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Psychological features of the course of SARS-CoV-2 in individuals with chronic nephrology diseases

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Abstract:

BACKGROUND: It's already known for certain that SARS-CoV-2 can affect any vital human organ, and super-complex cases are even characterized by multiple organ pathology. In particular, complications of COVID-19 for the kidneys can be irreversible. Consequently, this virus forces us to review the approaches and standards of diagnosis and treatment in most nosologies to minimize the risks as much as possible. Thus, a low level of prediction of the course of coronavirus infection requires a comprehensive approach considering the psychological characteristics of the individual suffering from this disease.

MATERIALS AND METHODS: The method of chronometric testing is used to predict the predisposition to the course of SARS-CoV-2 with nephrotic complications (using an electronic chronoscope) and calculate the duration of an individual's biological life cycle to predict the severity of the course of coronavirus infection. Experimental study of the localization of symptoms of chronic nephrological diseases in typological groups of patients with SARS-CoV-2 using the method of psychodiagnostics. The duration of the study is six months 2020–2021. The study was conducted under the guidance of a nephrologist at the Odrex Clinic I.I.

RESULTS: The results of an experimental study show that the psychological type determines the predisposition to the course of SARS-CoV-2 with nephrotic complications; in most of these patients, severe (834 patients) forms of the course coincided with the end of quarters of the long biological cycle of an individual's life.

CONCLUSION: The chronopsychotype makes it possible to predict the predisposition of individuals to the course of SARS-CoV-2 with nephrological complications and the severity of the disease.

Keywords:

Chronopsychotype, duration of an individual's biological life cycle, SARS-CoV-2

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Introduction

COVID-19 has turned into a pandemic and causes continuous bio-psychosocial, spiritual, and economic problems around the world, mainly affecting unprivileged segments of the population. Ukraine gradually introduced new rules of life into the lives of Ukrainians—complete isolation of the population, which gradually began to affect the whole country and disproportionately increased the need for mental health protection. Therefore, the need for psychological support for people at risk increases significantly.[1]

Special attention should be paid to the features of the course of SARS-CoV-2 predicting the severity of its course for each patient. Medicine today takes into account risk factors rather than etiologic pathogenic factors in determining the severity of the disease. At the same time, the possibilities of psychological support are much greater. They also take into account the possibilities

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of a predictive psychosomatic approach to consider the individual's psychological characteristics that affect the course of the disease. And they should deserve attention from doctors.

In particular, how to protect patients with chronic kidney disease from severe complications and what well-established ideas should be reviewed. Chronic cardiovascular, pulmonary, and excretory diseases are always at increased risk for any infections, including epidemiological ones. Therefore, these patients should be given special attention during the pandemic.[2]

The second aspect that puts patients with chronic kidney disease at particular risk is that the virus enters through the cell receptors due to angiotensin-converting enzyme inhibitors (ACE inhibitors) receptors. And it, in turn, is a key enzyme that supports normal blood pressure, respectively, and it plays an important role in diseases of the heart, blood vessels (with bronchial asthma), and kidneys. It's important to note that these receptors have certain localization in the human organs and body systems. And it is so in the proximal tubules of the kidneys. That is why about 30% of patients with COVID-19, according to American experts, have changes in kidney function. These changes can have differences in different populations that are caused by the different genotypes or psycho types. For example, Chinese and Ukrainian doctors didn't report such a frequency as in the United States, where almost every third patient who came to the attention of doctors recorded not just changes but acute kidney damage.[3]

Actually, we are talking about a sudden failure of all kidney functions—an emergency condition that, with its manifest course, may require renal replacement therapy. But, fortunately, more often, patients had lesions that did not require dialysis.[4]

So, the currently known data suggest that SARS-CoV-2 is dangerous for high-risk groups, and, in certain populations, infection with it can lead to kidney damage, which requires some caution on the part of not only doctors but also scientists in research areas.

