

ABSTRACT

the dissertation by Nursultanova Liza Narimanovna
on the topic: **"Prevalence of chronic kidney disease (CKD) and risk factors progression of renal failure in the Kyzylorda region"**, submitted for the degree
of Doctor of Philosophy (PhD) in the educational program 8D10139 - Public
Health

Relevance of the research topic

Chronic kidney disease (CKD) is currently considered one of the key global public health problems.

According to the Global Burden of Disease (GBD 2019), the incidence of CKD continues to increase and the disease itself is among the leading causes of death, surpassing conditions such as diabetes mellitus and chronic obstructive pulmonary diseases (Murray et al., 2020).

Over the past two decades, mortality from end-stage renal disease has increased by more than 40%, highlighting the systemic underestimation of the risks associated with CKD and requiring a review of existing screening, prevention, and clinical surveillance strategies, particularly in vulnerable regions with limited access to specialized nephrology care (Weiner et al., 2019).

CKD is characterized by a long asymptomatic course, which leads to its diagnosis mainly at advanced stages, when the SCF is significantly reduced and complications develop (Levey et al., 2015).

Moreover, the disease is closely associated with other non-communicable chronic conditions—arterial hypertension, type 2 diabetes, metabolic syndrome, and obesity. This multicomorbidity forms a single pathogenetic continuum and requires a multidisciplinary approach to diagnosis, treatment, and patient monitoring (Thomas et al., 2016; Jha et al., 2013).

Without the integration of efforts of cardiologists, endocrinologists, internists and nephrologists, as well as the active involvement of primary health care, timely detection and effective management of CKD remain unlikely (O'Hare et al., 2017).

For Kazakhstan, the problem of CKD is of particular importance due to geographic, sociodemographic, and organizational factors. Epidemiological data on the disease in the country is extremely fragmented.

Existing statistics primarily cover patients on renal replacement therapy, while the prevalence of early-stage CKD in the population remains unknown. We believe this is due to low detection rates, a lack of screening programs, and insufficient training among primary care physicians in interpreting key laboratory parameters (SCF, ACR) (Akimzhanov et al., 2021; Ministry of Health of Kazakhstan, 2020).

This study focuses on the Kyzylorda region, one of the most vulnerable regions of Kazakhstan. The high proportion of the rural population, the poor availability of specialized specialists, the high prevalence of hypertension and diabetes, and the fragmented nature of the primary care infrastructure create the

preconditions for the formation of a latent pool of under-screened patients with CKD (Sultanova et al., 2022).

Against the backdrop of a lack of local screening programs, poor public awareness, and inadequate training of primary care physicians, the Kyzylorda region is becoming an indicator region for assessing the effectiveness of the existing model for managing chronic nephrological patients.

A key barrier to the fight against CKD is low clinical awareness at the primary care level. General practitioners, who are at the forefront of patient interactions, often lack sufficient information about risk stratification criteria, testing algorithms, and management strategies for patients with early-stage CKD. This, in turn, limits the effectiveness of early detection programs and leads to delayed referral of patients to specialized care (Navarro-González & Mora-Fernández, 2020).

International experience shows that even in resource-limited settings, significant improvements in the quality of diagnosis and monitoring of patients with CKD are possible. The introduction of systematic questionnaires, the use of laboratory markers (SCF, ACR), continuous medical education for physicians, and the active use of digital solutions make it possible to develop a sustainable model for monitoring high-risk patients (Brück et al., 2017; KDIGO, 2013).

In our view, such approaches, however, require adaptation to the regional context and consideration of local characteristics, including socio-economic and cultural determinants (World Bank, 2019).

The issue of CKD is being actively studied internationally. KDIGO, NIH, WHO, and other major organizations have initiated large-scale studies, including the creation of registries, the implementation of standardized diagnostic criteria, and the evaluation of the effectiveness of various patient management models (KDIGO, 2013; NIH, 2020; WHO, 2018).

NHANES, CRIC, CKD-PC, and other programs have demonstrated that a significant proportion of patients with CKD remain unnoticed by the healthcare system in the early stages. Particular attention is being paid to issues of health literacy, treatment adherence, symptom perception, and patient quality of life (Fink et al., 2019; Grubbs et al., 2015).

