International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 12 PAGES: 21-28
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

Research Article

STRUCTURE OF THE METABOLIC SYNDROME AND COMORBID BACKGROUND IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Submission Date: December 20, 2022, Accepted Date: December 25, 2022,
Published Date: December 30, 2022
Crossref doi: https://doi.org/10.37547/ijmscr/Volume02Issue12-04

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ABSTRACT

This article discusses structure of the metabolic syndrome and comorbid background in patients with chronic obstructive pulmonary disease. In addition, pharmacological and non-pharmacological treatment of COPD can mask the impact of comorbidities, including obesity, and this factor has not been considered in almost any large study.

KEYWORDS

Chronic obstructive pulmonary disease, metabolic syndrome, comorbidity.

INTRODUCTION

Patients with chronic obstructive pulmonary disease (COPD) often have comorbidities such as osteoporosis, anemia, diabetes mellitus, metabolic syndrome, obesity, which are pathogenetically associated with COPD [5,6,8]. This comorbid pathology affects the health status of patients with COPD and the outcome of the disease [3,6]. According to various studies, the prevalence of obesity in patients with COPD is in the range from 10% to 50%, in addition, the relationship between obesity and the incidence of COPD has been shown [1,2,4]. However, it is not clear whether obesity has a detrimental effect on the course of COPD. Low body mass index has been regarded as an independent risk factor for death in patients with COPD [5]. Several studies have reported more severe respiratory symptoms, more exacerbations, more severe

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limitation in activities of daily living, and poorer health-related quality of life in COPD patients with obesity [7,9]. However, the results obtained are rather contradictory. In addition, pharmacological and non-pharmacological treatment of COPD can mask the impact of comorbidities, including obesity, and this factor has not been considered in almost any large study.

Thus, at the moment, it remains relevant to study the pathogenetic basis of the interaction between COPD and obesity, the features of the clinical course of COPD, spirometry parameters, cardiometabolic risks depending on the body mass index.

Material and methods. The study included 330 people (245 (74.2%) men and 85 (25.8%) women) diagnosed with stage II and III COPD aged 55 to 74 years, mean age 64.3±8.7 years. To solve the tasks set, 2 main research groups were formed. MS was the main classifying feature. Group I consisted of 229 patients (69.4%) with COPD and MS, group II consisted of 101 patients with COPD without MS (30.6%). MS was diagnosed in accordance with the criteria for diagnosing MS by the International Diabetes Federation (2005), clinical guidelines for the management of patients with MS of the Ministry of Health of the Russian Federation (2013) (1), 229 patients with COPD were selected for the study with MS.

The research materials were subjected to statistical processing using the methods of parametric and non-parametric analysis. Accumulation, correction, systematization of initial information and visualization of the obtained results were carried out in Microsoft Office Excel 2016 spreadsheets. Statistical analysis was carried out using the IBM SPSS Statistics v.23 program (developer - IBM Corporation).

Research results. As already mentioned, the study included 229 patients with COPD and MS, who made up group II, the proportion of these patients among all the patients studied was 69.4%. This suggests that MS is a common comorbid condition among patients with COPD. Men in this group accounted for 66.8% (153 patients), the proportion of women was 33.2% (76 patients).

According to the results of physical, laboratory and instrumental examinations, central (abdominal) type of obesity was revealed in all of them. The average value of waist circumference (WC) in women was higher than in men - 112.3±3.7 cm and 102.7±2.3 cm, respectively. The average value of BMI in this category of patients was 32.3±1.4 kg/m2. BP ≥ 140/90 mmHg Art. according to the individual diary of self-control, it was detected in 142 patients with COPD (62.4%). The mean SBP was 151.5±8.2 mm Hg. Art. The mean DBP was 98.3±7.6 mm Hg. st.

Table 1.

MS components in patients with COPD

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Criteria	Total- (MC+), n=229
Central (abdominal) type of obesity, abc./%	229/100,0
The average value of OT in women, cm	112,3±3,7
The average value of OT in men, cm	102,7±2,3
Average value of BMI, kg/m2	32,3±1,4
BP ≥ 140/90 mmHg st., abs. (%)	143/62,4
The average value of SBP, mm Hg. Art.	151,5±8,2
Mean DBP, mm Hg Art.	98,3±7,6
Dyslipidemia, abs. (%)	159/69,4
Average value of TG level, mmol/l	2,44±0,32
The average value of the level of HDL cholesterol, mmol / l	0,86±0,21
Average value of LDL cholesterol level, mmol/l	3,69±0,74
IGT, abs. (%)	49/21,4
Average value of glucose level after OGTT, mmol/l	9,1±3,7
IGN, abs. (%)	42/18,3
Mean fasting glucose, mmol/l	6,83±2,1
Combined violation of FGD and IGT, abs. (%)	35/15,3

