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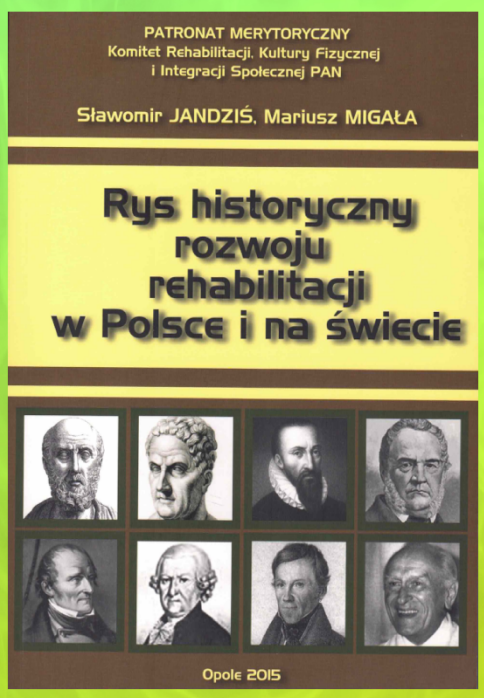

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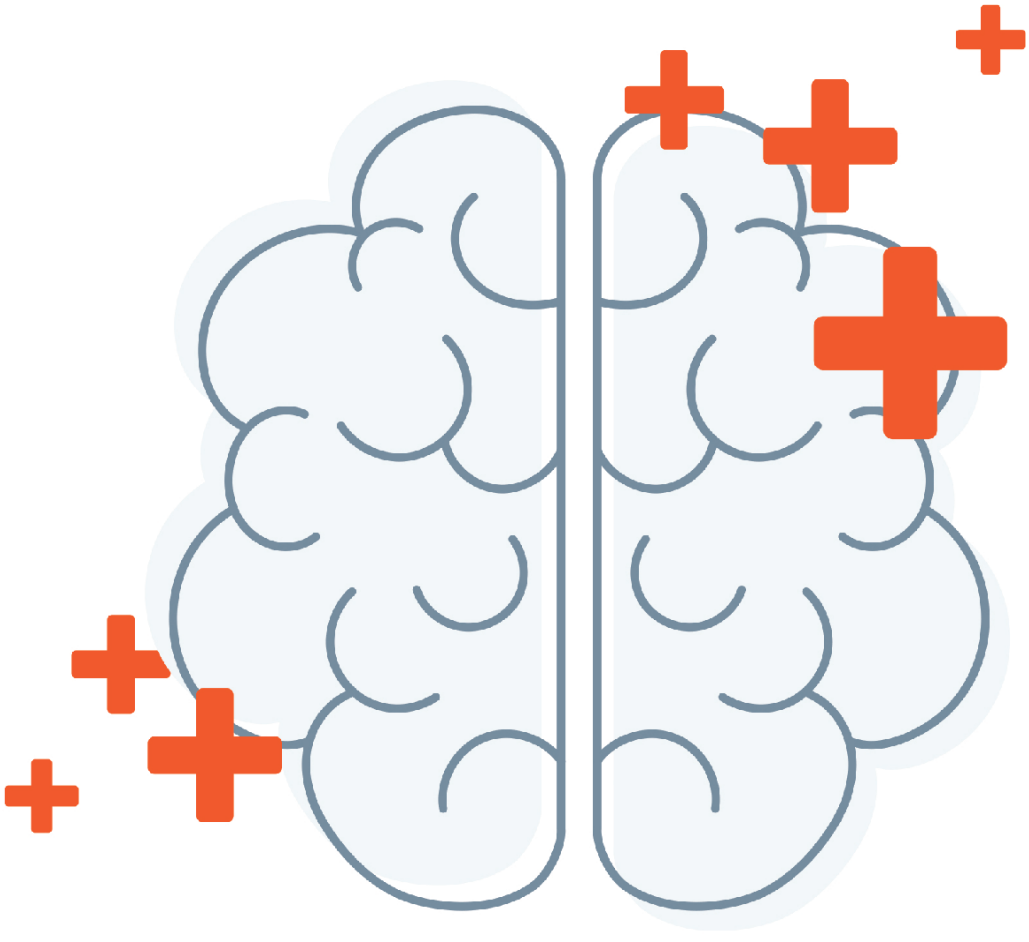

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The impact of body composition disorders on the quality of life of patients with chronic obstructive pulmonary disease

Wpływ zaburzeń składu ciała na jakość życia pacjentów z przewlekłą obturacyjną chorobą płuc

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Abstract

Introduction. COPD is a chronic inflammatory disease that constitutes a significant public health problem. It is characterized by not fully reversible, progressive limitation of airflow through the airways. In addition to the harmful pulmonary effects, COPD manifests itself with complications in other body systems, including body composition disorders, which adversely affects patients' quality of life and prognosis. The objective of this study was to assess the quality of life of patients with COPD and to assess the factors that will affect its deterioration.

