiomyocytes can lead to tachycardia and ectopic arrhythmias;
•with increased excitability of skeletal muscle cells, the patient experiences convulsions, muscle twitching, tics, tremors, pain in the calf and neck muscles, "obstetrician's hand," and writer's cramp;
• hyperexcitability of vascular smooth muscle cells is accompanied by high blood pressure and headache;
•increased excitability of the smooth muscles of the internal organs manifests itself in the form of unstable stool (constipation, diarrhea, abdominal pain due to intestinal motility disorders), stomach pain, bronchospasms , hypertonicity of the uterus, and spasm of the cervix during childbirth.

The second group of diseases is caused by the participation of magnesium in enzymes that service energy reactions – the metabolism of carbohydrates and ATP.

Therefore, magnesium deficiency is accompanied by increased fatigue (mental and physical) under normal loads, inadequate heat exchange (rapid depletion of energy resources, chilliness).

The third group of magnesium dysfunctions is associated with its structure-forming role in mediator metabolism:

•firstly , magnesium forms sites in the structure of a number of receptors (NMDA, AMPA receptors for acetylcholine, norepinephrine and dopamine;
•secondly, magnesium is necessary for the normal metabolism of neurotransmitters (tyrosine, dopamine, norepinephrine, serotonin, gamma- aminobutyric acid).

This group of causes leads to depression, impaired coordination of movements, attention, memory, mood, and is involved in the development of epilepsy, autism, all possible phobias and manias.

In addition, disruption of mediator metabolism and functional activity of receptors is one of the most important causes of the development of "diseases of civilization" caused by unhealthy diet and chronic stress (ischemic heart disease, arterial hypertension, diabetes, etc.), where disruption of catecholamine metabolism plays a significant role.

Conventionally, these clinical manifestations of magnesium deficiency can be grouped, but it should be remembered that one patient may have a combination of signs from different groups.

With a long-term magnesium deficiency, metabolic disorders develop.

First of all, pathological compartmentalization of elements is formed under the influence of hypomagnesia in various organs, biological fluids and tissues.

For example, in hypomagnesium Over the years, calcium salts accumulate in biological environments (calcification of joints, ligaments, bone aging), calcification of atherosclerotic plaques of the aorta and other vascular localizations (potentiated by pyridoxine deficiency).

Sciental Journal of Education Humanities and Social Sciences, Vol. 3. 3, (2025)
ISSN Online: 2961-0389
***Website**: https://scientaljournals.com/index.php/SJEHSS/index*

Submitted: January 19, 2025/ Accepted March 03, 2025/ Published March 11, 2025

It also initiates stone formation in the gallbladder, stone formation in the kidneys and bladder (potentiated by pyridoxine deficiency), and accumulation of toxic elements (Ni , Pb , Cd , Be , Al).

Long-term consequences of magnesium deficiency include the development of arterial hypertension, cardiovascular pathology, increased risk of myocardial infarction, stroke, atherosclerosis (potentiated by pyridoxine deficiency), diabetes and a number of oncological programs.

In children, magnesium and pyridoxine deficiency potentiates the development of autism, dyslexia, deviant behavior, and attention deficit hyperactivity disorder.

During the process of intensive growth in fetuses, children, adolescents, magnesium deficiency leads to a deficiency in the formation of connective tissue. Magnesium deficiency is extremely common and ranges from 16 to 43%.

The concept of “magnesium deficiency” should be distinguished from the concept of “hypomagnesemia” – a decrease in the concentration of magnesium in the serum (normally 0.75–1.26 mmol /l).

In pregnant women, the lower limit of the norm for magnesium is somewhat higher (0.8 mmol /l), therefore the sensitivity of the pregnant woman’s body even to a borderline deficiency increases sharply.

Diagnosing magnesium deficiency is not easy either by clinical signs, which is associated with the polysymptomatic manifestations that are caused by the participation of the microelement in the regulation of many physiological processes in the human body, or by a blood test, which provides incomplete information about the content of the microelement.

