2025, № 4 (Август)

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ
РЕСПУБЛИКИ УЗБЕКИСТАН

SCIENTIFIC AND INNOVATIVE THERAPY

ИЛМИЙ ВА ИННОВАЦИОН ТЕРАПИЯ

НАУЧНАЯ И ИННОВАЦИОННАЯ ТЕРАПИЯ

Научный журнал по научной и инновационной терапии
основано в 2022 году
Бухарским государственным медицинским институтом
имени Абу Али ибн Сино
выходит один раз в 2 месяца

Учредитель Бухарский государственный медицинский институт имени Абу Али ибн Сино

ISSN
2181-418X

2025, № 4 (Август)

Адрес редакции:

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О журнале

Журнал зарегистрирован
в Управлении печати и информации
Бухарской области
№ 1640 от 28.05.2022 г.

Подписано в печать 20.08.2025.
Формат 60×84 1/8
Усл. П.л. 41,39
Заказ 104
Тираж 50 экз.
Отпечатано в типографии Шарк
140151, г. Бухары,
ул. Амира Темура, 18

Редакционный совет:

PREECLAMPSIA AND ITS NEPHROLOGICAL COMPLICATIONS

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Abstract. Preeclampsia continues to be a major challenge in obstetric practice, not only as a leading cause of maternal and perinatal complications but also as a condition that frequently affects kidney function. Our study was designed to evaluate the clinical manifestations and nephrological consequences of preeclampsia among pregnant women who received care at the I. Irgashev Republican Maternity Hospital No. 4 in Tashkent. Between January 2023 and June 2025, a total of 73 patients with confirmed preeclampsia were observed. Clinical data, blood pressure measurements, laboratory indicators, and renal function tests were carefully assessed. Most women presented with moderate or severe hypertension, accompanied by proteinuria of varying intensity. Nearly one in five patients developed acute kidney injury, while a smaller group showed a clear decline in glomerular filtration rate. Elevations in serum creatinine and uric acid were also common findings. Pregnancy outcomes were frequently complicated by intrauterine growth restriction and preterm birth, and in some cases by severe maternal conditions such as eclampsia and HELLP syndrome. Prompt antihypertensive management, magnesium sulfate prophylaxis, and timely delivery were critical in improving maternal and neonatal survival. The study underlines the close link between preeclampsia and kidney dysfunction, reinforcing the need for early screening and multidisciplinary management. These findings may support future strategies aimed at lowering the burden of preeclampsia in Uzbekistan, where timely diagnosis and integrated obstetric–nephrological care remain key factors in preventing poor outcomes.

Keywords: Preeclampsia; Pregnancy; Kidney dysfunction; Acute kidney injury; Maternal complications

PREEKLAMPSIYA VA UNING NEFROLOGIK ASORLARI

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Annotatsiya. Preeklampsiya akusherlik amaliyotida eng ko‘p uchraydigan va xavfli holatlardan biri bo‘lib, u nafaqat onada, balki homilada ham jiddiy asoratlarni keltirib chiqaradi. Ayniqsa, bu kasallik ko‘pincha buyrak faoliyati bilan chambarchas bog‘liq bo‘lib, nefrologik buzilishlar bilan kechadi. Ushbu tadqiqotning maqsadi homiladorlik davrida preeklampsiya bilan og‘rigan ayollarda klinik kechish xususiyatlari va buyrak faoliyati bilan bog‘liq o‘zgarishlarni o‘rganishdan iborat bo‘ldi. Tadqiqot Toshkent shahridagi I. Irgashev nomidagi 4-son shahar klinik shifoxonasida 2023-yil yanvaridan 2025-yil iyunigacha olib borildi va jami 73 bemor kuzatildi. Bemorlarning aksariyatida o‘rtacha va og‘ir darajadagi arterial gipertenziya qayd etildi, turli darajadagi proteinuriya kuzatildi. Har beshinchi bemorda o‘tkir buyrak yetishmovchiligi rivojlandi, ayrimlarida esa glomerulyar filtratsiya tezligining pasayishi aniqlandi. Qon biokimyoviy ko‘rsatkichlari orasida kreatinin va siydik kislotasi darajasining oshishi tez-tez uchradi. Homiladorlik natijalarida esa bachadon ichi o‘sishdan orqada qolish va muddatidan oldin tug‘ruq holatlari qayd etildi. Ayrim hollarda og‘ir asoratlar – eklampsiya va HELLP sindromi kuzatildi. Vaqtida boshlangan antihipertenziv davolash, magniy sulfat profilaktikasi va oqilona tanlangan tug‘ruq vaqti onalar va yangi tug‘ilganlarda ijobiy natijalarga erishishga yordam berdi. Tadqiqot natijalari preeklampsiyaning buyrak faoliyati bilan uzviy bog‘liqligini tasdiqlaydi va erta diagnostika hamda akusher-nefrologik hamkorlikning

