ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

Therapy

UDC: 616.24-007-272-036.1

LABORATORY AND INSTRUMENTAL CHARACTERISTICS OF PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND HYPERTENSION

Tverezovskyi V.M.
Kharkiv National Medical University, Kharkiv, Ukraine

The article defines the clinical-laboratory and clinical-instrumental features of the comorbid course of chronic obstructive pulmonary disease (COPD) and hypertension (HTN). The aim of the study was to determine the clinical, laboratory and instrumental features of the comorbid course of COPD and HTN. The study was carried out in accordance with the existing recommendations of bioethical norms and rules. All patients took part in the study of their own free will with the signing of informed consent. 125 patients aged 18–50 years were examined, who were divided into 3 groups: group I – 48 patients with COPD and HTN, group II – 47 patients with an isolated course of COPD, group III (control) – 30 practically healthy people. Medical and statistical calculation was performed using the IBM SPSS 25.0 software package. Calculated median (Me) levels and their 25.0% (LQ) and 75.0% (UQ) quartiles. The probability of differences was determined using the Man-Whitney U-test with a statistical significance threshold of 0.05 (p=0.05). According to the results of the study, an excess of systolic and diastolic blood pressure levels was significantly stated in comorbidity of COPD and HTN and in patients with isolated COPD. The presence of lymphocytopenia and monocytosis in such patients has been reliably established and significant protein loss in COPD has been determined. Significant predominances of biochemical values of the blood of patients with comorbidity of COPD and HNT and with isolated COPD compared to the control were significantly recorded. Significant decreases in the levels of external respiratory function in COPD (especially in its comorbidity with HNT) were noted and a significant predominance of Caspase-8 levels was determined in the following patients: in comorbidity of COPD and HTN – 3.79 [3.57; 3.84] U/l and in isolated COPD – 3.48 [2.99; 3.72] U/l.

Keywords: *patients with chronic obstructive pulmonary disease, comorbidity of arterial hypertension, clinical and laboratory characteristics, clinical and instrumental characteristics, caspase-8.*

Цитуйте українською: Тверезовський ВМ. Лабораторно-інструментальні характеристики хворих із хронічним обструктивним захворюванням легень та гіпертонічною хворобою. Медицина сьогодні і завтра. 2023;92(2):6-16. https://doi.org/10.35339/msz.2023.92.2.tve

Cite in English: Tverezovskyi VM. Laboratory and instrumental characteristics of patients with chronic obstructive pulmonary disease and hypertension. Medicine Today and Tomorrow. 2023;92(2):6-16. https://doi.org/10.35339/msz.2023.92.2.tve [in Ukrainian].

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic and progressive disease [1] characterized by chronic inflammation [2], irreversible obstruction [3] and remodeling of the airways and lung parenchyma [4], which is associated with exposure to harmful particles [5] or tobacco smoke [3] and leads to progressive obstruction [6], expiratory dyspnea [7], chronic bronchitis and emphysema [8]. In addition to smoking, other risk factors for COPD are air pollution, use of industrial pesticides, chronic inhalation of dust, fuel vapors, etc. [9].

Literature data [2] show that COPD is one of the predominant causes of death [8] with a global prevalence of up to 10.1% with an upward trend in the following decades [2]. It has been proven that COPD leads to significant disability [10] and is now the third leading cause of death in the world [11]. This pathology is a significant medical and social problem due to the high levels of mortality and disability of patients [10], especially due to its comorbidity with other diseases. The most common comorbid conditions are cardiovascular pathology, diabetes mellitus, osteoporosis, chronic kidney disease, etc. [12]. According to Stratev et al. [10] in Switzerland, the main comorbidities in patients with COPD were hypertension (HNT) (35.0%), coronary heart disease (14.4%), atrial fibrillation and atrial flutter (10.0%), and type 2 diabetes mellitus (10.0%). Greulich et al. [12], comparing the incidence of comorbidities in patients with and without COPD, found that the incidence of hypertension was significantly more common in patients with COPD (70.96%) than without COPD (60.51%): odds ratio=1.595 [95% CI 1.571–1.620], p<0,001.

Comorbidity of COPD and HNT provokes the development of significant complications that lead to a significant decrease in respiratory function [3].

Therefore, the determination of clinical, laboratory and instrumental features of the comorbid course of COPD and HTN is of great medical and social importance.

The aim of the study – determination of clinical, laboratory and instrumental features of the comorbid course of COPD and HTN.

Materials and Methods

The study was carried out during 2019–2023 at the Department of Internal and Occupational Diseases of Kharkiv National Medical University and the Research Institute of Occupational Health and Occupational Diseases.