CKD is a fragmented field in Kazakhstan's scientific field. Research is primarily concentrated in large cities (Almaty, Astana, and Karaganda) and typically focuses on assessing dialysis needs, clinical and economic aspects, and the reasons for late treatment.

There are virtually no interdisciplinary regional studies that include assessment of the knowledge of primary care physicians, the level of patient awareness, or validated instruments for assessing quality of life.

The problems and scientific uncertainty within the framework of this study are concentrated around such aspects as the high proportion of asymptomatic forms of CKD and the impossibility of their timely detection with the current level of training of primary care physicians, as well as the lack of a unified system for monitoring key biomarkers (SCF, ACR).

In addition, there is a low level of public awareness about the symptoms, risks and consequences of CKD, a lack of validated quality of life questionnaires adapted to Kazakhstani realities, and insufficient integration of preventive strategies into primary health care practice due to a lack of educational programs and clinical decision support tools (Kassymbekova et al., 2022).

These deficiencies create a persistent gap between international clinical guidelines and actual local practice.

Bridging this gap requires a regionally focused study that will collect reliable epidemiological data, identify vulnerable population groups, assess barriers to early diagnosis, and formulate proposals to improve the effectiveness of primary care in CKD management.

In turn, the development of scientifically proven, validated, and practically feasible models of screening, routing, and educational support is a priority not only for clinical nephrology but also for the public health system as a whole. The study's results will enable the formulation of practical recommendations aimed at improving the accessibility and effectiveness of care for patients with CKD in the Kyzylorda region and, potentially, other regions of the country.

Purpose of the study

To study the prevalence and risk factors of chronic kidney disease, assess patient awareness and the competence of primary care physicians, and develop practical recommendations to improve the early detection, prevention, and management of CKD in the Kyzylorda region.

Research objectives

1. To study the epidemiological characteristics of chronic kidney disease in Kazakhstan and identify key risk factors for its development and progression in the regional population of the Kyzylorda region.

2. To assess the prevalence of early stages of chronic kidney disease in various clinical and demographic groups of the population of the Kyzylorda region and determine the diagnostic significance of biochemical markers for their timely detection.

3. To assess the level of awareness, knowledge, and quality of life of patients with chronic kidney disease, including those on program hemodialysis, and to analyze the impact of increased public literacy and continuous medical monitoring on improving the quality of life of this category of patients in the Kyzylorda region.

4. To assess the level of professional competence of primary health care physicians in the Kyzylorda region in matters of early diagnosis, prevention and management of patients with chronic kidney disease.

5. To develop applied tools and practical recommendations aimed at improving the diagnosis, prevention and management of patients with chronic kidney disease in the Kyzylorda region.

Research methods:

The design was combined: cross-sectional (WHO STEPS) and prospective. Data collection included standardized questionnaires, biometric measurements (blood pressure, height, weight, BMI, waist circumference), laboratory tests (serum

creatinine with eGFR calculated using the CKD-EPI method; urine albumin-to-creatinine ratio, ACR), review of outpatient records, and semi-structured interviews. Instruments included: KDQOL-SF 1.3 (local adaptation and psychometric validation), health literacy questionnaire, and primary care physician knowledge questionnaire.

Interventions - educational activities for patients on hemodialysis and a CME module for doctors (120 academic hours).

Statistics (SPSS 26.0) - descriptive analytics; χ^2 , t-test, ANOVA; correlation analysis; logistic regression with calculation of OR and 95% CI; effect sizes (Cramer's V); scale reliability (Cronbach's α), test-retest; significance level $p < 0.05$.

Objects of study:

Adult population aged 18–69 years in the Republic of Kazakhstan, outpatient patients with CKD, including those receiving program hemodialysis (Kyzylorda region); primary care physicians of the Kyzylorda region; regional nephrology service organizations (routing, registry, educational practices).