Psychological differentiation of individual psychological properties of a person shows that the signs of somatic disorders are fully consistent with them and, accordingly, can be quite predictable and determined following typological groups, as well as depend on the individual (own) biological time (Elkin D.G., Lisenkova V.P., Tsukanov B.I., Savenkova I.I.).[5-8] The dependence of individual typological characteristics of a person on time parameters (time characteristics, time factor, and unit of time), as well as their correlation, is an interdisciplinary problem, and therefore is studied by several sciences: philosophy, psychology, medicine, biology, physiology.[7,9,10] The application in practice of knowledge about the system of interdependencies and their relationship between individual typological characteristics of subjects, time characteristics, time factor, and unit of time in subjects suffering from nephrology disorders are of fundamental importance in conducting targeted psychological and somatic influence, in developing timely forecasting of the disease. As shown by the analysis of scientific literature on the problem of research, the study of the relationship and interdependence of somatic disorders, on the example of disorders of the nephrology profile in patients, taking into account individual typological characteristics of the individual, from time parameters (time characteristics, time factor and time unit), as well as their ratio, remained without the attention of scientists.

So, literature sources data give us an understanding that a person's psychological individual typological characteristics, as the aspect of somatic disorders occurring, have to be deeply studied and justified.

And it is here that the psychology of time can provide methodological assistance.[5] After all, P. Fress argued that the human biological clock is the brain itself.[11] Research of B.I. Tsukanov within the framework of the psychology of time and the human biological clock demonstrates that the work of this clock, which is based on more than a hundred biological rhythms, is innate, unchangeable, and highly stable.[8] So, if the countdown is so closely related to higher nervous activity, then the criterion for the quality of work of the internal organs of a person, that is, an indicator of the dynamics of the development of nephrology disorders, can be the reflection of time by an individual. The psyche as a reality was also discovered due to the time factor.[12] The research results allow us to talk about the temporal organization of the entire psyche, starting from sensation and ending with personality.[13] B.I. Tsukanov[8] managed to identify its unit of time and proved that the duration experienced directly can be represented as a series of discrete intervals that replace each other. Each individual has its unit of time, which does not change during life and determines the individual rhythmic structure of the human movement. Its discovery made it possible to build a model of the great biological cycle, which is consistent with the age-related periods of individual development and personality crises.

The law of time experience can be represented as a cycloid model—the trace of a "wheel that rolls without sliding." According to this model, special points were established—points of phase singularity, in which the ends and beginnings of cycles of different durations merge. In them, the most significant changes occur in the individual's psyche.[14,15] It's known that the individual

"τ-type" determines the belonging of an individual to its typological group and indicates its place in it.[16] The degree of severity of the disease, the process of recovery, and rehabilitation depends on the individual properties of the human psyche.[17] In other words, the "predominant" disease is one of the objective indicators of an individual's belonging to a certain typological group.[18] Based on the "τ-type", it's possible to assign a particular subject with high accuracy to a group with its "predominant" disease. The "predominant" diseases include chronic diseases. Insufficient development of the problem of "predominant" diseases of the nephrology profile, and the peculiarities of their manifestation in patients, led to the choice of the topic of our study.

The research purpose was to develop a system of psychological preventive and prognostic organizational measures for persons with nephrology disorders in the case of SARS-CoV-2 persistence, taking into account the individual typological characteristics of a patient's personality, depending on the time parameter.

Research objectives

(1) to analyze the data of scientific literature and study the theoretical foundations of psychological and somatic influence on subjects with nephrology disorders, taking into account the individual typological characteristics of a men's personality depending on the time parameters; (2) to determine the relationship between individual typological features in a group of subjects with nephrology disorders during COVID-19 and time parameters; (3) to develop a system of psychological and organizational measures of psychological and preventive orientation and forecasting on subjects with nephrology disorders.

Materials and Methods

Study design and setting

The study was carried out in the clinic "Odrex" in Odessa. The study was six months from November 2020 to April 2021. The study was conducted under the guidance of the Odrex Clinic's nephrology specialists. The documentary evidence is the advisory conclusions about the condition of patients in the Odrex Clinic.