The research was carried out in accordance with the existing recommendations of bioethical norms and rules. All patients took part in the study of their own free will, which was confirmed by the signing of an informed consent.

A total of 125 patients aged 18–50 years were examined and divided into 3 groups: group I – 48 patients with COPD and HTN, group II – 47 patients with isolated COPD, group III (control) – 30 healthy individuals randomized by age and gender.

The diagnosis of COPD was made taking into account the recommendations of the American Thoracic Society (ATS), the scientific committee of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) and local guidelines [13; 14]. The diagnosis of HTN was made in accordance with current recommendations [15–17].

Medical and statistical calculation of the obtained results was performed using the IBM SPSS 25.0 application package for Windows. The median (Me) levels and their 25.0% (LQ) and 75.0% (UQ) quartiles were calculated. The result was represented as Me [LQ; UQ]. The probability of differences in the obtained traits was determined using the Man-Whitney U-test. The threshold value of the statistical significance was taken as 0.05 (p=0.05).

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

Results and Discussion

When determining the medical, epidemiological, and functional characteristics of the examined patients with comorbidity of COPD and HTN, certain features were identified that have a significant impact on the clinical manifestations and course of the disease in such patients – *Table 1*.

Thus, the study determined that the age characteristics of the examined patients practically did not differ from each other and amounted to 62.0 [59.0; 66.0] years for the II group, 60.0 [58.0; 62.8] years for the I group, and 63.0 [55.5; 65.0] years for the III group (the data obtained were reliable only when comparing the II group and I, p=0.026). At the same time, the duration of COPD was significantly (p=0.014) longer by 1.5 years in the I group, compared to II (8.5 [7.0; 10.0] and 7.0 [6.0; 9.0] years, respectively). The duration of HD was observed at the level of 7.0 [6.0; 8.0] years. It should be noted that BMI values in all groups were recorded at almost the same level, but were insignificantly higher in the I groups (29.7 [26.1; 31.9] kg/m^2) compared to the II group (27.1 [25.9; 32.3] kg/m^2; p=0.089) and III group (28.9 [26.1; 31.3] kg/m^2; p=0.385). The levels of SBP and DAT were predictably significantly higher (p<0.001) in patients with I group (140 [131.3; 145.0] mmHg, and 85.0 [80.0; 90.0] mmHg, respectively) compared to patients with II group (130 [120.0; 130.0] mmHg, and 80.0 [75.0; 80.0] mmHg, respectively) and the III group (120 [115.0; 130.0] mmHg, and 80.0 [80.0; 85.0] mmHg, respectively). – *Table 1*.

It should be noted that when determining the characteristics of the clinical blood test among the patients we examined, we also found certain features, most of which were not characterized by a statistically significant difference, except for the indicators of lymphocyte and monocyte levels (p<0.001) when comparing the values of patients in the I group and HTN and II group with the control group – *Table 2*.

Table 1. Clinical, epidemiological, and functional characteristics of the examined patients, Me [LQ; UQ]

Indices	Control (n=30)	COPD (n=47)	COPD and HTN (n=48)	p_1	p_2	p_3
Age, years	63.0 [55.5; 65.0]	62.0 [59.0; 66.0]	60.0 [58.0; 62.8]	0.477	0.296	0.026
Duration of COPD, years	–	7.0 [6.0; 9.0]	8.5 [7.0; 10.0]	–	–	0.014
HTN duration, years	–	–	7.0 [6.0; 8.0]	–	–	–
BMI, kg/m^2	28.9 [26.1; 31.3]	27.1 [25.9; 32.3]	29.7 [26.1; 31.9]	0.541	0.385	0.089
SBP, mmHg Art.	120.0 [115.0; 130.0]	130.0 [120.0; 130.0]	140 [131.3; 145.0]	0.027	<0.001	<0.001
DBP, mmHg Art.	80.0 [80.0; 85.0]	80.0 [75.0; 80.0]	85.0 [80.0; 90.0]	0.593	<0.001	<0.001

Notes: p_1 – the significance of differences in the comparison between the control group and the COPD group; p_2 – in comparison of the control group and the COPD with HTN group; p_3 – in comparison of COPD and COPD with HTN groups.

