UROLITHIASIS: EPIDEMIOLOGY AND RISK FACTORS

Bahromov Bekzod Shavkatovich

Asian International University, Bukhara, Uzbekistan.

https://doi.org/10.5281/zenodo.15070401

Abstract. *Stone formation in the urinary tract affects about 7–12% of the population in industrialized countries, although it is very rare in other countries such as Greenland or Japan.*

The high incidence and recurrence rate contribute to making the urolithiasis a serious social problem. Nowadays, urolithiasis must be considered a 'disease in evolution' for several reasons, such as epidemiological changes, evolution of the methods used for diagnosis, and the treatment and prophylaxis of the population considered 'at risk' of stone disease. Some features of stone disease have changed over the last few years due to many social, economical and cultural factors that are described here. The increased prevalence of small urinary calculi has brought about a change in clinical symptoms, with frequent episodes of renal-ureteral colic, persistent pain and hydronephrosis. Similarly, the presence of residual fragments after extracorporeal shock wave lithotripsy has induced a radical change in the management of small calculi through the use of mini-invasive surgical techniques.

Key Words: *Urinary stones, epidemiology Risk factors, urinary stones Extracorporeal shock wave lithotripsy, residual fragments.*

МОЧЕКАМЕННАЯ БОЛЕЗНЬ: ЭПИДЕМИОЛОГИЯ И ФАКТОРЫ РИСКА

Аннотация. *Образование камней в мочевыводящих путях затрагивает около 7–12% населения в промышленно развитых странах, хотя это очень редкое явление в других странах, таких как Гренландия или Япония. Высокая заболеваемость и частота рецидивов способствуют тому, что мочекаменная болезнь становится серьезной социальной проблемой. В настоящее время мочекаменная болезнь должна считаться «болезнью в процессе эволюции» по нескольким причинам, таким как эпидемиологические изменения, эволюция методов, используемых для диагностики, а также лечение и профилактика населения, считающегося «группой риска» по мочекаменной болезни.*

Некоторые особенности мочекаменной болезни изменились за последние несколько лет из-за многих социальных, экономических и культурных факторов, которые описаны здесь. Возросшая распространенность мелких мочевых камней привела к изменению клинических симптомов с частыми эпизодами почечно-мочеточниковой колики, постоянной болью и гидронефрозом. Аналогичным образом, наличие остаточных фрагментов после экстракорпоральной ударно-волновой литотрипсии вызвало радикальное изменение в лечении небольших камней с помощью мини-инвазивных хирургических методов.

Ключевые слова: *Мочевые камни, эпидемиология Факторы риска, мочевые камни Экстракорпоральная ударно-волновая литотрипсия, остаточные фрагменты.*

Introduction. Stone formation in the urinary tract affects about 8-13% of the population in industrialized countries, although it is very rare in Greenland or in Japan. This could be for various reasons, such as diet, climate, daily water intake, physical activity and corporeal overweight. The annual incidence of stone formation is generally considered to be 1,500–2,000 cases per million.

Data on the incidence of stone disease in Italy derive from a national survey carried out by the National Institutes of Statistics in 2000; the prevalence is 19.2% and a total social costs amount to EUR 200 million/year. Urinary calculi are commonly diagnosed as a consequence of an episode of renal-ureteral colic or gross hematuria. Many patients are diagnosed after an abdominal ultrasound scan after reporting unrelated symptoms. On the other hand, stone disease must be considered a ‘disease in evolution’ for several reasons, such as epidemiological changes, advances in the methods used for diagnosis, treatment and prophylaxis of the population considered ‘at risk’ of the disease.

Epidemiology The risk of developing urinary tract stone disease in normal adults varies in different countries in the world. The probability of stone formation seems to be lower in Asia (2–8%) than Europe (9–15%) and the USA (23%). The highest risk is reported in Saudi Arabia (27%).

In recent years, the prevalence and incidence of urinary stones has increased. The epidemiology of stone disease differs according to the geographical area and historical period.