The problem of time parameters of individual typological characteristics of subjects with nephrology disorders during the persistence of SARS-CoV-2 is far from being fully solved as the following question arises: is the individual typological differentiation of psychological characteristics consistent with nephrology disorders in individuals during SARS-CoV-2.

Study participants and sampling

Our task was to investigate the localization of nephrology symptoms during COVID-19 in typological groups-was solved experimentally on a contingent of patients aged 20–73 years who suffered from chronic nephrology diseases and were treated for SARS-CoV-2.

For each subject, a questionnaire was filled out, with the help of which the following were found: (1) age (indicating the number of years and months at the time of the examination); (2) date, month, year of birth; (3) type of chronic nephrological disease; (4) severity of the course of COVID-19; (5) table with the definition of individual's τ-own unit of time.

Data collection tool and technique

In each patient examined by the chronometric test method,[9] the "τ-type" was determined, for which the classical method of reproducing the intervals of duration to = 2, 3, 4, 5 s was used, which were set by the experimenter and reproduced by the subject using an electronic chronoscope with an accuracy of 0.001 s.

At the same time, each subject was asked to reproduce the duration that he experienced and was limited to two signals "beginning" and "end." These signals were the click that occurs when the chronoscope is turned on and stopped.

The subject reproduced the intervals that were set on this chronoscope. The individual value of "τ-type" was calculated using the formula (1):

$$\tau(\mathrm{Ct}) = \frac{\Sigma t_s}{\Sigma t_o}$$

where "t_o" is the duration set by the experimenter, and "t_s" is the duration reproduced by the subject.

This relation was first proposed by Ehrenwald[5] to characterize the individual results of the reproduction method. But if Ehrenwald and other authors[13,19] used this relation as an immeasurable coefficient, then Tsukanov[20] gives it the content of an individual's unit of time.

Indeed, a given interval "t_o" is the duration experienced in one section of the "arrow of subjective time", and the duration of "t_s" is reproduced in its second section, concerning which "t_o" is already in the past.

Based on this, Tsukanov concludes that a given interval of t_o in a situation of tense waiting breaks up into a certain number of a person's proper units, and in this case, the duration t_s consists of that number.[20]

This method of reproducing the duration for determining the "τ-type" allows us to solve problems with psychodiagnostic of the symptoms of chronic diseases. The reproduction of each time interval was repeated five

times, and then the average value of each individual's time unit was calculated.

We set a task: to study the manifestation of the "C-metric" on the example of nephrourological disorders in different periods of the disease (exacerbation, convalescence, and remission).

According to the law of experiencing one's own time by the subject,[19] the large biological cycle of an individual is determined by the formula.[12]

$$C = 8.5\ \tau \text{ (years)} \quad (2)$$

where "τ" is the individual chronotype. This unit acts as a "step" that measures the passage of time in each individual's life from birth.

Ethical consideration

All patients included in the research have given the informative agreement for including their medical data in the non-personification study. The Ethical Comity of the Clinic Odrex (Odesa) has considered the research and gave the resume, and the study was conducted according to the principles of the Helsinki declaration: protocol No. 5 from April 05, 2020.

Results

We examined 834 patients (men and women) with chronic kidney and urinary tract diseases during the course of SARS-CoV-2 aged 20–73 years. Of these, 127 patients suffered from chronic glomerulonephritis, 126 patients with chronic pyelonephritis, 310 patients with dysmetabolic nephropathies, 158 patients with renal failure, and 113 patients with enuresis [see Figure 1].

The results of our study showed that the indicators of the own unit of time in individuals suffering from chronic kidney diseases are mainly distributed in the range: 0.86 s ≤ τ ≤ 0.94 s, which corresponds to the localization of kidney disease in typological groups of the continuous spectrum of "τ-types."[10]

Subjects with somatic disorders of the nephrology profile are characterized by a balanced level of arousal and inhibition, that is, the median or ambivertic type dominates in terms of "extraversion—introversion" and "neuroticism—stability." The ambivert type of temperament is conditional critical point through which the border between two types of orientation passes: moderately extroverted and moderately introverted.[3]

