

БИОМЕДИЦИНА ВА АМАЛИЁТ ЖУРНАЛИ

ЖУРНАЛ БИОМЕДИЦИНЫ И ПРАКТИКИ
JOURNAL OF BIOMEDICINE AND PRACTICE

ДАВРИЙЛИГИ: 2016-2026

ЖИЛД 11
СОҢ 1

2026



ЧОП
ЭТИЛГАН САНА:
06.02.2026

БИМЕДИЦИНА ВА АМАЛИЁТ ЖУРНАЛИ

11 ЖИЛД, 1 СОН

ЖУРНАЛ БИМЕДИЦИНЫ И ПРАКТИКИ

ТОМ 11, НОМЕР 1

JOURNAL OF BIOMEDICINE AND PRACTICE

VOLUME 11, ISSUE 1



Бош мухаррир:

Ризаев Жасур Алимжанович
тиббиёт фанлари доктори, профессор,
Самарқанд давлат тиббиёт университети ректори
ORCID ID: 0000-0001-5468-9403

Бош мухаррир ўринбосари:

Зиядуллаев Шухрат Худайбердиевич
тиббиёт фанлари доктори, Ўзбекистон Республикаси
Фанлар академиясининг Иммунология ва инсон
геномикаси институти директор ўринбосари,
ORCID ID: 0000-0002-9309-3933

Масъул котиб:

Самиева Гулноза Утқуровна
тиббиёт фанлари доктори, профессор,
Самарқанд давлат тиббиёт университети
ORCID ID: 0000-0002-6142-7054

Нашр учун масъул:

Шаханова Шахноза Шавкатовна
PhD, Самарқанд давлат тиббиёт университети,
онкология кафедраси доценти
ORCID ID: 0000-0003-0888-9150

ТАХРИРИЯТ КЕНГАШИ:

Арипова Тамара Уктамовна

Иммунология ва инсон геномикаси институти директори –
тиббиёт фанлари доктори, профессор, Ўзбекистон
Республикаси Фанлар академияси академиги

Jin Young Choi

Сеул миллий университети Стоматология мактаби оғиз ва
юз-жағ жарроҳлиги департаменти профессори, Жанубий
Кореянинг юз-жағ ва эстетик жарроҳлик ассоциацияси
президенти

Абдуллаева Наргиза Нурмаматовна

тиббиёт фанлари доктори, профессор, Самарқанд
давлат тиббиёт университети проректори, 1-клиникаси бош
врачи. **ORCID ID:** 0000-0002-7529-4248

Орипов Фирдавс Суръатович

тиббиёт фанлари доктори, профессор, Самарқанд
давлат тиббиёт университети Гистология, цитология ва
эмбриология кафедраси мудири
ORCID ID: 0000-0002-0615-0144

Мавлянов Фарход Шавкатович

тиббиёт фандар доктори, Самарқанд давлат тиббиёт
университети болалар жарроҳлиги кафедраси доценти
ORCID ID: 0000-0003-2650-4445

Магзумова Наргиза Махкамовна

тиббиёт фанлари доктори, Тошкент давлат тиббиёт
университети Оилавий тиббиётда акушерлик ва гинекология
кафедраси профессори **ORCID ID:** 0000-0002-9313-4918

Очилов Улугбек Усмонович

DSc, доцент, СамДТУ Дипломдан кейинги таълим
факултети Психиатрия курси мудири. СамДТУ Илмий
кенгаши котиби. <https://orcid.org/0000-0003-3553-8727>

Шавази Наргиз Нуралiena

DSc. Доцент, СамДМУ 3-сон акушерлик ва гинекология
кафедраси мудири <https://orcid.org/0000-0001-7859-9955>

Юлдашев Равшан Захидович

Тожикистон Давлат тиббиёт университети Онкология
ва нур таъхис кафедраси мудири, Тиббиёт фанлари
доктори, Профессор. Душанбе, Тожикистон.
<https://orcid.org/0009-0002-7165-5373>

Саидов Сандамир Абборович

тиббиёт фанлар доктори,
Тошкент фармацевтика институти
ORCID ID: 0000-0002-6616-5428

Бабалджанов Ойбек Абдужаббарович

тиббиёт фанлари доктори, Тошкент давлат тиббиёт
университети, Тери-таносил болалар тери-таносил
касаликлари ва ОИТС кафедраси доценти
ORCID ID: 0000-0002-3022-916X

Теребаев Билим Алдамуратович

тиббиёт фанлари доктори, доцент, Тошкент
педиатрия тиббиёт институти Факультет болалар
хирургия кафедраси. **ORCID ID:** 0000-0002-5409-4327

Юлдашев Ботир Ахматович

тиббиёт фанлари доктори,
Самарқанд давлат тиббиёт университети
№2-сон Педиатрия, неонатология ва болалар
касаликлари пропедевтикаси кафедраси доценти.
ORCID ID: 0000-0003-2442-1523

Ибрагимова Малика Худайбергеновна

тиббиёт фанлари доктори, профессор
Тошкент давлат тиббиёт университети
ORCID ID: 0000-0002-9235-1742

Рахимов Нодир Махамматкулович

тиббиёт фанлари доктори, Самарқанд давлат
тиббиёт университети, онкология кафедраси профессори
ORCID ID: 0000-0001-5272-5503

Даминов Феруз Асадуллаевич

Самарқанд давлат тиббиёт университети,
2-сон Даволаш факультети декани,
тиббиёт фанлари доктори, доцент.
Самарқанд, Ўзбекистон.

Миржурев Элбек Миршавкатович

тиббиёт фанлари доктори, профессор
ЎзССВ Тиббий ходимларни касбий малакасини
ривожлантириши марказининг Нейрореабилитация
кафедраси мудири, Тошкент, Ўзбекистон

Тагаев Шерқабул Бойқабдулович

тиббиёт фанлари доктори, хирургия кафедраси
доценти Тошкент давлат тиббиёт университети.
ORCID: 0009-0004-7661-9253.

Саҳифаловчи: Хуршид Мирзахмедов

Контакт редакций журналлов. www.tadqiqot.uz

ООО Tadqiqot город Ташкент,
улица Амира Темура пр.1, дом-2.

Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz

Тел: (+998-94) 404-0000

Editorial staff of the journals of www.tadqiqot.uz

Tadqiqot LLC The city of Tashkent,
Amir Temur Street pr.1, House 2.

Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz

Phone: (+998-94) 404-0000

Главный редактор:

Ризаев Жасур Алимджанович
доктор медицинских наук, профессор, Ректор Самаркандского государственного медицинского университета, **ORCID ID:** 0000-0001-5468-9403

Заместитель главного редактора:

Зиядуллаев Шухрат Худайбердиевич
доктор медицинских наук, Заместитель директора Института иммунологии и геномики человека Академии наук Республики Узбекистан, **ORCID ID:** 0000-0002-9309-3933

Ответственный секретарь:

Самиева Гульноза Уткуровна
доктор медицинских наук, профессор Самаркандского государственного медицинского университета. **ORCID ID:** 0000-0002-6142-7054

Ответственный за публикацию:

Шаханова Шахноза Шавкатовна
PhD, доцент кафедры онкологии Самаркандского государственного медицинского университета **ORCID ID:** 0000-0003-0888-9150

РЕДАКЦИОННЫЙ КОЛЛЕГИЯ:

Арипова Тамара Уктамовна

директор Института иммунологии и геномики человека доктор медицинских наук, профессор, академик АН РУз

Jin Young Choi

профессор департамента оральной и челюстно-лицевой хирургии школы стоматологии Стоматологического госпиталя Сеульского национального университета, Президент Корейского общества челюстно-лицевой и эстетической хирургии

Абдуллаева Наргиза Нурмаматовна

доктор медицинских наук, профессор, проректор Самаркандского государственного медицинского университета, **ORCID ID:** 0000-0002-7529-4248

Орипов Фирдавс Суръатович

доктор медицинских наук, профессор, заведующий кафедрой Гистологии, цитологии и эмбриологии Самаркандского государственного медицинского университета **ORCID ID:** 0000-0002-0615-0144

