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Clinical and Anamnestic Features of Patients with Ischemic Heart Disease and Chronic Obstructive Pulmonary Disease

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Abstract

Background: Stable ischemic heart disease (IHD) and chronic obstructive pulmonary disease (COPD) often coexist due to their high prevalence and common risk factors. The study aimed to assess the anamnestic features, risk factors, clinical course, and prognosis in patients with IHD-COPD comorbidity.

***Methods and Results*:** A total of 333 patients with IHD-COPD comorbidity (183 men and 150 women; mean age of 63.53±10.06 years) were included in this study. Stable IHD was verified in accordance with the 2014 ACC/AHA guideline. The diagnosis of COPD was established following GOLD report (2023). All patients were divided into four age groups: 18-44 years, 45-59 years, 60-74 years, and 75-90 years. The analysis showed that as age increased, the frequency of IHD-COPD comorbidity rose from 2.7% to 54.95%. The peak of the IHD-COPD comorbidity was most often observed at the age of 60-74. Among comorbid patients under 75 years of age, men were represented to a slightly greater extent than women, and vice versa at the age of ≥75 years. The proportion of smokers was 3.3 times higher in the age group of ≤44 years compared to the group of ≥75 years. With increasing age, the percentage of smokers among patients decreased (P<0.01).

Regardless of age, most patients with IHD and COPD were overweight. An increase in the age of patients with IHD and COPD was accompanied by a progressive decrease in SpO_2. So, in the age group of ≥75 years, SpO_2 was 89.9%, while for the age group of ≤44 years, it was 94% (P=0.0013). A significant increase in the level of CRP, a key factor in the destabilization of IHD and COPD, was also associated with an increase in the age of patients with IHD-COPD comorbidity (P=0.0000).

Combinations of "chest pain + dyspnea + weakness + cough + sputum" and "chest pain + dyspnea + weakness + syncope + palpitations + leg edema + cough + sputum" were significantly more common than other symptom combinations in both men and women (27.3% and 21.8% in men and 26.6% and 21.3% in women, respectively) (P<0.0001).

The Charlson comorbidity index (CCI) in patients with IHD-COPD comorbidity was 4.37±0.99 points. In the age group of ≤44 years, the mean CCI score was 2.88±0.60, corresponding to a survival rate of 77.2±3.6%. In the 45-59 age category, the CCI score was 3.42±0.49, with a survival rate of 67.1±1.2%. In the age group of 60-74 years, the CCI score was 4.65±0.64, corresponding to a survival rate of 33.4±1.4%. In the age group of ≥75 years, the CCI score was 5.70±0.66, corresponding to a survival rate of 9.27±1.5%. Differences between age groups were highly significant (P=0.000).

Conclusion: COPD and IHD share common risk factors, pathophysiological processes, and clinical symptoms and act synergistically as negative prognostic factors. Understanding pathophysiological mechanisms and clinical aspects of the IHD-COPD comorbidity opens perspectives for rational management strategies. (**International Journal of Biomedicine. 2025;15(1):64-71.**)

Keywords: ischemic heart disease • chronic obstructive pulmonary disease • comorbidity • Charlson comorbidity index

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Abbreviations

BMI, body mass index; **DBP,** diastolic blood pressure; **COPD,** chronic obstructive pulmonary disease; **CVD,** cardiovascular disease; **CRP,** C-reactive protein; **ESR,** erythrocyte sedimentation rate; **FBG**, fasting blood glucose; **Hb,** hemoglobin; **IHD,** ischemic heart disease; **LDL-C**, low-density lipoprotein cholesterol; **MACEs**, major adverse cardiovascular events; **PAD,** peripheral arterial disease; **RR,** respiratory rate; **SBP,** systolic blood pressure; **TC,** total cholesterol; **TG,** triglycerides.