Material and methods. The study included 37 patients of the University Hospital at the Jagiellonian University Medical College in Kraków at 8 Skawińska Street, who were diagnosed with COPD according to the GOLD guidelines. In the study group, a personal questionnaire was conducted, anthropometric data was collected, i.e. the Quetelet index was calculated, thigh circumference and skin folds were measured, and the subjective assessment of the quality of life was examined using the SGRQ-C questionnaire and the CAT Test.

Results. Based on the analysis of the collected materials, it was shown that the average assessment of the quality of life in the study population was at a low level of 61.8 points on the SGRQ-C scale. There was a large variation in the assessment of HRQoL depending on the stage of the disease. The best result, amounting to 23.0 points, was achieved by patients in stage 1, and the worst - 81.6 points. – patients in stage 4 according to GOLD guidelines. Among the main determinants of the quality of life in the study group, in addition to the degree of airway obstruction, there were: high intensity of clinical symptoms, such as cough, shortness of breath or expectoration of secretions, low body weight and the number of comorbidities. Conclusions. It has been shown that the loss of fat-free body mass and systemic complications are factors that significantly reduce the quality of life, and patients with fewer comorbidities and with increased BMI score better on the SGRQ-C scale. It has been proven that the progression of the disease contributes to the exclusion of patients from active social life and causes many mental problems. It was established that patients with COPD should be covered by multidisciplinary care and a special training program in order to prevent or delay the onset of systemic complications, which significantly worsen the patients' quality of life

Key words:

COPD, body composition, quality of life

Streszczenie

Wstęp. POChP to przewlekła choroba zapalna stanowiąca istotny problem zdrowia publicznego. Jej charakterystyczną cechą jest niecałkowicie odwracalne, postępujące ograniczenie przepływu powietrza przez drogi oddechowe. Oprócz szkodliwych następstw płucnych POChP manifestuje się powikłaniami w innych układach organizmu, w tym również zaburzeniami składu ciała, co wpływa niekorzystnie na jakość życia i rokowanie chorych. Celem niniejszej pracy była ocena jakości życia pacjentów z POChP oraz ocena czynników, które będą wpływały na jej pogorszenie.

Materiał i metody. Do badania włączono 37 pacjentów Szpitala Uniwersyteckiego CMUJ w Krakowie przy ulicy Skawińskiej 8, u których zdiagnozowano POChP wg wytycznych GOLD. W grupie badanej przeprowadzono ankietę osobową, zebrano dane antropometryczne, tj. obliczono wskaźnik Queteleta, dokonano pomiaru obwodu uda i pomiarów fałdów skórnych oraz zbadano subiektywną ocenę jakości życia przy pomocy kwestionariusza SGRQ-C i Testu CAT.

Wyniki. Na podstawie analizy zebranych materiałów wykazano, że średnia ocena jakości życia w badanej populacji mieściła się na niskim poziomie 61,8 pkt. w skali SGRQ-C. Wykazano duże zróżnicowanie co do oceny HRQoL w zależności od stadium zaawansowania choroby. Najlepszy wynik, wynoszący 23,0 pkt., osiągnęli pacjenci w 1 stopniu GOLD, a najgorszy – 81,6 pkt. – pacjenci w stopniu 4. Wśród głównych determinantów jakości życia w badanej grupie, oprócz stopnia obturacji dróg oddechowych, znalazły się: wysokie nasilenie objawów klinicznych, takich jak kaszel, duszność czy odkrztuszanie wydzieliny, niska masa ciała oraz ilość chorób współistniejących.

Wnioski. Wykazano, że utrata beztłuszczowej masy ciała i powikłania ogólnoustrojowe są czynnikiem istotnie obniżającym jakość życia, a pacjenci z mniejszą liczbą chorób współistniejących i ze zwiększonym wskaźnikiem BMI osiągają lepsze wyniki w skali SGRQ-C. Dowiedziono przy tym, że postęp choroby przyczynia się do wykluczenia pacjentów z aktywnego życia społecznego i dostarcza wielu problemów natury psychicznej. Ustalono, że chorzy na POChP powinni być objęci wielospecjalistyczną opieką i specjalnym programem treningowym w celu zapobiegania bądź też opóźnienia wystąpienia powikłań systemowych, istotnie pogarszających jakość życia chorych.

Słowa kluczowe:

POChP, skład ciała, jakość życia

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Introduction

Chronic obstructive pulmonary disease constitutes a significant public health problem. According to WHO data, it is among the top five causes of death in the world [1]. For nearly 40 years, scientists have described COPD solely in terms of respiratory dysfunction. Only in 2004, for the first time, information about the systemic consequences of COPD was included in the report by the American Thoracic Society and the European Respiratory Society [2]. Currently, COPD is presented as a chronic disease of the respiratory tract with significant extrapulmonary changes, which is characterized by not fully reversible airflow limitation through the lower respiratory tract [3]. The most common changes accompanying respiratory problems in COPD include a decrease in fat-free body mass (especially muscle mass), nutritional disorders and muscle weakness, which aggravate the severe condition of patients [4]. This study highlights the problem of systemic pathology, which consistently contributes to the deterioration of the quality of life of patients with COPD by gradually destroying their bodies. It indicates the correlation between respiratory dysfunction and systemic consequences, which in turn become the basis for the development of other chronic diseases.