Мавлянов Фарход Шавкатович

доктор медицинских наук, доцент кафедры Детской хирургии Самаркандского государственного медицинского университета, **ORCID ID:** 0000-0003-2650-4445

Магзумова Наргиза Махкамовна

Доктор медицинских наук, профессор кафедры акушерства и гинекологии Семейной медицины Ташкентский государственный медицинский университет **ORCID ID:** 0000-0002-9313-4918

Очилов Улугбек Усманович

DSc, доцент, заведующий курсом психиатрии факультета постдипломного образования СамГМУ. Секретарь Ученого совета СамГМУ. <https://orcid.org/0000-0003-3553-8727>

Шавази Наргиз Нуралиевна

DSc, доцент, заведующая кафедрой акушерства и гинекологии N 3 СамГМУ. <https://orcid.org/0000-0001-7859-9955>

Юлдашев Рашид Захидович

Заведующий кафедрой Онкологии и лучевой диагностики Таджикского медицинского университета, д.м.н., профессор, Душанбе, Таджикистан <https://orcid.org/0009-0002-7165-5373>

Сандов Сандамир Аброрович

доктор медицинских наук, Ташкентский фармацевтический институт **ORCID ID:** 0000-0002-6616-5428

Бабаджанов Ойбек Абдужаббарович

доктор медицинских наук, Ташкентский государственный медицинский университет, доцент кафедры Дерматовенерология, детская дерматовенерология и СПИД, **ORCID ID:** 0000-0002-3022-916X

Теребаев Билим Алдамуратович

доктор медицинских наук, доцент кафедры Факультетской детской хирургии Ташкентского педиатрического медицинского института. **ORCID ID:** 0000-0002-5409-4327

Юлдашев Ботир Ахматович

доктор медицинских наук, доцент кафедры Педиатрии, неонатологии и переподготовки детских болезней №2 Самаркандского государственного медицинского университета **ORCID ID:** 0000-0003-2442-1523

Ибрагимова Малика Худайбергатовна

доктор медицинских наук, профессор Ташкентский государственный медицинский университет **ORCID ID:** 0000-0002-9235-1742

Рахимов Нодир Махамматкулович

доктор медицинских наук, профессор кафедры онкологии Самаркандского государственного медицинского университета **ORCID ID:** 0000-0001-5272-5503

Даминов Феруз Асадуллаевич

Декан лечебного факультета №2 Самаркандского государственного медицинского университета, доктор медицинских наук, доцент. Самарканд, Узбекистан.

Мирджураев Эльбек Миршавкатович

Заведующий кафедрой Нейрореабилитации Центра развития профессиональной квалификации медицинских работников МЗ РУз, д.м.н., профессор Ташкент, Узбекистан

Тагаев Шеркабул Бойкабулович

доктор медицинских наук, доцент кафедры хирургии, Ташкентский государственный медицинский университет. **ORCID:** 0009-0004-7661-9253.

Верстка: Хуршид Мирзахмедов

Контакт редакций журналов. www.tadqiqot.uz
ООО Tadqiqot город Ташкент,
улица Амира Темура пр.1, дом-2.
Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz
Тел: (+998-94) 404-0000

Editorial staff of the journals of www.tadqiqot.uz
Tadqiqot LLC The city of Tashkent,
Amir Temur Street pr.1, House 2.
Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz
Phone: (+998-94) 404-0000

Chief Editor:

Rizaev Jasur Alimjanovich
MD, DSc, Professor of Dental Medicine,
Rector of the Samarkand State Medical University
ORCID ID: 0000-0001-5468-9403

Deputy Chief Editor:

Ziyadullaev Shukhrat Khudayberdievich
Doctor of Medical Sciences, Deputy Director of the Institute
of Immunology and Human Genomics of the Academy of
Sciences of the Republic of Uzbekistan
ORCID ID: 0000-0002-9309-3933

Responsible secretary:

Samieva Gulnoza Utkurovna
doctor of Medical Sciences, Professor,
Samarkand State Medical University
ORCID ID: 0000-0002-6142-7054

Responsible for publication:

Shakhanova Shakhnoza Shavkatovna
PhD, Docent Department of Oncology
Samarkand State medical university
ORCID ID: 0000-0003-0888-9150

EDITORIAL BOARD:

Aripova Tamara Uktamovna

*Director of the Institute of Immunology and Human Genomics -
Doctor of Medical Sciences, Professor, Academician of the
Academy of Sciences of the Republic of Uzbekistan*

Jin Young Choi

*Professor Department of Oral and Maxillofacial
Surgery School of Dentistry Dental Hospital
Seoul National University, President of the
Korean Society of Maxillofacial Aesthetic Surgery*

Abdullaeva Nargiza Nurmatovna

*Doctor of Medical Sciences, Professor, Vice-Rector
Samarkand State Medical University, Chief Physician of
the 1st Clinic ORCID ID: 0000-0002-7529-4248*

Oripov Firdavs Suratovich

*Doctor of Medical Sciences, Professor,
Head of the Department of Histology, Cytology and
Embryology of Samarkand State Medical University.
ORCID ID: 0000-0002-0615-0144*

Mavlyanov Farkhod Shavkatovich

*Doctor of Medicine, Associate Professor of Pediatric
Surgery, Samarkand State Medical University
ORCID ID: 0000-0003-2650-4445*

Magzumova Nargiza Makhamovna

*Doctor of Medical Sciences, Professor, Department
of Obstetrics and Gynecology, Family Medicine, Tashkent State
Medical University. ORCID ID: 0000-0002-9313-4918*

Ochilov Ulugbek Usmanovich

*DSc, Docent, Head of the Psychiatry Course at the Faculty of
Postgraduate Education of SamSMU. Secretary of the Academic
Council of SamSMU. <https://orcid.org/0000-0003-3553-8727>*

Shavazi Nargiz Nuraliyena

*DSc, Associate Professor, Head of the Department of Obstetrics
and Gynecology N 3 of Samarkand State Medical University.
<https://orcid.org/0000-0001-7859-9955>*

Yuldashev Ravshan Zakhidovich

*Head of the Department of Oncology and Radiation Diagnostics
at Tajik State Medical University, Doctor of Medical Sciences,
Professor. Dushanbe, Tajikistan <https://orcid.org/0009-0002-7165-5373>*

Saidov Saidamir

*Doctor of Medical Sciences,
Tashkent Pharmaceutical Institute,
ORCID ID: 0000-0002-6616-5428*

Babadjanov Oybek Abdujabbarovich

*Doctor of sciences in medicine, Tashkent State
Medical University, Docent the Department of
Dermatovenerology, pediatric dermatovenerology
and AIDS, ORCID ID: 0000-0002-3022-916X*

Terebaev Bilim Aldamuratovich

*Doctor of Medical Sciences, Associate Professor,
Tashkent Pediatric Medical Institute,
Faculty of Children Department of Surgery.
ORCID ID: 0000-0002-5409-4327.*

Yuldashev Botir Akhmatovich

*Doctor of Medical Sciences, Associate Professor of
Pediatrics, Neonatology and Propaedeutics of Pediatrics,
Samarkand State Medical University No. 2.
ORCID ID: 0000-0003-2442-1523*

Ibragimova Malika Xudayberganovna

*Doctor of Medical Sciences, Professor,
Tashkent State Medical University
ORCID ID: 0000-0002-9235-1742*

Rahimov Nodir Maxammatkulovich

*DSc, Professor of Oncology,
Samarkand State Medical University
ORCID ID: 0000-0001-5272-5503*

Daminov Feruz Asadullaevich

*Dean of the Faculty of Medicine No. 2, Samarkand State
Medical University, Doctor of Medical Sciences, Associate
Professor. Samarkand, Uzbekistan.*

Mirjuraev Elbek Mirshavkatovich

*Head of the Department of Neurorehabilitation Center
for the development of professional qualification of
medical workers, Doctor of Medical Sciences,
Professor. Tashkent, Uzbekistan
<https://orcid.org/0009-0008-2111-4388>*