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

Table 2. Clinical blood test results of examined patients, Me [LQ; UQ]

Indices	Control (n=30)	COPD (n=47)	COPD and HTN (n=48)	p_1	p_2	p_3
Hemoglobin, g/l	145.0 [136.5; 154.0]	150.0 [138.0; 160.0]	148.0 [138.0; 157.0]	0.062	0.160	0.563
SR, mm/h	5.0 [4.0; 10.0]	6.0 [4.0; 10.0]	7.0 [3.0; 10.0]	0.768	0.527	0.697
Erythrocytes, 10^{12}/l	4.7 [4.3; 4.9]	4.8 [4.3; 5.2]	4.8 [4.3; 5.1]	0.149	0.176	0.624
Leukocytes, 10^9/l	5.0 [5.0; 6.0]	5.9 [4.8; 6.9]	5.4 [4.9; 6.6]	0.612	0.750	0.628
Rods, %	2.5 [2.0; 4.0]	3.0 [2.0; 4.0]	2.0 [1.0; 3.0]	0.851	0.362	0.238
Segm, %	55.0 [50.8; 61.0]	59.0 [54.0; 63.0]	59.0 [52.3; 62.0]	0.028	0.043	0.757
Eosinophils, %	2.0 [2.0; 2.0]	2.0 [1.0; 3.0]	2.0 [1.0; 3.0]	0.193	0.487	0.072
Lymphocytes, %	36.0 [30.0; 40.0]	28.0 [26.0; 31.0]	28.0 [24.0; 33.5]	<0.001	<0.001	0.641
Monocytes, %	4.0 [4.0; 6.0]	8.0 [6.0; 9.0]	9.0 [7.0; 10.0]	<0.001	<0.001	0.195

Notes: p_1 – the significance of differences in the comparison between the control group and the COPD group; p_2 – in comparison of the control group and the COPD with HTN group; p_3 – in comparison of COPD and COPD with HTN groups.

Thus, lymphocyte levels were significantly lower in I group and in the II group compared to the III group: 28.0 [24.0; 33.5]%, 28.0 [26.0; 31.0]%, and 36.0 [30.0; 40.0]%, respectively; and monocytes, on the contrary, significantly exceeded the control values (9.0 [7.0; 10.0]%, 8.0 [6.0; 9.0]%, and 4.0 [4.0; 6.0]%, respectively) – *Table 2*.

Other indicators of statistically significant difference in the obtained values were not noted and had the following levels, which exceeded in the I group and II group compared to the III group: respectively hemoglobin – 148.0 [138.0; 157.0] g/l; 150.0 [138.0; 160.0] g/l (p=0.062); and 145.0 [136.5; 154.0] g/l (p=0.160); SR – 7.0 [3.0; 10.0] mm/h, 6.0 [4.0; 10.0] mm/h (p=0.768); and 5.0 [4.0; 10.0] mm/h (p=0.527); erythrocytes – 4.8 [4.3; 5.1]×10^{12}/l; 4.8 [4.3; 5.2]×10^{12}/l (p=0.149); and 4.7 [4.3; 4.9]×10^{12}/l (p=0.176); leukocytes – 5.4 [4.9; 6.6]×10^9/l; 5.9 [4.8; 6.9]× ×109/l (p=0.612); and 5.0 [5.0; 6.0]×109/l (p=0.750); subcutaneous neutrophils – 2.0 [1.0; 3.0]%; 3.0 [2.0; 4.0]% (p=0.851); and 2.5 [2.0; 4.0]% (p=0.362); rods neutrophils – 59.0 [52.3; 62.0]%; 59.0 [54.0; 63.0]% (p=0.028); and 55.0 [50.8; 61.0]% (p=0.043). At the same time, eosinophils were characterized by the same value and amounted to 2.0 [1.0; 3.0]% and 2.0 [1.0; 3.0]%, respectively (p=0.193); and 2.0 [2.0; 2.0]% (p=0.487) – *Table 2*.

It should be noted that according to the values of the biochemical analysis of the blood of the patients examined by us (Table 3), there was a significant predominance of almost all indicators in the I group compared to II and the III group. At the sa-

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

me time, almost all values of the biochemical blood test were also significantly higher among patients with II group compared to the III group. The study only established the predominance of total protein in the III group compared to with II group and I group, which determined a significant loss of protein in COPD. Thus, total protein levels were significantly higher in the III group (76.4 [69.7; 79.6] g/l) than in patients with II group (75.0 [64.5; 76.6] g/l; p=0.028); and the value of patients with I group (67.7 [61.8; 74.7] g/l; p=0.001); the probability of the difference between the obtained results between the group of patients with I group and II group was unreliable and amounted to (p=0.111) – *Table 3*.