Introduction

Cardiovascular diseases (CVDs) and chronic obstructive pulmonary disease (COPD) often coexist due to their high prevalence and common risk factors.[1] It has been shown that major CVDs are significantly more common in patients with COPD than in the general population. A meta-analysis by Chen et al.[2] showed that compared with individuals without COPD, COPD patients were more likely to be diagnosed with CVD (OR=2.46, 95%CI: 2.02-3.00, P<0.0001), including a two to five times higher risk of ischemic heart disease (IHD), cardiac arrhythmias, heart failure, diseases of the pulmonary circulation, and peripheral arterial disease (PAD). The prevalence of IHD in COPD patients ranges from 20% to 60%, heart failure from 10% to 30%, arrhythmia from 10% to 15%, and stroke ranges from 10% to more than 20% in hospitalized COPD patients, depending on the characteristics of the study population.[2-6] Peripheral arterial disease (PAD) was found in about 9% of COSYCONET study participants who had a diagnosis of COPD.[7] Patel et al.[8] noticed that COPD exacerbations were associated with acutely increased inflammation-related arterial stiffness.

A review by Crisan et al.[9] summarizes the most recent studies regarding the pathophysiology and epidemiology of modifiable risk factors shared by CVD, COPD, and COPD exacerbations that could influence overall morbidity and mortality due to major adverse cardiovascular events (MACEs) in patients with acute exacerbations of COPD. The acute exacerbations of COPD highly increase the risk of MACEs such as cardiovascular death, myocardial infarction, stroke, heart failure, unstable angina, and transient ischemic attack. Inflammatory mediators from lung tissue in COPD can enter the systemic circulation, destabilizing atheromatous plaques and forming endothelial dysfunction responsible for MACEs.[10] Cardiovascular risk factors are highly prevalent in COPD patients[11] and could contribute to COPD progression and exacerbations. Observational studies have shown that cardiovascular morbidity and mortality rates are more than double in the COPD cohorts compared with the general population.[2,12] Careful study and control of risk factors responsible for developing CVDs and COPD and assessing pathophysiological mechanisms in the IHD-COPD comorbidity are significant in predicting MACEs.

The study aimed to assess the anamnestic features, risk factors, clinical course, and prognosis in patients with IHD-COPD comorbidity.

Materials and Methods

The study was conducted among patients who sought consultation at the outpatient clinic of the Republican Specialized Scientific-Practical Medical Center of Cardiology. A patient survey was conducted using a specially developed questionnaire. Inclusion criteria included written informed consent, age between 18 and 90, and a confirmed diagnosis of stable IHD and COPD.

Stable IHD was verified in accordance with the 2014 ACC/AHA guideline.[13] The diagnosis of COPD was established following GOLD report (2023) by relevant specialists.[14]

Exclusion criteria were symptomatic hypertension, valvular heart disease, acute coronary syndrome, diabetes, renal impairment, thyroid dysfunction, and malignant neoplasms.

All patients underwent the following examinations: assessment of traditional risk factors, physical examination, clinical and biochemical laboratory methods, 12-lead ECG, and echocardiography. Office BP was measured using a mercury sphygmomanometer, according to Korotkov's method. The levels of total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and fasting blood glucose (FBG) were determined in the venous blood using Randox RX Daytona automated analyzer (RANDOX, UK). Oxygen saturation (SpO_2) in the blood was measured using the Little Doctor MD300C23 and Riester Ri-fox N pulse oximeters.

To assess long-term mortality risk in patients with comorbid pathologies, the Charlson comorbidity index (CCI) was used.[15] The CCI estimates 10-year survival in patients with multiple comorbidities based on the presence or absence of chronic conditions, with assigned weights between 1 and 6 per condition according to severity, in association with age. Age is weighted as 1 point for each decade from 50 to 90 years of age for both the original CCI and the adjusted CCI from 2011.[16] CCI was calculated according to the scoring system: mild (CCI scores of 1–2), moderate (CCI scores of 3–4), and severe (CCI scores ≥5).

Statistical analysis was performed using Statistica 12.0 (Statsoft Inc., USA). The normality of distribution was checked using the Kolmogorov-Smirnov test. Baseline characteristics were summarized as frequencies and percentages for categorical variables and mean ± standard deviation (SD) for continuous variables. The Mann-Whitney test was used to compare two independent groups. Multiple comparisons were performed using a one-way ANOVA and Tukey HSD post-hoc test. Group comparisons for categorical variables were performed using the chi-square test. The proportions difference test was also applied. A probability value of P<0.05 was considered statistically significant.