Research subjects:

Subjects The study focuses on the prevalence of chronic kidney disease and its stage distribution based on estimated glomerular filtration rate and albuminuria, the structure of demographic and behavioral risk factors, the diagnostic value of the combination of ACR and eGFR for early detection of the disease, the level of health literacy and quality of life indicators in patients with CKD according to the KDQOL-SF questionnaire, the professional competence of primary care physicians in the diagnosis and management of CKD, the impact of educational interventions on health literacy, treatment adherence and quality of life indicators, the reproducibility and validity of questionnaires adapted to the local context, as well as the effectiveness of an integrated model for CKD management in regional primary care settings.

Scientific novelty of the research

1. For the first time in the Republic of Kazakhstan, a population-based analysis of the prevalence of CKD based on eSFR was performed: clinically significant forms (eSFR < 60 ml/min/1.73 m²) account for 1.3% of the adult population, early stages (eSFR 60–89) — 25.2%; independent predictors were identified (age 50–69 years, female gender, low physical activity, low education level, nonlinear relationship with BMI — increased risk with underweight and obesity).

2. It has been shown that interregional differences visible in unadjusted (crude) estimates lose statistical significance after multivariate adjustment; geographic location alone is not an independent predictor of the presence of CKD.

3. The diagnostic utility of the combination of eGFR and albumin-to-creatinine ratio (ACR) for early detection of CKD at the primary care level, especially in patients with cardiovascular risk factors, was substantiated; high sensitivity of albuminuria to early stages was demonstrated.

4. A systematic assessment of the competencies of primary care physicians in CKD issues was conducted for the first time, identifying priority deficiencies and

linking results with professional experience; requirements for targeted continuing medical education programs were developed.

5. An integrated primary health care-oriented model of nephrology care (screening of eSCF+ACR, monitoring of anemia and nutritional status, regular assessment of quality of life, registry of CKD stages 1–5, “Patient Schools” and “Nephrologist Schools”) with proven feasibility in real outpatient practice has been developed and operationally tested.

Practical significance of the work:

1. The developed and implemented integrated model of outpatient nephrology care, adapted to the conditions of the Kyzylorda region, provides a logically structured algorithm for the early detection, stratification, and support of patients with CKD at the primary health care level, which can be scaled to other regions of Kazakhstan with similar resource constraints.

2. The adaptation and validation of the KDQOL-SF questionnaire (version 1.3) created the basis for routine assessment of quality of life in dialysis patients in Kazakhstani clinical practice and monitoring the effectiveness of therapy, taking into account the subjective perception of health.

3. The developed educational program, comprising 120 academic hours (4 credits), for primary care physicians helps improve their clinical competence in the diagnosis, prevention, and management of patients with CKD, including practical skills in assessing eGFR, interpreting ACR, and conducting educational conversations with patients.

4. The obtained data allow the use of the research results in planning regional prevention programs, developing strategic directions for combating CKD, and substantiating budgetary decisions for financing nephrological care at the outpatient level.

The main provisions submitted for defense

1. Interregional differences in the prevalence of chronic kidney disease (CKD) revealed in unadjusted estimates are not independent after accounting for age, sex, body mass index (BMI), physical activity level, and education in a multivariable logistic model. Independent predictors of CKD include age 50–69 years, female sex, low physical activity, low education level, and extreme BMI categories; the association with obesity is unstable and requires confirmation in larger samples.

2. The combined use of estimated glomerular filtration rate (eGFR) and albuminuria (ACR) provides higher diagnostic information for the early detection of CKD at the primary care level compared to the use of each criterion separately, due to increased sensitivity without a clinically significant decrease in specificity.

3. The Kazakhstani version of the KDQOL-SF questionnaire (v1.3) for patients with CKD: internal consistency of the scales and test-retest reproducibility were confirmed. The instrument was found to be suitable for routine clinical monitoring of quality of life in patients with CKD and for research purposes.

4. A primary care-oriented nephrology care model, including eSCF+ACR screening, regular quality-of-life assessment (KDQOL-SF), anemia and nutritional status monitoring, a regional CKD stages 1–5 registry, patient schools,

nephrologist schools, and a 120-hour CME program for primary care. The model's feasibility in healthcare settings in the Kyzylorda region and its technological reproducibility for subsequent scaling have been confirmed.