Tagaev Sher Kabul Baykabulovich

*Doctor of Medical Sciences, Associate Professor
of Surgery Department, Tashkent State Medical University
ORCID: 0009-0004-7661-9253.*

Page Maker: Khurshid Mirzakhmedov

Контакт редакций журналов. www.tadqiqot.uz
ООО Tadqiqot город Ташкент,
улица Амира Темура пр.1, дом-2.
Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz
Тел: (+998-94) 404-0000

Editorial staff of the journals of www.tadqiqot.uz
Tadqiqot LLC The city of Tashkent,
Amir Temur Street pr.1, House 2.
Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz
Phone: (+998-94) 404-0000

OBSTETRICS AND GYNECOLOGY

1. **Matlubov Mansur Muratovich, Muminov Abduhalim Abduvakil, Khudoyberdieva Gulrukh Sobirovna, Umarova Bibikhonum Azimjon kizi**
EFFECTIVENESS OF POSTOPERATIVE INTENSIVE THERAPY IN PREGNANT WOMEN WITH VARICOSE VEINS.....12

NEUROLOGY, PSYCHIATRY

2. **Mansurova Nargiza Asrorovna**
DIAGNOSTIC VALUE OF INFLAMMATORY PROCESSES IN DIFFERENTIATING PARKINSONISM SUBTYPES.....18
3. **Tulyaganova Nodirakhon Malikovna.**
EPIDEMIOLOGICAL ASPECTS OF DEVELOPMENTAL DISORDERS IN CHILDREN BORN FROM CONSANGUINEOUS MARRIAGES.....26
4. **Ochilov Ulug'bek Usmanovich, Turaev Bobir Temirpulotovich, Sultanov Shoxrux Khabibullaevich**
CORRECTION OF DEPRESSIVE DISORDERS AND EVALUATION OF THE EFFECTIVENESS OF COMPREHENSIVE REHABILITATION IN PATIENTS WITH CHEMICAL ADDICTIVE DISORDERS.....34
5. **Turaev Bobir Temirpulotovich, Sultanov Shoxrux Khabibullaevich**
FACTORS INFLUENCING THE EFFECTIVENESS OF MEDICAL AND SOCIAL REHABILITATION IN PATIENTS WITH CHEMICAL ADDICTIVE DISORDERS (LITERATURE REVIEW).....41
6. **Khakimova Sakhiba Ziyadulloyevna, Gaffarova Parvina Abdurafikovna**
ETIOPATHOGENETIC SIGNIFICANCE OF MAO-B INHIBITORS IN PARKINSON'S DISEASE AND THEIR ROLE IN REDUCING MOTOR SYMPTOMS.....48
7. **Mirzhuraev Elbek Mirshavkatovich, Adambaev Zufar Ibragimovich, Mamatkhanova Charos Bahodirovna**
STRATIFICATION OF MANAGEMENT FOR PATIENTS WITH COMBINED VERTEBROGENIC PATHOLOGY AND PELVIC ORGAN DYSFUNCTION: A MULTIDISCIPLINARY APPROACH.....55
8. **Rogov Alexey Vladimirovich, Lipartiya Mary Givievna**
CHARACTERISTICS OF THE SEVERITY OF PARANOID SCHIZOPHRENIA IN PATIENTS WITH AUTOAGGRESSIVE MANIFESTATIONS IN THE EARLY PERIOD OF THE DISEASE.....63

MORPHOLOGY

9. **Kiyomov Ikhtiyor Ergashevich, Islamov Shavkat Erjigitovich**
MORPHOLOGICAL CHANGES IN THE THYMUS DURING ACUTE EXPOSURE TO A DEFOLIANT.....69

ONCOLOGY

10. **Abdikarimov Azizbek Khurshidjon ugli, Yusupbekov Abrorbek Akhmedjanovich, Usmonov Begzod Boymatovich, Xasanov Akbar Ibroximovich**
HUMAN PAPILLOMAVIRUS AND OROPHARYNGEAL CANCER: CURRENT CLINICAL-EPIDEMIOLOGICAL AND PROGNOSTIC ASPECTS (REVIEW).....77

11. **Iskandarova Shakhnoza Tulkinovna, Khakimova Laylo Nuraliyevna, Yusupov Anvar Sobirovich**
STUDY OF THE DYNAMICS OF PROLACTIN AND GLUCOSE LEVELS IN PATIENTS WITH GASTRIC CANCER DURING THE PERIOPERATIVE PERIOD UNDER COMBINED EPIDURAL ANESTHESIA.....89
12. **Rakhmatov Dilshod Bakhridinovich**
EVALUATION OF RADIATION DOSE LOAD TO ORGANS AT RISK WHEN SWITCHING TO A HYPOFRACTIONATED REGIMEN OF POSTOPERATIVE RADIOTHERAPY FOR LEFT BREAST CANCER.....95
13. **Shernazarov Otamurod Narmuratovich**
ACOUSTIC ANALYSIS OF VOICE FUNCTION IN PATIENTS WITH BENIGN LARYNGEAL LESIONS.....101
14. **Ten Vladimir Denisovich, Alimov Ijod Rustamovich, Umarov Rustam Dilshodovich.**
OUR EXPERIENCE OF PERCUTANEOUS BIOPSY IN METASTATIC LESIONS OF THE LUMBAR SPINE.....105
15. **Umarov Rustam Dilshodovich, Alimov Ijod Rustamovich, Ten Vladimir Denisovich.**
ISOLATED LATERAL SURGICAL APPROACH FOR VERTEBRAL BODY TUMORS WITH EXTRADURAL INTRACANAL INVASION AT TH11–L2.....109
16. **Ismailov Avaz Alisherovich, Umarov Rustam Dilshodovich, Alimov Ijod Rustamovich,**
POSTERIOR DECOMPRESSIVE AND STABILIZING APPROACH FOR THORACIC AND LUMBAR VERTEBRAL BODY TUMORS WITH INTRACANAL EXTENSION.116
17. **Umarov Rustam Dilshodovich, Alimov Ijod Rustamovich, Ten Vladimir Denisovich**
ISOLATED LATERAL SURGICAL APPROACH FOR VERTEBRAL BODY TUMORS WITH EXTRADURAL INTRACANAL INVASION AT TH11–L2 LEVELS.....121
18. **Sharopov Sadullo Shukurillovich**
CORRELATION BETWEEN ELECTROENCEPHALOGRAPHIC CHANGES AND MRI CHARACTERISTICS IN PATIENTS WITH BRAIN TUMORS.....129

MEDICAL REHABILITATION

19. **Raimkulova Dilnoza Farkhaddinovna**
PROGNOSTIC CRITERIA AND ANALYSIS OF PHYSICAL PERFORMANCE IN ADOLESCENTS ENGAGED IN DIFFERENT TYPES OF SPORTS.....135
20. **Mamatkhanova Charos Bahodirovna**
STRATIFICATION OF SURGICAL AND REHABILITATION TREATMENT FOR POST-TRAUMATIC MYELOPATHIES AT THE CERVICAL AND THORACIC SPINE LEVELS.....142
21. **Mamatkhanova Charos Bahodirovna**
ANALYSIS OF PATIENTS WITH SPINAL PATHOLOGY AND SPINAL CORD DISEASES AT THE REPUBLICAN CENTER FOR REHABILITATION OF DISABLED PERSONS.....149
22. **Tukhtaev Firdavs Mukhitdinovich, Kadirov Jonibek Fayzullayevich**
THE IMPACT OF MINERAL AND ACID–BASE METABOLIC CORRECTION ON POSTOPERATIVE REHABILITATION IN CHILDREN WITH UROLITHIASIS.....155

DENTISTRY AND MAXILLOFACIAL SURGERY

23. **Boymurodov Shukhrat Abdujalilovich, Kurbanov Yoqubjon Khamdamovich, Yusupov Shokhrukh Shuhratovich, Djurayev Jamolbek Abdukakharovich, Soatov Ilyosjon Olimovich**
SIGNIFICANCE OF IL10 RS1800872, SERPINE1 RS1799768, NOS3 RS2070744, AND IL1B RS1143627 GENE POLYMORPHISMS IN PURULENT-NECROTIC PROCESSES OF THE MAXILLOFACIAL REGION.....160