Results

A total of 333 patients (183[55.0%] men and 150[45.0%] women) with IHD and COPD were included. The mean age of the cohort was 63.53±10.06 years, with men averaging 62.74±10.47 years and women 64.49±9.47 years (P=0.3744)]. The patients were divided into four age groups according to the 2016 WHO classification: 18-44 years (young age), 45-59 years (middle age), 60-74 years (elderly), and 75-90 years (senior age).

The analysis showed that as age increased (from 44 to 60-74 years), the frequency of IHD-COPD comorbidity rose from 2.7% to 54.95%. In old age, comorbidity tended to decrease (to 13.2%) (Table 1). An age-group analysis revealed that among patients younger than 74 years, men were more numerous than women, with little difference between age groups. Women were more common among patients 75 years

and older, but no statistically significant difference existed between groups.

Among patients ≤44 years, 66.7±16.7% were smokers, 3.3 times higher than in patients ≥75 years. The percentage of smokers decreased with age (χ^2=23.501, P<0.01).

Additionally, the relationship between the IHD-COPD comorbidity and COVID-19 was analyzed. The study found that 180 patients (54%) had a history of COVID-19. COVID-19 was most prevalent (66.6%) in younger patients under 44. As age increased, there was a trend toward a decrease in COVID-19 cases (43.2%) (χ^2=8.360, P<0.05) (Table 1).

Another important factor was a family predisposition to cardiovascular diseases. The results showed that 266 patients (79.9%) had a family history of CVD. The indicator varied from 70.1% in the 45-59 age group to 84.2% in the 60-74 age group (χ^2=7.865, P<0.05). A sedentary lifestyle accounted for a high percentage in all groups. No statistically significant difference was found between the groups (χ^2=3.324, P>0.05).

In the analysis of patients' average body mass index (BMI), the age group of 45-59 years had the highest BMI compared to other age groups (P=0.000). In addition, in all groups, overweight individuals (BMI 25–29.9 kg/m²) constituted the majority (Table 2). With increasing age in the study groups, the proportion of patients with obesity (BMI ≥30 kg/m²) decreases, while the proportion with second-degree obesity (BMI 35–39.9 kg/m²) increases (χ^2=27.110, P<0.01).

The presence of IHD and COPD significantly increases the stiffness of coronary arteries and worsens the prognosis for both conditions. In our study, systolic and diastolic blood pressure (SBP and DBP) tended to increase with age: from 135.01±29.26 mmHg and 83.81±11.1 mmHg in the age group of ≤44 years up to 149±35.9 mmHg and 87.2±13.01 mmHg in the age group of ≥75 years. The mean SBP and DBP in the entire cohort were 141.79±29.23 mmHg and 86.83±15.46 mmHg, respectively (Table 3).

Table 1.

Gender structure and risk factors for the development of IHD and COPD in the study age groups.

Parameter	Age groups										Statistics
	≤44 years n= 9 (2.7%)		45-59 years n=97 (29.1%)		60-74 years n=183 (54.9%)		≥75 years n=44 (13.2%)		Total n=333 (100%)		
	n	%	n	%	n	%	n	%	n	%	
Males	5	55.5±17.6	56	57.7±5.0	103	56.3±3.7	20	45.4±7.5	184	55.3±2.7	χ^2=2.029 df=3 P>0.05
Females	4	44.5±17.6	41	42.3±5.0	80	43.7±3.7	24	54.5±7.5	149	44.7±2.7	
Smoking	6	66.7±16.7	47	48.5±5.1	46	25.1±3.2	9	20.4±6.1	108	32.4±2.6	χ^2=23.501 df=3 P<0.01
History of COVID-19	6	66.7±16.7	63	64.9±4.8	92	50.3±3.7	19	43.2±7.5	180	54.05±2.7	χ^2=8.360 df=3 P<0.05
Family history of CVD	7	77.8±14.7	68	70.1±4.6	154	84.2±2.7	37	84.1±5.1	266	79.9±2.2	χ^2=7.865 df=3 P<0.05
Sedentary lifestyle	8	88.9±11.1	86	88.7±3.2	163	89.1±2.3	43	97.7±2.2	300	90.1±1.6	χ^2=3.324 df=3 P>0.05

Table 2.