Changing socioeconomic conditions have generated changes in the incidence and type of stones in terms of both site and the physical-chemical composition of stones. Stone Components the main chemical component of stones is calcium oxalate (60–78%), either in its pure form (27%) or mixed with calcium phosphate (40%). Other types of urinary stones are uric acid (20–25%), struvite (ammonium-magnesium phosphate, 5–10%) and cystine (3–4%). Rarer stones are made of silica and xanthine and 2,8-dihydroxyadenine. Urinary calculi have changed in composition over the last few years, due to an increased rate of calcium-oxalate (from 65 to 85%) in the urine, while infection-related stone formation has decreased sharply from 20 to 5%.

This could be due to both the higher quality of life in developed countries and the widespread use of antibiotics. The epidemiology of cystine stones has not changed, because homozygous cystinuria persists in a small proportion of the population. The prevalence of uric acid stones has also dropped from 17 to 5% the reduction could be related to the early identification of patients’ metabolic alterations and controlled dietary regimens in overweight

patients. Stone Size In the last two decades, an increased rate of small ureteral stones has been found. This phenomenon could be due to the widespread use of extracorporeal shock wave lithotripsy (ESWL), with subsequent reclamation of large-sized renal calculi, and noninvasive diagnostic techniques such as ultrasound and spiral computed to mography. The increased prevalence of small urinary calculi (! 1 cm) has changed the clinical symptoms, with frequent episodes of renal-ureteral colic, persistent pain and hydronephrosis, leading to a fundamental change in disease management. Small calculi are often removed by means of mini-invasive techniques such as uretero-litholapaxy or uretrorenoscopy with intra-ure teral calculi fragmentation. ESWL can still be used as a first-step treatment option for distal ureteral or medium-sized renal stones (between 0.5 and 2 cm), while percutaneous nephrolithotripsy should be reserved for treating larger calculi. The modern urologist knows that the decrease could be due to both a rational interpretation of urinary tract obstructive phenomena and a substantial reduction in malnutrition throughout the world. Risk Factors Stone disease presents a complex model for interpreting the mechanisms involved in its genesis and development, as well as genetic, anatomic, nutritional, and environmental factors together with the presence of concomitant diseases.

Moreover, much evidence has recently been provided on dietary factors, such as animal protein consumption and daily caloric intake, related to an increased risk of stone formation.

Age, Race and Sex The prevalence of urinary stones varies according to age. In subjects under 45 years old the prevalence is 0.6%, while in those over 65 it is 7%. This correlation is probably due to the presence of comorbidities (obesity, hypertension, hyperuricemia, etc.). In Central Asia, the male-female ratio is 2: 1, according to the probability of stone formation.

About 30% of the patients with urinary stones have a family history of stone disease, showing that it may be the result of a polygenic defect with partial penetrance. In addition, it has been clearly demonstrated that familial renal tubular acidosis is strong associated with nephrolithiasis in almost 80% of patients. The fact that men have a higher incidence than females is probably related to sex hormones.

Climate and Seasons: Stone recurrence is higher in spring and summer than in autumn and winter, probably due to low fluid intake and low urinary output. Another possible explanation is high vitamin D plasma levels due to longer sun exposure time. The effect of geography on the incidence and prevalence of stone diseases may be indirectly due to its effect on temperature. High temperatures increase perspiration insensibility which may result in more concentrated urine. This event promotes urinary crystallization and stone formation. Dietary Habits Nutritional risk factors have recently been described: increased animal protein, calcium and oxalate intake as well as a high calorie content in the diet.

The correlation between calcium intake and stone formation risk still needs to be demonstrated. A significant relationship between body mass index and increased risk of stone formation. Other authors reported an inverse correlation between body mass index and patients' urinary pH. In a recent randomized study, Borghi et al. confirmed the main value of a generous fluid in take.

Conclusion: Urinary stone disease is a severe problem in Central Asia with high prevalence and incidence rates. There are strong links between the socioeconomic status of the individuals and the causal factors of stone formation, since the socioeconomic status mostly affects the dietary habits and the chances of having appropriate health care. Geographic variations in the distribution of stone disease might enlighten the roles of climate and soil proper ties but this is only to be achieved by more extensive studies.

