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# REGIONAL FEATURES OF SALT METABOLISM AND THEIR ROLE IN THE PATHOGENESIS OF UROLITHIASIS (ON THE EXAMPLE OF THE OSH REGION)

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## ABSTRACT

As part of a study conducted at the University Clinic of Osh State University and the MK Medical Clinic medical centre, the aetiology of urolithiasis (ICD) among residents of the city of Osh and the Osh region was analysed. The study included clinical observations, laboratory data, and the results of patient questionnaires. Based on the collected material, the most significant aetiological factors contributing to the formation of concretions in the kidneys and urinary tract were identified. Among them, special attention was paid to the peculiarities of regional water supply and increased mineralisation of drinking water, unbalanced diet with a predominance of protein and salty foods, low fluid intake during hot periods of the year, hereditary predisposition and associated metabolic disorders, and insufficient physical activity leading to stagnant phenomena. The results of the study emphasise the need to develop preventive measures aimed at modifying lifestyle, improving the quality of drinking water, and expanding information and educational work among the population.

**Keywords:** Urolithiasis, Concretions, Aetiology, Salt, Kidneys, Water-Salt Metabolism, Nutrition.

## I. INTRODUCTION

Urolithiasis is one of the most common urological diseases, accounting for up to 30–40% of all hospitalisations in specialised hospitals. The disease is more frequently observed in men than in women, with the male-to-female ratio being approximately 95% to 5% [1, p. 3]. In countries with developed healthcare systems, such as the United States, annual hospitalisation for urinary tract stones reaches one case per 1,000 adults, and concretions are detected in 1% of autopsies [7]. In Russia, the incidence of nephrolithiasis among the adult population is about 460 per 100,000 people [2, p. 15]. According to data from the Ministry of Health of the Kyrgyz Republic for 2021, urolithiasis is diagnosed in less than 13% of the population, but the actual figures may be higher due to insufficient detection and late seeking of medical care.

It has been established that urolithiasis is more common in men, mainly between the ages of 30 and 50. Right-sided stones are more common, but 15–30% of patients have bilateral lesions. Despite numerous studies, there is still no single concept of the pathogenesis of nephrolithiasis [5, p. 7]. Stone formation is the result of complex physicochemical processes in the body, including impaired water-salt metabolism, metabolic disorders, drinking habits and diet, climatic and environmental factors, and genetic predisposition [3, p. 841].

Predisposing factors also include climatic and geographical characteristics of the region of residence, housing and living conditions, occupational hazards, and genetic predisposition, including enzyme disorders and tubulopathies. In some cases, stone formation is caused by concomitant pathologies, such as inflammatory diseases of the kidneys and urinary tract, as well as congenital anomalies that cause urinary outflow obstruction, metabolic and vascular disorders.

The geographical location and climatic conditions of the Osh region predetermine the presence of endemic areas with a high prevalence of urolithiasis, including the city of Osh and the Kara-Suu and Chon-Alai districts. The prevalence of the disease in these areas is influenced by the hot and dry climate, increased mineralisation of drinking water (especially excess calcium salts), and a diet dominated by animal products.

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**RESEARCH OBJECTIVE**

To identify the most significant aetiological factors of urolithiasis among the population of the city of Osh and the Osh region.

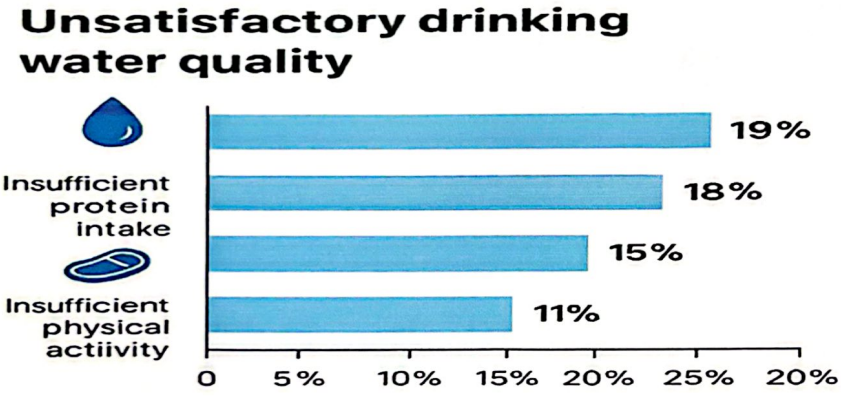
## II. MATERIALS AND METHODS

The study was conducted at the University Clinic of Osh State University and the MK Medical Clinic medical centre. The study included 120 patients with a confirmed diagnosis of urolithiasis and/or pronounced salt deposits in the urinary system. Selection was carried out using random sampling.

Of the total number of patients examined, 48 (40%) were women and 72 (60%) were men. The age range of participants varied from 18 to 75 years. All patients were asked to complete a questionnaire that included questions about potential etiological factors of ICD (diet, drinking water, physical activity, chronic diseases, heredity, etc.). Based on the collected data, a correlation analysis was performed to establish relationships between the identified factors and the incidence of the disease.

## III. RESULTS AND DISCUSSION

The questionnaire revealed the leading aetiological determinants influencing the development of urolithiasis among the population of the Osh region and the city of Osh.