Dyslipidemia - an elevated TG level, a reduced HDL-C level, an elevated LDL-C level - was detected in 159 patients with COPD (69.4%) according to the result of a biochemical analysis of venous blood. The average values of the above indicators were 2.44±0.32; 0.86±0.21 and 3.69±0.74 mmol/l, respectively. According to the results of OGTT, IGT was detected in 49 patients with COPD (21.4%). The mean glucose level after OGTT was 9.1±3.7 mmol/l. According to the results of biochemical analysis of venous blood, IFG was diagnosed in 42 patients with COPD (18.3%). The mean fasting glucose level was 6.8±2.1 mmol/L. Combined impairment of IFG and IGT was obtained in 35 patients with COPD (15.3%) (Table 1).

In group II, all COPD patients with MS were found to have a central (abdominal) type of obesity, but there were some differences in other components of MS. Table 2 shows that 272 patients with COPD (31.4%) had elevated blood pressure; elevated TG levels; reduced level of HDL cholesterol; elevated levels of LDL cholesterol. Moreover, in women this variant of MS was more common than in men - 36.8% versus 28.8%, respectively. In 33 COPD patients with MS (14.4%), in

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addition to the central (abdominal) type of obesity, BP and IGT were increased. Women had a slight advantage - 17.1%. In 36 patients with COPD (15.7%) had elevated BP and IFG, also in the group of women, the proportion of such patients was not significantly higher compared to men - 19.7% vs. 13.7%, respectively.

Table 2

Subtypes of MS in patients with COPD group II

MS structure	men, n=153 (66,8)		women, n=76 (33,2%)		total - COPD (MS+), n=229	
	n	%	n	%	n	%
central (abdominal) type of obesity + BP + elevated TG level + reduced HDL-C level + elevated LDL-C level;	44	28,8%	28	36,8%	72	31,4%
central (abdominal) type of obesity + BP + IGT;	20	13,1%	13	17,1%	33	14,4%
central (abdominal) type of obesity + BP + IFG;	21	13,7%	15	19,7%	36	15,7%
central (abdominal) type of obesity + BP + combined impairment of IFG and IGT;	13	8,5%	3	3,9%	16	7,0%
central (abdominal) type of obesity + elevated TG level + reduced HDL-C level + elevated LDL-C level;	15	9,8%	5	6,6%	20	8,7%
central (abdominal) type of obesity + elevated TG level + reduced HDL-C level + elevated LDL-C level + IGT;	21	13,7%	6	7,9%	27	11,8%
central (abdominal) type of obesity + elevated TG level + reduced HDL-C level + elevated LDL-C level + IFG;	11	7,2%	4	5,3%	15	6,6%
central (abdominal) type of obesity + elevated TG level + reduced HDL-C level + elevated LDL-C level + combined violation of IFG and IGT.	8	5,2%	2	2,6%	10	4,4%

The combination of elevated blood pressure values and combined impairment of IFG and IGT was observed in 16 patients (7.0%). Men had a significantly higher proportion of such patients, 8.5% versus 3.9%, respectively (Table 2). 20

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patients (8.7%) had central (abdominal) type of obesity + elevated TG level + reduced HDL-C level + elevated LDL-C level.

Table 3.

Comorbid background in patients with COPD depending on the presence of MS

Diseases	I group, n=229 (69,4%)		r<	II group, n=101 (30,9%)	
	COPD (MS+)			COPD (MS-)	
	N	%		n	%
Hypertonic disease	157	68,6%	0,05	42	41,6%
Atherosclerosis	132	57,6%	0,05	31	30,7%
ischemic heart disease	143	62,4%	0,005	36	35,6%
Type 2 diabetes	74	32,3%	0,05	21	20,8%
liver disease	112	48,9%	0,05	32	31,7%
kidney disease	89	38,9%	0,005	19	18,8%
Gastritis	156	68,1%	0,05	49	48,5%
Peptic ulcer of the stomach and 12 duodenal ulcer	25	10,9%		14	13,9%
Varicose veins of the lower extremities	29	12,7%		11	10,9%
Osteocondritis of the spine	167	72,9%	0,05	83	82,2%
Bronchial asthma	12	5,2%	0,05	9	8,9%
Posttuberculous pneumosclerosis	24	10,5%	0,05	19	18,8%

Men with such MS profile prevailed 9.8%. A fairly significant proportion of patients had an elevated TG level + a reduced HDL-C level + an elevated LDL-C level + ITG - 11.8% (27 patients). Fifteen patients with COPD (6.6%) had an elevated TG level, a reduced HDL-C level, and an elevated LDL-C level with IFG. In 4.4% of cases (10 patients), an aggressive type of MS was observed - in addition to the central (abdominal) type of obesity, there was an increased level of TG, a reduced level of HDL-C, an increased level of LDL-C, and a combined disorder of IFG and IGT.