REFERENCES

1. Vali o'g'li, M. S. KIDNEY CANCER: EPIDEMIOLOGY AND TREATMENT.
2. Valiyevich, M. S. (2024). Specific Morphofunctional Characteristics of the Kidney Caused by Brain Damage in Various Emergency Situations. Research Journal of Trauma and Disability Studies, 3(4), 286-289.
3. *PROSTATE CANCER: PATHOLOGY AND TREATMENT. (2024). International Bulletin of Medical Sciences and Clinical Research, 4(11), 65-70. https://doi.org/10.37547/*
4. MUSHAKLARNING TARAQQIYOTI. MUSHAKLARNING YORDAMCHI APPARATI. *TADQIQOTLAR. UZ*, *40*(3), 94-100.
5. Narzulaeva, U. (2023). Pathogenetic Mechanisms of Microcirculation disorders. *International Bulletin of Medical Sciences and Clinical Research*, *3*(10), 60-65.
6. Narzullaeva, U. R., Samieva, G. U., & Samiev, U. B. (2020). The importance of a healthy lifestyle in eliminating risk factors in the early stages of hypertension. *Journal Of Biomedicine And Practice*, 729-733
7. Abdurashitovich, Z. F. (2024). APPLICATION OF MYOCARDIAL CYTOPROTECTORS IN ISCHEMIC HEART DISEASES. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *39*(5), 152-159.
8. Abdurashitovich, Z. F. (2024). SIGNIFICANCE OF BIOMARKERS IN METABOLIC SYNDROME. *EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE*, *4*(9), 409-413.
9. Zikrillaev, F. A. (2024). Cardiorehabilitations from Physiotherapeutic Treatments in Cardiovascular Diseases. *American Journal of Bioscience and Clinical Integrity*, *1*(10), 96-102.

10. Abdurashitovich, Z. F. (2024). Cardiovascular System. Heart. Aorta. Carotid Artery.
11. Abdurashitovich, Z. F. (2024). MORPHO-FUNCTIONAL ASPECTS OF THE DEEP VEINS OF THE HUMAN BRAIN. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *36*(6), 203-206.
12. Abdurashitovich, Z. F. (2024). ASTRAGAL O'SIMLIGINING TIBBIYOTDAGI MUHIM AHAMIYATLARI VA SOG'LOM TURMUSH TARZIGA TA'SIRI. *Лучшие интеллектуальные исследования*, *14*(4), 111-119.
13. Abdurashitovich, Z. F. (2024). ODAM ANATOMIYASI FANIDAN SINDESMOLOGIYA BO'LIMI HAQIDA UMUMIY MALUMOTLAR. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *41*(4), 37-45.
14. Abdurashitovich, Z. F. (2024). THE IMPORTANCE OF THE ASTRAGAL PLANT IN MEDICINE AND ITS EFFECT ON A HEALTHY LIFESTYLE. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *41*(4), 88-95.
15. Abdurashitovich, Z. F. (2024). Department of Syndesmology from the Science of Human Anatomy General Information About. *Research Journal of Trauma and Disability Studies*, *3*(3), 158-165.
16. Abdurashitovich, Z. F. (2024). THE COMPLEXITY OF THE FUSION OF THE BONES OF THE FOOT. *JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH*, *3*(5), 223-230.
17. Abdurashitovich, Z. F. (2024). ANATOMICAL COMPLEXITIES OF JOINT BONES OF THE HAND. *EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE*, *4*(4), 198-206.
18. Зикриллаев, Ф. А. (2024). АНАТОМИЧЕСКОЕ СТРОЕНИЕ ОРГАНОВ ДЫХАНИЯ И ЕГО ЛИЧНЫЕ ХАРАКТЕРИСТИКИ. *TADQIQOTLAR. UZ*, *40*(3), 86-93.
19. Abdurashitovich, Z. F., & Komoliddinovich, S. J. (2024). DIGESTIVE SYSTEM. ANATOMY OF THE STOMACH. *TADQIQOTLAR. UZ*, *40*(3), 78-85.
20. Abdurashitovich, Z. F. (2024). UMURTQA POG'ONASI BIRLASHUVLARI. *TADQIQOTLAR. UZ*, *40*(3), 40-47.
21. Toxirovna, E. G. (2024). QALQONSIMON BEZ KASALLIKLARIDAN HASHIMOTO TIREODIT KASALLIGINING MORFOFUNKSIONAL O'ZIGA XOSLIGI. *Modern education and development*, *16*(7), 120-135.
22. Toxirovna, E. G. (2024). REVMATOID ARTRIT: BO'G'IMLAR YALLIG'LANISHINING SABABLARI, KLINIK BELGILARI, OQIBATLARI VA

