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FEATURES OF THE COURSE OF RENAL DYSFUNCTION

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Abstract

The article presents the results of a comparative analysis of clinical manifestations and hemodynamic parameters in 80 patients with renal dysfunction and 80 patients with arterial hypertension without signs of renal dysfunction. It was shown that disturbances in water-salt metabolism, нарушения циркадного ритма, and increased activity of the renin-angiotensin-aldosterone system lead to more pronounced clinical and hemodynamic changes in patients with renal dysfunction.

Keywords: Blood pressure, arterial hypertension, renal dysfunction, circadian index, clinical manifestations.

Introduction

CKD was the ninth leading cause of death globally, accounting for 1.48 million (1.30–1.65) deaths, and the 12th leading cause of DALYs, with an age-standardised DALY rate of 769.2 (691.8–857.4) per 100 000. Impaired kidney function as a risk factor accounted for 11.5% (8.4–14.5) of cardiovascular deaths. High fasting plasma glucose, body-mass index, and systolic blood pressure were all leading risk factors for CKD DALYs [7]. Chronic kidney disease (CKD) develops under the influence of a complex set of etiological factors, among which arterial hypertension and diabetes mellitus are the leading causes. A significant role is also played by glomerulonephritis, hereditary kidney diseases, and

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obstructive uropathies. The key risk factors for CKD progression include arterial hypertension, hyperglycemia, obesity, dyslipidemia, and smoking. The pathogenetic basis of the disease involves activation of the renin–angiotensin–aldosterone system, oxidative stress, chronic inflammation, and intraglomerular hypertension, leading to the gradual loss of nephrons and decline in renal function [9].

In patients with arterial hypertension, the development of renal dysfunction occurs at relatively early stages; however, the diagnosis is often established considerably later. In a study conducted in neighboring Kyrgyzstan, the prevalence of chronic kidney disease (CKD) among patients with arterial hypertension was 28.5% [4]. Among all examined patients (n=189), a moderate decline in renal function based on cystatin C levels was detected in 57.6% of cases. Investigation of the association between arterial hypertension and chronic kidney disease indicates that the high prevalence of reduced glomerular filtration rate is predominantly driven by the chronicity of elevated blood pressure, atherogenic dyslipidemia, hypertensive nephroangiosclerosis, and the burden of comorbid conditions. As reported in publications of the scientific society of nephrologists of the Russian Federation, in uncontrolled arterial hypertension, the renal filtration function progressively deteriorates, declining by approximately 13% per year [3].

Hypertriglyceridemia, being an independent factor of cardiovascular complications and CKD, is most frequently observed in patients with arterial hypertension accompanied by cardiac and renal damage. In patients with arterial hypertension and ischemic heart disease, serum triglyceride levels were 2.04 ± 0.3 mmol/L, whereas in patients with arterial hypertension and CKD, this показатель достигал 3.71 ± 1.1 mmol/L. A number of publications have demonstrated the adverse effects of atherogenic dyslipidemia on glomerular and tubulointerstitial structures of the kidneys [1,2].

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It has been established that mesangial cells of the glomeruli, which possess receptors for low-density lipoproteins, bind and oxidize lipids, resulting in enhanced proliferation of mesangial cells and increased production of proinflammatory cytokines that stimulate the development of glomerulosclerosis [5]. In turn, lipids accumulating in the glomerular basement membrane bind negatively charged glycosaminoglycans and, by neutralizing their negative charge, increase the permeability of the glomerular membrane to proteins. Under the influence of atherogenic dyslipidemia, damage to the renal tubulointerstitial tissue develops due to the accumulation of lipid particles, leading to disruption of tubular structure [2,3].

In addition, factors such as advanced age, reduced nephron number (including low birth weight), racial and ethnic characteristics, genetic predisposition, a history of acute kidney injury, diabetes mellitus, arterial hypertension, dyslipoproteinemia, smoking, obesity, metabolic syndrome, non-alcoholic fatty liver disease, hyperuricemia, autoimmune diseases, chronic and systemic infections, urolithiasis, obstructive diseases of the urinary tract, drug-induced toxicity, excessive protein intake, and pregnancy play a significant role in the development of renal dysfunction. Contemporary literature presents numerous studies substantiating the association of obesity and metabolic syndrome with arterial hypertension and its complications [8,11].

Objective

To study the clinical and hemodynamic characteristics of patients with arterial hypertension complicated by the development of renal dysfunction.

Materials and Methods

The study was conducted from 2022 to 2025 at the multidisciplinary clinic of the Bukhara State Medical Institute among patients with arterial hypertension and

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renal dysfunction developed on its background, who were receiving outpatient and inpatient treatment.