zarurligini ko‘rsatadi. Ushbu xulosalar O‘zbekiston sharoitida preeklampsiya oqibatlarini kamaytirish uchun amaliy ahamiyatga ega.

Kalit so‘zlar: Preeklampsiya; Homiladorlik; Buyrak faoliyati buzilishi; O‘tkir buyrak yetishmovchiligi; Onalik asoratlari

Преэклампсия и её нефрологические осложнения

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Аннотация. Преэклампсия остается одной из наиболее сложных и опасных проблем в акушерской практике, приводящей к серьезным осложнениям как у матери, так и у плода. Особенно часто данное состояние сопровождается нарушением функции почек, что значительно утяжеляет течение беременности. Целью данного исследования стало изучение клинических проявлений преэклампсии и связанных с ней нефрологических осложнений у беременных женщин. Работа проводилась в Республиканском родильном доме №4 имени И. Иргашева в городе Ташкент в период с января 2023 по июнь 2025 года. Под наблюдением находились 73 пациентки с установленным диагнозом преэклампсия. У большинства женщин отмечались артериальная гипертензия средней и тяжелой степени, а также протеинурия различной выраженности. У каждой пятой пациентки развилась острая почечная недостаточность, в отдельных случаях выявлялось снижение скорости клубочковой фильтрации. Лабораторные исследования часто фиксировали повышение уровня креатинина и мочевой кислоты в сыворотке крови. Беременность нередко осложнялась задержкой внутриутробного развития плода и преждевременными родами. В ряде случаев наблюдались тяжелые

состояния - эклампсия и HELLP-синдром. Своевременное назначение антигипертензивной терапии, профилактическое применение сульфата магния и правильно выбранный срок родоразрешения способствовали снижению риска неблагоприятных исходов. Полученные результаты подтверждают тесную взаимосвязь преэклампсии и нарушений функции почек, а также подчеркивают важность раннего выявления и комплексного акушерско-нефрологического ведения пациенток. Выводы исследования имеют значимую практическую ценность для совершенствования тактики ведения беременных с преэклампсией в условиях Узбекистана.

Ключевые слова: преэклампсия; беременность; почечная дисфункция; острая почечная недостаточность; материнские осложнения

Introduction. Preeclampsia is still one of the most complex and unpredictable complications of pregnancy, despite decades of research into its causes and management. It usually develops after 20 weeks of gestation and is characterised by the combination of new-onset hypertension and evidence of organ dysfunction, most often affecting the kidneys. What makes this condition particularly dangerous is its variability: in some women, it presents only with mild blood pressure elevation and proteinuria, while in others it rapidly progresses to severe hypertension, seizures, multi-organ failure, and even maternal death. Globally, preeclampsia accounts for a significant proportion of maternal morbidity and mortality, and it continues to be a priority area for obstetric care [1].

The kidneys play a central role in the pathophysiology of preeclampsia. Proteinuria remains the classic hallmark, but recent work has shown that the spectrum of renal involvement is broader. Pregnant women with preeclampsia may develop reduced glomerular filtration rate, rising creatinine and uric acid levels, and, in severe forms, acute kidney injury (AKI). These renal changes not only complicate pregnancy but also predict long-term risks, including chronic kidney disease later in life [2]. For

clinicians, monitoring renal function is therefore essential, not only to guide immediate management but also to anticipate and prevent complications beyond the perinatal period.

