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Assessment of the influence of vitamin D level on the course of chronic hepatitis C in comorbidity with chronic pancreatitis

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Abstract. Background. Chronic hepatitis C (CHC) is often complicated by the presence of concomitant gastrointestinal diseases, one of which is chronic pancreatitis (CP). This has a negative impact on the clinical course of both diseases, contributes to nutrient deficiencies, in particular vitamin D, and worsens the quality of life of patients. The aim of the research was to study the features of the clinical course of CHC in comorbidity with CP and to evaluate the quality of life in patients with different levels of vitamin D in blood serum. **Materials and methods.** The study included 120 patients who were divided into 2 groups: group 1 — 72 patients with CHC and CP and group 2 — 48 patients with CHC. In turn, patients of group 1, depending on the enzymatic activity of the pancreas, were divided into group 1a (n = 52), which included patients with CHC and CP with exocrine insufficiency (EI), and group 1b (n = 20) — patients with CHC and CP with preserved exocrine function of the pancreas. In all patients, fecal coproscopy was performed, the level of fecal elastase (FE-1), vitamin D, viral load was determined, and the degree of fibrosis and necroinflammatory activity was evaluated using FibroTest and ActiTest. Situational anxiety was assessed according to the Spielberger-Hanin method, and quality of life using the SF-12 questionnaire. The analysis and processing of the results of the examination of patients was carried out using the computer program Jamovi 2.3.2.1, Microsoft Office Excel for Windows 2016 using the Kruskal-Wallis method, the Mann-Whitney-Wilcoxon criterion and the Pearson correlation coefficient. The difference was considered to be statistically significant at $p < 0.05$. **Results.** A significantly lower level of vitamin D was found in patients of group 1a than in patients of groups 1b and 2. Patients of group 1 with higher stages of fibrosis (F2–3 and F3–4), a higher degree of necroinflammatory activity in the liver (> A2) and a high viral load have lower levels of vitamin D than those with initial stages of fibrosis and less severe necroinflammatory process in the liver. Patients with CHC, CP and exocrine insufficiency complained of mood changes, increased anxiety, rapid fatigue, and muscle weakness significantly more often than those with preserved exocrine function and patients with CHC. The level of vitamin D in people with CHC, CP and exocrine insufficiency positively correlates with the level of FE-1. In all patients with CHC in comorbidity with CP, a negative effect of low levels of vitamin D on indicators of quality of life and anxiety was found. **Conclusions.** A reduced level of vitamin D in the blood of patients with CHC and CP worsens the course of the disease and is associated with a decrease in quality of life.

Keywords: vitamin D; chronic hepatitis C; degree of liver fibrosis; chronic pancreatitis; enzymatic activity of the pancreas; quality of life

Introduction

Hepatitis C virus (HCV) is one of the most common causes of hepatitis [1]. Its course is complicated by the presence of extrahepatic manifestations and other diseases of the gastrointestinal tract. One of these diseases is chronic pancreatitis (CP), which causes a severe course of chronic

hepatitis C (CHC) and a decrease in the patient's quality of life [2, 3].

Vitamin D is an important biological compound that affects various physiological functions of the human body. Unlike other vitamins, vitamin D is a prohormone. Its primary function is to influence calcium-phosphorus



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metabolism, but it also plays an important role in protecting people from infectious pathogens, reducing the risk of autoimmune reactions, and maintaining health. A low level of vitamin D increases susceptibility to infections and the risk of autoimmune diseases [4]. Insufficiency of this vitamin is very common: according to scientists, about 1 billion people in the world have a reduced serum concentration of vitamin D.

C. Zhu et al., X. Cui et al. showed that vitamin D deficiency is associated with the presence of muscle weakness due to impaired phosphorus-calcium metabolism [5, 6]. According to L.L.N. Husemoen et al., Y. Cheng et al. receptors for vitamin D are present in the brain in areas responsible for regulating emotions and behavior, and a lack of vitamin D leads to deterioration of mental functions (rapid fatigue, mood deterioration, increased anxiety), which negatively affects the quality of life of patients with chronic liver and pancreatic gland diseases [7, 8].

