# EARLY DIAGNOSIS AND PREVENTION OF UROLITHIASIS IN THE ARAL SEA REGIONS

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## ABSTRACT

The study of the prevalence of morbidity is especially relevant in regions with an unfavorable environmental situation (the Aral Sea region), where, given its nature, an increase in the incidence of urological diseases can be assumed. It has been established that "the difficult environmental situation in the Aral Sea region has become the most important feature of the habitat of the population in this region, which has led to a deterioration in the health of the population and even close to an environmental disaster."

One of the most important tasks in solving this problem of the Aral Sea region is to study the prevalence of diseases of the urinary tract and the male reproductive system, the possibility of its control and reduction due to the activities of primary health care. The prevalence of urolithiasis (urolithiasis) in the world has now reached 4.5-12.0%, with an annual increase to 1500-2000 cases per 1 million population. This is due to changing socio-economic conditions, urbanization of society, the quality of food and drinking water, natural, climatic and environmental factors. In Uzbekistan, the average prevalence of ICD is 4.5%.

According to the data of the Research Institute of Public Health and Health Care Organization of the Ministry of Health of the Republic of Uzbekistan, in 2015 the number of patients with ICD in the republic as a whole increased by another 70.5 per 100 thousand population. The highest incidence of ICD is registered in the Khorezm region - 225.1 per 100 thousand population. In the structure of the total morbidity of the population of the Republic of Uzbekistan, urolithiasis accounted for only 3.0%, in the Khorezm region this figure was almost three times higher than the average level in the republic (8.2%). One of the most important results of epidemiological research is the possibility of detecting the early or initial stages of diseases and their preventive treatment or monitoring in primary health care settings, which will undoubtedly contribute to the improvement of the health of the population, and in particular the rural population.

**The purpose of the study was**  to increase the importance and expand the capabilities of primary health care in controlling the level of urolithiasis in the Aral Sea region, to develop an optimal set of preventive measures to prevent them.

**Object of research. A total of** 7597 people (87.4% of the total number of those to be examined) were examined in the selected areas of the Aral Sea region.

**Subject of research:** patients with urological diseases (kidneys, bladder, prostate gland, external genitalia, urine).

**Research Methods:** Epidemiological, socio-hygienic, statistical, general clinical (universal questionnaire, Doctor-U computer program, ultrasound, laboratory), etc.

To conduct an epidemiological survey of the population in the Khorezm region, the Avaz Utar SVP of the Yangiarik district and the Uygur SVP of the Yangibazar district were selected. In the Republic of Karakalpakstan, similar studies were carried out in the Kirkkiz SVP of the Ellikkala district and the Cheremushka SVP of the Nukus district. The population belonging to these sites was surveyed using the continuous method. Cluster and nest-typological methods of selection were used.

The study was carried out in 2 stages:

Stage 1 – screening studies in the Khorezm region (n=3991) and assessment of the effectiveness of treatment and preventive measures;

Stage 2 – screening studies in the Republic of Karakalpakstan (n=3606) and assessment of the effectiveness of treatment and preventive measures.

Patients were selected based on inclusion and exclusion criteria and willingness to participate in the study.

In order to create multi-alternative questions that allow us to identify symptoms specific to urological diseases (ICD), we selected English-language articles covering the period 2000-2015. In the process of initial analysis and subsequent sampling, 12 questions were selected, subsequently ordered and subjected to a translation process.

To determine the reliability and validity of the universal questionnaire in determining the presence of symptoms of urological disease, the degree of its sensitivity, specificity and accuracy was assessed. The reliability of the information obtained by filling out the questionnaire was assessed by comparison with the results of objective research methods.

The population selected for the epidemiological survey was a contingent of rural residents who actually lived their entire lives in this area. Employees of the Department of Urology of TMA and the Republican Specialized Center of Urology examined 7597 people in the selected areas, which amounted to 87.4% of the number of those to be examined (Table 1).

Table 1  Distribution of the population by territory

| SVP | Avaz Utar | Uigur | Kirkeyes | Cheremushka | Altogether |
|---|---|---|---|---|---|
| Total Population of the Parcel | 2200 | 2300 | 2400 | 1800 | 8692 |
| Number of respondents surveyed | 1943 | 2048 | 2034 | 1572 | 7597 |
| % | 88,3 | 89,0 | 84,8 | 87,3 | 87,4 |

The information obtained was documented with the help of specially designed examination cards, which included the data of an objective examination, the results of ultrasound scanning (ultrasound) and urine tests performed with the help of test strips. All the data obtained were entered into a specially developed computer program for subsequent statistical processing and accounting.

To screen for urolithiasis, it was necessary to identify the signs of the disease that made it possible to obtain reliable data on its prevalence. These signs include:

- history of surgery or other interventions undertaken to remove stones or their spontaneous passage;
- kidney, ureteral and bladder stones diagnosed by ultrasound;
- salt crystals in the renal cavities detected by ultrasonic sus, found in urine sediment during its microscopy, which is considered a sign of pre- or microlithiasis.

When analyzing the ultrasound data of the urinary system, attention was paid to morphological changes in the pelvis system and renal parenchyma (hydronephrosis, hydrocalycosis, cystic formations, tumors, etc.), signs of stones and salt conglomerates in the renal cavities were ascertained.

During the examination of urine, special attention was paid to the indicators of microscopy, nitrite test and pH. The latter parameter was emphasized both in the assessment of the conditions of crystal formation and in the determination of preventive measures. Microscopy of urine sediment was necessary to detect urinary crystals, determine their mineral affiliation and quantity. The diagnosis of crystalluria was valid when 3 crystals in 1 µl of urine were found in the counting chamber,$\geq$ which corresponded to 104-105 or more in 1 ml.