All other indicators were significantly higher in the I group and II group compared to the values of the III group, and in the I group were the highest values. Thus, AST levels were significantly higher in the I group (87.1 [18.0; 118.1] U/l), sig-

Table 3. Indicators of biochemical blood test of examined patients, Me [LQ; UQ]

Indices	Control (n=30)	COPD (n=47)	COPD and HTN (n=48)	p_1	p_2	p_3
AST, U/l	16.3 [11.4; 23.8]	45.8 [20.9; 79.5]	87.1 [18.0; 118.1]	<0.001	<0.001	0.077
ALT, U/l	18.4 [12.5; 24.7]	16.0 [9.5; 79.0]	70.9 [13.5; 96.2]	0.758	0.001	0.026
GGT, U/l	18.6 [14.6; 25.0]	30.2 [12.8; 44.5]	46.0 [32.2; 64.4]	0.013	<0.001	<0.001
ALP, U/l	65.5 [51.0; 73.5]	136.4 [103.8; 154.6]	132.2 [116.9; 154.7]	<0.001	<0.001	0.448
Albumin, g/l	41.7 [37.1; 43.6]	40.6 [38.1; 45.3]	41.8 [35.5; 51.7]	0.838	0.644	0.826
Total protein, g/l	76.4 [69.7; 79.6]	75.0 [64.5; 76.6]	67.7 [61.8; 74.7]	0.028	0.001	0.111
Total bilirubin, μmol/L	11.4 [7.38; 14.8]	13.3 [9.0; 18.1]	14.6 [11.1; 19.1]	0.048	0.003	0.175
Direct bilirubin, μmol/L	1.50 [1.05; 1.88]	1.70 [0.90; 2.50]	1.80 [1.23; 3.05]	0.189	0.013	0.186
Creatinine, μmol/L	69.9 [57.0; 75.9]	93.8 [82.5; 114.8]	120.7 [98.6; 129.4]	<0.001	<0.001	<0.001
Glucose, μmol/L	5.0 [4.3; 5.6]	5.3 [4.6; 6.1]	5.5 [4.8; 6.7]	0.072	0.006	0.236
Total cholesterol, mmol/L	4.25 [3.55; 4.83]	5.80 [4.80; 6.50]	8.85 [7.00; 10.18]	<0.001	<0.001	<0.001
TG, mmol/L	1.25 [0.75; 1.80]	2.50 [1.70; 3.20]	6.10 [4.92; 7.50]	<0.001	<0.001	<0.001

Notes: p_1 – the significance of differences in the comparison between the control group and the COPD group; p_2 – in comparison of the control group and the COPD with HTN group; p_3 – in comparison of COPD and COPD with HTN groups.

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

nificantly (p<0.001) higher than the III group (16.3 [11.4; 23.8] U/l) and the value of patients with II group (45.8 [20.9; 79.5] U/l); the significance of the difference between the I group and II group was p=0.077. At the same time, the same trends were found in the levels of ALT (70.9 [13.5; 96.2] U/l and 18.4 [12.5; 24.7] U/l, respectively (p=0.001); and 16.0 [9.5; 79.0] U/l; the significance of the difference between I group and II group was p=0.026; GGT (46.0 [32.2; 64.4] U/l; 18.6 [14.6; 25.0] U/l, respectively (p<0.001); and 30.2 [12.8; 44.5] U/l; the probability between the I group and II group was p<0.001) – *Table 3*.

At the same time, the levels of ALP in the I group and in the II group were significantly higher than the III group levels and amounted to 132.2 [116.9; 154.7] U/L; 136.4 [103.8; 154.6] U/L; and 65.5 [51.0; 73.5] U/L, respectively. The significance between I group and II group was p=0.448. Albumin levels were determined at almost the same range among patients of all groups, slightly exceeding in the I group (41.8 [35.5; 51.7] g/l) compared to II group (40.6 [38.1; 45.3] g/l) and III group (41.7 [37.1; 43.6] g/l). No statistically significant difference was found when comparing all groups – *Table 3*.

In addition, bilirubin fractions were significantly higher in patients with COPD (both in its I group and in the II group) compared to patients in the III group. The corresponding values for total bilirubin were 14.6 [11.1; 19.1] μmol/L (p=0.003); and 13.3 [9.0; 18.1] μmol/L (p=0.048); and 11.4 [7.38; 14.8] μmol/L (the probability between the I group and II group was p=0.175); and for direct – 1.80 [1.23; 3.05] μmol/L (p=0.013); and 1.70 [0.90; 2.50] μmol/L (p=0.189); and 1.50 [1.05; 1.88] μmol/L (statistical difference between COPD and HTN and COPD was p=0.186) – *Table 3*.