Clinical diagnosis	"chronotype"	Quantitative distribution of studied subjects (834 = 100 %) Quantity persons
Chronic glomerulonephritis	0.7 ≤ Ct < 0.8	127
Chronic pyelonephritis	0.8 ≤ Ct< 0.86	126
Dysmetabolic nephropathies	0.86 ≤ Ct ≤ 0.94	310
Chronic kidney failure	0.94 < Ct ≤ 1.0	158
Enuresis	1.0 < Ct ≤ 1.1	113

Figure 1: Localization of manifestations of chronic kidney diseases in the spectrum of "chronotype". "Computed tomography" (Ct)

The possibility of timely prediction of the course of nephropathies makes it possible to prevent the exacerbation of this disorder. Unfortunately, until now, it is not always possible to use the most rational, etiological, principle of treatment in nephrology, but timely and effective medical and preventive measures of influence can in some cases significantly change the prognosis. The urgency and unresolved problem of timely diagnosis of kidney diseases prompted us to conduct a chronopsychological study.

Accounting and statistical age years of the examined patients with chronic glomerulonephritis during the period of exacerbation of the disease are summarized in Table 1.

Comparison of accounting and statistical years shows that in "average group patients" chronic glomerulonephritis begins at an age determined in terms of an integer or the fractional number of long biological cycles lived, and the exacerbation of diseases coincides with the end of a long cycle or with the end of its quarter.

Here are individual data from some patients from the group of people suffering from chronic glomerulonephritis. They have a "C-frequency" manifestation of the disease.

Patient N. (τ = 0.86 s = 7.3 p.). He was caught in the respiratory department at the age of 65 years and 8 months: 12 days with high renal pressure, edema on the upper eyelids, changes in the general urinalysis (proteinuria, hematuria, cylindruria). In the blood test: accelerated ESR. The SARS-CoV-2 test was positive. Estimated age: 9 s. From the medical history: the first exacerbation of the disease was at the age of 36 years and 6 months. Estimated age: 5 s. The second exacerbation of the disease was at the age of 51 years, 1 month, and 6 days. Estimated age: 7 S.

Patient Ch. (τ = 0.87 S = 7.4 years) at the age of 48 years, 1 month and 6 days, edema appeared on the upper eyelids, pain in the lumbar and abdominal areas. In the general analysis of urine: proteinuria, macrohematuria, cylindruria. In the blood test: hypoproteinemia, hyperlipidemia, accelerated ESR. The SARS-CoV-2 test is positive. Estimated age: 6½ S. From the medical history: the first exacerbation of the disease was at the age of

29 years, 7 months, and 6 days. Estimated age: 4 S. The frequency of exacerbation is 1½ S.

Patient A. (τ = 0.89 s. S = 7.6 years). At the age of 58 years, 10 months, and 24 days, the patient noticed changes in the color of urine and complained of abdominal pain. In the general analysis of urine: proteinuria, macrohematuria, cylindruria. In the blood test: accelerated ESR. Clinically: moderate edema syndrome, hypertension syndrome. The SARS-CoV-2 test was positive. Estimated age: 7— S. From the medical history of the disease: the first exacerbation of the disease was at the age of 53 years, 2 months, and 12 days. Estimated age: 7 S. The frequency of exacerbation is — S.

Comparison of calculated and statistical periods show that in "average patients' group" *chronic pyelonephritis* begins at the age determined by a fractional number of long biological cycles lived, and the exacerbation of diseases coincides with the end of a long cycle or with the end of its quarter [Table 2].

Here are individual data of some patients from the group of patients suffering from chronic pyelonephritis. They have a "C-frequency" manifestation of the disease.

Patient T. (Ct = 0.88, S = 7.4 years) was admitted to the therapeutic department at the age of 37 years with a diagnosis of chronic pyelonephritis, acute period. The patient had symptoms of intoxication (fever, vomiting), dysuric syndrome, pain in the lumbar region. The SARS-CoV-2 test is positive. The estimated age of exacerbation of the disease: 5 C.