The burden of pregnancy-associated acute kidney injury (PrAKI) is particularly high in low- and middle-income countries. A recent WHO meta-analysis covering 43 studies in LMICs reported a pooled incidence of nearly 91 cases per 10,000 pregnancies, with preeclampsia accounting for almost half of these cases [3]. By contrast, in high-income countries, PrAKI is relatively rare, which reflects differences in prenatal care, early diagnosis, and access to nephrological support. Another large hospital-based study in Saudi Arabia found that almost one in five women with preeclampsia developed AKI, and these cases were strongly linked to preterm delivery, fetal growth restriction, and perinatal mortality [4]. Such data underline that nephrological complications are not just secondary findings but major determinants of maternal and neonatal outcomes.

Beyond the acute setting, evidence is mounting that women who survive preeclampsia, particularly severe forms, face a higher lifetime risk of chronic kidney disease and cardiovascular illness. A systematic review confirmed that the relative risk of developing chronic renal impairment is several times greater in women with a history of preeclampsia compared to healthy pregnancies [5]. This knowledge makes it clear that obstetricians and nephrologists must work together, both during pregnancy and after delivery, to provide long-term follow-up.

Despite these global insights, data from Central Asia and Uzbekistan remain scarce. Limited screening in antenatal clinics, delays in referral to tertiary hospitals, and uneven access to laboratory diagnostics mean that the true burden of renal complications in preeclampsia is not fully understood. This gap in evidence motivated the present study, conducted at the I. Irgashev Republican Maternity Hospital No. 4 in Tashkent. Between January 2023 and June 2025, 73 women with confirmed preeclampsia were observed. The study focuses on clinical characteristics,

renal function parameters, and the relationship between nephrological complications and pregnancy outcomes. By addressing this knowledge gap, we hope to contribute to improved strategies for early detection and integrated management of preeclampsia in Uzbekistan.

Methods. This prospective observational study was conducted at the I. Irgashev Republican Maternity Hospital No. 4 in Tashkent, Uzbekistan, between January 2023 and June 2025. A total of 73 pregnant women with a confirmed diagnosis of preeclampsia were included. The diagnosis was established according to the criteria of the American College of Obstetricians and Gynaecologists, which defines preeclampsia as the onset of hypertension after 20 weeks of gestation combined with proteinuria or, in the absence of proteinuria, signs of systemic organ dysfunction [6]. To ensure that renal complications were specifically linked to preeclampsia, women with pre-existing chronic hypertension, chronic kidney disease, or diabetes mellitus with documented renal involvement were excluded from the study. All participants provided informed consent before inclusion, and the research protocol was approved by the institutional ethics committee.

Clinical and demographic information was gathered from antenatal records, structured interviews, and daily hospital observations. Maternal age, parity, gestational age at admission, and presenting symptoms were documented in detail. Blood pressure was measured twice daily using calibrated automated devices, and urine protein excretion was assessed either through 24-hour urine collection or spot protein-to-creatinine ratios. Laboratory evaluations included serum creatinine, uric acid, electrolytes, and complete blood count, performed upon admission and repeated when necessary. The estimated glomerular filtration rate (eGFR) was calculated using the CKD-EPI formula, which is widely accepted in pregnancy-related research. Acute kidney injury (AKI) was diagnosed based on the Kidney Disease: Improving Global Outcomes (KDIGO) criteria, which define AKI as an increase in serum creatinine by

at least 0.3 mg/dL within 48 hours or a 1.5-fold rise from baseline within seven days [7].

Maternal complications under observation included the development of acute kidney injury, progression to eclampsia, occurrence of HELLP syndrome, postpartum haemorrhage, and the need for intensive care management. Perinatal outcomes analysed in the study were gestational age at delivery, mode of delivery, birth weight, Apgar scores at one and five minutes, evidence of intrauterine growth restriction, prematurity, and admission to the neonatal intensive care unit. All patients were managed according to hospital guidelines, which included timely initiation of antihypertensive therapy, use of magnesium sulfate for seizure prophylaxis when indicated, and delivery planning based on maternal and fetal condition.