Creatinine levels determined a significant (p<0.001 between all groups) predominance of values in the I group (120.7 [98.6; 129.4] μmol/L) and in patients with II group (93.8 [82.5; 114.8] μmol/L) compared to III group (69.9 [57.0; 75.9] μmol/L), as well as glucose values (5.5 [4.8; 6.7] μmol/L, respectively; p=0.006 and 5.3 [4.6; 6.1] μmol/L; p=0.072 and 5.0 [4.3; 5.6] μmol/L; the difference between I group and II group was found to be improbable p=0.236), total cholesterol (8.85 [7.00; 10.18] μmol/L and 5.80 [4.80; 6.50] μmol/L and 4.25 [3.55; 4.83] mmol/L, respectively; the probability between all groups was statistically significant and amounted to p<0.001) and TG levels (6.10 [4.92; 7.50] mmol/L; 2.50 [1.70; 3.20] mmol/L; and 1.25 [0.75; 1.80] mmol/L, respectively; confidence between all groups p<0.001) – Table 3.

It should be noted that the values of the external respiratory function of the examined patients also established certain features – *Table 4*.

As expected, there was a significant decrease in the level of external respiration function in I group, especially in II group. Thus, it is likely (p<0.001) that FEV1 values were significantly higher in the III group (85.0 [83.0; 88.7]%) compared to II group (61.0 [58.0; 65.0]%) and II group (57.0 [54.0; 60.0]%). FVC levels did not determine a significant difference between the groups and amounted to 65.0 [62.5; 68.0]%; p=0.185; 67.0 [64.0; 68.0]%; p= =0.833; and 65.0 [63.0; 67.0]%, respectively; (the significance between the groups with COPD was p=0.078) – *Table 4*.

It should be noted that the levels of VC and the FEV/FVC ratio were significantly (p<0.001) higher in the III group compared to II group and I group and were 86.0 [84.2; 88.6]%; 65.0 [62.0; 66.0]%; and 64.0 [61.3; 66.0]% (VC); and 82.2 [78.1; 88.5]%; 73.0 [71.0; 77.0]%; and 72.0 [69.0; 75.0]% (FEV/FVC), respectively. The corresponding statistical difference between II groups and when I groups

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

Table 4. Indicators of the function of external respiration of the examined patients, Me [LQ; UQ]

Indices	Control (n=30)	COPD (n=47)	COPD and HTN (n=48)	p_1	p_2	p_3
FEV1, %	85.0 [83.0; 88.7]	61.0 [58.0; 65.0]	57.0 [54.0; 60.0]	<0.001	<0.001	0.001
FVC, %	65.0 [62.5; 68.0]	67.0 [64.0; 68.0]	65.0 [63.0; 67.0]	0.185	0.833	0.078
VC, %	86.0 [84.2; 88.6]	65.0 [62.0; 66.0]	64.0 [61.3; 66.0]	<0.001	<0.001	0.091
FEV/FVC	82.2 [78.1; 88.5]	73.0 [71.0; 77.0]	72.0 [69.0; 75.0]	<0.001	<0.001	0.014
FEV1 (salbutamol test), %	–	3.10 [1.68; 3.53]	3.20 [3.00; 4.07]	–	–	0.199

Notes: p_1 – the significance of differences in the comparison between the control group and the COPD group; p_2 – in comparison of the control group and the COPD with HTN group; p_3 – in comparison of COPD and COPD with HTN groups.

was p=0.091 and p=0.014. The value of the same FEV1 in salbutamol was slightly higher in I groups (3.20 [3.00; 4.07]%) compared to II groups (3.10 [1.68; 3.53]%). The probability of the difference turned out to be insignificant and amounted to (p=0.199) – *Table 4*.

Based on the analysis of Caspase-8 levels among the examined patients, a significant (p<0.001) statistical difference was determined in comparison of all groups – *Table 5*.

There was a significant predominance of Caspase-8 levels in the I group (3.79 [3.57; 3.84] ng/ml) and II group (3.48 [2.99; 3.72] ng/ml) levels of the III group (2.83 [2.58; 3.01] ng/ml) – *Table 5*.

The results obtained by us fully coincide with other results that note the negative effect of COPD (especially when it is comorbid with HTN) on the indicators of clinical and biochemical blood tests, caspase-8 levels, and the value of external respiratory function. Thus, Kim S. H. et al. determined that the incidence of COPD in patients with hypertension was almost twice as high as in patients without hypertension: 22.9% and 14.3%, respectively (p<0.01). Analysis of average blood pressure showed a significant (p<0.01) excess of systolic, diastolic and pulse blood pressure in the group of patients with hypertension: (134.3±14.8) mmHg; (84.4±11.6) mmHg; and (49.9±14.1) mmHg, respecti-

Table 5. Cas-8 levels of examined patients, Me [LQ; UQ]

Indices	Control (n=30)	COPD (n=47)	COPD and HTN (n=48)	p_1	p_2	p_3
Caspase-8, ng/ml	2.83 [2.58;3.01]	3.48 [2.99; 3.72]	3.79 [3.57; 3.84]	<0.001	<0.001	<0.001

Notes: p_1 — the significance of differences in the comparison between the control group and the COPD group; p_2 – in comparison of the control group and the COPD with HTN group; p_3 – in comparison of COPD and COPD with HTN groups.