**Identified correlations**

Male gender ↔ Hereditary predisposition
($r = 0{,}40$; $p < 0{,}05$)

Male gender ↔ Smoking
($r = 0{,}39$; $p < 0{,}05$)

Male gender ↔ Alcohol abuse
($r = 0{,}31$; $p < 0{,}05$)

Sedentary work ↔ Low physical activity
($r = 0{,}37$; $p < 0{,}05$)

Water quality ⟶ Urinary tract infections
($r = -0.43$)

**Figure 1:** The most significant factors contributing to the emergence of ICD.

This distribution of indicators demonstrates the influence of a complex of natural climatic, socio-economic and behavioural factors characteristic of the southern regions of Kyrgyzstan. High air temperatures, a shortage of clean drinking water and dietary characteristics create favourable conditions for metabolic disorders that predispose to the formation of calculi.

A survey of 120 patients showed that:

85% (n = 102) of study participants mainly consume foods high in protein;

79% (n = 95) lead a sedentary lifestyle;

65% (n = 78) had a history of inflammatory diseases of the urinary tract.

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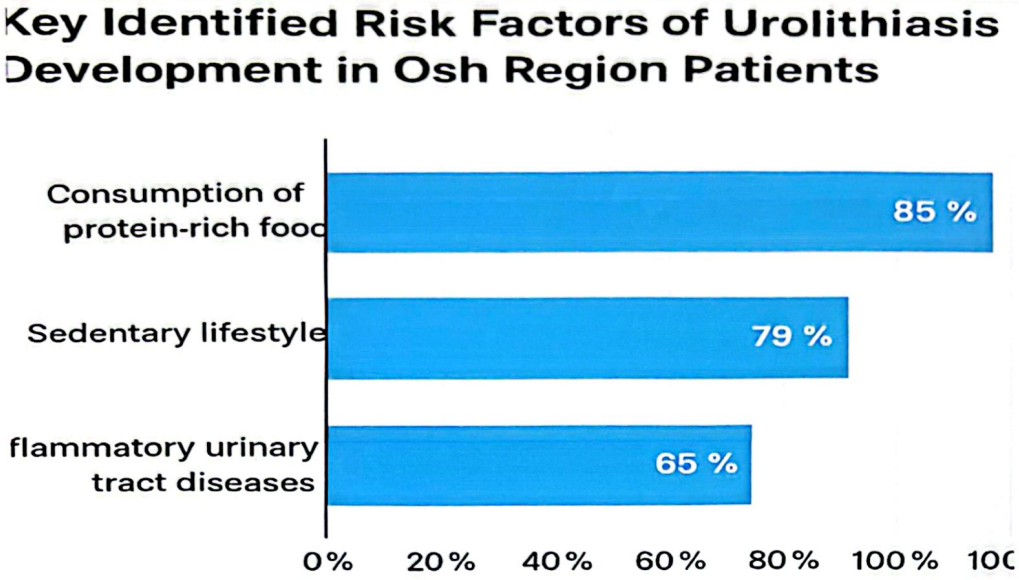


It was also noted that the development of ICD in a number of patients was associated with chronic diseases requiring long-term restriction of physical activity.

Spearman's correlation analysis was used to assess the relationships between the identified risk factors. Statistically significant associations were found between the following parameters:

Male gender ↔ hereditary predisposition ($r = 0.40$; $p < 0.05$);

Male gender ↔ smoking ($r = 0.39$; $p < 0.05$);

Male gender ↔ alcohol abuse ($r = 0.31$; $p < 0.05$);

Smoking ↔ alcohol consumption ($r = 0.63$; $p < 0.1$);

Sedentary work ↔ low physical activity ($r = 0.37$; $p < 0.05$).

Inverse correlations were also identified:

Between drinking water quality and the frequency of urinary tract infections ($r = -0.43$);

Between the level of physical activity and alcohol consumption ($r = -0.42$).

According to the US Centres for Disease Control and Prevention (CDC), Kyrgyzstan is one of 187 countries where tap water does not meet safety criteria. Laboratory tests conducted at the Osh State University Clinic showed a water hardness level of 275 ppm, indicating an elevated content of calcium and magnesium salts.

## IV. CONCLUSION

The population of Osh and the Osh region is characterised by the following aetiological features of urolithiasis:

High mineralisation of drinking water due to calcium and magnesium content;

Excessive consumption of meat and protein products;

Hot and dry climate affecting water-salt metabolism;

Insufficient physical activity, including occupationally related;

Limited insolation and associated hypovitaminosis (groups A, C, B);

Frequent occurrence of chronic urinary tract infections.

The combined effect of these factors, especially in the presence of a hereditary predisposition, male gender and harmful habits (smoking, alcohol), as well as concomitant metabolic disorders (gout, hyperparathyroidism), significantly increases the risk of kidney and urinary tract stones.

The data obtained emphasise the need for comprehensive preventive measures aimed at:

Improving the quality of drinking water;

Correcting eating habits;

Increasing physical activity;

Ensuring adequate sunlight exposure and preventing hypovitaminosis;

Early diagnosis and treatment of urinary tract infections.

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