International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 04 ISSUE 10 PAGES: 14-19
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY

Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ijmscr

Research Article

LABORATORY PARAMETERS IN PATIENTS WITH CHRONIC CEREBRAL ISCHEMIA DEPENDING ON THE PRESENCE OF CONCOMITANT CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Submission Date: Sep 29, 2024, **Accepted Date:** Oct 04, 2024,
Published Date: Oct 09, 2024
Crossref doi: https://doi.org/10.37547/ijmscr/Volume04Issue10-03

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ABSTRACT

This study investigates the laboratory parameters in patients with chronic cerebral ischemia (CCI) in relation to the presence of concomitant chronic obstructive pulmonary disease (COPD). CCI is characterized by a progressive reduction in cerebral blood flow, while COPD can exacerbate hypoxia, potentially worsening brain ischemia. The research evaluates blood biomarkers, including inflammatory markers and oxygenation indices, to determine the impact of COPD on CCI patients. Results suggest that patients with both CCI and COPD present with more severe inflammatory responses and lower oxygenation levels, which may influence the progression of cerebral ischemia and overall prognosis.

KEYWORDS

Chronic cerebral ischemia, chronic obstructive pulmonary disease, laboratory parameters, hypoxia, inflammation, oxygenation, comorbidity.

INTRODUCTION

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Chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality worldwide. According to a number of studies, the prevalence of COPD in the adult population is 5–9% (1). COPD is a common cause of visits to a doctor, hospitalizations and intensive care units. This is the only disease whose mortality continues to increase. Mortality from COPD ranks 4th among all causes of death in the general population, accounting for about 4% of the overall mortality structure [3].

There are no clear ideas about the nature of neurological complications in patients with COPD, the features of blood flow and neuro-visualization changes in the brain depending on the stage of the disease have not been sufficiently studied. Clinical and diagnostic features of the clinical picture in patients with chronic cerebral ischemia depending on the presence of concomitant chronic obstructive pulmonary disease, laboratory indicators and acid-base balance indicators, as well as the function of external respiration have not been sufficiently studied.

Aim of the study: To study laboratory parameters in patients with chronic cerebral ischemia depending on the presence of concomitant chronic obstructive pulmonary disease.

METHODS

Over a period of 3 years, patients were selected: 1) patients with CCI stage II with concomitant COPD (main group - MG); 2) patients with CCI stage II without COPD (comparison group - CG). The control group (CG) included 20 patients, 10 men and 10 women, average age 63.1±6.4 years (Table 1).

Table.1.

Distribution of patients by groups, gender and age

Groups	gender		Age, WHO, 2022		
			60 - 74 years old	75 - 90 years old	total
MG n=57	M	abs	13	21	34
		%	38,2%	61,8%	59,6%
	F	abs	9	14	23
		%	39,1%	60,9%	40,4%
	Total	abs	22	35	57
		%	38,6%	61,4%	47,5%

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CG n=63	M	abs	9	18	27
		%	33,3%	66,7%	42,9%
	F	abs	12	24	36
		%	33,3%	66,7%	57,1%
	total	абс	21	42	63
		%	33,3%	66,7%	52,5%
Total n=120	м	abs	22	39	61
		%	36,1%	63,9%	50,8%
	ж	abs	21	38	59
		%	35,6%	64,4%	49,2%
	total	abs	43	77	120
		%	35,8%	64,2%	100,0%

Note: OG – main group; CG – comparison group; m – men; f – women; abs – absolute values; WHO – World Health Organization.

The MG comprised 57 patients (47.5%) and the CG comprised 63 patients (52.5%). As can be seen from Table 1, the MG had a predominance of males - 34 (59.6%) versus females - 23 (40.4%) ($p < 0.05$). In the CG, there was a predominance of women - 36 (57.1%), the proportion of men was 42.9% ($p < 0.05$). The groups were dominated by elderly people according to WHO, 2022.

The diagnosis and stages of CIM were established according to generally accepted criteria for the Republic after conducting thorough clinical, neurological, neuropsychological and instrumental (duplex scanning, MRI of the brain) studies (2).

The diagnosis of COPD was made on the basis of complaints (shortness of breath, cough with sputum), clinical picture of the disease, anamnestic data (presence of risk factors), results of physical and laboratory examination methods, instrumental data (measurements of airflow limitation (spirometry) - the ratio of FEV1 / FVC < 70%; post-bronchodilator value of FEV1 less than 80% of the expected) in accordance with the "Global strategy for the diagnosis, treatment and prevention of chronic obstructive pulmonary disease"

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(National Heart, Lung, and Blood Institute; revision 2008) and the "Respiratory Medicine Guidelines" (4).

All patients underwent a standard clinical and neurological examination (analysis of patient complaints, life history and medical history, objective examination, including study of neurological status) and somatic examination, laboratory research methods.

Statistical processing of the research results was carried out using variation statistics methods using Microsoft Office Excel-2019 programs.

RESULTS

In the MG, there was a tendency towards an increase in the hemoglobin level - 147.5±19.7 g/l compared to the CG - 126.2+14.1 g/l.