24. **Alyavi Mufassal Nasirkhanovna, Khaydarov Artur Mikhaylovich, Alieva Muattar Abdulkhayevna**
COMPLEX TREATMENT OF CHRONIC GENERALIZED PERIODONTITIS IN PATIENTS WITH STABLE ANGINA PECTORIS.....171
25. **Ismoilov Mirkamol Xusan o'g'li Nigmatova Iroda Maratovna**
THE ROLE OF VITAMIN D IN THE CONDITION OF PERIODONTAL TISSUES DURING ORTHODONTIC TREATMENT IN PREGNANT WOMEN.....180
26. **Irgashev Shokhrukh Khasanovich**
ANALYSIS OF THE HYGIENIC INDICATORS OF THE ORAL MUCOSA OF PERSONS WHO HAVE UNDERGONE ORTHOPEDIC STOMATOLOGICAL TREATMENT.....190
27. **Ibragimova Malika Khudaiberganovna, Abduvahobova Dilnoza Anvarovna**
CLINICAL AND DIAGNOSTIC ASPECTS OF RED FLAT AND DEPRESSED ORAL MUCOSA.....196
28. **Rizaev Jasur Alimjanovich, Akhmedova Sayyora Mukhamadovna, Absalamova Nigora Fakhriddinovna**
IMPROVEMENT OF TREATMENT STRATEGIES FOR ORAL MUCOSAL LEUKOPLAKIA BASED ON IMMUNOHISTOCHEMICAL RESULTS.....204
29. **Otkhonova Mohinog Ganiyon qizi, Khramova Natalya Vladimirovna, Gafurov Zafar Atkhamovich**
JUSTIFICATION OF MAXILLARY RECONSTRUCTION USING A TIBIAL BONE AUTOGRAFT.....212
30. **Madazimov Madamin Muminovich, Turaev Feruz Fakhtullaevich, Yusufovna Mohamed Khava, Pustovetova Maria Gennadievna, Akramova Nozima Akramovna**
CELL-ASSISTED LIPOTRANSFER IN THE CORRECTION OF AESTHETIC AND POST-TRAUMATIC DEFORMITIES OF FACIAL SOFT TISSUES.....219

TRAUMATOLOGY

31. **Axtamov A'zam, Axtamov Azim**
STUDYING THE RESULTS OF RECONSTRUCTIVE SURGICAL TREATMENT OF COMBINED MENISCLE WOUNDS.....228
32. **Axtamov Azim, Axtamov A'zam**
DIAGNOSIS AND MODERN METHODS OF TREATMENT OF ACETABULUM INJURIES (LITERATURE REVIEW).....233
33. **Axtamov A'zam, Axtamov Azim**
EXPERIENCE IN TREATING INTRA-ARTICULAR FRACTURES OF THE DISTAL PART OF THE HUMERUS IN CHILDREN.....241
34. **Davirov Sharof Majidovich, Urinbaev Payzilla Urinbaevich, Mansurov Djalolidin Shamsidinovich**
OSTEOPLASTIC RECONSTRUCTION OF EXTENSIVE DIAPHYSEAL LONG BONE DEFECTS USING EXTERNAL FIXATION DEVICES.....246

PEDIATRICS

35. **Choliev Matyoqub Sulaymanovich, Khotamov Khusniddin Narzullayevich, Tilavov O'ktam Khamrayevich**
SOFT TISSUE NECROSIS IN CHILDREN: CLINICAL FEATURES, DIAGNOSIS AND PRINCIPLES OF TREATMENT.....256
36. **Umarova Saodat Sulaymonovna**
VITAMIN D DEFICIENCY AS A PREDICTOR OF INFLAMMATORY ACTIVITY IN CHILDREN WITH ACUTE RHEUMATIC FEVER.....264

37. **Rakhmatullaev Akmal Abadbekovich, Ergashev Mukhammadjon Tursunovich**
EFFECTIVENESS OF ENDOSCOPIC CORRECTION METHODS IN CHILDREN WITH
PRIMARY HIGH-GRADE VESICoureTERAL REFLUX.....275
38. **Akhmedzhanova Nargiza Ismailovna, Ganieva Marifat Shokirovna, Majidova Nilufar
Mansuralievna.** INNOVATIV METHODS OF EARLY DIAGNOSIS OF
TUBULOINTERSTISIAL LESIONS IN ACUTE PYELONEPHRITIS IN CHILD.....281
39. **Terebayev Bilim Aldamuratovich, Barnakulov Umrzok Khasanovich**
PROBLEMS OF DIAGNOSIS AND TREATMENT OF DOLICHOSIGMA ASSOCIATED
WITH CHRONIC CONSTIPATION IN CHILDREN.....288
40. **Tilavov Uktam Khamraevich, Chuliev Matyokub Sulaimonovich, Khotamov Khusniddin
Narzullaevich, Abduqodirov Oybek Ahmadjonovich**
DIAGNOSIS AND TREATMENT OF CYSTIC ADENOMATOID MALFORMATION OF
THE LUNGS IN CHILDREN.....299
41. **Tukhtaev Firdavs Mukhitdinovich, Kadirov Jonibek Fayzullayevich**
PERSONALIZED METABOLIC APPROACHES IN CHILDREN'S MEDICAL
REHABILITATION.....307
42. **Ibragimova Sapura Zakhidovna, Almedova Nargiza Nigmatjonovna, Botirov Mirzokhid
Mansurzhon Ugli, Shadibekova Oksana Borisovna, Aripova Nazokat Bahodirovna,
Erimbetova Indira Oralbaevna**
RESULTS OF THE USE OF EMICIZUMAB IN PATIENTS WITH HEMOPHILIA A – A
PILOT SINGLE-CENTER STUDY.....312
43. **Khaidarov Khusan Anvarovich**
THE ROLE OF VITAMIN D STATE IN DETERMINING THE SEVERITY AND
EFFECTIVENESS OF INPATIENT TREATMENT OF RECURRENT RESPIRATORY
TRACT INFECTIONS IN YOUNG CHILDREN.....319

SURGERY

44. **Abdurahmonov Ma'mur Mustafaevich, Umedov Xushvaqt Alisherovich,**
ASSESSMENT OF THE IMMUNE SYSTEM STATUS IN ACUTE DESTRUCTIVE
PANCREATITIS.....325
45. **Kurbanov Aslbek Sadullaevich, Arziev Ismoil Alievich, Arzieva Gulnora Borievna**
DIAGNOSTIC AND THERAPEUTIC POTENTIAL OF LAPAROSCOPY IN PATIENTS
WITH BLUNT ABDOMINAL TRAUMA.....331
46. **Yuldashov Parda Arzikulovich, Rakhmanov Kosim Erdanovich, Sayinaev Farrukh
Karamatovich**
OPTIMIZATION OF SURGICAL TREATMENT OF POSTOPERATIVE VENTRAL
HERNIAS BASED ON LAPAROSCOPIC PROSTHETIC METHODS.....336
47. **Kurbanova Sanobar Yuldashevna, Kamalov Zainitdin Saifutdinovich, Azizova Zukhra
Shukhratovna**
CLINICAL, IMMUNOLOGICAL, AND IMMUNOGENETIC FEATURES OF DISEASE
DEVELOPMENT IN ADULT PATIENTS WITH PYELONEPHRITIS (A LITERATURE
REVIEW).....346
48. **Umedov Xushvaqt Alisherovich, Abdurahmonov Ma'mur Mustafaevich**
CONTEMPORARY CLINICO-MORPHOLOGICAL CLASSIFICATION OF ACUTE
PANCREATITIS AND ITS COMPLICATIONS.....355
49. **Ollabergenov Odilbek Tozhiddinovich, Terebaev Bilim Aldamuratovich, Parpiev
Mirziyod Mirsaitovich**
CURRENT TRENDS IN THE DIAGNOSIS AND SURGICAL TREATMENT OF LIVER
ECHINOCOCCOSIS IN CHILDREN.....362

