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Intensity of COPD symptoms in comparison with spirometry parameters

Natężenie objawów POChP w porównaniu do parametrów spirometrycznych

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Summary

Chronic obstructive pulmonary disease (COPD) is one of the most common illnesses which occurs globally. In 2018 it was the third cause of death. Growing incidence of COPD in Poland causes crucial social, economic and individual consequences. Spirometry is a test which allows detecting COPD on its early stage, states its severity and also predicting forthcoming course of this illness. Along with FEV1, FVC is a standard parameter to check airways obstruction. Early detection of the disease before the first symptoms leads to

successful treatment. Nevertheless, patients usually arrive to be examined, when the symptoms intensity of COPD influence their normal existence.

The aim of the study was to analyze intensity of symptoms of COPD in the correlation with FEV1 and FEV1/FVC spirometry parameters.

Materials and methods

The study was conducted in the specialist respiratory care clinic. The study group consisted of 68 patients over 50 year's old suffering from moderate to severe COPD. Documentation analysis and diagnostic search was applied in the study. As far as the research tool is concerned CAT questionnaire has been used, which allows to estimate the intensity of the symptoms and how they affect everyday life of the patients and their state of well-being. Spirometry testing has been performed according to ERS standards with the use of MES Lung test 1000. Statistical analysis has been conducted with the use of ANOVA test.

Results

As far as the question in the CAT concerning sleeping disorders resulted from symptoms of COPD statistically significant differences were found in FEV1/FVC and FEV1 values. (anova, $F_{3, 66} =$ 4,556 i 4,169 respectively, $p<0,01$). Regarding FEV1/FVC and FEV1 values, clinically significant differences have been shown among women who stated in the CAT questionnaire they had minor problems with sputum excretion. (test t-student, $t_{16}=$ 2,746 i 2,279 respectively, $p<0,05$).

Conclusions

Evaluating intensity of the symptoms in the course of COPD in the study group, most of the problems were caused by effort dyspnea, cough and difficulties in everyday activities. Men, among whom the symptoms of disease cause the sleeping disorders have lower values of FEV1 than women. Sputum excretion has crucial influence on lowering FEV1 and FEV1/FVC.

Key words: COPD; spirometry; CAT; severity of symptoms

Streszczenie

Jedną z najczęściej występujących chorób na świecie jest przewlekła obturacyjna choroba płuc (POChP). W 2018 roku stanowiła ona trzecią przyczynę zgonów na świecie. W Polsce liczba zachorowań stale wzrasta, powodując poważne następstwa społeczne, ekonomiczne i indywidualne. Badaniem pozwalającym na wczesne wykrycie POChP jest spirometria, która określa stopień zaawansowania oraz przewidywanie dalszego przebiegu choroby. Standardowym wskaźnikiem drożności oskrzeli ocenianym w spirometrii jest FEV1, drugim ważnym parametrem jest FVC. Wczesne wykrycie choroby zanim pojawią się odczuwalne objawy jest powodem skutecznego jej leczenia, jednak pacjenci najczęściej zgłaszają się wtedy, gdy natężenie objawów POChP poważnie utrudnia normalne funkcjonowanie.

Celem badań było określenie natężenia objawów POChP w korelacji parametrów spirometrycznych FEV1 oraz FEV1/FVC.

Materiał i metody: Badanie przeprowadzono w poradni specjalistycznej chorób płuc. Grupę badaną stanowiło 68 pacjentów po 50. r.ż. z rozpoznaniem POChP w stopniu umiarkowanym do ciężkiego. W badaniu zastosowano metodę analizy dokumentacji medycznej pacjenta oraz sondażu diagnostycznego. Jako narzędzie badawcze posłużył standaryzowany kwestionariusz oceny przewlekłej obturacyjnej choroby płuc – CAT. Pozwala on określić w jakim natężeniu objawy kliniczne wpływają na codziennie funkcjonowanie pacjenta oraz jego samopoczucie. Badanie spirometryczne wykonano wg standardów ERS przy użyciu aparatu MES Lungtest 1000. Analizę statystyczną przeprowadzono z wykorzystaniem testu ANOVA.