Description of the main results of the study

1. The first objective of the study was to conduct a comprehensive assessment of the epidemiological characteristics of chronic kidney disease in Kazakhstan and identify key risk factors for its development and progression, with a focus on the regional characteristics of the Kyzylorda region. The cross-sectional study included 6,720 adult respondents from all regions of the country and showed that clinically significant CKD with an eSFR < 60 ml/min/1.73 m² occurs in 1.3% of the adult population, mild forms with a decrease in eSFR to 60–89 ml/min/1.73 m² occur in 25.2%, and 73.5% of those examined have normal kidney function with an eSFR ≥ 90 ml/min/1.73 m².

Regional differences were evident in the fact that in the Kyzylorda region, the proportion of individuals with a significant decrease in kidney function was 7.7%, which is significantly higher than the rates in other regions, where levels of 0.9% were recorded in the East Kazakhstan region and 0.6% in the Mangystau region. At the same time, the proportion with normal kidney function was 52.2%, and with a moderate decrease in eGFR - 40.1%. However, adjusted logistic regression analysis data showed that region of residence alone was not an independent predictor of the presence of CKD (OR = 1.28; 95% CI: 0.83–1.95; $p = 0.26$), indicating the significance of other factors, primarily the age composition of the sample.

Multivariate regression allowed us to identify independent predictors of CKD. The most pronounced association was established with age: the mean age of the group with eGFR < 60 was 56.8 ± 11.8 years versus 36.7 ± 12.3 years in the control group ($p < 0.001$), with almost 79% of cases occurring in the 50–69 age group. Female gender showed statistical significance as an independent risk factor. The effect of body mass index was nonlinear: the risk was associated with both obesity (OR = 1.24; 95% CI: 0.99–1.53; $p = 0.04$) and underweight (OR = 1.43; 95% CI: 1.09–1.88; $p < 0.001$). Among the social and behavioral factors, low physical activity was identified, occurring in only 16.5% of individuals with eGFR < 60 , and low level of education ($p = 0.04$).

In the prospective component of the study in the Kyzylorda region, early stages of CKD were detected in 23% of patients with cardiovascular disease, including a decrease in eGFR < 60 in 18% and albuminuria in 24%. In patients with urinary tract pathology, the prevalence of early stages was 26%, a decrease in eGFR was detected in 14%, and albuminuria in 32%. Moreover, the ACR demonstrated high diagnostic value in identifying early stages of CKD, especially when combined with risk factors for cardiovascular disease ($p < 0.001$).

The obtained results provided a population-based analysis of CKD in Kazakhstan, quantitatively establishing that clinically significant forms occur in 1.3% of the adult population, and confirming that in the Kyzylorda region, the leading risk factors for the development and progression of CKD are age 50–69 years, female gender, extreme values of the body mass index, low physical

activity, and low level of education, which is of direct importance for the formation of regionally oriented strategies for the prevention and early detection of the disease.

2. The second objective of the study was to assess the prevalence of early stages of chronic kidney disease in various clinical and demographic groups of the population of the Kyzylorda region and to determine the diagnostic significance of biochemical markers for their timely detection.

The study included three stratified groups. Among apparently healthy individuals ($n = 115$), no clinically significant abnormalities meeting CKD criteria were identified. The estimated glomerular filtration rate remained ≥ 90 ml/min/1.73 m² in all cases; 92% of participants had normoalbuminuria, and 8% had borderline albuminuria.

Among patients with cardiovascular disease and arterial hypertension ($n = 112$), the prevalence of early-stage CKD reached 23%, with diagnosis confirmed at repeat monitoring after 100–120 days. A decrease in eGFR < 60 ml/min/1.73 m² was observed in 18% of participants. Albuminuria (ACR ≥ 30 mg/g) was recorded in 24% of patients, with the following levels distributed: normoalbuminuria — 47%, borderline — 29%, microalbuminuria — 21%, and macroalbuminuria — 3%.