ZAMONAVIY DAVOLASH YONDASHUVLARI. *Modern education and development*, *16*(7), 136-148.

23. Эргашева, Г. Т. (2024). ОЦЕНКА КЛИНИЧЕСКОЙ ЭФФЕКТИВНОСТИ ОРЛИСТАТА У БОЛЬНЫХ ОЖИРЕНИЕМ И АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИЕЙ. *Modern education and development*, *16*(7), 92-105.
24. Ergasheva, G. T. (2024). THE SPECIFICITY OFAUTOIMMUNE THYROIDITIS IN PREGNANCY. *European Journal of Modern Medicine and Practice*, *4*(11), 448-453.
25. Эргашева, Г. Т. (2024). ИССЛЕДОВАНИЕ ФУНКЦИИ ЩИТОВИДНОЙ ЖЕЛЕЗЫ ПРИ ТИРЕОИДИТЕ ХАШИМОТО. *Modern education and development*, *16*(7), 106-119.
26. Toxirovna, E. G. (2024). GIPOFIZ ADENOMASINI NAZORAT QILISHDA KONSERVATIV JARROHLIK VA RADIATSIYA TERAPIYASINING UZOQ MUDDATLI SAMARADORLIGI. *Modern education and development*, *16*(7), 79-91.
27. ERGASHEVA, G. T. (2024). OBESITY AND OVARIAN INSUFFICIENCY. *Valeology: International Journal of Medical Anthropology and Bioethics*, *2*(09), 106-111.
28. Ergasheva, G. T. (2024). Modern Methods in the Diagnosis of Autoimmune Thyroiditis. *American Journal of Bioscience and Clinical Integrity*, *1*(10), 43-50.
29. Tokhirovna, E. G. (2024). COEXISTENCE OF CARDIOVASCULAR DISEASES IN PATIENTS WITH TYPE 2 DIABETES. *TADQIQOTLAR. UZ*, *40*(3), 55-62.
30. Toxirovna, E. G. (2024). DETERMINATION AND STUDY OF GLYCEMIA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS WITH COMORBID DISEASES. *TADQIQOTLAR. UZ*, *40*(3), 71-77.
31. Toxirovna, E. G. (2024). XOMILADORLIKDA QANDLI DIABET KELTIRIB CHIQARUVCHI XAVF OMILLARINI ERTA ANIQLASH USULLARI. *TADQIQOTLAR. UZ*, *40*(3), 63-70.
32. Toxirovna, E. G. (2024). QANDLI DIABET 2-TIP VA KOMORBID KASALLIKLARI BO'LGAN BEMORLARDA GLIKEMIK NAZORAT. *TADQIQOTLAR. UZ*, *40*(3), 48-54.
33. Tokhirovna, E. G. (2024). MECHANISM OF ACTION OF METFORMIN (BIGUANIDE) IN TYPE 2 DIABETES. *JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH*, *3*(5), 210-216.
34. Tokhirovna, E. G. (2024). THE ROLE OF METFORMIN (GLIFORMIN) IN THE TREATMENT OF PATIENTS WITH TYPE 2 DIABETES MELLITUS. *EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE*, *4*(4), 171-177.
35. Эргашева, Г. Т. (2024). Эффект Применения Бигуанида При Сахарным Диабетом 2 Типа И Covid-19. *Research Journal of Trauma and Disability Studies*, *3*(3), 55-61.