The prevalence of vitamin D deficiency in patients with CHC, according to various authors, is from 39.2 to 71 % and in patients with CP — from 22 to 86.6 %, respectively [9, 10]. According to the literature, 30–70 % of patients with CP develop exocrine insufficiency (EI) [11], which in turn leads to steatorrhea and reduced absorption of vitamin D, and as a result contributes to a decrease in its level in the blood and the emergence of negative physiological effects related to vitamin D deficiency [9].

O.P. Shevchenko-Makarenko et al. reported that HCV has a serious negative impact on patient quality of life [12]. In addition, according to L.S. Babinets et al., the severity of liver fibrosis and the presence of concomitant diseases of the gastrointestinal tract are recognized as factors that correlate with a lower level of quality of life in patients with CHC [13]. The impact of vitamin D deficiency on the quality of life of patients with CHC with concomitant CP is insufficiently studied, although its deficiency contributes to liver damage and accelerates the progression of fibrosis [14–16]. On the other hand, the presence of concomitant diseases, especially those that can be accompanied by a decrease in the absorption of fat-soluble vitamins (CP, cystic fibrosis, celiac disease, Crohn's disease), increases the likelihood of vitamin D deficiency and the development of related with it negative effects [9].

The purpose of the study is to investigate the features of the clinical course of CHC in comorbidity with CP and to assess the quality of life in patients with different serum vitamin D levels.

Materials and methods

There were 120 patients under observation, who were divided into 2 groups: group 1 — the main group, which consisted of 72 patients with CHC and CP and group 2 (comparison) — 48 patients with CHC (45.8 % men (22/48), 54.2 % women (26/48), average age 49.60 ± 7.22 years). The patients of group 1, depending on the enzymatic activity of the pancreas, were divided into group 1a, who had CHC in comorbidity with CP and exocrine insufficiency ($n = 52$; 55.8 % men (29/52), 44.2 % women (23/52), average age 52.40 ± 7.56 years) and 1b group ($n = 20$; 55 % men (11/20), 45 % women (9/20), average age 50.60 ± 7.73 years)

patients with CHC and CP with preserved exocrine function of the pancreas. The studied groups were homogeneous by gender and age.

Inclusion criteria: patients aged 18–70 years with a confirmed diagnosis of CHC with and without concomitant CP who agreed to participate in the study.

Exclusion criteria: the age of the subjects is less than 18 and more than 70 years; presence of markers of infection by other hepatitis viruses (A, B, D), autoimmune hepatitis and autoimmune pancreatitis, HIV infection; alcohol abuse; smoking; taking corticosteroids, immunosuppressive drugs; the presence of concomitant diseases of internal organs in the stage of decompensation, the patient's refusal to participate in the study.

All participants signed an informed consent to conduct research, the structure of which corresponded to the officially agreed, and the research itself to the requirements of the Declaration of Helsinki (1975) as amended, the International Code of Medical Ethics (1983) and the relevant laws of Ukraine and WHO regulations. The study was approved by the local ethics commission of the State Higher Educational Institution “Uzhhorod National University” (protocol No. 13/4 dated October 19, 2023).

The scientific research was carried out within the departmental theme “Combined pathology and correction of homeostasis disorders of residents of the Carpathian region, taking into account adverse factors”, state registration number 0121U110808 of the department of faculty therapy of the State Higher Educational Institution “Uzhhorod National University”.

The diagnosis of HCV was made in accordance with the International Classification of Diseases of the 10th revision and verified by the detection of total antibodies of the IgG class to the structural and non-structural proteins of HCV (antiHCV IgG+), as well as the indication of HCV + RNA in the blood with determination of the viral load and genotyping.

General clinical, biochemical, serological, and molecular genetic studies were carried out in certified laboratories of the central city clinical hospital of Uzhhorod, communal non-commercial enterprise “Regional Clinical Infectious Disease Hospital” of the Transcarpathian Regional Council, and commercial laboratories. Indicators of biochemical blood analysis — total bilirubin with its fractions, total protein and its fractions, activity of alanine aminotransferase and aspartate aminotransferase, alkaline phosphatase and γ -glutamyl transpeptidase were determined using an automatic biochemical analyzer and original ChemWell reagents Awareness Technology Inc. (USA).