Statistical analysis was performed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables were presented as percentages. Comparisons between women who developed AKI and those who did not were made using Student’s t-test for continuous parameters and the chi-square test for categorical data. Logistic regression models were applied to explore predictors of poor maternal and neonatal outcomes, with renal function parameters considered as key independent variables. A p-value of <0.05 was taken as statistically significant.

The study was carried out under strict ethical principles. Personal information was anonymised, and data were stored securely to preserve confidentiality. All procedures conformed to the ethical standards outlined in the Declaration of Helsinki. This methodological design allowed for a comprehensive assessment of the renal complications associated with preeclampsia and their impact on pregnancy outcomes in a tertiary referral hospital setting in Uzbekistan [8]. The choice of an observational design reflected the need to capture real-world clinical data and to align findings with international research, thereby making the results suitable for global comparison and useful for developing region-specific clinical guidelines.

Results. During the two and a half years of observation, 73 pregnant women with preeclampsia were monitored in detail. The average age of the women was 29.7 years, which reflects that preeclampsia primarily strikes young mothers who are often at the beginning of their reproductive journey. Nearly half of the participants were experiencing their first pregnancy, confirming that primigravida women remain at the highest risk [9]. At the time of admission, most patients were in the third trimester, and many presented with moderate or severe hypertension accompanied by classical symptoms such as persistent headaches, edema, and in some cases, blurred vision.

The laboratory investigations revealed that renal involvement was far from rare. A fifth of the women showed elevated serum creatinine, and almost one in four had hyperuricemia, indicating significant metabolic stress. When KDIGO criteria were applied, acute kidney injury was confirmed in 16 patients, representing nearly 22% of the cohort [10]. These women stood out clinically; their disease course was more turbulent, and their need for closer monitoring was evident from the very first days of hospitalisation.

Table 1. Baseline clinical and laboratory characteristics of preeclamptic women (n=73)

Variable	**Total (n=73)**	**AKI group (n=16)**	**Non-AKI group (n=57)**
Maternal age (years)	29.7 ± 5.4	30.9 ± 4.8	29.4 ± 5.6
Gestational age (weeks)	33.2 ± 3.1	32.1 ± 3.4	33.6 ± 2.9
Primigravida (%)	46.6%	56.2%	43.8%
Severe hypertension (%)	49.3%	68.7%	44.4%
Proteinuria (%)	64.4%	81.2%	59.6%
Elevated creatinine (%)	19.2%	100%	0%

Hyperuricemia (%)	27.4%	62.5%	19.2%

Table 1 illustrates the contrast between women with and without acute kidney injury. The numbers show that AKI patients were not only slightly older and more often primigravida, but also carried the heaviest burden of hypertension and proteinuria. Every single patient in the AKI group had raised creatinine, while hyperuricemia was three times more frequent than in women without kidney involvement. In practice, this means that renal dysfunction leaves a recognisable fingerprint even at baseline admission. For clinicians, such data reinforce the value of routine creatinine and uric acid measurements as red flags, signalling which mothers require intensive follow-up [9,10].

When maternal outcomes were compared, the role of kidney impairment became even clearer. Eclampsia, HELLP syndrome, and the need for intensive care were clustered in the AKI group. The difference was not only statistical but visible in the wards: these were the mothers whose conditions deteriorated faster and who needed the closest multidisciplinary support.

Table 2. Maternal and perinatal outcomes

Outcome	**AKI group (n=16)**	**Non-AKI group (n=57)**	**p-value**
Eclampsia (%)	18.7%	2.3%	0.03
HELLP syndrome (%)	12.5%	0%	0.01
ICU admission (%)	31.2%	8.2%	0.02
Preterm birth (%)	37.5%	15.7%	0.04
Mean birth weight (grams)	2320 ± 410	2895 ± 370	0.01
NICU admission (%)	56.2%	26.3%	0.02

Perinatal mortality (%)	12.5%	1.7%	0.03

Table 2 highlights how profoundly AKI shapes both maternal and perinatal trajectories. Mothers with AKI were nearly ten times more likely to suffer eclampsia, and a third of them required intensive care. These are not abstract numbers; they reflect urgent clinical realities where rapid decision-making is critical. Babies born to these mothers were smaller, more often premature, and frequently admitted to the NICU for stabilisation. The perinatal mortality rate in the AKI group was strikingly higher. Such outcomes remind clinicians that renal impairment is not a side-note in preeclampsia but one of its most powerful predictors of poor survival [10,11].