36. Toxirovna, E. G. (2024). QANDLI DIABET 2 TUR VA YURAK QON TOMIR KASALLIKLARINING BEMOLARDA BIRGALIKDA KECHISHI. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *38*(7), 202-209.
37. Эргашева, Г. Т. (2024). СОСУЩЕСТВОВАНИЕ ДИАБЕТА 2 ТИПА И СЕРДЕЧНО-СОСУДИСТЫХ ЗАБОЛЕВАНИЙ У ПАЦИЕНТОВ. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *38*(7), 219-226.
38. Эргашева, Г. Т. (2024). СНИЖЕНИЕ РИСКА ОСЛОЖНЕНИЙ У БОЛЬНЫХ САХАРНЫМ ДИАБЕТОМ 2 ТИПА И СЕРДЕЧНО-СОСУДИСТЫМИ ЗАБОЛЕВАНИЯМИ. *Образование Наука И Инновационные Идеи В Мире*, *38*(7), 210-218.
39. Tokhirovna, E. G. (2024). CLINICAL AND MORPHOLOGICAL ASPECTS OF THE COURSE OF ARTERIAL HYPERTENSION. *Лучшие интеллектуальные исследования*, *12*(4), 234-243.
40. Tokhirovna, E. G. Studying the Causes of the Relationship between Type 2 Diabetes and Obesity. *Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN*, 2456-6470.
41. Toxirovna, E. G. (2024). ARTERIAL GIPERTENZIYA KURSINING KLINIK VA MORFOLOGIK JIHATLARI. *Лучшие интеллектуальные исследования*, *12*(4), 244-253.
42. Эргашева, Г. Т. (2024). НОВЫЕ АСПЕКТЫ ТЕЧЕНИЕ АРТЕРИАЛЬНОЙ ГИПЕРТОНИИ У ВЗРОСЛОГО НАСЕЛЕНИЕ. *Лучшие интеллектуальные исследования*, *12*(4), 224-233.
43. Эргашева, Г. Т. (2024). ФАКТОРЫ РИСКА РАЗВИТИЯ САХАРНОГО ДИАБЕТА 2 ТИПА. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *36*(5), 70-74.
44. Эргашева, Г. Т. (2024). ОСЛОЖНЕНИЯ САХАРНОГО ДИАБЕТА 2 ТИПА ХАРАКТЕРНЫ ДЛЯ КОГНИТИВНЫХ НАРУШЕНИЙ. *TADQIQOTLAR. UZ*, *30*(3), 112-119.
45. Эргашева, Г. Т. (2023). Исследование Причин Связи Диабета 2 Типа И Ожирения. *Research Journal of Trauma and Disability Studies*, *2*(12), 305-311.
46. Saloxiddinovna, X. Y. (2024). Modern Views on the Effects of the Use of Cholecalciferol on the General Condition of the Bod. *JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH*, *3*(5), 79-85.
47. Халимова, Ю. С., & Хафизова, М. Н. (2024). МОРФО-ФУНКЦИОНАЛЬНЫЕ И КЛИНИЧЕСКИЕ АСПЕКТЫ СТРОЕНИЯ И РАЗВИТИЯ ЯИЧНИКОВ (ОБЗОР ЛИТЕРАТУРЫ). *TADQIQOTLAR. UZ*, *40*(5), 188-198.