Body mass index (BMI) in the study age groups.

BMI (kg/m²)	Age groups										Statistics
	≤44 years n= 9		45-59 years n=97		60-74 years n=183		≥75 years n=44		Total n=333		
	n	%	n	%	n	%	n	%	n	%	
≤18.4	0	0	0	0	0	0	0	0	0	0	χ^2=27,110 P<0.01
18.5-24.9	2	22.2±13.9	11	11.3±3.2	27	14.8±2.6	12	27.3±6.7	52	15.6±2.0	
25-29.9	3	33.3±15.7	39	40.2±5.0	88	48.1±3.7	13	29.5±6.9	143	42.9±2.7	
30-34.9	3	33.3±15.7	31	32.0±4.7	42	23.0±3.1	8	18.2±5.8	84	25.2±2.4	
35-39.9	0	0.0	8	8.2±2.8	20	10.9±2.3	11	25.0±6.5	39	11.7±1.8	
≥40	1	11.1±10.5	8	8.2±2.8	6	3.3±1.3	0	0.0	15	4.5±1.1	
Mean BMI, kg/m²	29.2±1.8		30.6±0.7		29.1±0.4		29.3±0.8		29.8±0.3		F=125.0391 P=0.000

Table 3.

Clinical characteristics of the study patients.

Indicator	Age groups					
	≤44 years n= 9	45-59 years n=97	60-74 years n=183	≥75 years n=44	Statistics	Total n=333
SBP, mmHg	135.01±29.26	139.6±26.84	143.12±24.92	149±35.9	F=1.4546 *P*= 0.2269	141.79±29.23
DBP, mmHg	83.81±11.1	84.6±15.5	86.25±16.10	87.2±13.01	F=0.4168 *P*=0.7411	86.83±15.46
SpO_2, %	94.0±11.1	92.9±3.1	92.5±2.2	89.9±2.2	F=11.7682 *P*=0.0000 P_{1-2}=0.7225 P_{1-3}=0.4657 P_{1-4}=0.0013 P_{2-3}=0.7170 P_{2-4}=0.0000 P_{3-4}=0.0000	92.3±1.6
Respiratory rate, bpm	18.75±1.75	19.38±1.52	20.16±1.52	21.29±1.40	F=18.7788 *P*=0.0000 P_{1-2}=0.6294 P_{1-3}=0.0332 P_{1-4}=0.0000 P_{2-3}=0.0003 P_{2-4}=0.0000 P_{3-4}=0.0001	20.05±1.63
Heart rate, bpm	82.62±15.83	83.21±16.28	83.50±14.10	85.76±11.88	F= 0.3584 *P*= 0.7831	82.91±15.24

The reduction in SpO_2 was seen with age (P=0.000). A more significant decrease in blood oxygen saturation was observed in patients with CHD and COPD aged 75 and over. So, in the age group of ≥75 years, SpO_2 was 89.9%, while for the age group of ≤44 years, it was 94% (*P*=0.0013).

The average respiratory rate (RR) and heart rate (HR) values in the study patients were 20.05±1.63 breaths per minute and 82.91±15.24 beats per minute, respectively. With increasing age, the average values of HR tended to increase from 82.62±15.83 beats per minute to 85.76±11.88 beats per minute. The RR for patients under 40 averaged 18.75±1.75 breaths per minute, while for patients over 75 years old, it was 21.29±1.40 breaths per minute (*P*=0.000).