Wyniki: Stwierdzono istotne statystycznie różnice w wynikach FEV1/FVC i FEV1 w pytaniu kwestionariusza CAT dotyczącego problemów ze snem w związku z objawami POChP (anova, F3, 66= odpowiednio 4,556 i 4,169, $p<0,01$). Istotne statystycznie okazały się

różnice w wynikach FEV1/FVC i FEV1 w grupie kobiet, które podawały w teście CAT odkrztuszanie wydzieliny w stopniu łagodnym (test t-studenta, t16= odpowiednio 2,746 i 2,279, $p<0,05$).

Wnioski: Oceniając natężenie objawów klinicznych w przebiegu POChP, najwięcej trudności w funkcjonowaniu pacjenta sprawia duszność wysiłkowa, kaszel oraz trudności z wykonywaniem czynności dnia codziennego. Mężczyźni, u których objawy choroby zaburzają sen, mają niższe wartości FEV1 niż kobiety. Odkrztuszanie wydzieliny ma znaczący wpływ na zmniejszenie FEV1 i FEV1/FVC.

Słowa kluczowe: POChP; spirometria; CAT; nasilenie objawów

Introduction

Chronic obstructive pulmonary disease (COPD) is one of the most important public health problems. According to data from the year 2017, the disease was 4 cause of death in the world. The disease is too late recognized and treated, as evidenced by, inter alia, the fact that in the year 2018 was already 3 cause of death in the world. According to WHO, COPD is the cause of ab. 3 million deaths per year. For comparison, you must provide that due to lung cancer mortality is estimated at 1.7 million [1, 8].

COPD is a chronic disease characterized by airflow limitation in the lower respiratory tract accompanied by inflammatory component. The cause is harmful agents, such as tobacco smoke, gases, dusts, which cause permanent damage to the lung parenchyma, the bronchi and Bronchioles. In people under 40 years of age diagnosed disease is very rare, and the main reason is it genetically α1-antitrypsin deficiency [2]. COPD is characterized by the presence of chronic cough with coughing up secretions and stuffiness that usually worsens after exercise. In the course of the disease are tightening, which adversely affect prognosis [9].

The diagnosis of COPD is determined based on carefully conducted an interview with the patient, research concerned spirometric and radiological chest. Guidelines for GOLD (2018. Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease) indicate the validity of the test spirometric in the diagnosis of the disease and to monitor the degree of its gravity. The basis for confirmation of the fixed air flow restriction in accordance with the guidelines is in the study of spirometric characteristics of airflow obstruction arrest expressed reduction indicator FEV1/FVC less than 0.7 (70%) (the Tiffeneau) calculated based on the FEV1 (Forced Expiratory Volume expiratory). Other tools to help in the assessment of the severity of the restrictions in the flow of the air: the scale for evaluation of shortness of breath mMRC (Modified Medical Research Counci) and test (CAT COPD Assess-ment Test) used to evaluate symptoms in a patient with COPD [3].

Perform periodic tests of spirometric allows diagnosis of the disease even before the advent of the first common signs. Impaired ventilation with COPD are visible for a number of years before a diagnosis of the disease. Before you develop symptoms, such as cough or shortness of breath, FEV1 is greatly reduced. Patients with COPD suffer from the symptoms quite late, usually report to a doctor when the FEV1 is below 50% predicted, making it much worse prognosis [10].

To the test result spirometric was reliable, it is necessary to fulfil several criteria: correct operation of spirometr, the correct preparation of the patient, the patient's position during the test, the knowledge of the patient's medications, This having an impact on the result of the test spirometric, knowledge of techniques for examination by the person carrying out the study, knowledge of the criteria of accuracy and repeatability of the results obtained, the reference result to the clinical picture of the disease. The person performing the examination and/or evaluation the result should make its assessment in accordance with the criteria of the ATS/ERS (American Thoracic Society/European Thoracic Society) [11]. Considering the value of FEV1 stands out for 4 degrees of severity of COPD:

a) ≥ 80% light (GOLD 1)

b) ≥ 50% (< 80%) moderate (GOLD 2)

c) ≥ 30% (<50%) severe (GOLD 3)

d) < 30% very severe (GOLD 4)

The objective of the research

The purpose of the research was to determine the correlation of symptoms of COPD with parameters, FEV1 and FEV1/FVC.