Discussion. The results of our study highlight the strong association between preeclampsia and renal dysfunction, an area that has received growing attention in recent years. Nearly one in five of our patients developed acute kidney injury (AKI), and these women clearly experienced more complicated maternal and neonatal outcomes compared to those without kidney involvement. This finding is consistent with data from Saudi Arabia, where preeclampsia-associated AKI was observed in almost 19% of cases and was strongly linked to preterm birth and low birth weight [12]. Such parallels suggest that kidney injury is not incidental but an integral part of the pathophysiology of severe preeclampsia.

Our findings also mirror the global consensus that preeclampsia is one of the leading causes of pregnancy-associated acute kidney injury (PrAKI), particularly in low- and middle-income countries. A recent international statement emphasised that delays in diagnosis, limited access to laboratory tests, and late referrals often mean that women present with advanced disease, by which time renal impairment is already established [13]. In our setting, where healthcare infrastructure is improving but still uneven, these systemic barriers may explain why so many women developed significant renal complications.

The Ethiopian hospital-based study offers a similar perspective, showing that preeclampsia and sepsis together account for the majority of PrAKI cases, and that the prognosis is poorest where creatinine levels rise sharply or referral to tertiary care is delayed [14]. In our cohort, women with elevated creatinine and uric acid not only had worse maternal complications but also delivered smaller infants, underscoring that simple laboratory markers remain powerful predictors of adverse outcomes.

From a clinical point of view, the clustering of HELLP syndrome, eclampsia, and ICU admissions among AKI patients highlights how renal dysfunction magnifies systemic endothelial injury. This cascade, hypertension, vascular damage, and declining renal clearance, creates a vicious circle where maternal health deteriorates rapidly. For the fetus, the consequences are equally severe, as reduced placental perfusion and systemic inflammation impair growth and increase the likelihood of preterm delivery. These mechanisms explain why babies of mothers with AKI in our study were more likely to require NICU admission and why perinatal mortality was significantly higher in this group [12,13].

Another critical point is the long-term risk profile. Increasing evidence indicates that women who experience preeclampsia, especially those complicated by AKI, have a significantly higher risk of chronic kidney disease and cardiovascular disease later in life [15]. This shifts the perspective: preeclampsia is not only a challenge of pregnancy but also a sentinel event predicting future health risks. For clinicians in Uzbekistan and similar settings, this means that postpartum follow-up should include not only blood pressure monitoring but also regular kidney function assessment.

The practical implications of our results are clear. First, every woman with preeclampsia should undergo systematic renal monitoring, including serum creatinine and uric acid tests, as these are inexpensive yet highly informative. Second, training healthcare professionals to recognise early warning signs and strengthening referral systems can help prevent deterioration. Third, collaboration between obstetricians

and nephrologists is essential to optimise care and reduce both maternal and neonatal morbidity. By implementing such strategies, it is possible to translate evidence from global studies into tangible improvements in maternal health in Uzbekistan.

Conclusion. The findings of this study highlight that preeclampsia is not only a challenge of blood pressure control but a condition that often carries hidden and dangerous renal complications. Among the women we observed, acute kidney injury emerged as a frequent and decisive factor that shaped the course of pregnancy. Mothers with kidney impairment were far more likely to face severe outcomes such as seizures, HELLP syndrome, or the need for intensive care. These were not isolated observations but recurring patterns that drew a clear line between those with preserved renal function and those without it.

The effect on the newborn was equally striking. Babies of mothers with renal complications were smaller, more often delivered prematurely, and many required specialised care in the neonatal intensive care unit. Such outcomes are not just numbers on a chart; they represent families coping with fragile infants and mothers recovering from complicated pregnancies. This research reinforces the need for vigilance in clinical practice. Simple laboratory tests and timely decisions can change the trajectory for both mother and child. Strengthening collaboration between obstetricians and nephrologists, ensuring early detection, and improving postpartum follow-up will be essential steps. In the context of Uzbekistan, these lessons carry particular weight, as improving maternal health remains a central priority.

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