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

vely. In the comparison group, the corresponding indicators were (116.3±10.7) mmHg; (76.4±7.6) mmHg; and (39.8±8.7) mmHg [18]. A regression analysis determined a significant ($p<0.01$) association of COPD and hypertension after standardization of data by age and smoking anamnesis: odds ratio=1.71 [95% CI (1.37–2.13)] [18].

Conclusions

Thus, when determining the medical-epidemiological, clinical-laboratory and clinical-instrumental features of the course of comorbidity of COPD and HTN, there were:

1. There was a significant ($p<0.001$) expected excess of SBP and DAT levels in patients I group (140 [131.3; 145.0] mmHg; and 85.0 [80.0; 90.0] mmHg, respectively) compared to patients of II group (130 [120.0; 130.0] mmHg; and 80.0 [75.0; 80.0] mmHg, respectively) and the III group (120 [115.0; 130.0] mmHg; and 80.0 [80.0; 85.0] mmHg, respectively).

2. The presence of lymphocytopenia and monocytosis in I group and in II group was reliably established ($p<0.001$) compared to III group: 28.0 [24.0; 33.5]%; 28.0 [26.0; 31.0]%; and 36.0 [30.0; 40.0]% (lymphocyte values); and 9.0 [7.0; 10.0]%; 8.0 [6.0; 9.0]%; and 4.0 [4.0; 6.0]%, respectively (monocyte values).

3. Significant protein loss in COPD (especially when combined with HTN) was significantly determined compared to controls: respectively (75.0 [64.5; 76.6] g/l ($p=0.028$); 67.7 [61.8; 74.7] g/l ($p=0.001$); and 76.4 [69.7; 79.6] g/l.

4. Significant predominances of biochemical values of the blood of the examined patients in I group and in II group were reliably recorded compared to the III group: respectively AST ($p<0.001$) – 87.1 [18.0; 118.1] U/l; 45.8 [20.9; 79.5] U/l; and 16.3 [11.4; 23.8] U/l; ALT – 70.9 [13.5; 96.2] U/l ($p=0.001$); 16.0 [9.5; 79.0] U/l ($p=0.758$); and 18.4 [12.5; 24.7] U/l; GGT – 46.0 [32.2; 64.4] U/l ($p<0.001$); and 30.2 [12.8; 44.5] U/l; and 18.6 [14.6; 25.0] U/l ($p=0.013$).

5. The predominance of ALP levels in the I groups and in II group (<132.2 [116.9; 154.7] U/l; 136.4 [103.8; 154.6] U/l; and 65.5 [51.0; 73.5] U/l, respectively); creatinine (120.7 [98.6; 129.4] μmol/l; 93.8 [82.5; 114.8] μmol/l; and 69.9 [57.0; 75.9] μmol/l, respectively); total cholesterol (respectively 8.85 [7.00; 10.18] μmol/l; 5.80 [4.80; 6.50] μmol/l; and 4.25 [3.55; 4.83] mmol/L); and TG (6.10 [4.92; 7.50] μmol/l; 2.50 [1.70; 3.20] μmol/l; and 1.25 [0.75; 1.80] mmol/L, respectively).

6. Higher glucose levels were significantly observed in patients with I group and in II group compared to the values of the III group (5.5 [4.8; 6.7] μmol/l ($p=0.006$); 5.3 [4.6; 6.1] μmol/l ($p=0.072$); and 5.0 [4.3; 5.6] μmol/l, respectively), total bilirubin (14.6 [11.1; 19.1] μmol/l ($p=0.003$); 13.3 [9.0; 18.1] μmol/l ($p=0.048$); and 11.4 [7.38; 14.8] μmol/l); and direct bilirubin (1.80 [1.23; 3.05] μmol/l ($p=0.013$); 1.70 [0.90; 2.50] μmol/l ($p=0.189$); and 1.50 [1.05; 1.88] μmol/l, respectively).

7. As expected, there were significant decreases in the level of external respiratory function in COPD, especially in its comorbidity with HTN in terms of a probable ($p<0.001$) predominance of FEV1 values in the III group (85.0 [83.0; 88.7]%) compared to isolated COPD (61.0 [58.0; 65.0]%) and its comorbidity with HTN (57.0 [54.0; 60.0]%, VC (86.0 [84.2; 88.6]%; 65.0 [62.0; 66.0]%; 64.0 [61.3; 66.0]%) and FEV/FVC (82.2 [78.1; 88.5]; 73.0 [71.0; 77.0]; and 72.0 [69.0; 75.0], respectively).