Material and methods

The study was conducted in the year 2018 in outpatient lung diseases in the district ostrowiecki. The test group was 68 patients diagnosed with moderate to severe COPD. The criteria for inclusion to the test group were: the diagnosis of COPD (GOLD 2, 3 (B), (D),) being patient specialist clinic, age 40-79 years, the patient's ability to fill out surveys. Exclusion criteria are defined as: patients unable to participate in the study, unable to perform spirometric studies and other clinically important respiratory diseases for example. asthma, cystic fibrosis. As a research tool used standardized test questionnaire assessing COPD-CAT.

CAT questionnaire to determine to what extent COPD affects daily functioning and well-being. The test consists of six-level scale from 0-5, where the patient alone selects the degree of the most defining its current status of the severity of the symptoms. 0 specifies the best score while the 5 worst. The CAT test is characterized by 8 areas: cough, shortness of breath, sneezing, chest tightness, shortness of breath, difficulty in functioning of the everyday and the difficulties in the functioning of the society. Statistical analysis was performed using ANOVA test.

For the purpose of determining the FEV1 (forced expiratory volumes first second) and Tiffeneau (FEV1/FVC) uses the spirometr MES 1000. The patient prior to study confirmed the decline on the day of the test drugs that may affect the test result spirometric, in this fast-acting bronchodilator. The study was made in accordance with the criteria of the ERS (European respiratory society). All patients perform spirometry correctly by obtaining 3 repeatable curves flow-volume.

The results

In the study participated 20 women and 48 men. The largest group consisted of people aged 60-79 years (N-63), a group of over 40 years of age was only 5 people. The largest group of people were people with tertiary education (N-47), a somewhat smaller group said basic education (N-12). Only one person from the general public surveyed had higher education, and 8 persons secondary education. Place of residence for 52 people was the city, and for the

16 respondents. All respondents were active smokers of cigarettes. Smoking cigarettes for 30 years was the most (N-43). The response of cigarettes by 50 years showed up 23 people. Only one person from the general public surveyed smoked cigarettes for less than 10 years and one for more than 50 years. The most common disease of the companion for the test group were hypertension (N-62) and hyperlipidemia (N-62). Out of the surveyed 23 reported that in the past had a myocardial infarction, while 7 people stroke.