In case of deficiency, Mg^{2+} can be released from bone depots and the initial decrease in serum magnesium concentration is prevented and, therefore, normomagnesemia does not exclude possible deficiency.

If hypomagnesemia is detected (serum magnesium less than 0.8 mmol /l), the diagnosis of "magnesium deficiency" is indisputable. However, in this case, as a rule, the possibilities of compensation have already been exhausted and the deficiency of the microelement is more pronounced.

Thus, in studies conducted in the USA in the 1990s, it was shown that hypomagnesemia occurred in 47.1% of cases (Wang , 1990), but clinical signs of magnesium deficiency were detected in more than 72% of American adults.

According to the results of a study of magnesium levels in 16,000 German residents in 2001, a suboptimal level (below 0.76 mmol/l) was found in 33.7% of those examined. Most of the population, especially the elderly, have an alimentary magnesium deficiency caused by insufficient magnesium consumption, as well as the consumption of highly refined foods depleted in magnesium.

People whose lives and work are associated with physical or emotional stress (for example, athletes, military personnel, prisoners, etc.) may experience a hidden magnesium deficiency, which is associated with insufficient replenishment of magnesium losses:

ISSN Online: 2961-0389
***Website**: https://scientaljournals.com/index.php/SJEHSS/index*

Submitted: January 19, 2025/ Accepted March 03, 2025/ Published March 11, 2025

• with unhealthy diet;

•with an increased need for this element due to high and prolonged physical activity, stress and significant loss of magnesium through sweat (especially in hot and humid conditions, as well as during a planned visit to the sauna).

Studies of mineral metabolism in athletes have shown that plasma and erythrocyte magnesium levels are often at the lower limit of normal before and after competitions, as well as during training sessions that increase in intensity.

magnesium content was carried out in the context of the concept of elemental homeostasis (Mg , K, Ca , Na , P, Se , Zn , Co , Cr , Cu , Fe , Mn , Mo , Si , Li , Ni, V, Pb , Sn , Cd , Al , As, Be , Bi and Ti) in 24 athletes. None of the examined athletes had a magnesium monodeficiency, however, it was the leader among the 25 elements studied.

Replenishment of magnesium deficiency facilitated the restoration of the level of such neuroactive microelements as manganese, calcium and zinc according to the cascade principle, and also contributed to achieving higher athletic results, increased tolerance to heavy physical exertion, restored the magnesium quota taking into account increased losses with sweat (up to 15%) and during physical exertion.

Deficiency of this microelement is often found in alcoholics and patients with diabetes.

Magnesium is a vital element, the fourth most common metal in the human body after calcium, sodium and potassium. It is the second most common intracellular cation after potassium. In the body of most animals, magnesium is present in an amount of about 0.4 g/kg of body weight [3].

A person weighing 70 kg has an average of 25–28 g of magnesium (slightly more than 1000 mmol). About half of this amount (50–53%) is found in bones, 27–28% in muscles, 19–20% in other soft tissues; about 0.5% of the total body magnesium is contained in red blood cells, and 0.3–0.4% of magnesium is found in blood plasma. Bones provide a large exchangeable pool that smooths out sharp changes in plasma magnesium concentration. Overall, one third of skeletal magnesium is exchangeable, serving as a reservoir for maintaining physiological levels of extracellular magnesium.

Approximately half of the magnesium in blood plasma is in a free state, and the other half is bound to albumin and anions of weak organic acids.

Magnesium is a cofactor in over 300 enzyme systems and is required for fundamental processes such as energy production and nucleic acid synthesis. Magnesium's role in energy production includes: converting adenosine triphosphate (ATP) to cyclic adenosine monophosphate (cAMP) via adenylate synthesis Clases , participation in oxidative phosphorylation and glycolysis reactions.

Magnesium is essential for the synthesis of RNA and DNA. Intracellular magnesium stores are found in high concentrations in the mitochondria, where this element plays a key role in the synthesis of ATP from adenosine diphosphate (ADP) and inorganic phosphate. More than 3,500 proteins in the human body bind to magnesium.