From the medical history of the disease, it's known that the first exacerbation was at the age of 22 years, 2 months, and 12 days. The estimated age of the 1st exacerbation: 3 S. The second exacerbation of the disease was at the age of 29 years, 7 months, and 6 days. The estimated age of the 2nd exacerbation: 4S. Frequency of exacerbation: S.

Calculated and statistical age/years of the examined individuals with metabolic nephropathies during the acute period are summarized in Table 3.

Comparison of calculated and statistical years shows that in "average group" patients, *metabolic nephropathies* begin at an age determined in terms of an integer or the fractional number of large biological cycles experienced, and the exacerbation of the disease coincides with the end of a long cycle or with the end of its quarter. Here

Table 1: Accounting and statistical age of onset of glomerulonephritis

Group	«Chronotype" (in s)	S	Cycles (in years)			Statistical age of patients	σ
Men (30ind.)	0.86 ≤ Ct ≤ 0.88	7.3	5S	7S	9S	36-51-65	1.7
			36.5	51.1	65.7		
Women (21ind.)	0.86<Ct ≤ 0.87	7.4	4S	6½S	8S	29-48-59	1.4
			29.6	48.1	59.2		
Men (20ind.)	0.89 ≤ Ct ≤ 0.91	7.6	7S	7-S	8½S	53-58-64	1.2
			53.2	58.9	64.6		
Women (20ind.)	0.89< Ct ≤ 0.90	7.7	7¼S	8S	9-S	55-61-75	1.1
			55.8	61.6	75.1		
Men (20ind.)	0.92 ≤ Ct ≤ 0.94	7.8	4-S	6S	7¼S	37-46-56	1.3
			37.1	46.8	56.6		
Women (16ind.)	0.92<Ct ≤ 0.93	7.9	6S	6½S	7S	47-51-55	1.1
			47.4	51.4	55.3		

Computed tomography (Ct)

Table 2: Accounting and statistical age of onset of pyelonephritis exacerbation

Group	"Chronotype" (in s)	S	Cycles (in years)			Statistical age of patients	σ
Men (19ind.)	0.86 ≤ Ct ≤ 0.88	7.4	3S	4S	5S	22-29-37	1.6
			22.2	29.6	37		
Women (12ind.)	0.86 ≤ Ct <0.87	7.3	4S	5½S	7S	29-40-51	1.3
			29.6	40.2	51.1		
Men (31ind.)	0.89 ≤ Ct ≤ 0.91	7.7	7S	7-S	8½S	53-59-65	1.3
			53.9	59.7	65.5		
Women (34ind.)	0.89 ≤ Ct <0.90	7.5	7 ¼S	8S	9-S	54-60-73	1.1
			54.4	60	73.1		
Men (10ind.)	0.92 ≤ Ct ≤ 0.93	7.9	4-S	6S	7 ¼S	37-47-57	1.7
			37.5	47.4	57.2		
Women (10ind.)	0.92 ≤ Ct <0.93	7.8	6S	6½S	7S	46-50-54	1.3
			46.8	50.7	54.6		

Computed tomography (Ct).

Table 3: Accounting and statistical age of onset of dysmetabolic nephropathy exacerbation

Group	"Chronotype" (in s)	S	Cycles (in years)			Statistical age of patients	σ
Men (35ind.)	0.8< Ct <0.86	7.0	3S	4S	5S	21-28-35	1.3
			21	28	35		
Women (41ind.)	0.8< Ct ≤ 0.86	7.1	4S	5½S	7S	28-39-49	1.1
			28.4	39.05	49.7		
Men (35ind.)	0.87 ≤ Ct ≤ 0.89	7.4	7S	7-S	8½S	51-57-62	1.2
			51.8	57.4	62.9		
Women (37ind.)	0.89 ≤ Ct<0.9	7.6	7 ¼S	8S	9-S	55-60-74	1.1
			55.1	60.8	74.1		
Men (32ind.)	0.9 ≤ Ct ≤ 0.93	7.8	4-S	6S	7 ¼S	37-46-56	1.6
			37.1	46.8	56.6		
Women (130ind.)	0.9 ≤ Ct ≤ 0.92	7.7	6S	6½S	7S	46-50-53	1.3
			46.2	50.1	53.9		

Computed tomography (Ct)

are individual data from some patients from the group of patients suffering from metabolic nephropathies. They have a "C-frequency" manifestation of the disease.