50. **Askarov Pulat Azadovich, Bazarov Bahrom Boymamatovich, Kurbaniyazov Zafar Babadjanovich**
THE IMPACT OF CONCOMITANT SURGICAL PATHOLOGY ON THE OUTCOMES OF SIMULTANEOUS OPERATIONS IN PATIENTS WITH VENTRAL HERNIAS AND MORBID OBESITY.....369
51. **Egamberdiev Abdukahhor Abduqodirovich, Arzieva Gulnora Borievna**
ASSESSMENT OF CLINICAL OUTCOMES AND TECHNICAL FEATURES OF ENDOVIDEOSURGICAL TREATMENT OF HIATAL HERNIA.....377
52. **Madazimov Madamin Muminovich, Turaev Feruz Fakhtullayevich, Kiziun Yana Viktorovna, Pustovetova Maria Gennadievna, Akramova Nozima Akramovna, Kiyamov Azizbek Utkirovich**
STUDY OF BREAST BLOOD SUPPLY USING DUPLEX ULTRASOUND IN REDUCTION MAMMOPLASTY.....385

INFECTIOUS DISEASE

53. **Imamov Otabek Sunnatovich, Mahmudov Sherzod Xasanovich, Djumaev Normurod Davlatovich, Bakhodirova Shahlo Bahoriddinovna, Tokhtayev Gairatillo Shukhratillo ugli.**
THE IMPORTANCE OF TEMPERATURE IN THE ETIOLOGY AND MODERN LABORATORY DIAGNOSTICS OF DERMATOMYCOSIS.....394
54. **Imamov Otabek Sunnatovich, Mahmudov Sherzod Xasanovich, Djumaev Normurod Davlatovich, Ernazarova Feruzabonu Ravshanbekovna, Tokhtayev Gairatillo Shukhratillo ugli**
MODERN ETIOLOGICAL SPECTRUM OF DERMATOMYCOSIS PATHOGENS IN THE TASHKENT REGION.....403
55. **Yusupov Mashrab Ismatillovich**
GUT MICROBIOTA: CORRELATION OF PHYSICAL LOAD, DIET, AND HEAT EXCHANGE.....409
56. **Faizullaev Sherzod Kobiljon ugli, Shakharov Dilshod Zhura ugli, Tukhtaev Shohzod Eshmurod ugli, Khuzhamberdiev Sodikjon Uchkun ugli, Samibaeva Umida Khurshidovna**
FEATURES OF THE CLINICAL PICTURE OF THE NEW CORONAVIRUS INFECTION (COVID-19).....420
57. **Samibaeva Umida Khurshidovna, Faizullaev Sherzod Kobiljon ugli, Shakharov Dilshod Zhura ugli, Tukhtaev Shohzod Eshmurod ugli, Khuzhamberdiev Sodikjon Uchkun ugli**
EVALUATION OF THE CLINICAL EFFICACY OF GLYCYRRHIZIC ACID IN PATIENTS WITH COVID-19.....435
58. **Samibaeva Umida Khurshidovna, Faizullaev Sherzod Kobiljon ugli, Shakharov Dilshod Zhura ugli, Tukhtaev Shohzod Eshmurod ugli, Khuzhamberdiev Sodikjon Uchkun ugli**
EVALUATION OF THE CLINICAL EFFICACY OF GLYCYRRHIZIC ACID IN PATIENTS WITH COVID-19.....447
59. **Rashidov Zafar Rakhmatullaevich**
CLINICAL SIGNIFICANCE OF DOPLEROGRAPHY IN THE DETECTION AND MONITORING OF RENAL TUBERCULOSIS.....453

OPHTHALMOLOGY

60. **Nazirova Zulfiya Rustamovna, Turakulova Dilfuza Mukhitdinovna, Khamrayev Shakhruh Ilkhom ugli.**
SURGICAL TREATMENT OF CONGENITAL AND ACQUIRED CATARACTA IN CHILDREN: ANALYSIS OF MODERN METHODS AND STAGES.....460

61. **Turakulova Dilfuza Mukhitdinovna, Nazirova Zulfiya Rustamovna, Axrorova Malika Nosir qizi.**
ANALYSIS OF SURGICAL TREATMENT OF INTRAOCULAR LENS SUBLUCATION IN CHILDREN.....470
62. **Iskandarova Shakhnoza Tulkinovna, Miralimova Malika Mukhammadovna, Yangiyeva Nodira Rakhimovna**
ASSESSMENT OF THE INFORMATIVE VALUE OF PARENTAL QUESTIONNAIRES IN THE EARLY DETECTION OF REFRACTIVE DISORDERS IN PRESCHOOL CHILDREN.....477

NEUROSURGERY

63. **Asadov Khamidulla Fatkhullaevich, Okhunov Alisher Oripovich, Asadov Khumoyun Hamidullaevich.**
A NERVE-SPARING ENDOSCOPIC TUNNEL TECHNIQUE FOR THE SURGICAL TREATMENT OF CHRONIC OCCIPITAL MIGRAINE.....485
64. **Okhunov Alisher Oripovich, Asadov Khamidulla Fatkhullaevich, Asadov Khumoyun Hamidullaevich.**
STRATEGY FOR SELECTING THE EXTENT AND STAGING OF SURGICAL TREATMENT IN COMBINED FORMS OF CHRONIC MIGRAINE.....492

БИОМЕДИЦИНА ВА АМАЛИЁТ ЖУРНАЛИ

ЖУРНАЛ БИОМЕДИЦИНЫ И ПРАКТИКИ | JOURNAL OF BIOMEDICINE AND PRACTICE

UDC: 616.61-002-053.2:578.

AKHMEDZHANOVA Nargiza Ismailovna

DSc, professor

Samarkand State Medical University

GANIEVA Marifat Shokirovna

PhD, associate professor


MAJIDOVA Nilufar Mansuralievna

assistant

Andijan State Medical Institute

INNOVATIVE METHODS OF EARLY DIAGNOSIS OF TUBULOINTERSTITIAL LESIONS IN ACUTE PYELONEPHRITIS IN CHILDREN

For citation: Akhmedzhanova Nargiza Ismailovna, Ganieva Marifat Shokirovna, Majidova Nilufar Mansuralievna. INNOVATIVE METHODS OF EARLY DIAGNOSIS OF TUBULOINTERSTITIAL LESIONS IN ACUTE PYELONEPHRITIS IN CHILD // Journal of Biomedicine and Practice. 2026, vol. 11, issue 1.

 <http://dx.doi.org/10.5281/zenodo.18519923>

ANNOTATION

The COVID-19 pandemic has revealed previously unrecognized clinical features of infectious and inflammatory kidney diseases in pediatric patients. **Objective:** To determine the significance of tubuloglomerular abnormalities biomarkers (γ -GT, β 2M, NGAL, KIM-1) in clinical and laboratory diagnostics in children with acute pyelonephritis after COVID-19. **Methods.** The study included 100 children with clinically and laboratory-confirmed acute pyelonephritis. The control group consisted of 25 apparently healthy children, matched for age and gender. **Results.** The study results revealed a statistically significant increase in urinary γ -GT, KIM-1, NGAL, and β 2-microglobulin concentrations compared to the control group. In patients in the first group, γ -GT levels were 4.57 times higher than the control group, KIM-1 levels were 3.77 times higher, NGAL levels were 25.96 times higher, and β 2M levels were 7.64 times higher. **Conclusion.** Determining the concentrations of these parameters allows us to identify early signs of tubulointerstitial damage, assess the activity of the pathological process in the renal tubular apparatus, and identify risk groups for chronic pyelonephritis.

Keywords: post-COVID complications, acute pyelonephritis, tubulointerstitial lesions, KIM-1, NGAL, β 2-microglobulin, γ -GT.