In the group of patients with urinary system pathology ($n = 107$), early stages of CKD (KDIGO G1–G3) were confirmed in 26% of cases. A decrease in eGFR < 60 ml/min/1.73 m² was detected in 14% of participants, albuminuria — in 32%. The distribution of albuminuria was as follows: normoalbuminuria — 35%, borderline — 33%, microalbuminuria — 27%, macroalbuminuria — 5%.

The diagnostic value of the estimated glomerular filtration rate and albumin-to-creatinine ratio was confirmed by the study results. Albuminuria demonstrated high sensitivity as an early indicator of CKD ($p < 0.001$). The highest frequency of micro- and macroalbuminuria was observed in patients with arterial hypertension and cardiovascular disease, confirming the pathogenetic link between hypertensive vascular disease and the development of renal impairment.

The results of a prospective study showed that in the Kyzylorda region, risk groups—individuals with cardiovascular diseases and urinary tract pathologies—have a high prevalence of undiagnosed early stages of CKD.

3. Adaptation and psychometric validation of the Kazakhstani version of the international KDQOL-SF v1.3 questionnaire confirmed its reliability and reproducibility. The internal consistency of the scales specific to dialysis patients ranged from 0.71 to 0.89, with the exception of the cognitive functions scale (0.59), which is explained by the limited number of questions. Test-retesting showed high stability (0.79–0.99; $p < 0.001$).

A prospective comparative study involving 86 patients on hemodialysis showed a significant impact of educational interventions and monitoring. Patients in the intervention group ($n = 43$) demonstrated a significantly higher level of health literacy (median 30 versus 15 points in the control; $p < 0.001$), full adherence to treatment (100% versus 49%; $p = 0.001$; Cramer's $V = 0.613$), and high availability of information (91% versus 7%; $p < 0.001$). In the intervention group, 100% of patients reported constant monitoring by medical staff versus 57%

in the control group. A strong correlation was established between the level of literacy and adherence ($r = 0.751$; $p < 0.001$), availability of information ($r = 0.629$; $p < 0.001$) and control by health workers ($r = 0.644$; $p < 0.001$).

Quality of life assessed by the KDQOL-SF and SF-36 scales was significantly higher in the intervention group. In specialized domains, the greatest differences were noted on the scales "Symptoms/Problems" (75.2 ± 10.3 vs. 68.4 ± 15.4 ; $p < 0.001$), "Social Support" (69.4 ± 13.1 vs. 55.5 ± 18.3 ; $p < 0.001$), "Support of Dialysis Staff" (65.1 ± 10.7 vs. 51.2 ± 15.1 ; $p < 0.001$), "Satisfaction with Medical Care" (54.5 ± 12.1 vs. 41.2 ± 20.1 ; $p < 0.001$). In the general SF-36 scales, the indicators of physical functioning (71.3 ± 11.8 versus 66.2 ± 9.3 ; $p < 0.001$) and general activity (68.4 ± 14.2 versus 58.8 ± 21.2 ; $p < 0.001$) were significantly higher.

An assessment of the professional competence of 44 primary care physicians in the Kyzylorda region revealed significant knowledge gaps. The average score was 44.2 ± 7.5 with a target level of 65. Physicians with more than 7 years of experience showed better results (47.8 ± 6.8 vs. 40.4 ± 7.4 ; $p < 0.001$), especially in knowledge of risk factors (24.4 ± 3.1 vs. 20.9 ± 2.6 ; $p = 0.035$) and algorithms for managing patients with CKD (7.6 ± 2.4 vs. 6.8 ± 3.1 ; $p = 0.048$). Only 4.5% of experienced doctors and not a single young specialist had completed advanced training courses on CKD, while 82% of senior doctors attended specialized seminars versus 18% among doctors with less than 7 years of experience ($p < 0.001$).

4. The fourth objective of the study assessed the professional competence of primary care physicians in the Kyzylorda region in the early diagnosis, prevention, and management of patients with chronic kidney disease. The study included a prospective component and surveys of 44 general practitioners and internists working in primary care facilities in the region.