According to the results of the examination of residents of the Khorezm region by the ultrasound method, 66 were diagnosed with urinary tract stones, which amounted to 16.5±0.2 cases per 1000 population.

The prevalence of urinary tract stones in men (18.7±0.3 cases per 1000 men) was significantly higher than in women (15.1±0.2 cases per 1000 women) (P<0.001). As the age of the population increases, the incidence of urolithiasis gradually increases. The peak incidence in men is at the age of 40-49 years, in women - at the age of 50-59 years.

The prevalence of urinary tract stones among the population of the Republic of Karakalpakstan was 11.1±0.2 cases per 1000 population. Moreover, this indicator in men was significantly higher than in women – 12.7±0.3 and 10.0±0.2 per 1000 examined of the corresponding sex (P<0.001, respectively).

The peak incidence of urinary tract stones in men was at the age of 50-59 years; in women, at the age of 60-69 years.

It should be noted that the data obtained by us on the prevalence of urinary tract stones are 3.9 times higher than similar indicators published in the statistical collections of the Ministry of Health of the Republic of Uzbekistan for the Khorezm region and 6.9 times higher than the indicators for the Republic of Karakalpakstan (Table 2).

Table 2 Prevalence of urinary tract stones according to our data and according to the materials of the Ministry of Health (per 100 thousand population)

| Index | Khorezm region | Republic of Karakalpakstan | Difference in indicators |
|---|---|---|---|
| Own research data (2015-2019) | 1653,7 | 1109,3 | 544,4 |
| Official statistics | 428,5 | 161,1 | 267,4 |
| Difference in indicators | +1225,2 | +948,2 | |
| Ratio Indicator | 3,9 | 6,9 | |

These data indicate that the population, having urinary tract stones, does not go to health care facilities, therefore, the disease is detected at a later date. This has a significant impact on the effectiveness and quality of treatment.

To establish the true incidence of chronic sluggish diseases, we recommend conducting special epidemiological studies with the inclusion of the method of medical examination of the population, since 48.5% (almost half) of all diseases diagnosed with urinary tract stones are first detected during the medical examination of respondents.

According to the results of an in-depth study, the prevalence of crystalluria in the Khorezm region was $55.1\pm0.4$ cases per 1000 population. The incidence of crystalluria increases with increasing age. The intense incidence of crystalluria was higher in women than in men ($P<0.01$).

However, the elimination of the influence of the different composition of the population by sex through the application of the standardization method showed that the standardized indicators for men (53.6) were higher than for women (49.8). Therefore, if the number of males and females in each age group were the same, the intense prevalence of crystalluria in males would be substantially higher than in females. The highest incidence rate in men was between the ages of 40 and 49 years.  for women – at the age of 50-59 years.

The prevalence of crystalluria among the population of the Republic of Karakalpakstan for the years under study averaged $61.6\pm0.1‰$. This indicator increases sharply from the age of 30-39 years, the peak incidence ($127.7\pm1.5‰$) falls on the age of 40-49 years. The level of crystaluria is relatively high at the age of 50-59 ($100.8\pm1.6$) and 60-69 years ($94.2\pm2.5\%$). In all age groups, with the exception of 1-14 year olds, the rates of crystalluria in men were significantly higher than in women.

To assess the efficacy and feasibility of prophylactic treatment of prelithiasis in the entire region, 442 residents were selected. As a result of the treatment, 342 (86.0%) of them had crystal disappearance in the urine sediment and renal ultrasound. 56 (14.0%) patients with persistent crystalluria were included in the groups (depending on the type of crystals found in the urine) of prophylactic treatment and dynamic follow-up.

## FINDINGS

1. Developed for general practitioners, the universal questionnaire is a simple and affordable method for early detection  of the most common urological diseases, as it has higher sensitivity, specificity and accuracy than the traditional survey method.

2. The developed computer program can be used  to study the prevalence  of urological diseases, as it allows you to collect the results of the examination of patients and enter them into the database, process and analyze them, as well as generate study reports.

3. The incidence of formed urinary tract stones in the Khorezm region was 16.5, in the Republic of Karakalpakstan - 11.1 per 1000 population. The prevalence of urinary tract stones is significantly higher in men than in women ($P<0.001$). With the increasing age of the examined, the incidence of urolithiasis gradually increases. The peak incidence in the Khorezm region in men is at the age of 40-49 years, in women - 50-59 years, in the  Republic of Karakalpakstan - 50-59 and 60-69 years, respectively.

4.  The data obtained by us on the prevalence of urinary tract stones are 3.9 times higher than the indicators published in the statistical collections of the Ministry of Health of the Republic of Uzbekistan for the Khorezm region, and 6.9 times higher than the indicators for the Republic of Karakalpakstan. To establish the true level of prevalence of urological diseases, we recommend conducting special epidemiological studies with the inclusion of the method of medical examination of the population, since 48.5% (almost half) of all diseases diagnosed with urinary tract stones are first detected during the medical examination of respondents.

5.  The initial stage of stone formation (prelithiasis) is crystalluria. At the stage of crystal formation and aggregation, crystalluria, as a rule, is asymptomatic, in 20-40% of cases ending in the formation of a stone. The prevalence of prelithiasis (crystalluria) in the Khorezm region was 55.1‰, in the Republic of Karakalpakstan – 61.6‰.  The highest level of crystalluria in the Khorezm region was at the age of 50-59 years, and in the Republic of Karakalpakstan at the age of 40-49 years. Individuals with prelithiasis constituted a risk group for which preventive measures were developed and implemented.

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