АХМЕДЖАНОВА Наргиза Исмаиловна

Д.м.н. профессор

Самаркандский государственный медицинский университет

ГАНИЕВА Марифат Шокировна

К.м.н., доцент

МАДЖИДОВА Нилуфар Мансуралиевна

Ассистент

Андижанский государственный медицинский институт

ИННОВАЦИОННЫЕ МЕТОДЫ РАННЕЙ ДИАГНОСТИКИ ТУБУЛОИНТЕРСТИЦИАЛЬНЫХ ПОРАЖЕНИЙ ПРИ ОСТРОМ ПИЕЛОНЕФРИТЕ У ДЕТЕЙ

АННОТАЦИЯ

Пандемия COVID-19 выявила ранее неучтённые особенности клинического течения инфекционно-воспалительных заболеваний почек у педиатрических пациентов. **Цель исследования:** определить значимость биомаркеров тубуло-гломерулярных нарушений (γ -ГТ, β_2 М, NGAL, KIM-1) в клиничко-лабораторной диагностике у детей с острым пиелонефритом после перенесённого COVID-19. **Методы.** В исследование были включены 100 детей с клинически и лабораторно подтверждённым острым пиелонефритом. Контрольную группу составили 25 практически здоровых детей, сопоставимых по возрасту и полу. **Результаты.** Результаты исследования показали статистически значимое повышение концентраций γ -ГТ, KIM-1, NGAL и β_2 -микроглобулина в моче по сравнению с контрольной группой. У пациентов первой группы уровень γ -ГТ превышал показатели контроля в 4,57 раза, KIM-1 — в 3,77 раза, NGAL — в 25,96 раза, а β_2 М — в 7,64 раза. **Заключение.** Определение концентрации этих показателей позволяет выявить ранние признаки тубулоинтерстициального повреждения, оценить активность патологического процесса в канальцевом аппарате почек и выделить группы риска по хронизации пиелонефрита.

КЛЮЧЕВЫЕ СЛОВА: постковидные осложнения, острый пиелонефрит, тубулоинтерстициальные поражения, KIM-1, NGAL, β_2 -микроглобулин, γ -ГТ.

AXMEDJANOVA Nargiza Ismailovna

DSc, professor

Samarqand Davlat Tibbiyot Universiteti

G'ANIYEVA Ma'rifat Shokirovna

PhD, dostent

MAJIDOVA Nilufar Mansuralievna

assistent

Andijon davlat tibbiyot instituti

BOLALARDA O'TKIR PYELONEFRITDA TUBULOINTERSTITSIAL ZARARLANISHLARNI ERTA TASHXIS QILISHNING INNOVATSION USULLARI

ANNOTATSIYA

COVID-19 pandemiyasi bolalarda yuqumli va yallig'lanishli buyrak kasalliklarining ilgari tan olinmagan klinik xususiyatlarini aniqladi. **Maqsad:** COVID-19 dan keyin o'tkir pielonefritli bolalarda klinik va laboratoriya diagnostikasida tubuloglomerulyar anomaliyalar biomarkerlarining (γ -GT, β_2 M, NGAL, KIM-1) ahamiyatini aniqlash. **Usullar.** Tadqiqotga klinik va laboratoriya tomonidan tasdiqlangan o'tkir pielonefritli 100 bola kiritilgan. Nazorat guruhi yoshi va jinsi bo'yicha mos keladigan 25 nafar sog'lom boladan iborat edi. **Natijalar.** Tadqiqot natijalari nazorat guruhiga nisbatan siydikdagi γ -GT, KIM-1, NGAL va β_2 -mikroglobulin konsentratsiyasining statistik jihatdan sezilarli darajada oshganligini ko'rsatdi. Birinchi guruhdagi bemorlarda γ -GT darajasi nazorat guruhiga qaraganda 4,57 baravar, KIM-1 darajasi 3,77 baravar, NGAL darajasi 25,96 baravar va β_2 M darajasi 7,64 baravar yuqori bo'lgan. **Xulosa.** Ushbu parametrlarning konsentratsiyasini aniqlash bizga tubulointerstisial shikastlanishning dastlabki belgilarini aniqlash, buyrak naychalari apparatida patologik jarayonning faolligini baholash va surunkali pielonefrit uchun xavf guruhlarini aniqlash imkonini beradi.

KALIT SO'ZLAR: COVIDdan keyingi asoratlar, o'tkir pielonefrit, tubulointerstitial shikastlanishlar, KIM-1, NGAL, β_2 -mikroglobulin, γ -GT.

Introduction: SARS-CoV-2 is capable of infecting various kidney structures, including glomerular cells and the epithelium of the proximal convoluted tubules. Morphological changes most often manifest as signs of focal segmental glomerulosclerosis and/or acute tubular necrosis [12].

However, invasive methods such as renal needle biopsy, especially in children, are associated with a high risk of complications, including severe hemorrhagic reactions. This significantly limits the capabilities of morphological analysis and requires the implementation of alternative, safer diagnostic methods [10].

One of the most promising approaches to noninvasive diagnosis of tubulointerstitial disorders is urinary enzyme analysis. This method allows for the assessment of the nephron tubular apparatus in the early stages of the pathological process, when changes are still reversible. Enzymuria is considered a sensitive marker, enabling earlier detection of functional disorders compared to traditional biochemical indicators [11].

γ -Glutamyl transferase (γ -GT) is localized primarily in the apical membrane of epithelial cells of the proximal tubules and the descending limb of the loop of Henle [6, 7, 9]. Increased activity in urine indicates damage to the tubular epithelium, since the enzyme is expressed on the cell surface and is rapidly released during sublethal or lethal destruction of the cells [8].

Modern approaches to diagnosing inflammatory and destructive changes in the tubulointerstitial zone include the use of biomarkers based on biologically active molecules. Neutrophil gelatinase-associated lipocalin-2 (NGAL), kidney injury molecule 1 (KIM-1), and β_2 -microglobulin (β_2 M) are considered the most clinically significant. These markers not only reflect the level of inflammatory activity but also enable the implementation of the concept of early, highly specific, and non-invasive diagnostics [1, 2, 3, 4, 5].

The aim: of the study was to determine the significance of biomarkers of tubuloglomerular disorders (γ -GT, β_2 M, NGAL, KIM-1) in clinical and laboratory diagnostics in children with acute pyelonephritis after COVID-19.

Materials and methods. The study involved 100 children aged 7–17 years suffering from acute pyelonephritis. The patients were divided into two groups, each containing 50 subjects. The control group consisted of 25 apparently healthy children of the same age range. Laboratory and instrumental studies were conducted at the L.M. Isaev Research Institute of Microbiology, Virology, Infectious and Parasitic Diseases of Samarkand State Medical University.

Patients were divided into three groups: Group 1 (control group) consisted of 25 healthy children; Group 2 consisted of 50 patients with acute pyelonephritis who had recovered from COVID-19; and Group 3 consisted of 50 children with acute pyelonephritis without a history of COVID-19.

Urinary syndrome assessment included proteinuria (mg/day), leukocyturia (cells/field of vision), bacteriuria (CFU/ml), Nechiporenko test (cells/ml), and urine culture with clinically significant growth ($>10^5$ CFU/ml). Proximal tubular function was assessed by daily protein excretion (mg/l), and distal tubular function was assessed by the Zimnitsky test, titratable acid levels, and ammonia excretion (mmol/day).

Blood was collected from the cubital vein on an empty stomach. Serum was separated by centrifugation (3000 rpm, 15 min) and stored at -20°C for ≤ 3 months. Daily urine output was collected in a common container, from which 15 ml of samples were isolated and frozen at -20°C until analysis.

The study determined the levels of γ -glutamyl transferase (γ -GT, U/L), NGAL (ng/mL), β_2 -microglobulin (β_2 M, mg/L), and KIM-1 (ng/mL) in urine.