The degree of activity of the pathological process was determined by the level of increase in alanine aminotransferase activity, according to the international classification of liver diseases (Los Angeles, 1994). The degree of fibrosis and necroinflammatory activity of the liver was determined using a non-invasive diagnostic method — FibroMax, which includes: FibroTest, ActiTest, SteatoTest, AshTest, NashTest and is produced by BioPredictive (Paris, France). Also, the patients underwent an ultrasound examination of the abdominal organs according to the generally accepted method. All patients underwent stool coproscopy, where the appearance

of a small amount of neutral fat, altered muscle fibers and extracellular starch made it possible to suspect a violation of the exocrine function of the pancreas and the formation of chronic pancreatitis.

The diagnosis of CP was established in accordance with the Marseille-Rome criteria (1989) with additions and clarifications of the International Classification of Diseases of the 10th revision [16], as well as in accordance with the Order of the Ministry of Health of Ukraine dated September 10, 2014, No. 638 “On the approval and implementation of medical and technological documents on the standardization of medical of help in chronic pancreatitis”.

The exocrine function of the pancreas was evaluated based on the results of fecal coproscopy and pancreatic fecal elastase-1 (FE-1), which was studied by means of ELISA, using the test systems of ScheBo® Biotech AG (Germany). The interpretation of the results was carried out according to the following gradation: the level of FE-1 in feces is more than 200 µg/g of feces — the exocrine secretory function of the pancreatic gland is preserved; 150–200 µg/g of feces — a mild degree of exocrine insufficiency; 100–150 mcg/g of stool — moderate EI; less than 100 mcg/g of feces — severe EI.

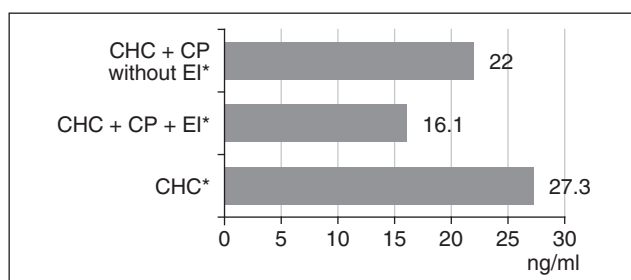


Figure 1. The level of vitamin D in patients with CHC and CHC and CP

Note: * — $p < 0.001$ when comparing groups.

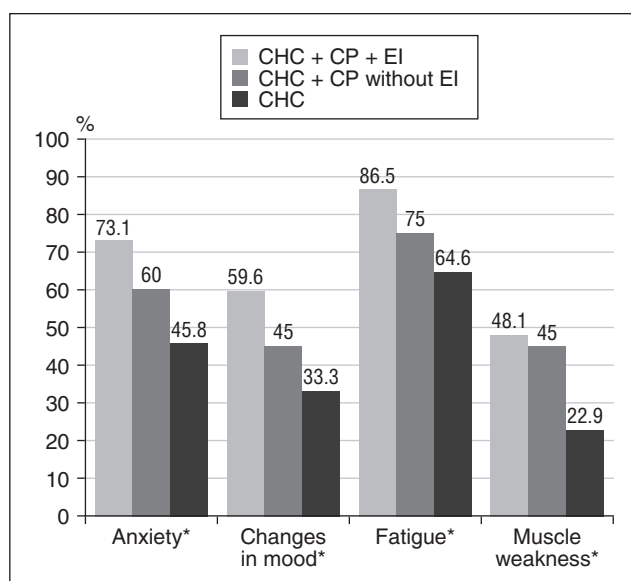


Figure 2. Frequency of complaints related to vitamin D deficiency in different groups of patients

Note: * — $p < 0.05$ when comparing groups.

Research on the level of 25(OH) D was carried out in certified commercial laboratories. Assessment of vitamin D status was carried out according to the classification of M.F. Holick (2011), according to which vitamin D deficiency is established at a level of 25(OH)D in blood serum < 20 ng/ml, vitamin D insufficiency is diagnosed at levels of 25(OH)D — 20–29 ng/ml; the level of 25(OH)D — 30–85 ng/ml is considered to be within the normal range.