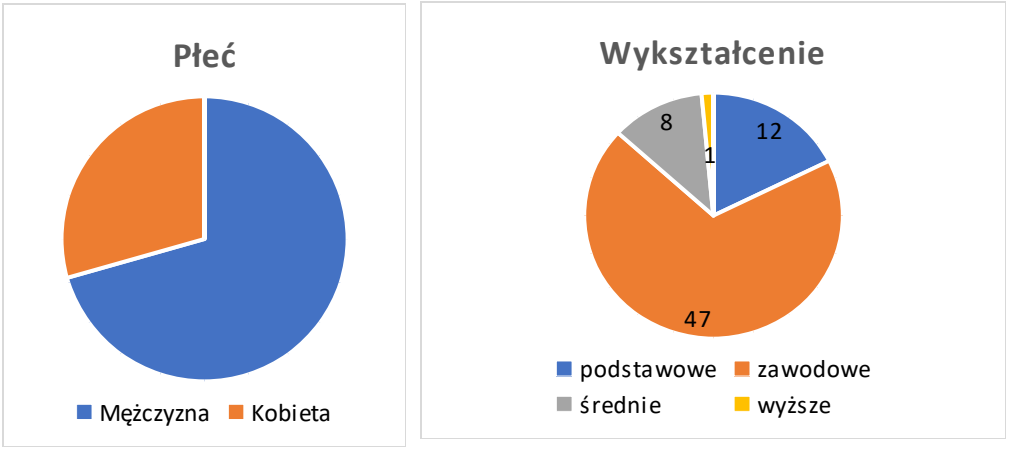


Figure 1. Characteristics of surveyed due to gender and education

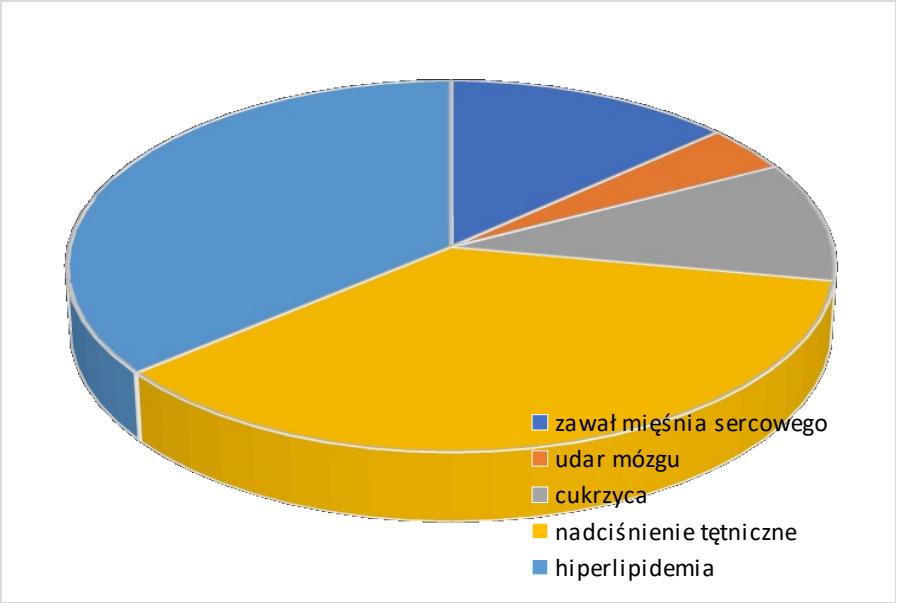
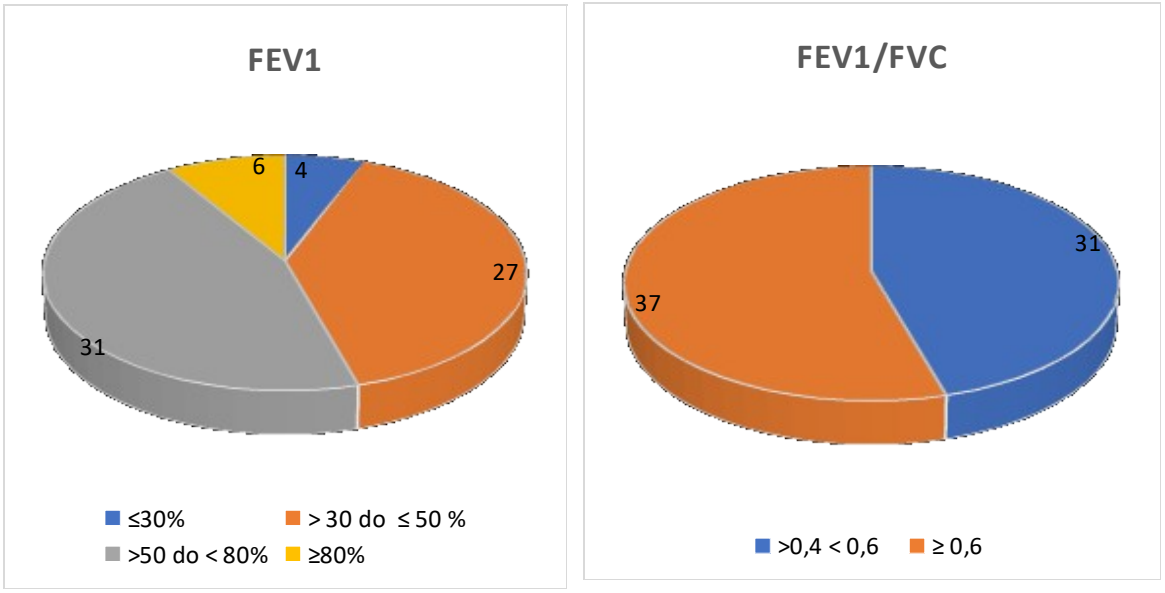


Figure 2. The accompanying disease COPD

Patients included in the study were classified in the GOLD group, c. 31 people the value of FEV1 ranged between > 50 to < 80% predicted, suggesting a moderate airflow obstruction. Little smaller group (N-27) were patients with severe bronchial obstruction-FEV1 > 30 to ≤ 50% predicted. In 6 patients had obturation the degree of light-FEV1 ≥ 80% predicted. The least a large group of test subjects were patients with very severe bronchial obstruction-FEV1 ≤ 30% predicted. (N-4). In 37 test indicator FEV1/FVC was ≥ 0.6, in the remaining 31 patients this rate was in the range of 0.4 > < 0.6.