A variety of comorbid pathologies were observed in patients with COPD. From the data in Table 3, it can be noted that there are differences in the representation of comorbid conditions in patients with COPD, depending on the presence of MS.

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In group I, compared with group II, such pathologies as hypertension, atherosclerosis, coronary artery disease, type 2 diabetes mellitus, liver disease and kidney disease were significantly more common - 68.6%, 57.6%, 62.4%, 32.3 % 48.9% and 38.9% versus 41.6%, 30.7%, 35.6%, 20.8%, 31.7% and 18.8%, respectively. Bronchial asthma and post-tuberculous pneumosclerosis were also presented to a greater extent in group I.

The results of a comparative analysis of the studied subgroups in group I in terms of the incidence of comorbid pathology are presented in tables 4 and 5.

Table 4.

Comorbid background in COPD patients with MS depending on the past coronavirus infection

Diseases	I-A subgroup		r<	I-B subgroup	
	n	%		n	%
Hypertonic disease	45	60,0%	0,05	112	72,7%
Atherosclerosis	34	45,3%	0,05	98	63,6%
ischemic heart disease	38	50,7%	0,05	105	68,2%
Type 2 diabetes	16	21,3%	0,005	58	37,7%
liver disease	26	34,7%	0,05	86	55,8%
kidney disease	16	21,3%	0,05	73	47,4%
Gastritis	53	70,7%		103	66,9%
Peptic ulcer of the stomach and 12 duodenal ulcer	2	2,7%	0,005	23	14,9%
Varicose veins of the lower extremities	6	8,0%	0,005	23	14,9%
Osteocondritis of the spine	49	65,3%		118	76,6%
Bronchial asthma	3	4,0%		9	5,8%
Posttuberculous pneumosclerosis	6	8,0%		18	11,7%

Table 4 shows that in patients of group I (COPD with MS) in subgroup I-A (patients with COPD+MS who had a history of coronavirus infection), the prevalence of such diseases as hypertension, atherosclerosis, IHD, type 2 diabetes mellitus, liver disease, kidney disease, bronchial asthma and post-tuberculous pneumosclerosis were significantly higher compared with the I-B subgroup (in patients with COPD and MS who did not have a history of covid) - 72.7%, 63.6%, 68.2%, 37.7%, 55.8%, 47.4% vs. 60.0%, 45.3%, 50.7%, 21.3%, 34.7%, 21.3% respectively.

In group II, where there were patients with COPD without MS, differences in the structure of comorbid pathology were also observed in subgroups. Table 5 shows that in the II-B subgroup, such systemic vascular diseases as hypertension, atherosclerosis, coronary artery disease, type 2 diabetes mellitus were significantly more common compared to the II-B subgroup.

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Table 5.

Comorbid background in patients with COPD without MS, depending on the past coronavirus infection

	II-A subgroup		r<	II-B subgroup	
	n	%		n	%
	16	34,0%	0,05	26	48,1%
Hypertonic disease	10	21,3%	0,05	21	38,9%
Atherosclerosis	11	23,4%	0,005	25	46,3%
ischemic heart disease	7	14,9%	0,005	14	25,9%
Type 2 diabetes	14	29,8%		18	33,3%
liver disease	8	17,0%		11	20,4%
kidney disease	28	59,6%	0,005	21	38,9%
Gastritis	8	17,0%	0,05	6	11,1%
Peptic ulcer of the stomach and 12 duodenal ulcer	4	8,5%	0,05	7	13,0%
Varicose veins of the lower extremities	41	87,2%		42	77,8%
Osteocondritis of the spine	3	6,4%	0,05	6	11,1%
Bronchial asthma	7	14,9%	0,05	12	22,2%

Thus, based on the presented data, it can be concluded that in patients with COPD and MS, the incidence and spectrum of comorbid pathology is much higher compared to patients with COPD without MS. As for patients with COPD and MS and with a history of coronavirus infection, they are more likely to have diseases of the cardiovascular system - hypertension and atherosclerosis, as well as type II diabetes. According to the literature (3,5) on the study of COVID-19, it is also indicated that people with a large set of concomitant diseases, especially cardiovascular diseases, suffered more often and more severely.

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