8. A significant predominance of Caspase-8 levels was found in the I group (3.79 [3.57; 3.84] ng/ml); equalized with the levels in II group (3.48 [2.99; 3.72] ng/ml) and in the III group (2.83 [2.58; 2.58; 3.01] ng/ml).

Conflict of interest is absent.

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

References

1. Greulich T, Weist BJD, Koczulla AR, Janciauskiene S, Klemmer A, Lux W, et al. Prevalence of comorbidities in COPD patients by disease severity in a German population. Respir Med. 2017;132:132-8. DOI: 10.1016/j.rmed.2017.10.007. PMID: 29229085.

2. Tang Y, Cai QH, Wang YJ, Fan SH, Zhang ZF, Xiao MQ, et al. Protective effect of autophagy on endoplasmic reticulum stress induced apoptosis of alveolar epithelial cells in rat models of COPD. Biosci Rep. 2017;37(6):BSR20170803. DOI: 10.1042/BSR20170803. PMID: 28963374.

3. Bewley MA, Preston JA, Mohasin M, Marriott HM, Budd RC, Swales J, et al. Impaired Mitochondrial Microbicidal Responses in Chronic Obstructive Pulmonary Disease Macrophages. Am J Respir Crit Care Med. 2017;196(7):845-5. DOI: 10.1164/rccm.201608-1714OC. PMID: 28557543.

4. Mendy A, Forno E, Niyonsenga T, Gasana J. Blood biomarkers as predictors of long-term mortality in COPD. Clin Respir J. 2018;12(5):1891-9. DOI: 10.1111/crj.12752. PMID: 29227024.

5. Mizumura K, Maruoka S, Shimizu T, Gon Y. Autophagy, selective autophagy, and necroptosis in COPD. Int J Chron Obstruct Pulmon Dis. 2018;13:3156-72. DOI: 10.2147/COPD.S175830. PMID: 30349225.

6. Liu X, Ma C, Wang X, Wang W, Li Z, Wang X, et al. Hydrogen coadministration slows the development of COPD-like lung disease in a cigarette smoke-induced rat model. Int J Chron Obstruct Pulmon Dis. 2017;12:1309-24. DOI: 10.2147/COPD.S124547. PMID: 28496315.

7. Yin HL, Yin SQ, Lin QY, Xu Y, Xu HW, Liu T. Prevalence of comorbidities in chronic obstructive pulmonary disease patients: A meta-analysis. Medicine (Baltimore). 2017;96(19): e6836. DOI: 10.1097/MD.0000000000006836. PMID: 28489768.

8. Kadota T, Fujita Y, Yoshioka Y, Araya J, Kuwano K, Ochiya T. Extracellular Vesicles in Chronic Obstructive Pulmonary Disease. Int J Mol Sci. 2016;17(11):1801. DOI: 10.3390/ijms17111801. PMID: 27801806.

9. Vij N, Chandramani-Shivalingappa P, Van Westphal C, Hole R, Bodas M. Cigarette smoke-induced autophagy impairment accelerates lung aging, COPD-emphysema exacerbations and pathogenesis. Am J Physiol Cell Physiol. 2018;314(1):C73-C87. DOI: 10.1152/ajpcell.00110.2016. PMID: 27413169.

10. Stratev V, Petkova D, Dimitrova V, Petev J. Comorbidities of COPD in Bulgarian Patients - Prevalence and Association with Severity and Inflammation. Folia Med (Plovdiv). 2018;60(1):102-9. DOI: 10.1515/folmed-2017-0078. PMID: 29668450.

11. Di Daniele N. Therapeutic approaches of uncomplicated arterial hypertension in patients with COPD. Pulm Pharmacol Ther. 2015;35:1-7. DOI: 10.1016/j.pupt.2015.09.004. PMID: 26363278.

12. Greulich T, Weist BJD, Koczulla AR, Janciauskiene S, Klemmer A, Lux W, et al. Prevalence of comorbidities in COPD patients by disease severity in a German population. Respir Med. 2017;132:132-8. DOI: 10.1016/j.rmed.2017.10.007. PMID: 29229085.

13. Nici L, Mammen MJ, Charbek E, Alexander PE, Au DH, Boyd CM, et al. Pharmacologic Management of Chronic Obstructive Pulmonary Disease. An Official American Thoracic Society Clinical Practice Guideline. Am J Respir Crit Care Med. 2020;201(9):e56-e69. DOI: 10.1164/rccm.202003-0625ST. PMID: 32283960.