Patient S. (Ct = 0.81 s = 7.0 years) was caught in the therapeutic department with complaints of pain in the lumbar region and with polyarthritis. The SARS-CoV-2 test was positive. Objectively: vegetative disorders (hypotension, excessive sweating), urinary syndrome. In the urine test: uraturia, hyperstenuria. Patient's age: 35 years.

From the medical history of the disease: at the age of 21, transient changes in urine (proteinuria, phosphaturia, leukocyturia) were observed. The estimated age of the first exacerbation: 3 S. The estimated age of the second: 5 S. Frequency of exacerbation: 2 S.

Patient P. (Ct = 0.82 S = 7.0 years). On the dispensary register with a diagnosis of metabolic nephropathy in the early stage as well as oxalaturia. From the medical history, it's known that the first exacerbation of the disease occurred at the age of 28 years, the second, at the age of 35 years. The SARS-CoV-2 test was positive. The estimated age of the first exacerbation: 4 S. The estimated age of the second: 5 S. Frequency of exacerbation: S.

Patient A. (Ct = 0.81 S = 7.1 years) was born on December 21, 1939. She was admitted to the therapeutic department at the age of 39 years, 1 month, and 6 days with a diagnosis of metabolic nephropathy in the early-stage phosphaturia. The SARS-CoV-2 test was positive. From the medical history of the disease: first exacerbation was at the age of 28 years, 4 months, and 24 days. The estimated age of the first exacerbation: 4 S. The estimated age of the second is 5½ S. Frequency of exacerbation: 1½ S.

Accounting and statistical age/years of the examined individuals with functional enuresis are summarized in Table 4. Comparison of calculated and statistical years shows that in "average group" patients, *functional enuresis* begins at the age determined in terms of an integer or the fractional number of experienced large biological cycles.

Here are individual data from some patients from the group of patients suffering from functional enuresis. They have a "C-frequency" of the onset of the disease.

Patient O. (Ct = 0.81 S = 7.0 years). Symptoms of urinary incontinence appeared at the age of 24 years and 6 months. General urinalysis—non-pathology. According to the results of the cystoscopy, neurogenic bladder hyperreflexia was fixed. The SARS-CoV-2 test was positive. Estimated age: 3½ S.

Patient P. (Ct = 0.82 S = 7.0 years) was hospitalized at the age of 31 years, 6 months, and 19 days with the symptoms of nighttime urinary incontinence. The SARS-CoV-2 test was positive. Calculated index: 4 ½ S.

Patient D. (Ct = 0.83 S = 7.1 years) was hospitalized at the age of 38 years and 6 months with the symptoms of urinary incontinence. The examination revealed no changes in the general urinalysis. The SARS-CoV-2 test was positive. Estimated age: 5½ S.

What was common among all subjects? The manifestations of enuresis coincided with the ends of a quarter of long cycles or full cycles depending on the value of the chronotype in the spectrum of "subject time orientation."

Discussion

Why exactly do kidney diseases predominate in a group of individuals whose own unit of time is in the range of 0.86 s ≤ τ ≤ 0.94 s during the course of SARS-CoV-2? The answer to this question is given by the teaching of Hippocrates, Tsukanov, Savenkova according to which, in the psychological structure of an individual, his type of temperament, there is a locus minoris resistentie that