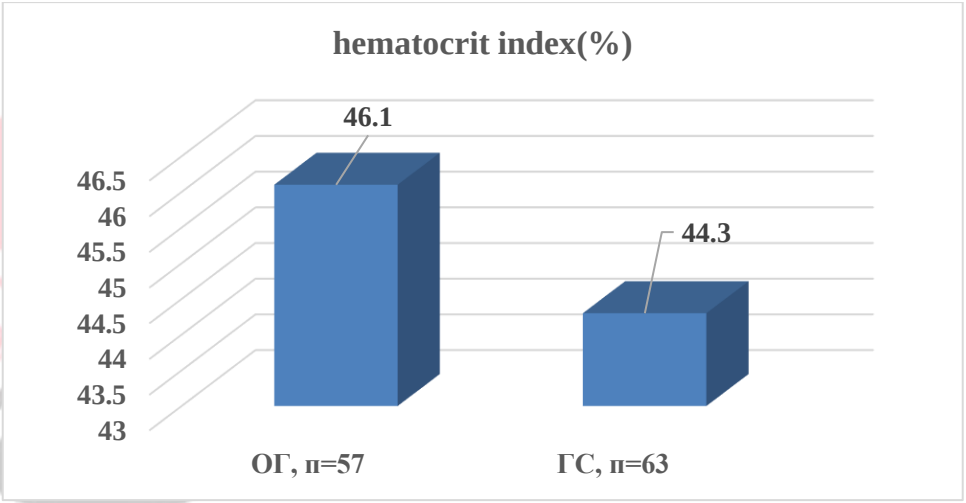

Figure 1. Hematocrit values (%).

Notes: significance of differences * p < 0.05 between groups.

A significant difference was found between the groups (p>0.05). The hematocrit index was significantly (p<0.05) higher in the MG - 46.1+6.6%, compared to the CG - 44.3±3.1% (p>0.05) (Fig. 1). The values of the erythrocyte level did not differ significantly and were in the MG - 4.9±0.41012/L; in the CG - 4.3±1.61012/L. The number of platelets did not differ significantly: in the MG - 229.9±67.9X109/L, in the CG - 189.4±123.8X109/L. The level of leukocytes differed in different groups: in the MG - 8.6±2.8X10 9/l, in the CG - 4.7+1.8X10 9/l (p>0.05).

When evaluating biochemical blood tests, the following indicators were significantly different:

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Cholesterol mmol/l, Bilirubin mmol/l, ALT IU/l, AST IU/l,

Prothrombin µmol/l, Glucose mmol/l.

Table 2

Blood biochemistry parameters

Indicators	MG, n=57	CG, n=63	p<
Cholesterol mmol/l	6,6±1,4	5,2±1,3	0,05
Bilirubin mmol/l	14,0±2,6	10,3+6,7	0,05
ALT IU/L	32,1 ±24,9	23,9+19,1	0,005
AST IU/L	31,6±29,1	19,5±9,0	0,005
Prothrombin µmol/l	79,7±42,1	73,2±10,2	0,05
Glucose mmol/l.	7,4±1,9	5,6±0,5	0,05
Creatinine mmol/l	0,08±0,01	0,07±0,003	

In the MG, the values of these indicators were 6.6±1.4, 14.0±2.6, 32.1±24.9, 31.6±29, 179.7±42.1, 7.4±1.9 versus 5.2±1.3, 10.3+6.7, 23.9+19.1, 19.5±9.0, 73.2±10.2, 5.6±0.5 in the CG, respectively. There were no significant differences in the values of Creatinine mmol/l between the groups (Table 2).

Table 3.

Blood acid-base balance indicators

Acid-base balance indicators	MG, n=57	CG, n=63	p<
PO 2 mmHg	57,4 ±7,5	69,9 ± 8,3	0,01
RSO 2 mmHg	48,1 ± 10,6	42,8 ± 6,9	0,05
AB mmol/l.	5,3 ± 3,4	6,1 ±9,5	0,05
HCO3 mmol/l.	31,4 ±4,1	28,5 ± 3,7	0,05

Note: bicarbonate (HCO^3), partial pressure of oxygen (Po^2), AB (mmol/l) — true bicarbonates of the blood (actual bikarbonate);

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Patients in the MG had significantly lower levels of partial pressure of oxygen and oxygen saturation in the morning hours (significantly lower levels of PO2 (p = 0.01), as well as higher levels of PCO2 in the morning hours) (Table 3.).

The blood gas composition in the MG, the pO2 level was 57.4 ± 7.5 mm Hg, in the CG, the pO2 level was 69.9 ± 8.3 mm Hg. Thus, patients with CCI with concomitant COPD had a significantly lower PO2 level (p = 0.01), as well as a higher PCO2 level in the morning hours.

CONCLUSION

Patients in the MG had significantly lower levels of partial pressure of oxygen and oxygen saturation in the morning hours (significantly lower levels of PO2 (p = 0.01), as well as higher levels of PCO2 in the morning hours)

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