γ -GT activity (U/L) was determined using a colorimetric enzymatic method on an automated biochemical analyzer. This method is based on the ability of γ -GT to catalyze the transfer of a γ -glutamyl group from a substrate to an acceptor, resulting in the formation of a colored compound. Stain intensity was measured spectrophotometrically at a wavelength of 405 nm. To improve the

informativeness of the results, the value was normalized to the urinary creatinine level and expressed as U/mmol creatinine.

Urine concentrations of NGAL (ng/mL), β 2M (mg/L), and KIM-1 (ng/mL) were determined by enzyme-linked immunosorbent assay (ELISA) using sandwich diagnostic kits (ELISA). This method involves the specific binding of the antigen to monoclonal antibodies immobilized on a plate, after which secondary antibodies conjugated to the enzyme were added to the complex. After incubation with a chromogenic substrate (3,3',5,5'-tetramethylbenzidine, TMB), an enzymatic reaction occurred, forming a colored product. Changes in optical density were recorded using a plate spectrophotometer at a wavelength of 450 nm. Biomarker concentrations were calculated using calibration curves constructed using standard solutions. Before analysis, all urine samples were centrifuged at 3000 rpm for 10 minutes, and the supernatant was used for analysis. To exclude the influence of urine acidity on β 2M levels, samples with a pH <6 were pre-neutralized to physiological levels.

Urine renal biomarker levels (γ -GT, NGAL, β 2M, KIM-1) were analyzed upon admission of children to the hospital.

Statistical analysis of the study results was performed using Microsoft Excel (version 2016, USA) and StatPlus v.7 (AnalystSoft Inc., USA). Normal distribution of quantitative variables was tested using the Kolmogorov-Smirnov test. Differences between two groups were analyzed using the parametric Student's t-test, and comparisons between three groups were performed using a one-way analysis of variance using Fisher's exact test.

Quantitative values are presented as mean and standard deviation ($M \pm SD$). The χ^2 (chi-square) test was used to analyze categorical variables and compare proportions. Differences were considered statistically significant at $p < 0.05$.

Results and discussion: In this study, clinical and laboratory monitoring of patients in groups 1 and 2 was conducted during hospitalization, before the start of therapy. Two main groups were identified for comparative analysis. The first (main) group included 50 children diagnosed with acute pyelonephritis (AP) who had previously recovered from COVID-19. The comparison group (group 2, n=50) consisted of patients with AP who had no history of COVID-19. The interval between COVID-19 and hospitalization ranged from 3 weeks to 2.5 months. The control group included 25 apparently healthy children.

A comparative analysis of individual clinical and laboratory parameters, including total protein levels, body temperature on admission, white blood cell count, erythrocyte sedimentation rate (ESR), and glomerular filtration rate (GFR), was conducted between the two groups of patients. To assess the statistical significance of the differences, the parametric Student's t-test for independent samples was used. According to the obtained results, the average values of total serum protein in groups 1 and 2 did not differ significantly ($p > 0.05$) (Table 1). At the same time, the body temperature at the time of admission to the hospital in children of the comparison group (group 2) was statistically significantly higher (39.2 ± 0.5 °C) than in patients of the main group (38.2 ± 0.4 °C) ($p = 0.003$). Statistically significant differences in the level of leukocytes, ESR and SCF were also noted between the groups ($p < 0.001$ for all three parameters), which reflects the differences in the severity of the inflammatory process and the functional state of the kidneys in patients (Table 1).

Table 1
Mean values of individual clinical and laboratory parameters ($M \pm SD$) in sick children in the compared groups

Parameter	Group 1 (n=50)	Group 2 (n=14)	p-meaning
Total protein, mg/ml	55,7 \pm 2,9	56,2 \pm 3,9	0,487
Temperature, °C	39,2 \pm 0,5	38,2 \pm 0,4	0,002
Leukocytes, 10 ⁹ /l	24,7 \pm 2,8	12,8 \pm 4,1	<0,001
ESR, mm/h	38,1 \pm 5,1	25,3 \pm 4,9	<0,001

Parameter	Group 1 (n=50)	Group 2 (n=14)	p-meaning
GFR, ml/min/1.73 m ²	61,4 ± 7,2	82,4 ± 5,1	<0,001

Note: The table was compiled by the authors. Abbreviations: ESR – erythrocyte sedimentation rate; SCF – glomerular filtration rate.

In recent years, markers reflecting the activity of enzymes produced by kidney tissue and excreted in urine have become key diagnostic tools in assessing inflammatory processes. Determination of these biomolecules in urine is a non-invasive, clinically convenient approach, enabling the early diagnosis of pathological changes at the cellular level. The use of such methods facilitates more accurate prognosis of the course and outcome of the disease.

Analysis of γ -glutamyl transferase (γ -GT) levels revealed a significant increase in children with acute pyelonephritis. Specifically, in Group 1, the mean value was 35.10 ± 0.13 U/L, which exceeded the same value in children in Group 2 (11.44 ± 0.05 U/L; $p \leq 0.05$) and the control group (7.67 ± 0.01 U/L). It was found that, compared with healthy children, the level of γ -GT in patients of the 1st group increased by 4.57 times, and in the 2nd group – by 1.49 times (Table 2).

Table 2

Enzymuria values in children with pyelonephritis who recovered from COVID-19

Indicator	Healthy children (n = 25)	Group 1 (n = 50)	Group 2 (n = 50)
γ -GT, U/L	$7,67 \pm 0,01$	$35,10 \pm 0,13$ ($p \leq 0,001$)	$11,44 \pm 0,05$ ($p \leq 0,05$)

Note: p is the level of reliability of differences in enzymuria indices between patients in the active phase of pyelonephritis and healthy children.

This study examined the expression of kidney injury molecule-1 (KIM-1) in children with acute pyelonephritis who had recovered from COVID-19.

Laboratory analysis results revealed a statistically significant increase in urinary KIM-1 concentrations in patients in Group 1 (5.73 ± 0.03 ng/ml) compared to Group 2 (2.97 ± 0.01 ng/ml; $p \leq 0.01$), as well as compared to healthy children (1.52 ± 0.01 ng/ml). These data confirm the presence of severe tubular damage in children who had recovered from COVID-19, with the development of an inflammatory process in the tubulointerstitial zone of the kidneys (Table 3).

Table 3

Urine KIM-1 levels in children with pyelonephritis who recovered from COVID-19 (ng/ml)

Indicator	Healthy children (n = 25)	Group 1 (n = 50)	Group 2 (n = 50)
KIM-1, ng/ml	$1,52 \pm 0,01$	$5,73 \pm 0,03$ ($p \leq 0,01$)	$2,97 \pm 0,01$ ($p \leq 0,05$)

Note: p is the level of statistical significance of differences when comparing KIM-1 expression indices in urine between children with active pyelonephritis and healthy children.

β 2-microglobulin (β 2M) levels were analyzed as a biomarker of renal function in the children included in the study.

In Group 1, urinary β 2-microglobulin (β 2M) levels were significantly higher than in healthy children—7.64 times (2.37 ± 0.03 mg/L vs. 0.31 ± 0.01 mg/L; $p \leq 0.001$). In Group 2, this indicator increased 3.74 times (1.16 ± 0.04 mg/L; $p \leq 0.001$) compared to the control group.

We also analyzed levels of neutrophil gelatinase-associated lipocalin-2 (NGAL), or siderocalin. A statistically significant increase in the NGAL (neutrophil gelatinase-associated

lipocalin) level in the urine of patients in Group 1 was observed compared to children in Group 2. The average NGAL concentration in Group 1 patients was 111.64 ± 0.24 ng/ml, which was significantly higher than the values in the comparison group (47.66 ± 0.38 ng/ml; $p \leq 0.001$).

According to laboratory urine analysis data, the majority of patients with pyelonephritis (80.1%, $n=97$) had turbid urine, indicating severe inflammatory changes.