A total of 160 individuals were included in the study. The main group consisted of 80 patients with arterial hypertension and renal dysfunction, while the control group included 80 patients with arterial hypertension without signs of renal dysfunction. The mean age of patients in the main group was 62.42 ± 7.8 years; among them, 33 were men (41.25%) and 47 were women (58.75%). In the second group (patients with arterial hypertension without renal dysfunction), the mean age was 63.11 ± 7.5 years; this group included 26 men (32.5%) and 54 women (67.5%).

The diagnosis of arterial hypertension was established according to the clinical guidelines of the European Society of Cardiology (2018, 2024). Renal dysfunction was diagnosed in accordance with the criteria of KDIGO (2021, 2024).

Exclusion criteria: acute myocardial infarction and unstable angina (within the past 6 months), acute renal failure, acute glomerulonephritis, severe arrhythmias, congenital heart defects, acute cerebrovascular events, autoimmune diseases, diffuse connective tissue diseases, exacerbation of acute and chronic inflammatory diseases, advanced stages of chronic kidney disease, liver diseases, bronchial asthma, exacerbation of chronic obstructive pulmonary disease, psychiatric and oncological diseases, secondary arterial hypertension, and diabetes mellitus.

In all patients, complaints, medical history, and general clinical condition were assessed. Standard laboratory investigations were performed, including complete blood count and urinalysis, biochemical parameters (creatinine, urea, lipid profile, glucose), as well as measurement of cystatin C levels.

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Results of the study

According to the analysis, headache and fatigue were the main clinical manifestations of arterial hypertension. Their prevalence among patients with renal dysfunction was 86.25% and 78.75%, respectively. In the second group, these indicators were 73.7% and 62.5%, respectively, indicating a higher frequency of these symptoms in the first group compared to the second group (Table 1).

Table 1 Distribution of clinical manifestations across different groups.

Clinical manifestations:	Group I n=80	Group II n=80
Headache %	86,25	73,7
Fatigue, %	78,75	62,5
Dyspnea, %	72,5	48,75
Dysuric disorders, %	58,75	35

Exertional dyspnea and dysuric disorders were more frequently observed in the first main group (72.2% and 58.9%, respectively), which can be explained by the interaction between cardiac and renal hemodynamics, as well as disturbances in sodium–water balance. In contrast, in the second main group these показатели составили 48.9% and 34.4%, respectively (Table 1).

In addition, 24-hour ambulatory blood pressure monitoring was performed in our study to assess blood pressure levels. Based on the monitoring results, blood pressure profiles, types of circadian rhythm, and hemodynamic parameters were analyzed. Figure 1 presents the mean 24-hour blood pressure values in the studied patients. In the first main group, the mean systolic blood pressure was 150.92 mmHg and diastolic blood pressure was 92.17 mmHg; in the second main group, the corresponding values were 143.9 and 88.21 mmHg, respectively.

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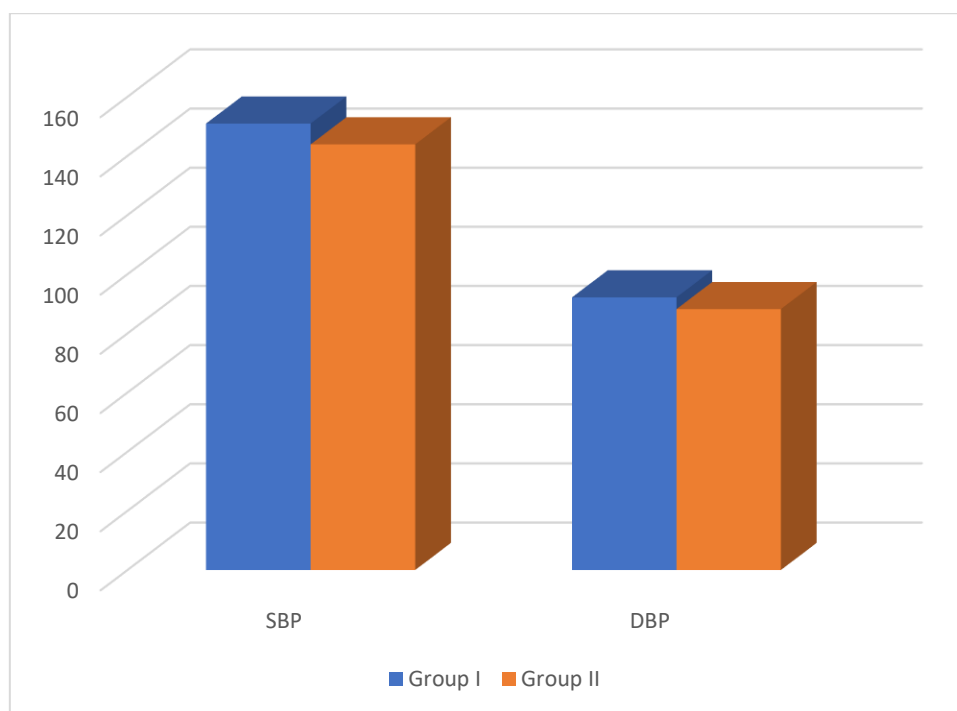


Figure 1. Comparative analysis of systolic and diastolic blood pressure between the groups (SBP — systolic blood pressure, DBP — diastolic blood pressure).