Objective

The objective of the study was to assess the quality of life of patients in various clinical stages of chronic obstructive pulmonary disease and to determine whether there is a relationship between the quality of life of patients and their body composition determined by anthropometric measurements (BMI, thigh circumference and skin fold values), assuming that the lower these values, the greater the impoverishment of the body and the worse the quality of life, and the patient may struggle with cachexia. It was checked whether relatively simple, cheap, easily accessible and repeatable measurements of the Body Mass Index, thigh circumference and skin folds are sufficient to talk about abnormalities in body composition, quality of life and prognosis on their basis, or whether, due to their disadvantages and limitations, other methods of assessing the amount of adipose tissue, such as bioelectrical impedance analysis, magnetic resonance imaging or X-ray absorptiometry, should be used [2]. Thus, the question was asked whether the above measurements could be an important variable of morbidity and mortality in COPD.

Material and methods

Patients with chronic obstructive pulmonary disease were qualified for the study based on their medical history, physical examination and spirometry results, in accordance with the GOLD guidelines. The participants were treated at the Clinical Ward of the Pulmonology Clinic and the Clinical Ward of Allergy and Immunology of the 2nd Department of Internal Medicine at the Jagiellonian University Medical College. Participation in the study was anonymous and voluntary. All research procedures were performed at the hospital premises.

The criteria for inclusion in the study included diagnosed COPD and the patient's consent to participate in the study. The exclusion criteria included patients in acute condition

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(myocardial infarction, pulmonary embolism), patients with COPD and influenza – due to increased epidemiological risk. Each time, the research procedure followed the same scheme: conducting a personal survey, measuring thigh circumferences in a standing position, measuring skin folds in a standing position, assessment using the CAT test, assessment using the SGRQ-C questionnaire, and assessment using the mMRC scale. Thirty-seven patients, including 19 men and 18 women, aged 43 to 84, participated in the study. The characteristics of the basic parameters of the study group, broken down by gender, are presented in Table 1.

Table 1. Characteristics of the basic parameters of the study group

Parametry Parameters	Kobiety/Women Średnia/Mean ± SD (Min; Max)	Mężczyźni/Men Średnia/Mean ± SD (Min; Max)
Age [years]	67.7 ± 49 (59; 78)	70 ± 9.2 (43; 84)
Total thickness of the skin folds [mm]	73.9 ± 29 (36; 150)	67 ± 30.7 (24; 134)
Thigh circumference at the widest point [cm]	50.3 ± 7.6 (40; 65)	50.4 ± 11.4 (35; 90)
Thigh circumference 6 cm above the kneecap [cm]	40.5 ± 6.2 (30; 53)	41 ± 4.9 (30; 49)
BMI [kg/m^2]	28.3 ± 6.9 (17.5; 40.6)	28.1 ± 4.8 (18.2; 36.3)
FEV1%	51 ± 15 (25; 83)	52.6 ± 16.8 (27; 81)

Results and discussion

The collected material was statistically analysed using Statistica 10 PL. A 5% inference error and the associated significance level of p = 0.05 were assumed, indicating the existence of statistically significant differences or correlations. Patients were classified on the basis of the spirometry test results and assigned to one of 4 groups determining the severity of the disease. Figure 1 presents the percentage share of patients in particular groups according to the GOLD spirometry classification [5].

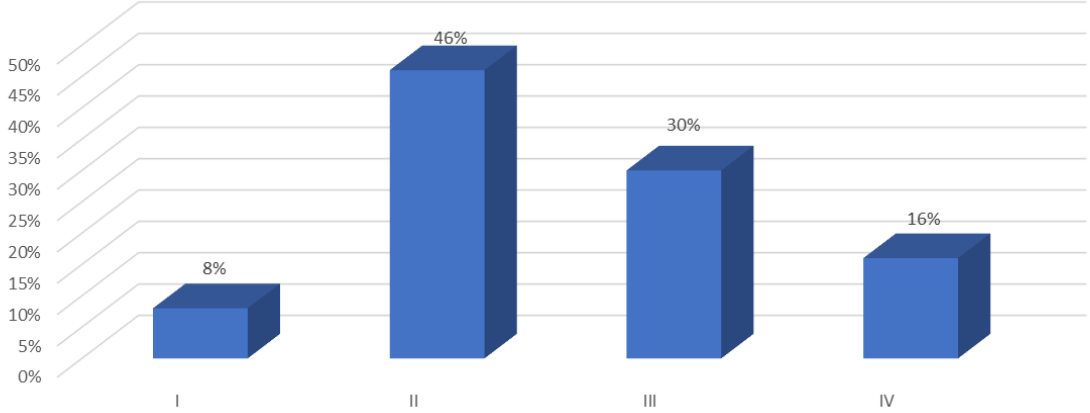

Fig. 1. Stages of COPD in the study group according to GOLD guidelines
Stage I – mild, stage II – moderate, stage III – severe, stage IV – very severe