Among the biochemical indicators, we analyzed C-reactive protein (CRP), lipid profile parameters, and blood coagulation parameters since they allow assessment of the severity of the atherosclerotic process (Table 4). The average TC level in patients with CAD and COPD was 236.4±5.3 mg/dL. The highest blood TC level was observed in the age group of ≥75 years - 244.7±13.1 mg/dL (*P*=0.0000). The highest blood TG level (242.2±11.0 mg/dL) was observed in the age group of 45-59 years (*P*=0.0000). The blood LDL-C level was highest (149.3±4.1 mg/dL) in the age group of 60-74 years (P=0.0000). The FBG level (7.6±0.3 mmol/L) was also highest in the age group of 60-74 years (*P*=0.000).

Table 4

The main biochemical indicators of the study patients.

Indicator	Age groups					
	≤44 years n= 9	45-59 years n=97	60-74 years n=183	≥75 years n=44	Statistics	Total n=333
TC, mg/dL	241.9±40.0	236.4±9.8	233.9±7.3	244.7±13.1	F= 12.4585 *P*=0.0000 P_{1-2}=0.4704 P_{1-3}=0.1398 P_{1-4}=0.8962 P_{2-3}=0.2629 P_{2-4}=0.0002 P_{3-4}=0.0000	236.4±5.3
TG, mg/dL	189.7±25.3	242.2±11.0	240.9±9.4	207.4±21.0	F=134.0872 *P*=0.0000 P_{1-2}=0.0000 P_{1-3}=0.0000 P_{1-4}=0.0000 P_{2-3}=0.8426 P_{2-4}=0.0000 P_{3-4}=0.0000	235.1±6.7
LDL-C, mg/dL	148.4±15. 7	148.6±6.0	149.3±4.1	146.0±7.7	F= 3.8458 *P*=0.0099 P_{1-2}=0.9992 P_{1-3}=0.9686 P_{1-4}=0.6696 P_{2-3}=0.7709 P_{2-4}=0.0665 P_{3-4}=0.0042	148.1±3.0
FBG, mmol/L	5.7±0.6	6.9±0.4	7.6±0.3	6.4±0.3	*F=11.7682 P=0.0000* P_{1-2}=0.7225 *P_{1-3}=0.4657* *P_{1-4}=0.0013* *P_{2-3}=0.7170* *P_{2-4}=0.0000* *P_{3-4}=0.0000*	7.2±0.2
CRP, mg/L	7.2±1.2	8.3±0.6	8.0±1.0	14.0±1.8	F= 403.8707 *P*=0.0000 P_{1-2}=0.0159 P_{1-3}=0.1206 P_{1-4}=0.0000 P_{2-3}=0.1095 P_{2-4}=0.0000 P_{3-4}=0.0000	8.8±0.7

Table 4 (continued)

The main biochemical indicators of the study patients.

Indicator	Age groups					
	≤44 years n= 9	45-59 years n=97	60-74 years n=183	≥75 years n=44	Statistics	Total n=333
Fibrinogen, g/L	3.8±0.6	3.5±0.2	3.8±0.3	3.5±0.2	F= 32.3289 P=0.0000 P_{1-2}=0.0100 P_{1-3}=1.0000 P_{1-4}=0.0159 P_{2-3}=0.0000 P_{2-4}=1.0000 P_{3-4}=0.0000	3.6±0.2
Leukocytes, $\times 10^9$/L	7.6±1.0	7.8±0.4	7.9±0.2	7.3±0.3	F=41.6268 P=0.0000 P_{1-2}=0.2886 P_{1-3}=0.0351 P_{1-4}=0.0569 P_{2-3}=0.0684 P_{2-4}=0.0000 P_{3-4}=0.0000	7.8±0.2
ESR. mm/h	14.6±1.6	11.5±0.9	14.1±0.7	15.5±1.7	F= 225.2536 P=0.0000 P_{1-2}=0.0000 P_{1-3}=0.4359 P_{1-4}=0.0575 P_{2-3}=0.0000 P_{2-4}=0.0000 P_{3-4}=0.0000	14.77±8.09
Hemoglobin (Hb), g/L	132±6	131±2	126±2	121±2	F= 247.1973 P=0.0000 P_{1-2}=0.5554 P_{1-3}=0.0000 P_{1-4}=0.0000 P_{2-3}=0.0000 P_{2-4}=0.0000 P_{3-4}=0.0000	127±1

Table 5.

