



## STUDY OF THE EPIDEMIOLOGY OF CHRONIC RENAL FAILURE

**Islomova Shaxnoza Salomovna**

Senior Lecturer, Department of Organization of Pharmaceutical Practice, Tashkent Pharmaceutical Institute

**Suyunov Nizom Dovurovich**

Doctor of Pharmaceutical Sciences, Professor, Department of Organization of Pharmaceutical Practice, Tashkent Pharmaceutical Institute

**Xidoyatova Zulfiya Sharipovna**

Candidate of Biological Sciences, Associate Professor, Department of Organization of Pharmaceutical Practice, Tashkent Pharmaceutical Institute

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### ABSTRACT

Renal failure has been theoretically analyzed using domestic and foreign literature sources. The literature review includes an analysis of the etiology and epidemiology of renal failure. Currently, a large number of people worldwide suffer from renal failure, which is characterized by severe complications, a high risk to life, significant treatment costs, and difficulties in diagnosis. Therefore, preventive measures and standard treatment protocols are being implemented. The possibility of analyzing medicinal products used in the treatment of renal failure has emerged. The etiology and epidemiology of renal failure, along with a theoretical analysis of global statistical data, are presented.

### Introduction

The human body contains two kidneys, which filter the blood and produce urine. Through urine, toxins are excreted from the body. The kidneys regulate blood pressure and maintain electrolyte balance. Renal failure is classified into three forms:

1. **Prerenal renal failure** is caused by impaired blood flow to the kidneys, resulting in insufficient renal perfusion. As a consequence, urine formation is disrupted, and pathological changes occur in the kidneys. Prerenal renal

failure accounts for approximately 55% of cases.

2. **Renal (intrinsic) renal failure** is associated with pathological changes in renal tissue. Although blood supply to the kidneys is adequate, urine formation is impaired. This form occurs in about 40% of patients.

3. **Postrenal renal failure** occurs when urine is produced in the kidneys but cannot be excreted due to obstruction in the urinary tract. If the obstruction is limited to the urinary tract, renal function may remain intact, and



IF = 9.2

renal failure does not develop. This form accounts for approximately 5% of cases.

Renal failure has a significant global health impact and is a direct cause of mortality, as well as an important risk factor for cardiovascular diseases [1,15,21]. When diagnosed early, acute renal failure can be treated without complications. In contrast, complete recovery from chronic renal failure is difficult, with disease duration ranging from 2.7 to 3.5 years [12,2]. There is a close relationship between renal failure and cardiovascular diseases. Risk factors for cardiovascular complications in renal failure include increased arterial stiffness, atherosclerosis, anemia, and reduced glomerular filtration rate (GFR) [1,8,16]. Renal failure is a syndrome characterized by decreased kidney function, which may occur suddenly (acute) or develop gradually (chronic). It primarily arises due to massive blood loss, hypotension, incompatible blood transfusion, electric shock, septic abortion, drug toxicity, or poisoning with heavy metal salts, leading to damage of the renal parenchyma. According to research findings, renal failure is classified into two main types: **acute renal failure (ARF)** and **chronic renal failure (CRF)**. In acute renal failure, disturbances occur in nitrogen, water, electrolyte, and metabolic balance, resulting in reduced urine output or complete cessation of urine production (anuria, uremia) [8]. Blood urea levels increase, leading to uremic intoxication. Fluid accumulation occurs in subcutaneous tissues, abdominal cavity, and thoracic cavity. Chronic renal failure is a widespread and dangerous condition, characterized by an

asymptomatic course in the early stages. CRF represents a significant problem not only in nephrology but also in many related medical specialties [4,17,11,10]. Due to partial or complete loss of kidney function, excess fluid and metabolic waste accumulate in the body. The main causes of chronic renal failure include long-term kidney and urinary tract diseases such as glomerulonephritis, pyelonephritis, tuberculosis, urolithiasis, congenital and hereditary kidney diseases, cardiovascular diseases, gout, diabetes mellitus, obesity, liver cirrhosis, and others. These conditions lead to renal tissue shrinkage (nephrosclerosis) or cystic dilation (hydronephrosis). Risk factors influencing the progression of chronic renal failure include age, arterial hypertension, elevated total cholesterol, decreased glomerular filtration rate, anemia, and hyperphosphatemia [1,4,7,5,6,20,21,9]. Glomerulonephritis is an inflammatory condition of the renal glomeruli. Its etiology may include diabetes mellitus or systemic lupus erythematosus, as well as streptococcal infections (commonly caused by *Streptococcus pyogenes*, group A beta-hemolytic streptococcus), which predominantly affect children. Chronic renal failure typically progresses through five stages, determined by the glomerular filtration rate (GFR). GFR is the primary functional indicator reflecting the volume of plasma filtered by the kidneys per minute. Normal GFR ranges from 90 to 120 ml/min/1.73 m<sup>2</sup> and physiologically declines with age. A decrease in GFR leads to acute and chronic renal failure, diabetic nephropathy, and hypertensive kidney damage [4,12,10,2,14].