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On average, patients came to the hospital for worsening lung disease 3 times ± 2.3 in the last year. The examined patients had been struggling with diagnosed COPD for an average of 9 ± 6.5 years. Each participant experienced shortness of breath during moderate-intensity exercise. The severity of dyspnoea was strongly correlated with the stage of COPD, Pearson's correlation coefficient was 0.75. 92% (n = 34) of the patients declared that due to shortness of breath they walk slower than other people of their age. 46% of the patients (n `= 15) indicated that they had to stop about every 100 meters or every few minutes to catch their breath. 10% of the patients (n=4) felt too breathless to leave the house and were unable to move away from the bed or armchair.

Analysis of anthropometric data

Based on the BMI index, patients were assigned to 5 groups, indicating underweight, normal weight or overweight. The percentage share of patients in particular groups is presented in Figure 2. A statistically significant correlation between BMI values and the intensity of dyspnoea in the mMRC scale was found at the level of p = −0.56.

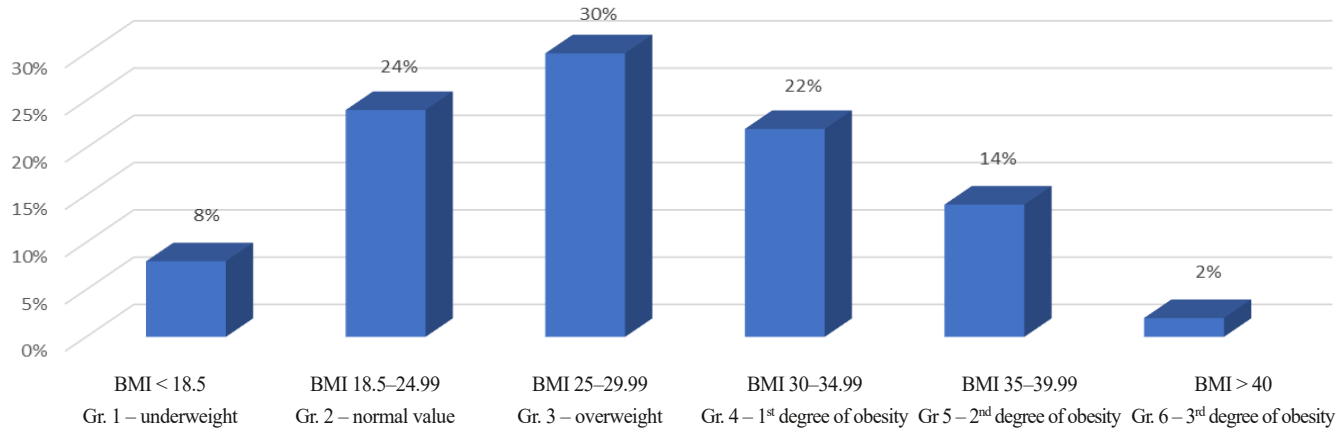

Fig. 2. Division of patients into groups in terms of BMI

It was checked whether the BMI value is related to the progression of COPD and whether, as assumed, a decrease in the Quetelet index is observed along with the deterioration of lung ventilation parameters. The following results were obtained: in the mild stage of the disease, the mean BMI was 31.6 ± 6.6 with a median of 32.2; the second stage was characterized by the average BMI of the patients at the level of 30.9 ± 5.2 with a median of 30.3. The patients in the penultimate stage of COPD had an average BMI of 27.8 ± 4.9 with a median of 27.4. The mean BMI in the last-stage group was 23.2 ± 6.6 with a median of 21.4. There was a clear trend of BMI decreasing with the progression of COPD. A strong relationship between these parameters is confirmed by the correlation at the level of p = −0.96. The difference between the mean FEV1 values in the two extreme

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BMI groups was also examined. The underweight patients had a mean forced expiratory volume in one second of 27.7% ± 0.6 with a median of 28. The group of obese patients with a BMI over 30 achieved lung ventilation parameters of 57.8% ± 15.5 with a median of 55. The mean difference in FEV_1 in the comparison of underweight patients with obese patients was 30%. Gradual reduction of the lung ventilation parameters became the cause of body impoverishment and weight loss. A detailed distribution of BMI in subsequent stages according to GOLD is presented in Figure 3. It was calculated that in this case the correlation between belonging to individual BMI groups and the stage of COPD is at the level of p = −0.41.