A statistically significant decrease in titratable acid excretion was observed in patients included in the study: 23.22 ± 0.63 mmol/24 h in Group 1 and 32.04 ± 0.24 mmol/24 h in Group 2; $p \leq 0.001$ (while in healthy subjects this indicator was equal to 49.0 ± 1.8 mmol/24 h) and ammonia 30.12 ± 1.22 and 35.08 ± 1.12 mmol/24 h, respectively; $p \leq 0.001$ (while in healthy children this indicator was equal to 44.3 ± 1.1 mmol/24 h), which indicates a pronounced impairment of hydrogen and ammonium ion transport in the distal tubules. At the same time, urine pH in patients remained within the normal range ($p \geq 0.1$), which may indicate compensatory mechanisms that maintain acid-base balance against the background of tubular dysfunction.

Elevated levels of γ -glutamyl transferase (γ -GT) observed in patients in the first group likely reflect the development of pathophysiological processes, including hypoxic renal tissue injury, endothelial dysfunction, and disturbances in the glutathione metabolism system induced by COVID-19 infection.

Patients in the first group showed a statistically significant increase in KIM-1 (Kidney Injury Molecule-1) levels compared to those in the second group, likely related to more severe ischemic and toxic damage to the proximal tubules, as well as activation of tubulointerstitial remodeling mechanisms, reflecting the extent of renal tissue damage.

The obtained results suggest that increased β 2M levels in patients are associated with disruption of the glomerular barrier due to SARS-CoV-2 infection, reduced reabsorption capacity of proximal tubular cells, as well as the development of vasculopathy and disturbances in protein and electrolyte metabolism.

Due to its ability to bind and transport iron, NGAL is involved in maintaining redox homeostasis and limiting prooxidant effects, indicating its antioxidant and cytoprotective functions. Under conditions of virus-induced hypoxia and endothelial dysfunction, increased NGAL expression can be considered an element of the adaptive response aimed at stabilizing cell membranes, reducing apoptosis, and stimulating reparative processes. The obtained results demonstrate a pronounced correlation between the level of NGAL in urine and the severity of renal parenchyma damage, which confirms the fact of significant damage to renal tissue in children who have had SARS-CoV-2 infection.

CONCLUSION

Children who have recovered from SARS-CoV-2 infection are prone to more profound impairment of kidney function and structure, particularly in the tubulointerstitial component. Exacerbation of post-viral immune-inflammatory reactions, along with vascular dysfunction, hypovolemia, and fluid and electrolyte imbalances, contribute to the development of acute kidney injury. Accumulated data indicate an increased risk of developing latent or progressive tubulopathy in children who have recovered from COVID-19 compared to patients without a relevant history.

To early detect latent renal tubular damage and stratify patients according to the risk of chronicity, monitoring the condition of the proximal and distal tubules is essential. The most informative in this case are noninvasive biomarkers of kidney damage, such as KIM-1, NGAL, β 2-microglobulin, and γ -glutamyl transferase (γ -GT), whose concentrations in urine allow us to assess the severity of tubulopathy.

Dynamic monitoring of these markers is recommended in patients with previous COVID-19 infection, even in the absence of pronounced clinical symptoms, to promptly detect subclinical disturbances in the renal tubulointerstitial structure and prevent the progression of the disease to a chronic form.

REFERENCES | ЧОҚКИ | IQTIBOSLAR:

1. Akhmedzhanova N.I., Akhmedzhanov I.A., Ismailova Z.A., Gapparova G.N. Evaluation of the functional state of the kidneys in renal complications in children during the COVID-19 pandemic: an observational cohort retrospective clinical study. *Kuban Scientific Medical Bulletin*. 2023;30(3):25-33. <https://doi.org/10.25207/1608-6228-2023-30-3-25-33>, (in Russ).
2. Axmedjanova NI, Axmedjanov IA, Ismailova ZA, Gapparova GN. Evaluation of Kidney Functioning in Children with Renal Complications During COVID-19 Pandemic: A Retrospective Observational Cohort Clinical Study. *Kuban Scientific Medical Bulletin*. 2023;30(3):25-33, <https://doi.org/10.25207/1608-6228-2023-30-3-25-33>
3. Akhmedzhanova N.I., Akhmedzhanov I.A., Ismailova Z.A., Gapparova G.N. Clinical and laboratory assessment of renal complications in children during the COVID-19 pandemic. *Doktor axborotnomasi*. 2023;2(110):13-16. <https://doi.org/10.38095/2181-466X-20231102-13-16>, (in Russ).
4. Akhmedzhanova NI, Akhmedzhanov IA, Ismailova ZA, Gapparova GN. Clinical and laboratory evaluation of renal complications in children during the COVID-19 pandemic. *Doktor axborotnomasi*. 2023;2(110):13-16 (In Russ.). <https://doi.org/10.38095/2181-466X-20231102-13-16>
5. Bogdanova EO, Galkina OV, Zubina IM, Dobronravov VA. Urine proteins and fibroplastic changes in kidney compartments in immune glomerulopathies. *Nephrology*. 2017; 21 (6): 54-59. DOI:10.24884/1561-6274-2017- 21-6-54-59, (in Russ).
6. Trailin AV, Pletn MV, Nikonenko AS, et al. Diagnostic value of beta-2-microglobulin, enzymes, serum and urine interleukins in chronic renal allograft dysfunction // *Clinical laboratory diagnostics*. 2015;60(11):31–37, (in Russ).
7. Shamkhalova M.Sh., Mokrysheva N.G., Shestakova M.V. COVID-19 and kidneys. 2020;23(3):235-241. <https://doi.org/10.14341/DM12506> (in Russ).
8. Alvarado A., Franceschi G., Resplandor E., Sumba J., // Orta N. COVID-19 associated with onset nephrotic Syndrome in a pediatric patient: considinse or related conditions? *Pediatr Nephrol*. 2021; 36(1):205–207. <https://doi.org/10.1007/s00467-020-04724-y>.
9. Abbasi A. Discriminatory Precision of Neutrophil Gelatinase-Associated Lipocalin in Detection of Urinary Tract Infection in Children: a Systematic Review and Meta-Analysis [Text] / A. Abbasi, F. Nabizadeh, M. Gardeh [et. al] // *Arch Acad Emerg Med*. – 2020. - V.8(1). – P. 56.
10. Gabarre P., Dumas G., Dupont T., Darmon M., Azoulay E., Zafrani L. (2020). Acute kidney injury in critically ill patients with COVID-19. *Intensive Care Med*, 46, 1339–1348. <https://doi.org/10.1007/s00134-020-06153-9>
11. Hee Sun Baek, Min Hyun Cho. // Kidney complications associated with COVID-19 infection and vaccination in children and adolescents: a brief review// *Clin.Exp. Pediatr* Vol.66/№ 10, C. 424–431, 2023 <https://doi.org/10.3345/cep.2023.00738>.
12. Health RCoPaC. // Guidance: paediatric multisystem inflammatory syndrome temporally associated with COVID-19(PIMS). 2020.
13. Rizaev JA, Shamsiev JA, Zayniev SS Ways to Optimize Patient Outcomes and Improve the Quality of Medical Care in Surgically Correctable Congenital Malformations in Samarkand // *European Journal of Research Development and Sustainability*. – 2021. – T. 2. – No. 3. – pp. 45-48.
14. Alimjanovich, R. J. "MINIMALLY INVASIVE METHODS OF TREATMENT OF UROLITHIASIS IN CHILDREN. REVIEW OF THE CURRENT STATUS OF THE ISSUES." *JOURNAL OF BIOMEDICINE AND PRACTICE* 8.2 (2023).

БИОМЕДИЦИНА ВА АМАЛИЁТ ЖУРНАЛИ

ЖУРНАЛ БИОМЕДИЦИНЫ И ПРАКТИКИ

JOURNAL OF BIOMEDICINE AND PRACTICE

Контакт редакций журналов. www.tadqiqot.uz
ООО Tadqiqot город Ташкент,
улица Амира Темура пр.1, дом-2.
Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz
Тел: (+998-94) 404-0000

Editorial staff of the journals of www.tadqiqot.uz
Tadqiqot LLC The city of Tashkent,
Amir Temur Street pr.1, House 2.
Web: <http://www.tadqiqot.uz/>; E-mail: info@tadqiqot.uz
Phone: (+998-94) 404-0000