Features of the symptom complexes in examined patients depending on gender.

Symptom combination	Men (n=183)		Women (n=150)		P-value	Both sexes	
	n	%	n	%		n	%
Chest pain + dyspnea	4	2.2	6	4.0	0.340	10	3.0
Chest pain + dyspnea + weakness	8	4.4	3	2.0	0.224	11	3.3
Chest pain + dyspnea + weakness + headache + cough	6	3.3	11	7.3	0.099	17	5.1
Chest pain + dyspnea + weakness + cough + sputum	50	27.3	40	26.6	0.886	90	27.0
Chest pain + dyspnea + weakness + syncope + palpitations + leg edema + cough + sputum	40	21.8	32	21.3	0.912	72	21.6
Chest pain + dyspnea + weakness + syncope + cough	16	8.7	17	11.3	0.429	33	9.9
Chest pain + weakness + syncope + palpitations + headache	32	17.5	22	14.7	0.491	54	16.2
Dyspnea + weakness + palpitations	9	4.9	8	5.3	0.869	17	5.1
Dyspnea + weakness + palpitations + leg edema + cough + sputum	18	9.8	11	7.3	0.421	29	8.7
Statistics	P<0.0001		P<0.0001			P<0.0001	

The mean values of CRP increased with age: from 7.2±1.2 mg/L in the age group of ≤44 years to 14.0±1.8 mg/L in the age group of ≥75 years (P=0.0000). The highest fibrinogen levels were found in age groups of ≤44 years and 60-74 years: 3.8±0.6 g/L and 3.8±0.3 g/L, respectively. The lowest ESR value was recorded in the age group of 45-59 years (11.5±0.9 mm/h) (P=0.0000). As age increased, the average Hb level decreased in the study age groups (P=0.0000).

The different symptom combinations did not differ in frequency between women and men (Table 5). Combinations of "chest pain + dyspnea + weakness + cough + sputum" and "chest pain + dyspnea + weakness + syncope + palpitations + leg edema + cough + sputum" were significantly more common than other symptom combinations in both men and women (27.3% and 21.8% in men and 26.6% and 21.3% in women, respectively) (P<0.0001) (Table 5).

The CCI score in patients with IHD-COPD comorbidity was 4.37±0.99. In the age group of ≤44 years, the mean CCI score was 2.88±0.60, corresponding to a survival rate of 77.2±3.6%. In the 45-59 age category, the CCI score was 3.42±0.49, with a survival rate of 67.1±1.2%. In the age group of 60-74 years, the CCI score was 4.65±0.64, corresponding to a survival rate of 33.4±1.4%. In the age group of ≥75 years, the CCI score was 5.70±0.66 points, corresponding to a survival rate of 9.27±1.5%. Differences between age groups were highly significant (P=0.000) (Table 6).

Table 6.

The Charlson comorbidity index (CCI) and 10-year survival rate in the study age groups.

Indicator	Age groups					
	≤44 years n= 9	45-59 years n=97	60-74 years n=183	≥75 years n=44	Statistics	Total n=333
CCI, score	2.88±0.60	3.42±0.49	4.65±0.64	5.70±0.66	F=183.670 P=0.0000 P_{1-2}=0.0509 P_{1-3}=0.0000 P_{1-4}=0.0000 P_{2-3}=0.0000 P_{2-4}=0.0000 P_{3-4}=0.0000	4.37±0.99
Survival rate, %	77.2±3.6	67.1±1.2	33.4±1.4	9.27±1.5	F=20931.4851 P=0.0000 P_{1-2}=0.0000 P_{1-3}=0.0000 P_{1-4}=0.0000 P_{2-3}=0.0000 P_{2-4}=0.0000 P_{3-4}=0.0000	41.25±1.4

Discussion

COPD and several cardiovascular diseases (heart failure, ischemic heart disease, stroke, etc.) share similar risk factors and often coexist in the same patient. [4,5,17,18]