To assess the quality of life, we used the SF-12 quality of life questionnaire — a shortened version of the SF-36 questionnaire, which is much easier for respondents. This questionnaire is able to provide information about the state of physical and mental health. Indicators of each scale are measured in points (from 0 to 100), and a higher score indicates a higher quality of life. Values of indicators of physical and mental components of health from 0 to 20 points correspond to a poor quality of life; 21–40 — average; 41–60 — good; 61–80 — very good; 81–100 — excellent. The value of the integral indicator of quality of life is determined by calculating the arithmetic mean of the sum of indicators. The scales of the test make it possible to evaluate two integral indicators characterizing the quality of life: physical component of health and mental component of health.

Situational anxiety was determined using the Spielberger-Hanin method. When analyzing the results, the following anxiety scores were used: less than 30 points — low, 31–44 points — average, more than 45 points — high.

The analysis and processing of the results of the examination of patients was carried out using the computer program Jamovi 2.3.21 (Australia), Microsoft Office Excel for Windows 2016 (USA), Statistics for Windows v.7.0 (StatSoft Inc., USA) using non-parametric methods for evaluating the obtained results. The normality of the distribution of interval variables was assessed by the Shapiro-Wilk criterion. Mean values are shown as $M \pm SD$. Comparison of mean values was performed using the Mann-Whitney U test and the Kruskal-Wallis criterion depending on the number of groups. Categorical data analysis was performed using Pearson's χ^2 test with Yates correction and Fisher's exact test. The relationship between interval data was analyzed using the Pearson correlation coefficient. The assessment of the strength of the connection between the variables was carried out according to the Chaddock scale. The difference was considered statistically significant at $p < 0.05$.

Results

When analyzing the obtained data, we established that the level of vitamin D was reduced in all the examined. However, patients of the first group have a significantly lower average level of vitamin D than patients of the second group (17.70 ± 3.39 ng/ml vs. 27.3 ± 1.9 ng/ml, $p < 0.001$).

By comparing the data of patients with different enzymatic function of the pancreas, it was found that the level of vitamin D is significantly lower in the group of patients with CHC and CP with EI than in patients with CHC and CP with preserved exocrine function of the pancreas (16.00 ± 2.29 ng/ml versus 22.00 ± 1.52 ng/ml, $p < 0.001$) (Fig. 1).

Analyzing the complaints, we found that patients with CHC and CP with CKD and, accordingly, the lowest level of vitamin D, are more often bothered by mood changes, increased anxiety, rapid fatigue, and muscle weakness. In particular, increased anxiety was subjectively noted by 73.1 % (38/52) of patients in the group 1a (CHC, CP, and EI), 60.0 % (12/20) of patients in the group 1b (CHC and CP without EI) in comparison with patients of the second group (CHC), where there were 45.8 % (22/48) of such persons ($p = 0.021$); mood changes — 59.6 % (31/52) of patients in group 1a, 45.0 % (9/20) of patients in group 1b and 33.3 % (16/48) of patients in group 2 ($p = 0.031$); rapid fatigue — 86.5 % (45/52) of patients of the first group, 75.0 % (15/20) of the patients of the group 1b against 64.6 % (31/48) of the patients of the second group ($p < 0.037$); muscle weakness — 48.1 % (25/52) of patients of the first group, 45 % (9/20) of the patients of the first group, compared with 22.9 % (11/48) of the patients of the second group ($p = 0.026$) (Fig. 2).

When comparing the serum vitamin D content of patients with CHC and CP, a statistically significant difference in values was found depending on the degree of fibrosis and necroinflammatory activity in the liver. It was established that a lower level of vitamin D is significantly more often registered in patients with CHC and CP with a high degree of fibrosis (F2–3 and F3–4) and pronounced necroinflammatory activity in the liver than in patients with initial stages of fibrosis and less pronounced necro-inflammatory activity in the liver ($p = 0.008$ and $p < 0.001$, respectively).

However, when comparing the obtained values, it was found that the level of vitamin D in CHC patients is significantly higher than in CHC and CP patients with similar stages of fibrosis and necroinflammatory activity ($p < 0.05$) (Table 1).