≥

Figure 3. Characteristics of the test group because of the FEV 1 and FEV1/FVC

In the course of further research, statistical analysis has been a subjective rating of the severity of the symptoms in COPD. The most noticeable symptoms that indicated subjects, are shortness of breath when climbing stairs, cough and difficulty in performing everyday activities.

All respondents reported a problem with a feeling of shortness of breath when climbing stairs. 16 patients the symptoms ware in very heavy, 32 to the extent that heavy, and 18 people showed mild shortness of breath. Cough in the evaluation of 8 patients makes their operation to the extent that a heavy, moderate 35, 24 patients with mild degree. The difficulty with the performance of everyday activities indicated: in moderate and mild degree after 32 patients.

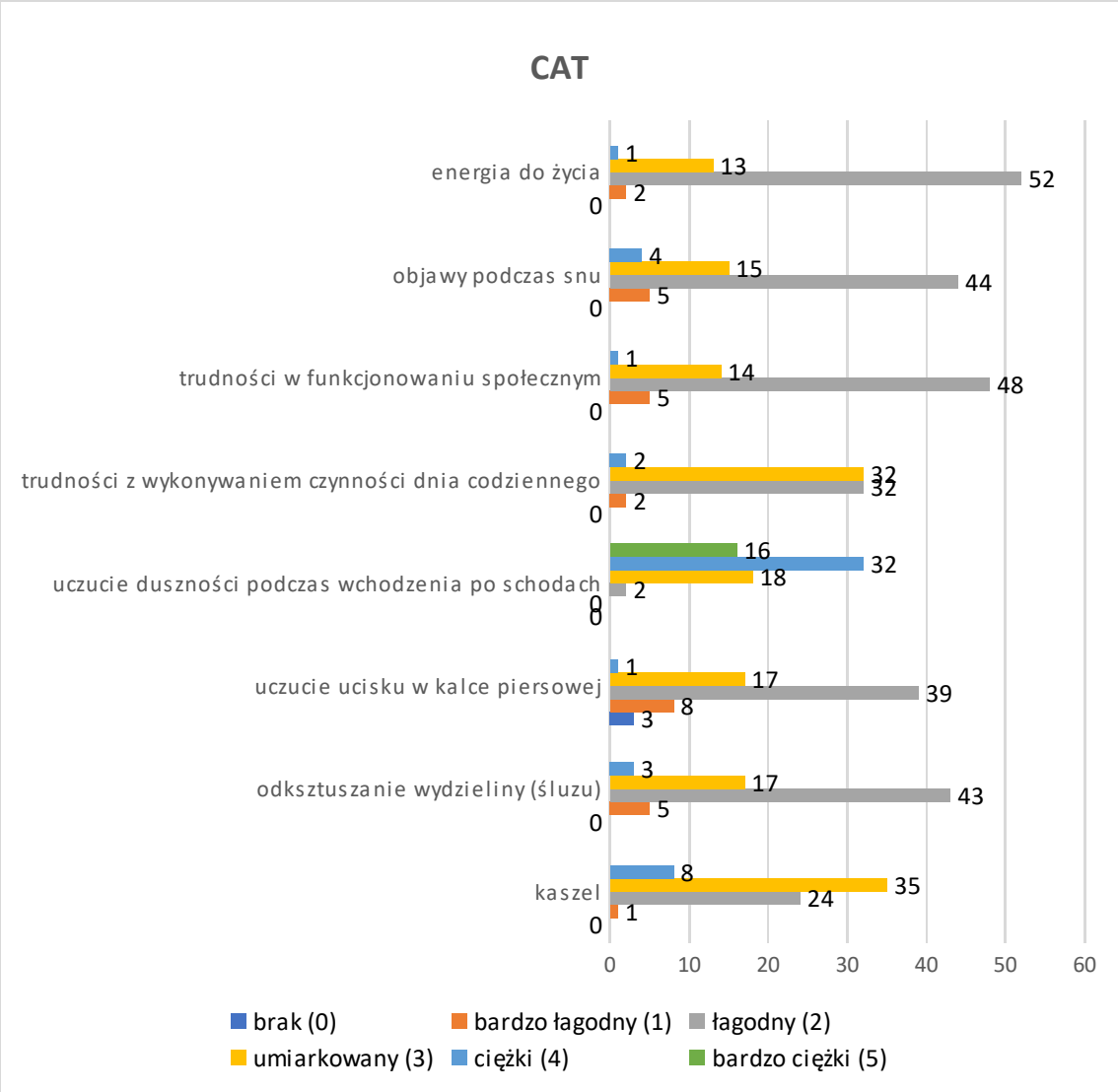


Figure 4. Assessment of the severity of the symptoms in COPD

In the further part of this work an attempt analysis of the independent variables, such as: age, gender, place of residence, education level, number of years smoking cigarettes, accompanying disease in correlation with the results of spirometry (FEV1, FEV1/FVC) and CAT test.