Our study analyzed risk factors, demographic data, clinical and anthropometric characteristics, and laboratory and instrumental indicators in patients with IHD-COPD comorbidity. The close association of CVD with COPD is explained by many potential mechanisms, including aging, systemic inflammation, and arterial stiffness.[19-21] Our research data indicates that the highest prevalence of IHD-COPD comorbidity is observed in patients over 40 years of age. According to the literature, the incidence of COPD, IHD, and hypertension progressively increases with age, and their combination is quite common in older age.[22-24]

The fundamental role of inflammation in all stages of atherosclerosis, from onset to progression and ultimately to thrombotic complications, has been established in numerous studies.[18,25] COPD is also associated with systemic inflammation, and patients with COPD have a significantly increased risk of cardiovascular disease.[20,26] Among biochemical markers, CRP is a key factor of destabilization in the comorbid course of coronary heart disease and COPD. By enhancing cytokine production, CRP activates the complement system, stimulates the uptake of low-density lipoproteins by macrophages, and increases leukocyte adhesion to the vascular endothelium. A study by Ambrosino[27] showed that COPD is significantly and independently associated with endothelial dysfunction. Prolonged circulation of the pro-inflammatory cytokines in COPD patients induces the inflammatory process in the atherosclerotic plaque, promoting its growth and damage.

A meta-analysis by Chen et al.[2] showed that compared with individuals without COPD, COPD patients were more likely to be diagnosed with CVD (OR=2.46, 95%CI: 2.02-3.00, P<0.0001).

The Charlson comorbidity index (CCI) is the most widely used comorbidity index.[15] The CCI was developed specifically to predict long-term mortality. The original CCI was based on 19 different categories of medical conditions, including diabetes with diabetic complications, myocardial infarction, congestive heart failure, peripheral vascular disease, chronic lung disease, mild to severe liver disease, hemiplegia, kidney disease, leukemia, lymphoma, metastatic tumor, and acquired immunodeficiency syndrome, each weighted according to their potential impact on mortality. Since then, the CCI has been adapted, tested, and validated for predicting the outcome and risk of death from many comorbidities.[28,29] The CCI estimates 10-year survival in patients with multiple comorbidities. In our study, the Charlson Index score averaged 4.37±0.99 points, corresponding to a survival rate of 41.25±1.4%. According to the CCI, the survival rate decreased with increasing age, from 77.2±3.6% to 9.27±1.5%. In a study by Eroglu et al.,[30] CCI was strongly associated with mortality (P=0.000) in COPD patients with CVD (hypertension, heart failure, and diabetes mellitus. The Kaplan-Meier analysis showed a significant association between the increasing number of comorbidities and long-term mortality.

Conclusion

The tendency to increase IHD-COPD comorbidity is associated with an increase in patients' ages. The peak of the combined course of IHD and COPD is most often observed at the age of 60-74. Among comorbid patients under 75 years of age, men are represented to a slightly greater extent than women, and vice versa at the age of ≥75 years. The proportion of smokers is 3.3 times higher in the age group of ≤44 years compared to the group of ≥75 years. With increasing age, the percentage of smokers among patients decreases (P<0.01).

Regardless of age, the majority of patients with IHD and COPD are overweight. An increase in the age of patients with IHD and COPD is accompanied by a progressive decrease in SpO_2. A significant increase in the level of CRP, a key factor in the destabilization of IHD and COPD, is also associated with an increase in the age of comorbid patients. For IHD-COPD comorbidity, the most common combination of clinical symptoms includes chest pain, shortness of breath, weakness, cough, and sputum production. In patients with IHD and COPD, the average CCI score for 10-year survival is 4.37±0.99, corresponding to a survival rate of 41.25±1.4%. The CCI value significantly increases with age, and a survival rate drops to 9.27±1.5% in patients with IHD-COPD comorbidity aged 75 years and over.

The combination of COPD and CVD is an important problem of modern medicine. Understanding

pathophysiological mechanisms and clinical aspects of the IHD-COPD comorbidity opens perspectives for rational management strategies.

Competing Interests

The authors declare that they have no competing interests.

Ethical Considerations

The study protocol was reviewed and approved by the Ethics Committee of the Republican Specialized Centre of Cardiology. All participants provided written informed consent.

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