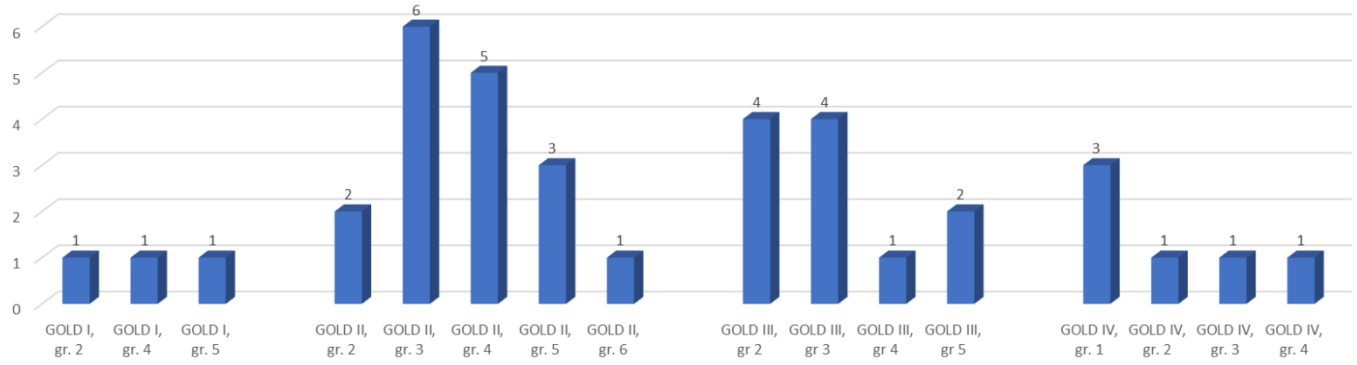

Fig. 3. Distribution of BMI in particular stages of COPD in the study group

Gr. 1 – underweight; Gr. 2 – normal value; Gr. 3 – overweight; Gr. 4 – 1st degree of obesity; Gr 5 – 2nd degree of obesity; Gr. 6 – 3rd degree of obesity

In the course of the study, it was found that among the patients, the thigh circumference at the widest point ranged from 35 to 90 cm and was on average 50.3 ± 9.6 cm. Thigh circumference 6 cm above the kneecap ranged from 30 to 53 cm and was on average 40.9 ± 5.5 cm. For patients with stage 4 COPD, the mean value of U1 circumference was 43.3 ± 8.1, while the average for patients with stage 1 COPD was 56 ± 9. Significant differences in these dimensions indicate the ongoing impoverishment process as the disease progressed. The chapter "Quality of life analysis" presents the correlation between BMI and thigh circumference parameters and the results of the SGRQ-C questionnaire.

The third measurement concerned the estimation of body fat content in the body of the examined person based on the measurement of skin folds. Based on the obtained results, the percentage of fat-free mass in the body of each patient was calculated, and the results were multiplied by the weight of individual patients, obtaining an estimated amount of fat-free mass expressed in kilograms. Patients with COPD usually show signs of malnutrition in the advanced stage of the disease, therefore the mean values of fat-free body mass were compared with the GOLD stage. There is a clear downward trend in FFM with the progression of COPD. The difference in the fat-free mass content in the patient's body is 14.4 kg on average between the 1st and 4th stage according to GOLD, to the disadvantage of the extremely advanced stage. In the first stage according to GOLD, the mean FFM was 63 kg ± 4.0 with a median of 64.4. In stage 2 patients, the mean FFM was 56.7 kg ± 9.5 with a median of 54.7. Stage 3 patients had

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a mean FFM of 55.2 kg ± 8.8 with a median of 54.5. At the last stage, the mean FFM was 48.6 kg ± 11 with a median of 48.1. The above analysis shows that the mean fat-free body mass of patients with COPD expressed in kilograms and the stage of the disease in these patients correlate at the level of p = 0.98.

Quality of life analysis

Based on the information collected in the SGRQ-C questionnaire, the incidence of disease symptoms, social activity and the impact of the disease on patients' lives were determined. After analysing the collected material, it was found that for the vast majority of patients, 86% (n = 32), lung disease is the biggest problem or causes them a lot of trouble. 95% of the patients (n = 35) reported coughing and expectoration of varying intensity. 51% of them (n = 18) coughed most days of the week. Only 5% of patients (n = 2) had no sputum retention at all. 51% of the patients (n = 19) experienced shortness of breath daily, and 41% (n = 15) experienced shortness of breath for several days a week. Figure 4 shows activities that cause dyspnoea in patients.