Testy efektów międzyobiektowych

Zmienna zależna: FEV1/FVC

Źródło	Typ III sumy kwadratów	df	Średni kwadrat	F	istotność
Model skorygowany	2808,069[a]	38	73,897	1,225	,288
Stała	828,598	1	828,598	13,736	,001
plec	47,274	1	47,274	,784	,383
wyksztalcenie	113,698	3	37,899	,628	,603
wiek_przed	21,563	1	21,563	,357	,555
papierosy	249,562	3	83,187	1,379	,269
zamieszkanie	76,177	1	76,177	1,263	,270
hospitalizacje	,000	0	.	.	.
zawal	60,501	1	60,501	1,003	,325
udar	87,388	1	87,388	1,449	,238
nadcisnienie	1,685	1	1,685	,028	,868
hiperlipidemia	124,677	1	124,677	2,067	,161
cukrzyca	6,543	1	6,543	,108	,744
CAT_kaszel	34,561	3	11,520	,191	,902
CAT_sluz	416,856	3	138,952	2,303	,098
CAT_ucisk	628,750	4	157,187	2,606	,056
CAT_schody	35,470	2	17,735	,294	,747
CAT_trudnosci	147,421	3	49,140	,815	,496
CAT_pewnosc	409,171	2	204,586	3,391	,047
CAT_sen	268,906	3	89,635	1,486	,239
CAT_energia	194,899	3	64,966	1,077	,374
Błąd	1749,414	29	60,325		
Ogółem	238039,808	68			
Ogółem skorygowane	4557,483	67			

a. R kwadrat = ,616 (Skorygowane R kwadrat = ,113)

Table 1. Statistical analysis of dependent variable FEV1/FVC

Statistical significance was noted between the various categories of the questionnaire. The significance is unmistakable in the question relating to coughing up phlegm in the results of the FEV1/FVC and FEV1 (anova, F3, 67 = 4.454 respectively and 3.224, $p < 0,05$) it was also noted that patients who have identified the severity of coughing up the extent of severe have a much lower Tiffeneau, than in other categories of severity of this symptom. There were also statistically significant differences in FEV1 between the group that defined the coughing up secretions of moderate to severe and those who have identified this symptom as a lightweight. A group of moderate seriousness symptom did not differ significantly in terms of result of FEV1 than other groups.

Statistically significant differences were in the results of the FEV1/FVC and FEV1 in the Group of women who serve in the test, CAT coughing up phlegm in the degree of mild (student's t test, t16 = 2.746 respectively and 2.279, p < 0,05). Among men there was no statistically significant difference in the results of the FEV1/FVC and FEV1 in the groups the severity of coughing up phlegm according to the CAT (anova, F3, 45 = 2.253 respectively and 1.852, p > 0,05).

Testy efektów międzyobiektowych

Zmienna zależna: FEV1

Źródło	Typ III sumy kwadratów	df	Średni kwadrat	F	istotność
Model skorygowany	7740,021[a]	38	203,685	1,323	,219
Stała	861,791	1	861,791	5,597	,025
plec	636,783	1	636,783	4,136	,051
wyksztalcenie	385,074	3	128,358	,834	,486
wiek_przed	147,663	1	147,663	,959	,336
papierosy	657,590	3	219,197	1,424	,256
zamieszkanie	12,088	1	12,088	,079	,781
hospitalizacje	,000	0	.	.	.
zawal	233,581	1	233,581	1,517	,228
udar	453,525	1	453,525	2,946	,097
nadcisnienie	880,526	1	880,526	5,719	,023
hiperlipidemia	70,536	1	70,536	,458	,504
cukrzyca	36,141	1	36,141	,235	,632
CAT_kaszel	123,873	3	41,291	,268	,848
CAT_sluz	1666,177	3	555,392	3,607	,025
CAT_ucisk	210,805	4	52,701	,342	,847
CAT_schody	106,329	2	53,165	,345	,711
CAT_trudnosci	600,118	3	200,039	1,299	,293
CAT_pewnosc	407,122	2	203,561	1,322	,282
CAT_sen	1090,141	3	363,380	2,360	,092
CAT_energia	567,254	3	189,085	1,228	,317
Błąd	4464,920	29	153,963		
Ogółem	286652,000	68			
Ogółem skorygowane	12204,941	67			

a. R kwadrat = ,634 (Skorygowane R kwadrat = ,155)