Table 4: Accounting and statistical age of onset of functional enuresis

Group	"Chronotype" (in s)	S	Cycles (in years)			Statistical age of patients	σ
Men (13ind.)	0.8< Ct <0.86	7.0	3½S	4½S	5½S	24-31-38	1.4
			24.5	31.5	38.5		
Women (32ind.)	0.8< Ct ≤ 0.86	7.1	4 ¼S	5S	5 ¼S	30-35-37	1.2
			30.2	35.5	37.1		
Men (13ind.)	0.87 ≤ Ct ≤ 0.89	7.4	3S	4S	5S	22-29-37	1.7
			22.2	29.6	37		
Women (15ind.)	0.89 ≤ Ct<0.9	7.6	4½S	5S	5½S	34-38-41	1.3
			34.2	38	41.8		
Men (20ind.)	0.9 ≤ Ct ≤ 0.93	7.8	4-S	6S	7 ¼S	37-46-56	1.7
			37.1	46.8	56.6		
Women (20ind.)	0.9 ≤ Ct ≤ 0.92	7.7	6S	6½S	7S	46-50-53	1.6
			46.2	50.1	53.9		

Computed tomography (Ct)

indicates the place of least resistance for each person. As we can see, the urinary system is the "place of least resistance" in individuals with these indicators of their unit of time.

Significantly, this includes individuals of a "purely" equilibrium type of temperament (τ = 0.9 years), as well as with sanguine and melancholic manifestations.[9] Individuals with τ = 0.9 s, according to Eysenck indicators, are at conditional zero, they have an average level of arousal and inhibition that balance each other, and the distinguishing feature of their behavior is caution without fear. This type of temperament was named "equilibrium" by B.I. Tsukanov.[8,20] The disease itself has drawn the boundaries of the spread of chronic kidney diseases in the range of 0.86 s ≤ τ ≤ 0.97 s and does not go beyond these groups.

And such a differentiation of the values of the proper unit of time will make it possible not only to predict the type of disease but also the form of its possible manifestation. Therefore, it can be argued that individuals with these values of their time unit are at risk of kidney disease during the course of SARS-CoV-2.

Based on a randomized representative distribution of "τ-types" in the human population, taking into account the boundaries of typological groups,[14] it's not difficult to see that the smallest group in the human population is the "equilibrium" type group (4%). If we compare the statistics of diseases according to the World Health Organization, then chronic non-communicable diseases of the kidneys and urinary tract in the absence of congenital pathology make up the smallest percentage group among the adult population.

In our opinion, medicine can find an explanation of statistical data on the chronization of kidney diseases if it takes into account the psychological characteristics of the patient's personality.

All this makes it extremely important to focus the efforts of clinicians and psychologists on finding means and methods that can maximize the time of the pre-dialysis period for the development of chronic renal failure, that is, timely forecasting of the course of kidney diseases and timely prevention of the development of renal failure. In this regard, there is a growing interest of researchers in studying the mechanisms of progression of renal diseases, primarily chronic glomerulonephritis, which, together with tubulointerstitial nephritis and amyloidosis, often acquires the significance of a secondary lesion that develops within a certain chronic systemic or metabolic-endocrine disorder.[21]

It's generally accepted that there is a steady increase in the number of patients who need long-term (lifelong) hemodialysis, peritoneal dialysis, or kidney transplantation—in all economically developed countries, the number of patients who are again on dialysis significantly exceeds the number of deaths, and the general group of patients receiving renal therapy is significantly increasing. So, in Ukraine, at the end of 2020, more than 372 thousand patients were in therapy, which was two times higher than in 2010. Moreover, it's predicted that the number of patients with uremia will increase annually by 6% over the next ten years, so by 2030, it will amount to more than 650,000 people.[15] It's also important to emphasize that the average age of patients undergoing hemodialysis is steadily increasing; at the same time, approximately one-third of the patients who join the therapy program aged 65–74 years die during the first year of such treatment from coronary heart disease, including 12% from myocardial infarction; 20% of patients have atherosclerotic damage to peripheral arteries, 11%—cerebrum and vascular encephalopathy.

The results of our study indicate that the indicators of the proper unit of time in patients with chronic pyelonephritis are distributed in the range of 0.86 s ≤ τ ≤ 0.93 s, which corresponds to the localization of kidney

disease in typological groups of the continuous spectrum of "τ-types." In general, pyelonephritis is considered a microbial-inflammatory process of tubulointerstitial kidney tissue. In the classification of pyelonephritis, primary and secondary pyelonephritis are distinguished. The secondary is divided into obstructive and metabolic disorders.