It was found that in patients with CHC and CP with chronic liver disease with high degrees of necroinflammatory activity in the liver (A2–3 and A3–4) and a deep degree of fibrosis (F3–4), a lower level of vitamin D is determined ($p = 0.018$

Table 1. Vitamin D level in patients with CHC and CP and patients only with CHC with different degrees of fibrosis and necroinflammatory process in the liver, ng/ml

Fibrosis degree	Group 1	Group 2	Inflammatory activity	Group 1	Group 2
	CHC + CP, n = 72	CHC, n = 48		CHC + CP, n = 72	CHC, n = 48
FibroTest	Vitamin D		ActiTest	Vitamin D	
F0–1	19.50 ± 3.82* [^]	29.10 ± 1.74*	A0–1	19.60 ± 2.82* [^]	28.0 ± 1.7*
F1–2	18.40 ± 2.73* [^]	27.20 ± 0.56*	A1–2	18.10 ± 3.77* [^]	27.80 ± 1.45*
F2–3	16.50 ± 2.19* [^]	26.50 ± 0.65*	A2–3	15.90 ± 2.72* [^]	25.20 ± 1.85*
F3–4	14.40 ± 2.69* [^]	23.60 ± 1.31*	A3–4	15.4 ± 1.1* [^]	26.4 ± 0.5*

Notes: * — $p < 0.05$ when comparing the level of vitamin D in patients with different degrees of fibrosis and necro-inflammatory activity in the liver within the same group; [^] — $p < 0.05$ when comparing the level of vitamin D in patients with CHC and CHC + CP with the same degree of fibrosis or necroinflammatory activity in the liver.

Table 2. Level of vitamin D in patients with CHC and CP with CHC with different degrees of fibrosis and necroinflammatory activity in the liver, ng/ml

ActiTest	Vitamin D	FibroTest	Vitamin D
A0–1	17.90 ± 2.44*	F0–1	16.7 ± 3.0*
A1–2	15.60 ± 1.99*	F1–2	17.00 ± 1.84*
A2–3	15.40 ± 2.07*	F2–3	16.00 ± 1.75*
A3–4	15.4 ± 1.1*	F3–4	13.40 ± 0.58*

Note: * — $p < 0.05$ when comparing different degrees of fibrosis and necro-inflammatory activity in the liver.

Table 3. Vitamin D level in patients with CHC and CP with different viral loads

Viral load, IU/ml	Group 1		Group 1a		Groups 1b	
	CHC and CP, n = 72		CHC, CP and EI, n = 52		CHC and CP without EI, n = 20	
	Abs./%	Vitamin D, ng/ml	Abs./%	Vitamin D, ng/ml	Abs./%	Vitamin D, ng/ml
High ($> 8 \times 10^5$)	24/33.3	15.60 ± 2.92*	22/42.3	14.90 ± 2.03*	2/10.0	22.60 ± 0.78
Moderate ($6-8 \times 10^5$)	25/34.7	18.40 ± 3.32*	19/36.5	16.8 ± 2.4*	5/25.0	22.5 ± 0.6
Low ($< 6 \times 10^5$)	23/31.9	19.10 ± 2.98*	11/21.2	16.90 ± 1.81*	13/65.0	21.5 ± 1.9

Note: * — $p < 0.05$ when comparing patients with different viral loads within each group.

Table 4. Level of FE-1 and vitamin D in patients with CHC, CP and different degrees of exocrine insufficiency

Degree of EI	Average level of FE-1, $\mu\text{g/g}$	Level of vitamin D, ng/ml
Mild (150–200 $\mu\text{g/g}$)	171.0 \pm 17.3	16.90 \pm 2.16*
Moderate (100–150 $\mu\text{g/g}$)	124.00 \pm 8.98	15.00 \pm 1.47*
Severe (< 100 $\mu\text{g/g}$)	52.7 \pm 12.9	14.50 \pm 3.13*

Note: * — $p = 0.013$ when comparing patients with different degrees of exocrine insufficiency.