Stage	GFR (ml/min/1.73 m <sup>2</sup> )	Description
Stage 1	>90	Normal kidney function with signs of damage (e.g., proteinuria)
Stage 2	60-89	Mild renal impairment
Stage 3	30-59	Moderate renal impairment
Stage 4	15-29	Severe renal impairment
Stage 5	<15	End-stage renal disease requiring dialysis or kidney transplantation

Currently, chronic renal failure is more common in adults, while in children it is mainly associated with genetic disorders or severe glomerulonephritis [5]. According to the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI), chronic kidney disease is defined as kidney damage or reduced kidney function persisting for at least three months, regardless of etiology, and represents a significant medical and social problem. In developed countries, chronic renal failure has become a healthcare priority due to declining quality of life and increasing mortality rates over recent decades [13,2]. Early diagnosis, effective treatment, and prevention strategies remain critical challenges in modern medicine [6].

#### **Aim of the Study**

To analyze the global prevalence and growth trends of renal failure and assess epidemiological challenges associated with the disease.

#### **Materials and Methods**

A statistical analysis method was applied to evaluate the epidemiology of renal failure.

#### **Results and Discussion**

According to the World Health Organization and other medical sources, approximately 850 million people worldwide suffer from kidney diseases [14,7]. Statistical analyses indicate that 30–60% of patients with kidney diseases develop nephrosclerosis, leading to chronic renal failure. Nephrosclerosis (from Greek *nephros* — kidney, *sclerosis* — hardening) is characterized by fibrotic replacement of renal tissue, resulting in kidney shrinkage and functional impairment.

Chronic renal failure is one of the most pressing public health problems of the 21st century, characterized by high morbidity and mortality rates. Over the past 20 years, age-standardized incidence rates have increased by 5–13% in developed countries such as the



United States, the United Kingdom, and China [16,6,13].

In the United States, the incidence of chronic renal failure increased from 133.1–162.4 cases per million population between 1974 and 1981 to 268.1 cases per million by 1996, reaching 600–700 cases per million in the past decade. Annual incidence is estimated at 50–60 new cases per million population. In the Russian Federation, incidence rates increased from 19–109.2 cases per million in the 1970s to 100–600 cases per million in recent years. Similar trends have been observed in Tatarstan and the Kyrgyz Republic. Although official statistics are limited in Uzbekistan and Central Asia, the prevalence of chronic renal failure continues to rise, reaching approximately 400–600 cases per million population.

The disease is more common in men than in women; however, complications tend to be more severe in women. Treatment strategies depend on the classification of renal failure (prerenal, renal, or postrenal) and include various pharmacotherapeutic agents such as diuretics, antispasmodics, antihypertensive drugs, iron (III) hydroxide dextran complexes, hemodialysis, and others.

Iron preparations (e.g., iron sulfate, iron dextran) are used to correct iron deficiency anemia.

Angiotensin receptor blockers (ARBs) such as losartan and valsartan are prescribed for hypertension management and renal protection. Diuretics (furosemide, torasemide) are used to eliminate excess fluid. In patients with diabetes mellitus, glucose-lowering agents adjusted to renal function, including insulin and DPP-4 inhibitors (e.g., linagliptin), are recommended [18,15].

Due to the high risk of hypoglycemia, regular self-monitoring of blood glucose is an essential component of treatment in patients with chronic renal failure [11,14]. According to modern classifications, renal replacement therapy is required in the terminal stage of chronic renal failure. Renal replacement therapy includes peritoneal dialysis, hemodialysis, and kidney transplantation. Among these, kidney transplantation is considered the most effective and economically advantageous treatment option compared to hemodialysis [3,4,7,22].

**Conclusion.** Based on the literature review, the global epidemiology of chronic renal failure was theoretically analyzed. The prevalence of chronic renal failure was found to be higher in the United States compared to Uzbekistan and other CIS countries. Future research will focus on conducting assortment and content analyses of pharmacotherapeutic groups of drugs used in the treatment of this disease.

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