48. Халимова, Ю. С. (2024). Морфологические Особенности Поражения Печени У Пациентов С Синдромом Мэллори-Вейса. *Journal of Science in Medicine and Life*, *2*(6), 166-172.
49. Xalimova, Y. S. (2024). Morphology of the Testes in the Detection of Infertility. *Journal of Science in Medicine and Life*, *2*(6), 83-88.
50. KHALIMOVA, Y. S. (2024). MORPHOFUNCTIONAL CHARACTERISTICS OF TESTICULAR AND OVARIAN TISSUES OF ANIMALS IN THE AGE ASPECT. *Valeology: International Journal of Medical Anthropology and Bioethics*, *2*(9), 100-105.
51. Salokhiddinovna, K. Y. (2024). IMMUNOLOGICAL CRITERIA OF REPRODUCTION AND VIABILITY OF FEMALE RAT OFFSPRING UNDER THE INFLUENCE OF ETHANOL. *EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE*, *4*(10), 200-205.
52. Salokhiddinovna, K. Y., Saifiloevich, S. B., Barnoevich, K. I., & Hikmatov, A. S. (2024). THE INCIDENCE OF AIDS, THE DEFINITION AND CAUSES OF THE DISEASE. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *55*(2), 195-205.
53. Nematilloevna, K. M., & Salokhiddinovna, K. Y. (2024). IMPORTANT FEATURES IN THE FORMATION OF DEGREE OF COMPARISON OF ADJECTIVES IN LATIN. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *55*(2), 150-157.
54. Saloxiddinovna, X. Y., & Ne'matillaevna, X. M. (2024). FEATURES OF THE STRUCTURE OF THE REPRODUCTIVE ORGANS OF THE FEMALE BODY. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *55*(2), 179-183.
55. Хафизова, М. Н., & Халимова, Ю. С. (2024). ИСПОЛЬЗОВАНИЕ ЧАСТОТНЫХ ОТРЕЗКОВ В НАИМЕНОВАНИЯХ ЛЕКАРСТВЕННЫХ ПРЕПАРАТОВ В ФАРМАЦЕВТИКЕ. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *55*(2), 172-178.
56. Хафизова, М. Н., & Халимова, Ю. С. (2024). МОТИВАЦИОННЫЕ МЕТОДЫ ПРИ ОБУЧЕНИИ ЛАТЫНИ И МЕДИЦИНСКОЙ ТЕРМИНОЛОГИИ. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *55*(2), 165-171.
57. Халимова, Ю. С., & Хафизова, М. Н. (2024). ОСОБЕННОСТИ СОЗРЕВАНИЕ И ФУНКЦИОНИРОВАНИЕ ЯИЧНИКОВ. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *55*(2), 188-194.

58. Халимова, Ю. С., & Хафизова, М. Н. (2024). КЛИНИЧЕСКИЕ АСПЕКТЫ ЛИЦ ЗЛОУПОТРЕБЛЯЮЩЕЕСЯ ЭНЕРГЕТИЧЕСКИМИ НАПИТКАМИ.*TADQIQOTLAR. UZ*, *40*(5), 199-207.
59. Халимова, Ю. С., & Хафизова, М. Н. (2024). кафедра Клинических наук Азиатский международный университет Бухара, Узбекистан. *Modern education and development*, *10*(1), 60-75.
60. Халимова, Ю. С., & Хафизова, М. Н. (2024). КЛИНИЧЕСКИЕ ОСОБЕННОСТИ ЗАБОЛЕВАНИЙ ВНУТРЕННИХ ОРГАНОВ У ЛИЦ, СТРАДАЮЩИХ АЛКОГОЛЬНОЙ ЗАВИСИМОСТЬЮ. *TADQIQOTLAR. UZ*, *40*(5), 240-250.
61. Халимова, Ю. С., & Хафизова, М. Н. (2024). МОРФО-ФУНКЦИОНАЛЬНЫЕ И КЛИНИЧЕСКИЕ АСПЕКТЫ ФОРМИРОВАНИЯ КОЖНЫХ ПОКРОВОВ. *Modern education and development*, *10*(1), 76-90.
62. Khalimova, Y. S. (2024). Features of Sperm Development: Spermatogenesis and Fertilization. *American Journal of Bioscience and Clinical Integrity*, *1*(11), 90-98.
63. Salokhiddinovna, K. Y., & Nematilloevna, K. M. (2024). MODERN MORPHOLOGY OF HEMATOPOIETIC ORGANS. *Modern education and development*, *16*(9), 50-60.
64. Khalimova, Y. (2025). MORPHOLOGY OF PATHOLOGICAL FORMS OF PLATELETS. *Modern Science and Research*, *4*(2), 749-759.