Enzyme systems that function thanks to magnesium ensure: protein synthesis, muscle contraction, nervous tissue function, glycemic control, binding of hormones to their receptors,

Sciental Journal of Education Humanities and Social Sciences, Vol. 3. 3, (2025)
ISSN Online: 2961-0389
***Website**: https://scientaljournals.com/index.php/SJEHSS/index*

Submitted: January 19, 2025/ Accepted March 03, 2025/ Published March 11, 2025

excitability of the heart muscle, transmembrane ion flow, and closing of calcium channels [4, 7, 8].

Magnesium homeostasis is maintained by the intestines, bones and kidneys. Magnesium, like calcium, is absorbed in the intestines and stored in bone minerals, and excess magnesium is excreted by the kidneys and intestines.

Magnesium is absorbed primarily in the small intestine, although some also enters the colon. Two intestinal transport systems for magnesium are known. Most magnesium is absorbed in the small intestine via a passive paracellular mechanism driven by an electrochemical gradient. A small but important regulatory fraction of magnesium is transported through transcellular voltage- gated channel carriers , which also play an important role in intestinal calcium absorption.

Of the total amount of magnesium consumed with food, only about 24–76% is absorbed in the intestine, with the rest excreted in the feces. Notably, intestinal absorption is not directly proportional to magnesium intake, but depends primarily on magnesium saturation.

The lower the magnesium level in the body, the more of this element is absorbed in the intestine, so the relative absorption of magnesium will be high when the intake is low and vice versa. When the concentration of magnesium in the intestine is low, active transcellular transport predominates, primarily in the distal parts of the small and large intestine.

A zero magnesium balance, for example, is established if, on average, about 360 mg of magnesium is ingested orally per day and, in the absence of a need to retain it in the body, about 260 mg of magnesium is excreted from the body through the intestines, and another 100 mg through the kidneys.

Primary uptake of magnesium occurs mainly by blood cells. The biological half-life of magnesium in the body is approximately 1000 hours (42 days) [9–11].

The first quantitative method was developed by Mendel and Benedict (1909), who investigated the excretion of magnesium in urine. After removal of calcium by precipitation as oxalate, magnesium was precipitated with ammonium phosphate in an alkaline solution. The resulting precipitate, containing magnesium pyrophosphate , was calcined and weighed. The procedure was lengthy, since after removal of calcium the assessment could be completed only after 3.5 hours. However, the method was sufficiently accurate and was used for almost 50 years. An accelerated method by Hoffman (1937) involved precipitation of magnesium by adding 8-hydroxyquinoline in an alkaline solution.

Magnesium 8-hydroxyquinoline was then determined colorimetrically . But the lightness of the precipitate made it difficult to separate it completely by centrifugation, which introduced errors into the results of the assessment. The titanium yellow method was the most widely cited and at the same time the most criticized .

Titanium yellow is a compound with the formula $C_{28}H_{19}N_5Na_2O_6S_4$ that does not contain any titanium. It is a triazene , a dye used in microscopy.

It is also used as a reagent for the detection of magnesium. As an acid-base indicator, it changes color from yellow to red in the pH range of 12 to 13.

Sciental Journal of Education Humanities and Social Sciences, Vol. 3. 3, (2025)
ISSN Online: 2961-0389
***Website**: https://scientaljournals.com/index.php/SJEHSS/index*

Submitted: January 19, 2025/ Accepted March 03, 2025/ Published March 11, 2025

The method was liked because of its relative simplicity: magnesium is precipitated with sodium hydroxide in the presence of titanium yellow. The dye is adsorbed by magnesium hydroxide, and the color changes from yellow to red. But yellow is sometimes present in plasma or when collecting blood with mild hemolysis, which makes the determination difficult.

Any excess dye dilutes the red color. Other elements - calcium, iron can interfere with the accurate determination of magnesium concentration. A more recent method is titration of magnesium solution with ethylenediaminetetraacetate (EDTA) (Carr and Frank , 1956).