Table 2. Statistical analysis of dependent variable FEV1

In the test group, there were no statistically significant differences between the categories of CAT for coughing, tightness in the chest, the stairs, the functioning of society, energy for life and the results of spirometrycznymi-FEV1 and FEV1/ FVC.

It was found statistically significant differences in the results of the FEV1/FVC and FEV1 and problems sleeping (anova, F3, 66 = 4.556 respectively and 4.169, $p < 0,01$). The result of the FEV1/FVC in the group that determines the degree of semen symptoms during sleep referred to as heavy was significantly lower than in the other groups ($p < 0,01$). The result of FEV1 in the group the severity of symptoms during sleep in the degree of severe was significantly lower than in groups of moderate to mild and moderate ($p < 0,01$). By analyzing a group of men and their responses to a question about symptoms during sleep, there have not been significant statistically difference in the results of the FEV1/FVC (anova, F3, 44 = 2,311, $p > 0,05$). Statistically significant differences in the results of the FEV1 (anova, F3, 44 = 3,112). Men describing the symptoms the night as heavy, they had much lower FEV1 than the group that specifies the symptoms as light intensity. There was no statistically significant difference in the results of the FEV1/FVC and FEV1 among women (anova, F2, 17 = 3.402 respectively and 3.478, $p > 0,05$).

Discussion

COPD is a chronic disease in which the development and largely influenced by being passive or active smoker of tobacco. It is a disease for middle aged people (mainly after 40 years of age). In the test group, until 63 people were after 60-year life. Often, this disease is accompanied by other disorders of the cardiovascular system. In 62 surveyed the problem was hypertension and hyperlipidemia. 23 people in the past had a heart attack, and 7 people stroke.

Similar results received and. Brodnicka, who has studied 196 patients with COPD. In this group the most common health problem reported by the subjects were also hypertension (47.7%) and heart disease (36.2%) [4].

In our study it was noted a significant decrease in FEV1 and FVC/FV1 patients who reported sleep problems associated with symptoms of COPD. Very similar correlation noted Janson (C) with a group of co-investigators, in patients with asthma. His test was 98 patients, among whom up 51% reported sleep problems associated with shortness of breath and

coughing. The researcher observed a significant decrease in FEV1 in patients, who in the morning made spirometry [5]. A similar relationship noted Lowe and co. who carried out the study on 4826 people, of which 73% were active smokers of cigarettes. In the Group of smokers was found to significantly reduce the value of FEV1 compared to spirometric values obtained 5 years before [6].

Maria C Magnus and co. conducted a multicentric in England, Sweden and Wales on 503 325 cigarette smokers aged 40-69 years of age. The Group was diverse: 41 369 patients with asthma, COPD patients 47 342, the other patients were healthy, but had smoked cigarettes. This study also showed mean decrease in FEV1 and FEV1/FVC in smokers patients diagnosed with COPD [7].

The literature stresses that the main symptom of clinical disease is shortness of breath, which is the most common cause of failure in patients. [12] this is confirmed by our research that has shown that symptom was reported by all subjects.

Conclusions

1. In assessing the severity of symptoms in COPD most difficulties IP makes shortness of breath when climbing stairs, cough, perform activities of daily living.

2. Analysed by socio-demographic variables, patients did not influence significantly statistically on the spirometry test results.

3. It was found statistically significant differences in the results of the FEV1/FVC and FEV1 in the question of the questionnaire CAT, which concerned the sleep problems in connection with the symptoms of COPD.

4. Coughing up secretions has a significant impact on the reduction of FEV1 and FEV1/FVC.

5. The men, whose symptoms interfere with sleep, have a lower value of FEV1 than women.

6. Women with symptom of coughing up secretions occurs at moderate, have reduced FEV1 and FEV1/FVC than men who expectorate jars with the same intensity.

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