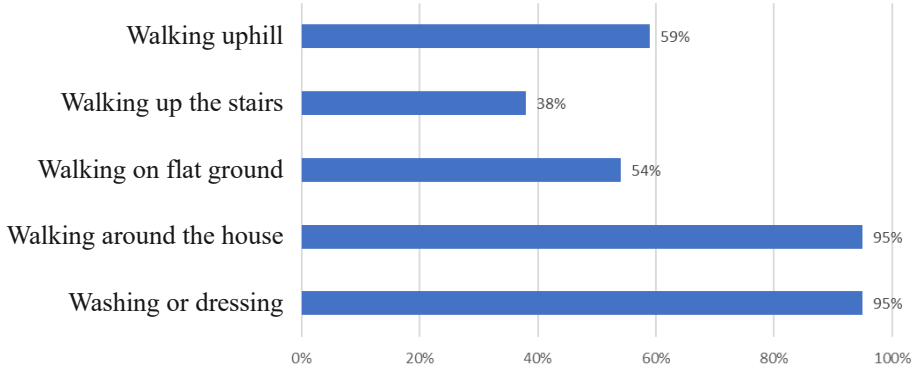

Fig. 4. Activities that cause shortness of breath in patients

In addition to many medical problems, the patients also struggled with psychosocial problems. 65% of the participants (n=24) feared that their disease was burdensome for family and friends. 38% (n = 14) believed that breathing difficulties made them disabled. For 68% (n = 25) shortness of breath was the reason for fear and panic. Breathing problems caused that as many as 86% of the participants (n = 32) got tired easily, and for 57% (n = 21) everything required too much effort. The deterioration of the quality of life (QoL) among the participants also resulted from the limitation of everyday functioning. 32% (n = 12) admitted that due to the disease they do not leave home to do shopping, and 27% are unable to do household chores. The disease stopped ¼ of the patients from doing whatever they wanted to do. On the other hand, 38% (n = 14) felt unable to perform most of the activities they wanted to do. Based on the analysis of the collected data, it was found that the average total SGRQ-C score was 62.8 ± 18.9 points, which means that the overall QoL level is relatively low. The highest QoL values were obtained in the "impact on life" sub-

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scale, where the mean score was 54.1 ± 21.5 with a median of 57.5. On the "symptoms" subscale, which assessed coughing, sputum retention, wheezing, and difficulty breathing, the mean score was 61.5 ± 21.2 with a median of 64.6. The worst QoL was obtained by the participants in the "activity" subscale. The mean score was 78.1 ± 20.7 with a median of 83.4. This subscale focused primarily on limitation in activity caused by severe breathing difficulties and shortness of breath. Table 2 contains the cumulative results of the assessment of the quality of life of the patients participating in the study.

Table 2. Results of the SGRQ-C scale for the study group

SGRQ-C	N	Mean	SD	ME	Min	Max
Symptoms	37	61.5	21.2	64.6	10.3	97.3
Symptoms	37	78.1	20.7	83.4	29.8	100
Impact on life	37	54.1	21.5	57.5	2.0	93.2
Total	37	62.8	18.9	66.5	12.04	93.5

These results were also compared with individual variables specific to each patient. On this basis, an analysis of the impact of variables such as the frequency of hospitalizations, the number of comorbidities, BMI, thigh circumference and stage of COPD according to GOLD on the level of the SGRQ-C quality of life index, divided into 3 subscales: symptoms, activity and impact on life, was developed. The results of this summary are presented in tables 3, 4, 5.

Table 3. The influence of individual variables on the assessment of the quality of life SGRQ-C – symptoms

"Symptoms" subscale	N	M	SD	Pearson's correlation
Annual hospitalization rate				
1–2 times	16	59.7	25.3	
3-4 times	8	63.3	17.7	0.79
5 times and more	11	62.8	17.7	
Comorbidities				
1–2	13	56.8	22.1	
3–5	14	64.9	19.7	0.98
6 and more	8	69.1	15.9	
BMI				
Underweight	3	77.5	26.7	
Normal weight	9	59.3	24.7	
Overweight	11	65.6	17.6	−0.85
1st degree of obesity	8	56.3	21.9	
2nd degree of obesity	5	53.1	21.4	
3rd degree of obesity	1	70.7	–	
Thigh circumference				
≤ 45 cm	10	65.8	22.2	
46–55 cm	19	61.7	22.6	−1.0
≥ 56 cm	8	56.7	17.9	
GOLD				
1 stage	3	27.8	16.3	
2 stage	17	60.3	18.5	0.9
3 stage	11	61.7	18.2	
4 stage	6	75.5	21.6	

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Table 4. The influence of individual variables on the assessment of the quality of life SGRQ-C – activity

"Activity" subscale	N	M	SD	Pearson's correlation
Annual hospitalization rate				
1–2 times	16	71.4	23.1	
3-4 times	8	82.2	19.5	0.94
5 times and more	11	85.3	15.3	
Comorbidities				
1–2	13	75.4	23.3	
3–5	14	75.8	16.6	0.87
6 and more	8	92.0	12.9	
BMI				
Underweight	3	97.3	4.7	
Normal weight	9	80.6	21.4	
Overweight	11	82.5	17.8	
1st degree of obesity	8	67.9	22.0	−0.94
2nd degree of obesity	5	66.3	22.3	
3rd degree of obesity	1	91.7	–	
Thigh circumference				
≤ 45 cm	10	89.6	13.4	
46–55 cm	19	73.8	22.0	−0.94
≥ 56 cm	8	70.0	20.8	
GOLD				
1 stage	3	40.2	11.9	
2 stage	17	73.1	18.2	0.97
3 stage	11	86.3	12.7	
4 stage	6	98.6	3.3	

Table 5. The influence of individual variables on the assessment of the quality of life SGRQ-C – impact on life