A structured questionnaire, "Assessment of Knowledge of Continuous Professional Education on Chronic Kidney Disease," based on the current clinical protocol of the Republic of Kazakhstan, was used to assess knowledge. The questionnaire covered five content domains: complaint assessment, CKD detection algorithms, risk factors, preventive measures, and patient management algorithms. The internal consistency of the instrument, based on the Cronbach's alpha coefficient, ranged from 0.73 to 0.81 for key scales reflecting clinically significant aspects (preventive measures - 0.81, patient management algorithm - 0.77, risk factors - 0.74, detection algorithm - 0.73), indicating high reliability. The "patient complaint assessment" scale showed moderate consistency (0.62).

The overall level of physician competence was insufficient. The average knowledge score was 44.2 ± 7.5 , compared to a target of 65. It was found that most physicians lack the skills to interpret biomarkers (eGFR, ACR) and do not apply calculation formulas, significantly limiting the early diagnosis of CKD.

A comparative analysis by experience revealed significant differences. Physicians with more than 7 years of experience demonstrated a higher overall level of knowledge (47.8 ± 6.8 vs. 40.4 ± 7.4 ; $p < 0.001$), as well as better

indicators of knowledge of risk factors (24.4 ± 3.1 vs. 20.9 ± 2.6 ; $p = 0.035$) and patient management algorithms (7.6 ± 2.4 vs. 6.8 ± 3.1 ; $p = 0.048$).

Significant educational gaps were identified. Only 4.5% of physicians with more than seven years of experience had completed specialized continuing education courses on CKD, compared to no such participants among young specialists. Meanwhile, 82% of experienced physicians participated in specialized seminars and conferences, compared to 18% of physicians with less than seven years of experience ($p < 0.001$), indicating a direct link between educational activity and knowledge level.

Based on the data obtained, a targeted educational program, "An Integrated Approach to CKD: Training for Primary Care," was developed, comprising 120 academic hours (4 credits). The program aims to address training gaps, enhance physicians' clinical competence in the early diagnosis, prevention, and management of CKD, and develop practical skills in calculating and interpreting eGFR and ACR, as well as organizing patient-centered education.

5. The primary objective of the fifth stage of the study was to develop applied tools and practical recommendations aimed at improving the diagnosis, prevention, and management of patients with chronic kidney disease in the Kyzylorda region. Based on the results of the previous stages, which included epidemiological analysis, assessment of physician competence, and patient quality of life, several key solutions were developed and tested.

nephrology care model focused on primary care has been developed. The model provides a consistent algorithm for the early detection, stratification, and management of patients with chronic kidney disease. Screening using estimated glomerular filtration rate and albumin-to-creatinine ratio has been implemented, confirming the diagnostic utility of this combined approach. A regional registry of patients with stages 1–5 has been created to systematically track disease progression. Regular monitoring of anemia and nutritional status has been introduced, with evidence demonstrating that anemia correction statistically significantly improves quality of life by improving vitality and physical functioning. Educational programs have been organized in the form of schools for patients and physicians.

The model integrates the validated KDQOL-SF questionnaire version 1.3 for routine assessment of the quality of life of patients on hemodialysis.

Given the identified competency gap among primary care physicians, a targeted educational program, "Integrated Approach to Chronic Kidney Disease: Training for Primary Care," was developed. The program is designed for 120 academic hours (4 credits) and includes theoretical and practical modules on diagnosis, stratification, therapy, and patient education. The practical component includes skills in calculating glomerular filtration rate, interpreting the albumin-to-creatinine ratio, and conducting educational discussions with patients. Implementation of the program promotes clinical competence and creates the preconditions for reducing morbidity and slowing disease progression.

Guidelines and information materials have been prepared for primary care physicians. They are aimed at supporting patient self-management, improving

communication, and routing. Practical recommendations have been formulated for managers and physicians at healthcare organizations, including incorporating albuminuria and estimated glomerular filtration rate indicators into screening protocols, expanding screening to include younger patients, developing individualized prevention and treatment plans that take into account comorbidities, ensuring access to diagnostics, treatment, and renal replacement therapy, improving hemodialysis patient education, and organizing a continuous education system for primary care physicians with the participation of visiting professors.