Table 5. Comparative characteristics of quality of life in patients with CHC and patients with CHC and CP depending on the enzymatic activity of the pancreas, points

Indicator	Group 1a	Group 1b	Group 2	Statistical significance
	CHC, CP and EI, n = 52	CHC and CP without EI, n = 20	CHC, n = 48	
Integral index	30.40 \pm 6.02* [^]	34.50 \pm 6.64* [^]	48.50 \pm 7.07*	$p < 0.001^*$; $p = 0.029^{\wedge}$
Physical health	29.5 \pm 6.6* [^]	33.90 \pm 5.62* [^]	47.90 \pm 7.92*	$p < 0.001^*$; $p = 0.01^{\wedge}$
Mental health	30.4 \pm 6.7* [^]	35.10 \pm 8.35* [^]	49.10 \pm 8.36*	$p < 0.001^*$; $p = 0.047^{\wedge}$
Situational anxiety	47.40 \pm 2.37* [^]	38.30 \pm 3.68* [^]	34.30 \pm 2.48*	$p < 0.001^*$; $p < 0.001^{\wedge}$

Notes: * — $p < 0.001$ when comparing quality of life and situational anxiety in patients of groups 1a, 1b and 2; [^] — $p < 0.05$ when comparing quality of life and situational anxiety in patients of groups 1a and 1b.

and $p = 0.003$) (Table 2), than in patients with initial stages of fibrosis and necroinflammatory activity in the liver.

When analyzing the obtained data, it was also possible to find out that the level of vitamin D decreases with the increase of the viral load in patients of group 1 ($r = -0.447$, $p < 0.001$) (Table 3).

A positive correlation was found between the level of vitamin D and the level of FE-1 ($r = 0.431$, $p = 0.001$) in patients of group 1a (Table 4).

All patients interviewed using the SF-12 questionnaire had a reduced quality of life. However, in patients of group 1, the integral indicator, as well as the separate physical and mental components, were lower than in patients of group 2 (31.50 \pm 6.43 vs. 48.50 \pm 7.07, 30.80 \pm 6.62 vs. 47.90 \pm 7.92, 31.70 \pm 7.43 vs. 49.10 \pm 8.36, respectively) and this difference was statistically significant ($p < 0.001$). When comparing the quality of life in patients with different enzymatic activity, it was established that these indicators were lower in patients of group 1a than in patients of group 1b (Table 5).

It was found that quality of life indicators in patients of group 1 were positively correlated with the level of vitamin D. In patients with higher levels of vitamin D, quality of life was better according to the following indicators: integral index ($r = 0.473$, $p < 0.001$); physical health ($r = 0.402$, $p < 0.001$); mental health ($r = 0.446$, $p < 0.001$). Also, in patients of group 1, both with impaired and preserved exocrine function of the pancreas, compared to patients in group 2, a higher level of situational anxiety was noted ($p < 0.001$), which was negatively correlated with the level of vitamin D ($r = -0.806$, $p < 0.001$).

Discussion

When analyzing the obtained data, we found that patients with CHC have lower than normal levels of vitamin D, which complements the results of research conducted by other scientists [17, 18].

Our data about the lower levels of vitamin D in patients with CHC and CHC and CP with greater degrees of fibrosis and higher degrees of necroinflammatory activity in the liver confirm the involvement of vitamin D in the processes of inflammation and fibrogenesis in the liver, which is consistent with the results obtained by A.S. Dadabhai et al. [19], F. Cai et al. [9], who proved that vitamin D affects the intensity of the inflammatory process and fibrosis both in the liver and in the pancreas.

The positive correlation found by us between the level of vitamin D and the level of FE-1 can indicate both the influence of vitamin D on the processes of pancreatic inflammation and fibrosis with a violation of its function, and the possible insufficient absorption of fat-soluble vitamin D in the intestine as a result of digestive disorders due to a decrease in the production of pancreatic enzymes. These results are consistent with the data of other scientists, who demonstrated that patients with CKD have lower levels of vitamin D more often than patients with preserved exocrine function of the pancreas [9, 20].

The data we obtained confirm that the physical and mental quality of life in patients with CHC and CP are lower, and the level of anxiety is higher than in patients with CHC without concomitant CP, which is consistent with the results obtained by other scientists [13].