But modern medicine is unable to explain and predict the development of a certain form of pyelonephritis. The fact that many etiological factors that cause the development of pyelonephritis are listed, without justifying what exactly causes a certain form of development of this disease, calls into question the validity of these causes.

And the answer to the question, why in patients with SARS-CoV-2 causes significant changes in the composition of urine and at the same time the disease proceeds in an asymptomatic form, we don't find it in clinical diagnosis.

Modern medicine prefers the infectious factor in the occurrence of pyelonephritis. Among the bacterial etiology, *Escherichia coli* can be marked. It causes about 70% of pyelonephritis development. Other aggressive factors which can contribute to kidney diseases are *Proteus spp*., *Staphylococcus spp*., and *Chlamydia spp*. So, what diagnosis should a doctor make when bacterial urine culture does not produce a pathogenic amount of microflora, and changes in urine exist?

Examination of individuals suffering from chronic pyelonephritis confirmed the teaching that the urinary system is the "place of least resistance" in individuals with their unit in the range: $0.86\ s \leq \tau \leq 0.93\ s$, which includes individuals with a "purely" equilibrium type of temperament, as well as with sanguine and melancholic manifestations. All examined patients with dysmetabolic nephropathies according to" τ-types " were located in the range: $0.87\ s \leq \tau \leq 0.94\ s$. Common to these diseases is mainly the defeat of interstitial tissue with the deposition of salts, which even leads to the formation of infiltrates in the future. In urine tests, this is manifested by the accumulation of oxalates (oxalaturia), urates (uraturia), phosphates (phosphaturia). These forms of nephropathies are explained by a violation of the metabolism of glucose, uric, and phosphoric acid, respectively. But the reasons for the violation of these exchanges are not clear and medicine cannot predict this or that form of nephropathy with the help of clinical data.

We find explanations taking into account the psychological characteristics of each patient with such a disease. The examined patients for such form of metabolic nephropathy as uraturia had the corresponding values of their unit of time in the continuous spectrum of "τ-types": $0.9\ s \leq \tau \leq 0.92\ s$.

The examined patients for such form of metabolic nephropathy as oxalaturia had the corresponding values of their unit of time in the continuous spectrum of "τ-types": $0.87\ s \leq \tau \leq 0.89\ s$.

The examined patients for such form of metabolic nephropathy as phosphaturia had the corresponding values of their unit of time in the continuous spectrum of "τ-types": $0.93\ s \leq \tau \leq 0.94\ s$.

Examination of patients suffering from metabolic nephropathies confirms the teaching that the urinary system is the place of least resistance in individuals with their time unit in the range: $0.87\ s \leq \tau \leq 0.94\ s$, which includes individuals with a "purely" equilibrium type of temperament, as well as with sanguine and melancholic manifestations.

Moreover, it's possible to predict the form of manifestation of the disease and carry out timely prevention of the disease, taking into account traditional medical prevention schemes for patients with excretory tract disease.

Limitation and recommendation

The novelty of the study is that when predicting the course of coronavirus infection, it is important to follow a comprehensive approach of taking into account the psychological characteristics of the person suffering from this disease.

Further research should be directed to the study of the consistency of periods of exacerbation, convalescence, and remission of kidney disease with the duration of the biological life cycle of a person who has suffered from COVID-19.

Conclusion

For effective prevention in medicine, it's necessary to fully take into account the individual psychological characteristics of each individual prone to chronic nephrology diseases. This will make it possible to predict the place of its least resistance, first of all, such individual nosology forms of diseases as pyelonephritis, glomerulonephritis, metabolic nephropathies, cystitis.

Indicators of the own unit of time in patients with SARS-CoV-2 persistence suffering from chronic kidney disease are distributed in the range: $0.86\ s \leq \tau \leq 0.94\ s$, which corresponds to the localization of kidney disease in typological groups of the continuous spectrum of "τ-types."

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Conflicts of interest

There is no conflict of interest in each possible case in our research.

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