14. Feshchenko YuI, Havrysiuk VK, Dziublyk OYa, Mostovoi YuM, Pertseva TO, Polianska MO, et al. Adapted clinical guideline: chronic obstructive pulmonary disease Ukr. pulmonology journal. 2020;3:5-36. DOI: 10.31215/2306-4927-2020-109-3-5-36.

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

15. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, et al. Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension. 2018;71(6):e13-e115. DOI: 10.1161/HYP.0000000000000065. PMID: 29133356.

16. Williams B, Mancia G, Spiering W, Agabiti Rosei E, Azizi M, Burnier M, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. Eur Heart J. 2018;39(33):3021-104. DOI: 10.1093/eurheartj/ehy339. PMID: 30165516.

17. Order of the Ministry of Health No.384 on 24 Jun 2012. Arterial hypertension. Unified clinical protocol for primary, emergency and secondary (specialized) medical care. 2012. 72 p.

18. Kim SH, Park JH, Lee JK, Heo EY, Kim DK, Chung HS. Chronic obstructive pulmonary disease is independently associated with hypertension in men: A survey design analysis using nationwide survey data. Medicine (Baltimore). 2017;96(19):e6826. DOI: 10.1097/MD.0000000000006826. PMID: 28489760.

Тверезовський В.М.

ЛАБОРАТОРНО-ІНСТРУМЕНТАЛЬНІ ХАРАКТЕРИСТИКИ ХВОРИХ ІЗ ХРОНІЧНИМ ОБСТРУКТИВНИМ ЗАХВОРЮВАННЯМ ЛЕГЕНЬ ТА ГІПЕРТОНІЧНОЮ ХВОРОБОЮ

В статті визначено клініко-лабораторні та клініко-інструментальні особливості коморбідного перебігу хронічного обструктивного захворювання легень (ХОЗЛ) і гіпертонічної хвороби (ГХ). Метою дослідження було визначення клінічних та лабораторних і інструментальних особливостей коморбідного перебігу ХОЗЛ і ГХ. Проведене дослідження виконано згідно з існуючими рекомендаціями біоетичних норм та правил. Усі хворі приймали участь у дослідженні за власним бажанням із підписанням інформованої згоди. Було обстежено 125 пацієнтів 18–50 років, яких було розподілено на 3 групи: I група – 48 хворих на ХОЗЛ і ГХ, II група – 47 пацієнтів з ізольованим перебігом ХОЗЛ, III група (контрольна) – 30 практично здорових осіб. Медико-статистичний розрахунок виконано за допомогою пакета програм IBM SPSS 25.0. Розраховані медіанні (Me) рівні та їх 25,0 % (LQ) та 75,0 % (UQ) квартилі. Вірогідність відмінностей визначали за допомогою U-тесту Мана-Уітні з пороговою величиною статистичної значущості 0,05 (p=0,05). За результатами дослідження було вірогідно констатовано перевищення рівнів систолічного та діастолічного артеріального тиску при коморбідності ХОЗЛ і ГХ та у пацієнтів із ізольованою ХОЗЛ. Достовірно встановлено наявність лімфоцитопенії та моноцитозу у таких хворих і визначено значну втрату білку при ХОЗЛ. Вірогідно зафіксовано значні переважання біохімічних значень крові хворих при коморбідності ХОЗЛ і ГХ, і при ізольованій ХОЗЛ порівняно з контролем. Відзначено значні зниження рівнів функції зовнішнього дихання при ХОЗЛ (особливо при її коморбідності з ГХ) та визначено значне переважання рівнів Caspase-8 у таких хворих: при коморбідності ХОЗЛ і ГХ – 3,79 [3,57; 3,84] нг/мл, а при ізольованій ХОЗЛ – 3,48 [2,99; 3,72] нг/мл.

Ключові слова: *хворі з хронічним обструктивним захворюванням легень, коморбідність артеріальної гіпертензії, клініко-лабораторні характеристики, клініко-інструментальні характеристики, каспаза-8.*

Надійшла до редакції 21.05.2023

ISSN print 2414-4495, ISSN online 2710-1444, https://msz.knmu.edu.ua, msz.journal@knmu.edu.ua

Information about the authors

Tverezovskyi Volodymyr M. – Postgraduate student of the Department of Internal and Occupational Diseases, Kharkiv National Medical University.

Address: Ukraine, 61022, Kharkiv, Trinklera str., 6.

E-mail: vm.tverezovskyi@knmu.edu.ua

ORCID: 0000-0002-9953-9553.