Conclusions

In patients with CHC in comorbidity with CP with exocrine insufficiency of the pancreatic gland, a significantly lower level of vitamin D, higher stages of fibrosis (F3–4) with high viral load and necro-inflammatory activity in the liver were found than in patients with CHC and CP with preserved enzymatic activity and CHC without CP. The level of vitamin D in patients with CHC and CP with exocrine insufficiency is positively correlated with the level of FE-1.

Patients with CHC and CP with exocrine insufficiency of the pancreatic gland significantly more often complain of mood changes, increased anxiety, rapid fatigue, and muscle weakness than patients with CHC and CP without exocrine insufficiency and patients with CHC.

In patients with combined CHC and CP, a negative effect of low levels of vitamin D on indicators of quality of life and anxiety was revealed.

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Дербак М.А., Бучок О.В., Ганич Т.М., Рішко О.А., Тімашев В.В.
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Оцінка впливу рівня вітаміну D на перебіг хронічного гепатиту С, коморбідного з хронічним панкреатитом

Резюме. *Актуальність.* Хронічний гепатит С (ХГС) часто ускладнюється супутніми захворюваннями шлунково-кишкового тракту, одним з яких є хронічний панкреатит (ХП). Це негативно впливає на клінічний перебіг обох хвороб, призводить до дефіциту поживних речовин, зокрема вітаміну D, та погіршує якість життя (ЯЖ) пацієнтів. *Мета дослідження:* вивчити особливості клінічного перебігу ХГС, коморбідного з ХП, та оцінити ЯЖ в осіб із різним умістом вітаміну D у сироватці крові. *Матеріали та методи.* У дослідження включені 120 хворих, які були розділені на дві групи: першу — 72 пацієнти із ХГС та ХП, другу — 48 осіб із ХГС. У свою чергу, першу групу залежно від ферментативної активності підшлункової залози (ПЗ) розділено на групу 1а (n = 52), що включала хворих на ХГС та ХП із зовнішньосекреторною недостатністю (ЗСН) ПЗ, та групу 1б (n = 20) — пацієнти із ХГС та ХП зі збереженою зовнішньосекреторною функцією ПЗ. В усіх хворих проводили копроскопію, визначали рівень фекальної еластази (ФЕ-1), вітаміну D, вірусного навантаження, встановлювали ступінь фіброзу та некрозапальної активності за допомогою FibroTest та ActiTest. Ситуативну тривожність оцінювали за методикою Спілберге-ра — Ханіна, а ЯЖ — за допомогою опитувальника SF-12. Аналіз і обробку результатів обстеження хворих здійснювали за допомогою комп'ютерної програми Jamovi 2.3.2.1,

Microsoft Office Excel for Windows 2016 з використанням методу Краскела — Уолліса, критерія Манна — Уїтні — Віл-коксона та коефіцієнта кореляції Пірсона. Різницю вважали статистично значущою при $p < 0,05$. *Результати.* У хворих групи 1а встановлено вірогідно нижчий рівень вітаміну D, ніж у групах 1б та 2. У пацієнтів першої групи з вищими стадіями фіброзу (F2–3 та F3–4), більшим ступенем некрозапальної активності печінки (> A2) та високим вірусним навантаженням реєструється нижчий рівень вітаміну D, ніж в осіб із початковими стадіями фіброзу та менш вираженою некрозапальною активністю печінки. Хворі на ХГС, ХП із ЗСН ПЗ вірогідно частіше скаржилися на зміни настрою, підвищену тривожність, швидку втомлюваність та м'язову слабкість, ніж особи зі збереженою зовнішньосекреторною функцією ПЗ та пацієнти із ХГС. Рівень вітаміну D у хворих на ХГС, ХП із ЗСН ПЗ позитивно корелює з умістом ФЕ-1. В усіх хворих на ХГС, коморбідний із ХП, виявлено негативний вплив низьких рівнів вітаміну D на показники ЯЖ та тривожності. *Висновки.* Знижений рівень вітаміну D в крові пацієнтів із ХГС та ХП погіршує перебіг захворювання та асоційований зі зниженням якості життя.

Ключові слова: вітамін D; хронічний гепатит С; ступінь фіброзу печінки; хронічний панкреатит; ферментативна активність підшлункової залози; якість життя