EDTA chelates magnesium at alkaline pH . Magnesium also forms a complex with the dye eriochrome black T. The dye is added to a solution containing magnesium to form a cherry-red complex. When EDTA is added from the burette, magnesium ions are driven off the indicator until free indicator appears in solution, indicated by a blue colour change in the solution. When microquantities are used , the end point is gradually approached, but the end point of a single drop is difficult to detect. A further difficulty is that eriochrome black T reacts similarly with calcium. This requires either prior removal of calcium from the solution or estimation of the calcium content with a calcium-specific indicator and subsequent determination of (calcium + magnesium); magnesium is then determined by the difference (Wilkinson , 1957). Since the concentration of calcium, for example, in plasma is much greater than that of magnesium, this method is undesirable.

All of the methods described involve several steps. Separation of calcium is often necessary. And all of these methods require the collection of at least 2 ml of blood plasma. However, at present, the most commonly used methods for determining magnesium content in routine clinical laboratories are photometric methods, since they are easy to automate.

the Calmagite and Magon (xylidyl blue) dye-binding methods .

The latter method has become especially widespread. Calmagite , which has a high molar absorption (about 20,000 at pH = 10), is a sensitive indicator for detecting those metal ions with which it reacts. Magnesium solutions in the presence of this indicator acquire a distinct red color. The xylidyl blue photometric test is based on the fact that in an alkaline medium magnesium ions form a purple complex with xylidyl blue. In the presence of glycol ether diamine traacetate or EDTA, which bind calcium ions, the reaction is specific and the intensity of the purple color is proportional to the concentration of magnesium. The optical density is measured at a wavelength of 520 nm .

The test is designed to determine magnesium concentrations in the measurement range of 0.05 to 5 g/ dL (0.02–2.05 mmol /L). If the value exceeds the upper limit of the range, the sample should be diluted 1 + 4 with isotonic sodium chloride solution and the result obtained should be multiplied by 5. Ascorbic acid in concentrations up to 30 mg/ dL , bilirubin in concentrations up to 40 mg/ dL (684 μmol /L), calcium in concentrations up to 25 mg/ dL (6.25 mmol /L) and lipemia with triglyceride content up to 2000 mg/ dL do not affect the accuracy of the test. Hemolysis interferes with the determination, since magnesium is released from red blood cells.