According to the results of our study, in the first group with developed renal dysfunction, the distribution of chronotypes based on the degree of nocturnal blood pressure decline was as follows: the “dipper” type accounted for 23.7%, insufficient nocturnal decline — 56.3%, excessive decline of more than 20% — 3.8%, and patients with nocturnal blood pressure elevation — 16.2%.

In the second group, a nocturnal blood pressure decline of 10–20% was observed in 45% of patients, a decline of less than 10% in 40%, “over-dipper” pattern in 5%, and a nocturnal hypertension profile in 10% of patients (Figure 2).

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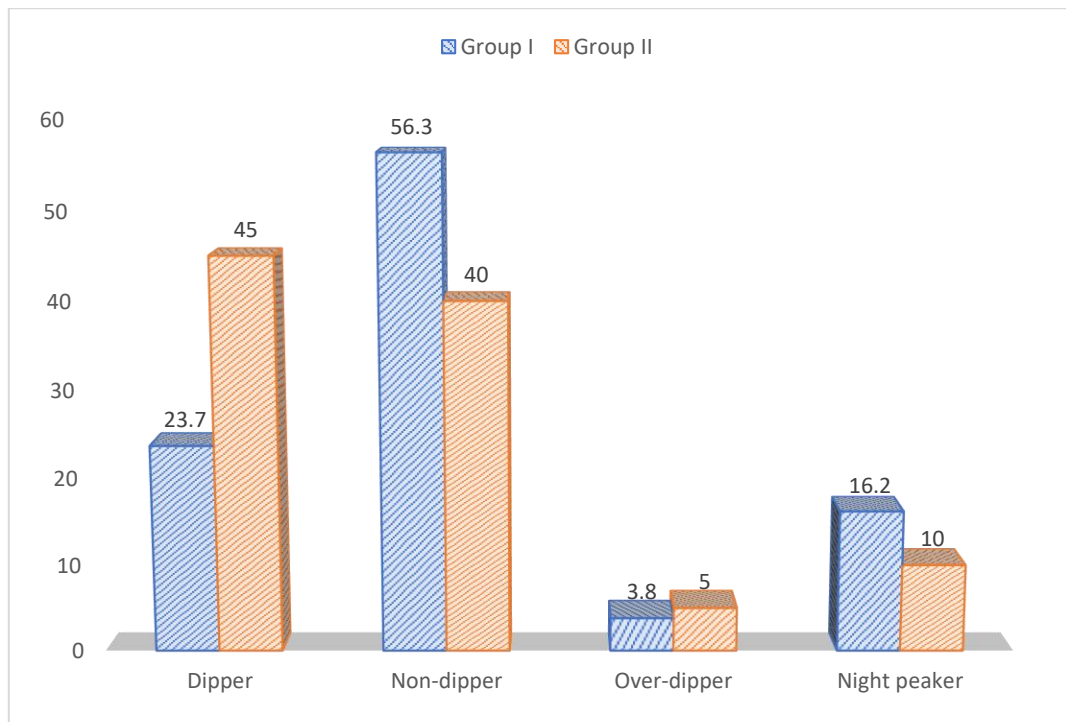


Figure 2. Distribution of patients according to the degree of nocturnal blood pressure decline.

Patients with arterial hypertension and concomitant renal dysfunction demonstrated significantly higher mean 24-hour blood pressure levels compared with individuals without renal involvement. This finding reflects enhanced activation of the renin–angiotensin–aldosterone system, increased sodium retention, and disruption of circadian blood pressure regulation in the setting of renal impairment. Elevated blood pressure in patients with renal dysfunction is driven by a complex and multifactorial pathophysiological interplay, including nephron loss, expansion of extracellular fluid volume due to sodium retention, heightened sympathetic nervous system activity, activation of hormonal systems—particularly the renin–angiotensin–aldosterone axis—and endothelial dysfunction [10].

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Conclusion

The complex and multifactorial mechanisms underlying elevated blood pressure in patients with renal dysfunction necessitate early and optimized antihypertensive therapy, including the use of evidence-based drug combinations at adequate dosages, to achieve and maintain target blood pressure levels.

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