"Impact on life" subscale	N	M	SD	Pearson's correlation
Annual hospitalization rate				
1–2 times	16	45.9	24.3	
3-4 times	8	58.4	21.0	0.97
5 times and more	11	63.3	11.6	
Comorbidities				
1–2	13	48.8	24.2	
3–5	14	53.7	17.0	0.96
6 and more	8	69.4	11.1	
BMI				
Underweight	3	78.2	5.5	
Normal weight	9	55.0	21.2	
Overweight	11	59.1	24.8	
1st degree of obesity	8	43.1	14.6	−0.89
2nd degree of obesity	5	44.2	21.2	
3rd degree of obesity	1	56.9	–	
Thigh circumference				
≤ 45 cm	10	65.4	18.7	
46–55 cm	19	49.4	21.6	−0.96
≥ 56 cm	8	44.21	21.8	
GOLD				
1 stage	3	15.6	15.6	
2 stage	17	51.9	20.2	0.95
3 stage	11	58.0	14.7	
4 stage	6	73.5	6.9	

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The results of the second questionnaire assessing the quality of life – the CAT test – were analysed separately. The average result in this test obtained by the study group was 23.9 ± 7.9. The lowest score was 8 and the highest was 37. In the group of patients in the first stage according to GOLD, the mean CAT score was 9.3 ± 2.3; in the second stage 22 ± 7.2; in the third 28.5 ± 3.4; and in the last stage it was 29.2 ± 5.2

Discussion

Quality of life is one of the primary measures of COPD severity. It is also defined as a measure of the effectiveness of the implemented treatment [6]. Szyguła et al. found that the quality of life depends on health and is modified by limited functioning and activity in society [7]. Based on the analysis of the collected material, it was found that the global assessment of the quality of life of patients with COPD is at a low level and amounts to an average of 62.8 points. This negative assessment of QoL in patients with COPD is confirmed by other authors, both Polish and foreign. Kupcewicz's research on 96 patients of the Department of Internal Medicine and Cardiology in Biskupiec shows significantly low HRQoL, at an average level of 61.4 points. [8]. The average level of quality of life in a study by Indian authors conducted on 175 patients of the Internal Medicine Department of a hospital in central India was 49.81 points [9]. In this study group, many factors were noted that closely correlate with the subjective assessment of QoL, such as: disease severity, lung ventilation parameters, BMI, thigh circumference or the number of comorbidities. The results of our own research did not confirm the correlation between the quality of life and gender, which is also confirmed by the reports of other authors.

As literature review shows, the assessment of the quality of life of patients, apart from typical respiratory problems, is largely affected by the severity of nutritional disorders. It leads to many negative clinical consequences, e.g. it increases the occurrence of shortness of breath, causes a decrease in the efficiency of skeletal muscles and translates into a decrease in exercise capacity. Ultimately, cachexia is considered a risk factor for death from respiratory causes [10]. Therefore, a reliable assessment of nutritional disorders in patients with COPD is one of the key elements of planning medical care and can improve the quality of life and the course of the disease in these patients. Depending on the selection of study groups, it has been shown that weight loss due to complex metabolic disorders affects up to 50% of patients in the advanced stage of the disease [11]. As the most frequently observed signs of body composition disorders include a decrease in total body weight and muscle mass, it was decided to evaluate these two parameters and examine their impact on the assessment of the quality of life in patients with COPD [12]. In this study group, it was noted that BMI consistently decreases with increasing severity of COPD, and all patients who were underweight were classified as being at the last clinical stage. According to literature review, other authors also noticed that the frequency of body composition disorders is the highest in the group of patients in stage 4 according to GOLD [13]. This indicates

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a close correlation between disease progression and persistent chronic inflammation in the body and the development of cachexia and FFM loss. In the study group, the FEV_1 value was the lowest among underweight patients and on average 30 percentage points lower than in the group of obese patients. In the study conducted by Hallin et al., the underweight group with the lowest FEV_1 parameters was prospectively three times more likely to die than patients in other BMI groups [14]. After analysing the impact of body weight on the assessment of the quality of life in the study group, the reports of Shoup et al. were confirmed that in patients with COPD who are underweight, there is a much greater decrease in HRQoL than in other patients. The latest reports by Emtner et al. also indicate that low body weight is correlated with reduced quality of life [15]. Although BMI values do not provide information on the body composition and structure, a positive correlation between quality of life and BMI can be clearly observed in this study. While in the group of underweight people, the average quality of life was 84 points on the SGRQ-C scale, i.e. very low, in each subsequent group it was constantly improving to achieve a satisfactory average score of 52.5 points in the group with 2nd degree obesity. This relationship confirms the assumptions of other authors about a strong correlation between weight loss and the ongoing process of body impoverishment.