References

1. Е.С.Акарачкова. Магний и его роль в жизни и здоровье человека // SPVS (2009), 6/11/09. P.6-10.
2. Elmurotova D.B., Nishonova N.R., Kulueva F.G., Uzoqova G.S., Xo'jamberdiyeva J.N., Jo'rayeva Sh.A. Mashaits: islamic interpretation of the greek philosophical heritage // South Eastern European Journal of Public Health (SEEJPH), (ISSN: 2197-5248) V.XXV, S2, 2024, Posted:05-12-2024, P.516-522, https://www.seejph.com/index.php/seejph
3. Shodiev A.A., Mussaeva M.A., Nishonova N.R., Elmurotova D.B., Islamova D.X. Improving Structure and Superconductivity of Coated Cuprate Tapes by Irradiation with Electrons and Gamma-Rays // Nanotechnology Perceptions, ISSN 1660-6795, V.20, N.7 (2024), P. 209-126, https://nano-ntp.com/index.php/nano/article/view/3822
4. I. Mullojonov, Q.I. Narziqulova , V.G. Makhsudov , E.Ya. Ermetov, D.B. Elmurotova, M.I. Bazarbayev. Study of the appearing molar volume of electrolyte solutions and its application in health-biological processes // MedForum: Int. Conf. on Patient-Centered Approaches to Medical Intervention 2024, Dr. Tanima Bhattacharya et al. (eds) © 2024 Taylor & Francis Group, London, P.38-40.
5. M.I. Bazarbayev, B.T. Rakhimov, Sh.A. Isroilova, D.B. Elmurotova, D.I. Sayfullayeva. Enhancing biophysics problem-solving skills in medical students through a targeted three-step strategy // MedForum: Int. Conf. on Patient-Centered Approaches to Medical Intervention 2024, Dr. Tanima Bhattacharya et al. (eds) © 2024 Taylor & Francis Group, London, P.112-114.
6. М.И. Базарбаев., Д.Б. Элмуротова., Ш.К. Нематов., Ш.Ш. Азимов., Т.З. Даминов., А.Р. Махкамов. Современные подходы к гигиене рук медицинского персонала //The journal of humanities & natural sciences, Issue 8, V.1, 2024. P.208-217.
7. Elmurotova D.B., Odilova N.J., Jumanov Sh.E. Semmelweis against puberner fever in hungary // Western European Journal of Linguistics and Education, V.2, Iss1, January-2024 ISSN (E): 2942-190X, P.56-59, Germany. https://westerneuropeanstudies.com/index.php/2/article/view/255
8. Элмуротова Д.Б., Элмуратов Э.Б. Исследование и совершенствование техники и технологии по освоению скважин в сложных горно-геологических условиях на месторождениях Республики Узбекистан // Лучшие интеллектуальные исследования, Ч-13, Т.5, Январь-2024, С.11-23, Россия. http://web-journal.ru/index.php/journal/issue/view/89
9. Elmurotova D.B., Sayfullayeva D.I., Isroilova Sh.A. Terms of medical information system, World Bulletin of Public Health (WBPH), V.34, May, P.91-92, 2024 ISSN: 2749-3644, Berlin. https://www.scholarexpress.net
10. Elmurotova D.B, Majlimov F.B., Zuparov I.B., Kayumova K.S., Xudoyberdiyev B.A. A modern approach to hand hygiene in medicine // European Journal of Humanities and Educational Advancements (EJHEA), V.5 N.05, May 2024 ISSN: 2660-5589, P.51-53, Spain. https://www.scholarzest.com

11. Elmurotova D., Arzikulov F., Egamov S., Isroilov U. Organization of direct memory access // Intent Research Scientific Journal-(IRSJ), ISSN (E): 2980-4612, V.3, Is.10, October – 2024, P. 31-38., Philippines, https://intentresearch.org/index.php/irsj/article/view/345
12. Элмуротова Д.Б., Базарбаев М.И., Азимов Ш.Ш., Нематов Ш.К. Гигиены рук с Земмельвейсем - спаситель матерей // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №1, Fevruary, 2024, ISSN: 3030-3451, B.160-168. www.innoist.uz
13. Elmurotova D.B., Iminova X.X., Ibodullayeva S.O., Isroilova Sh.A., Sayfullayeva D.I. Ma’lumotlar bazasida axborot xavfsizligini ta`minlash ta’moillari// Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №3, 10-aprel, 2024, C.52-56. www.innoist.uz
14. Элмуротова Д.Б., Зупаров И.Б. Автоматизация обработки данных при оценки кислотно-щелочного состояния организма // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №3, 10-aprel, 2024, C.138-140. www.innoist.uz
15. Элмуротова Д.Б., Шодиев А.А., Ибрагимова Э.М., Муссаева М.А., Хаитов Ф.Н. Магнитные наноструктуры, сформированные в ВТСП-YBCOлент, облученных 5 Мэв электронами // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №3, 10-aprel, 2024, C.153-157. www.innoist.uz
16. Elmurotova D.B., Zuparov I.B., Sattorova D.U., Abduvaliyev A., Sayfullayeva Z.I. Tranzistor-tranzistor mantiqiy elementlar va ularning yaratilish tarixi // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №3, 10-aprel, 2024, C.422-424. www.innoist.uz
17. Elmurotova D.B., Abduvaliyev A.M. Biotibbiy robototexnikada insult robotlashtirish sistemasi // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №3, 10-aprel, 2024, C.340-342. www.innoist.uz
18. Elmurotova D.B., Akbarova A. Kontakt linzalarni tibbiyotda qo’llanilishi // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №3, 10-aprel, 2024, C.348-350. www.innoist.uz
19. Элмуротова Д.Б., Базарбаев М.И., Азимов Ш.Ш., Дамиров Т.З., Махкамов А.Р. Гигиены рук при нозокомиальныой инфекции // Innovations in Science and Technologies, ilmiy-elektron jurnali, V1, №4, may, 2024, B.4-5. www.innoist.uz
20. Elmurotova D.B. Mustaqil ta’limning maqsadi va vazifasi // Toshkent Tibbiyot Akademiyas axborotnomasi, ISSN 2181-7812, Toshkent-2024, B.56-57, www.tma-journals.uz
21. Элмуротова Д.Б., Норбутаева М.К., Файзиева Н.А., Ривожиддинова М.К., Абдужалилова М.А. Влияние и свойств рентгенотерапии // Modern education and development, V.11, No 2, October-2024, ISSN:3060-4567 C.334-341, Узбекистан, https://scientific-jl.org/index.php/mod/article/view/135/126
22. Элмуротова Д.Б., Урманбекова Д.С., Жаксимуратова Х.Т., Кудратов Ж. Дистанционная лучевая терапия// Journal of new century innovations , V.62, No 3,