Approbation of dissertation work.

1. As part of the international forum “Practice Oriented Science: UAE – Russia – India”, which took place on July 31, 2024 in Dubai (United Arab Emirates), the results of the scientific research were tested in the format of a report in the “Medical Sciences” section,

2. As part of the Interuniversity International Congress "Higher Education: Scientific Research", held on July 25, 2024 in Moscow (Russian Federation).

Thus, the approbation covered international scientific platforms, confirming the relevance and significance of the conducted research.

Published works related to the dissertation research

As a result of the conducted study, 13 scientific works were published, including:

1 article in a journal indexed in the international databases Scopus and Web of Science Core Collection (Clarivate Analytics);

3 articles in journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan;

2 theses in the proceedings of international scientific and practical conferences;

4 authors' certificates;

2 methodological guidelines.

1. Pharmacy of Kazakhstan Journal, No.4 (August), 2022, pp. 73–79. DOI 10.53511/PHARMKAZ.2022.42.35.012. “Assessment of Risk Factors Affecting the Course of Chronic Kidney Disease and Progression of Renal Failure.”

2. Pharmacy of Kazakhstan Journal, No.1 (246), 2023, pp. 165–170. DOI 10.53511/PHARMKAZ.2023.41.92.023. “Risk Factors for the Progression of Renal Failure.”

3. Bulletin of KazNMU Journal, No.4, 2020, pp. 291–294. “Prevalence of Chronic Renal Failure in Kazakhstan.”

4. Interuniversity Scientific Congress, pp. 56–66. DOI 10.34660/INF.2024.88.80.072. “The Impact of Increased Literacy and Continuous Monitoring of Hemodialysis Patients on Quality of Life.”

5. International University Scientific Forum. Practice-Oriented Science: UAE–Russia–India, UAE, July 31, 2024, pp. 126–131. DOI 10.34660/INF.2024.75.56.004. “Adaptation of the KDQOL-SF Quality of Life Questionnaire for Patients with Chronic Kidney Disease for the Population of Kazakhstan.”

6. Scientific Reports, Vol. 13, 14710 (2023). DOI 10.1038/s41598-023-42031-2. Scopus, Percentile = 92. “Prevalence of Chronic Kidney Disease in Kazakhstan: Evidence from a National Cross-Sectional Study.”

7. Author’s Certificate No. 45514 dated May 6, 2024. Questionnaire “Dynamic Monitoring of Patients with Chronic Kidney Disease.”

8. Author’s Certificate No. 45513 dated May 6, 2024. Questionnaire “Kidney Disease and Quality of Life (KDQOL-SF™ 1.3).”

9. Author’s Certificate No. 45510 dated May 6, 2024. Questionnaire “Assessment of Literacy Level of Patients Receiving Hemodialysis.”

10. Author’s Certificate No. 45509 dated May 6, 2024. Questionnaire “Assessment of Continuing Professional Education Knowledge about Chronic Kidney Disease.”

11. Methodological Recommendations “Improving the Organizational Work of the Nephrology Service in Chronic Kidney Disease (CKD).”

12. Educational Program “An Integrated Approach to CKD: Training for Primary Health Care Physicians.”

The author's personal contribution to the research.

The dissertation topic, analysis design, and content were developed by the author personally based on a detailed study of the current state of the topic. The author conducted a clinical examination of the patients, reviewed the archival medical records of all studied patients, outlined the inclusion aspects, and also tracked the follow-up of patients with acquired kidney disease (CKD) and risk factors for renal failure in the Kyzylorda region. The dissertation candidate personally participated in the examination and analysis of the immediate and long-term recovery outcomes for all patients at various stages. The author presented the main provisions and wrote the dissertation text and abstract.

Structure and volume of the dissertation.

The work is presented on 180 pages of computer-typed text and includes 5 chapters, a list of references comprising 210 sources, and 9 appendices. The text contains 20 tables and 25 figures illustrating the results of the cross-sectional and prospective components of the study.