October-2024, C.203-207, Узбекистан, https://modernedu-dv.com/index.php/newjournal/issue/view/56

23. Elmurotova D.B., Esanov Sh.Sh., Umarov J.S., Bozorov U.A., Abdullayev I.A. Tibbiy texnika xizmatlarini tashkil etish va o‘tkazish tartibi // Tadqiqotlar, jahon ilmiy – metodik jurnali, 48-son, No-1, Octyabr-2024, ISSN 3030-3613, P.109-113. Uzbekiston. https://scientific-jl.org/index.php/tad/article/view/243.
24. Элмуротова Д.Б., Эсанов Ш.Ш., Умаров Ж.С., Бозоров У.А. Автоматизированные системы управления медико-биологическими параметрами// Ustozlar uchun , V.62, No-1, Octyabr-2024, P.54-59. Uzbekiston. https://pedagoglar.org/index.php/02/article/view/5343
25. Elmurotova D.B., Djurayeva N.R., Ixrorova S.I., Nurboboyev X.A., Sattorova D.U. Tibbiy biologik parametrlarni boshqarishning avtomatlashtirilgan tizimlarida ma’lumotlar bazasi va ularni boshqarish // Tadqiqotlar, jahon ilmiy – metodik jurnali, 48-son, No-1, Octyabr-2024, ISSN 3030-3613, P.114-120. Uzbekiston. https://scientific-jl.org/index.php/tad/article/view/244.
26. Shodiev A.A., Mussaeva M.A., Elmurotova D.B. Magnetic resistance of YBaCuO, GdBaCuO HTSC tapes irradiated with 1–5 MeV electrons and ^{60}Co gamma rays // World scientific research journal, WSRJ, V.32, Issue 1, October-2024, P.94-104. Uzbekiston, https://scientific-jl.org/index.php/wsrj/article/view/440
27. Elmurotova D.B., Fayziyeva N.A., Yoqubboyeva E.Z., Orifqulova M.F., Imanova L.N. SQL tili asosida ishlaydigan tizimlar tarkibi // Journal of new century innovations, V.64, Issue 2, November-2024, B.6-11, https://scientific-jl.org/index.php/new
28. Элмуротова Д.Б., Норбутаева М.К., Файзиева Н.А., Ривожиддинова М.К., Абдужалилова М.А. Влияние и свойств рентгенотерапии // Modern education and development, V.11, No 2, October-2024, ISSN:3060-4567 C.334-341, Узбекистан, https://scientific-jl.org/index.php/mod/article/view/135/126
29. Элмуротова Д.Б., Урманбекова Д.С., Жаксимуратова Х.Т., Кудратов Ж. Дистанционная лучевая терапия// Journal of new century innovations , V.62, No 3, October-2024, C.203-207, Узбекистан, https://modernedu-dv.com/index.php/newjournal/issue/view/56
30. Elmurotova D.B., Esanov Sh.Sh., Umarov J.S., Bozorov U.A., Abdullayev I.A. Tibbiy texnika xizmatlarini tashkil etish va o‘tkazish tartibi // Tadqiqotlar, jahon ilmiy – metodik jurnali, 48-son, No-1, Octyabr-2024, ISSN 3030-3613, P.109-113. Uzbekiston. https://scientific-jl.org/index.php/tad/article/view/243.
31. Элмуротова Д.Б., Эсанов Ш.Ш., Умаров Ж.С., Бозоров У.А. Автоматизированные системы управления медико-биологическими параметрами// Ustozlar uchun , V.62, No-1, Octyabr-2024, P.54-59. Uzbekiston. https://pedagoglar.org/index.php/02/article/view/5343
32. Elmurotova D.B., Djurayeva N.R., Ixrorova S.I., Nurboboyev X.A., Sattorova D.U. Tibbiy biologik parametrlarni boshqarishning avtomatlashtirilgan tizimlarida ma’lumotlar bazasi va ularni boshqarish // Tadqiqotlar, jahon ilmiy – metodik jurnali,

48-son, No-1, Octyabr-2024, ISSN 3030-3613, P.114-120. Uzbekiston. https://scientific-jl.org/index.php/tad/article/view/244.

33. Shodiev A.A., Mussaeva M.A., Elmurotova D.B. Magnetic resistance of YBaCuO, GdBaCuO HTSC tapes irradiated with 1–5 MeV electrons and ^{60}Co gamma rays // World scientific research journal, WSRJ, V.32, Issue 1, October-2024, P.94-104. Uzbekiston, https://scientific-jl.org/index.php/wsrj/article/view/440
34. Elmurotova D.B., Fayziyeva N.A., Yoqubboyeva E.Z., Orifqulova M.F., Imanova L.N. SQL tili asosida ishlaydigan tizimlar tarkibi // Journal of new century innovations, V.64, Issue 2, November-2024, B.6-11, https://scientific-jl.org/index.php/new
35. Elmurotova D.B., Xo’jabekova R.G., Abdumo’minova M.A., Abdurahmonov S.A. ko‘p funktsionalli bemor monitorlari va ularni kuzatish tizimi // Ta'lim innovatsiyasi va integratsiyasi, ISSN: 3030-3621, V.35, №2, Dekabr-2024, B.173-176. https://scientific-jl.org
36. Elmurotova D.B., Murodqulova Z.E., Chinorova K.D., Abdurazzoqov J.T. Telemeditsina resurslari va biotelemetriya // Ta'lim innovatsiyasi va integratsiyasi, ISSN: 3030-3621, V.35, №2, Dekabr-2024, B.177-181. https://scientific-jl.org
37. Elmurotova D.B., Abduvaliyev A.M., Abdurahmonov S.A. Biosignal qabul qiluvchi qurilma – Pulsoksimetr // TADQIQOTLAR jahon ilmiy – metodik jurnali, ISSN-3030-3613, V.52, №2, Dekabr-2024, B.186-190.
38. Elmurotova D.B., Tursinov A.R., Bekmurodova F.D., Abdurahmonov S.A. Tibbiyotda boshqaruv tizimining o‘rni // TADQIQOTLAR jahon ilmiy – metodik jurnali, ISSN-3030-3613, V.52, №2, Dekabr-2024, B.191-194.
39. Elmurotova D.B., Abdurashidova N.B., Begmatova G.O., Abdurahmonov S.A. Ultratovush aparatining axborotni qabul qilish mexanizmi // TADQIQOTLAR jahon ilmiy – metodik jurnali, ISSN-3030-3613, V.52, №2, Dekabr-2024, B.195-199.
40. Elmurotova D.B., Aliqulova S, Rahmonqulova Z., Abdurahmonov S. Tibbiyot tashkilotlarida ma’lumotlarning xavfsizligi // TADQIQOTLAR jahon ilmiy – metodik jurnali, ISSN-3030-3613, V.52, №2, Dekabr-2024, B.207-211.