As there is a possibility that with normal BMI values, the body composition may still be disturbed, in the course of the study, skin fold measurements were made, on the basis of which the FFM content in the patients' bodies was estimated. When analysing the available data, it was noted that lower FFM values are associated with disease progression expressed by FEV_1. This is probably due to insufficient oxygen supply and progressive hypoxia as a result of airway obstruction. In addition, patients with the lowest FFMI (below 18 kg/m^2) had correspondingly worse quality of life scores compared to the group with the highest FFMI (over 23 kg/m^2) by an average of 23.5 points on the SGRQ-C scale. Polish authors show that in the blood of patients with reduced FFM there is a higher concentration of inflammatory markers, which may be associated with the progression of the disease severity and the loss of fat-free body mass [16].

The relationship between the thigh circumference values and the assessment of the quality of life among patients is also interesting. In their studies, Marquis et al. proved the occurrence of a decrease in the cross-sectional area of the thigh muscles measured by computed tomography in severe COPD [17]. In this study, the lowest measurements of thigh circumference measured with a tape measure were also recorded among patients in the last group according to GOLD. They averaged 43 cm. It was noted that patients whose thigh circumference was below 45 cm had worse SGRQ-C parameters by an average of 20 points compared to patients with U1 circumference above 56 cm. Marquis et al. also found that muscle mass loss in the quadriceps femoris is a good predictor of mortality in patients with COPD. The studies of these authors show that systematic periodic measurements of the thigh circumference may be helpful in controlling the loss of muscle mass in the

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quadriceps femoris as a predictor of death. As muscle atrophy in patients with airway obstruction is partially reversible, a proper diagnosis will be the starting point for implementing procedures to prevent their negative consequences in patients with COPD, including a decrease in their quality of life. The American Thoracic Society attributes peripheral muscle atrophy to physical inactivity and persistent chronic systemic inflammation [18]. In this study, the lowest thigh circumference values, below 45 cm, were strongly correlated with a high SGRQ-C score in the "activity" subscale (average 89.6 points) and a mean disease duration of 9.5 years, which correlates with the research results of the society mentioned above. Emtner et al. prove that an important component of pulmonary rehabilitation of patients with COPD is strength training leading to the improvement of muscle and circulatory system function. Care for maintaining optimal muscle mass and counteracting muscle atrophy as factors adversely affecting the progression of the disease is also postulated in the study by Sanders et al. The researchers summarize their results with a conclusion that the correct therapeutic intervention in the case of diagnosed cachexia should include physical exercise, pharmacological interventions, improving the energy balance and the availability of nutrients, and in the future behavioural therapy sensitizing patients to anabolic stimuli, which is also a good conclusion for this discussion on body composition disorders [19].

Due to the conducted studies, in addition to formulating their main objective, it was decided to ask additional research questions regarding the impact of the progressive loss of FEV_1 and comorbidities on HRQoL. They are important for this study, because they deal with the main topic and, together with the assessment of body composition disorders, complete the characteristics of determinants of the quality of life of patients with COPD. Based on literature review, it was established that the stage of COPD is a factor significantly affecting the assessment of the quality of life. Researchers from South Korea show a relationship between the severity of COPD and HRQoL, especially in the severe and very severe stages of the disease [20]. Similar conclusions are drawn by Agrawal et al. In their studies in the 3rd and 4th stage according to GOLD, statistically significant differences in the assessment of HRQoL were found compared to the group of patients in the mild stage. The correlation between FEV_1 scores and quality of life scores ranged from −0.4 on the impact on life subscale to −0.53 on the symptoms subscale. The correlations described by foreign authors are similar to the results of this study, where the correlation between FEV_1 and SGRQ-C scores in the study group ranged from −0.48 for the "symptoms" subscale to −0.73 for the "activity" subscale [21]. Patients in the first stage of COPD, whose airway patency remained at the level of more than 80% of the flow in the first second of forced expiration, assessed their quality of life at 23 points, which is relatively high. The same score drastically decreased with the decrease in FEV_1. In patients in the last stage of the disease, where the percentage of forced expiratory volume in one second fell below 30, the quality of life expressed by the SGRQ-C scale was

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rated at 81.6 points, which is extremely low. The progression of the disease, the increase in the frequency of symptoms and the loss of bronchial patency due to obstruction have negative effects, which seems obvious, in every sphere of the patient's life. It negatively affects both the patient's activity and functioning in everyday life. This study confirms the observations of other authors on this issue.

The coexistence of COPD with diseases in systems other than the respiratory system also has a significant impact on the further prognosis of patients. Their development may be causally related to COPD or occur independently [22]. Among the diseases that are most often mentioned as accompanying COPD, diseases of the cardiovascular system are listed first. It is assumed that the presence of circulatory problems coexisting in patients with airway obstruction results from many conditions common for the development of diseases in both systems. It was indicated that smoking, chronic hypoxia, oxidative stress and the ongoing systemic inflammatory process are largely responsible for both circulatory and respiratory diseases [23]. It turns out that COPD, as the underlying disease, increases the risk of other diseases, e.g. as a result of reduced activity, it may increase the risk of type 2 diabetes or hypertension. Comorbidities cause deterioration of patients' quality of life, hinder proper diagnosis and implementation of appropriate treatment, and increase its costs [24]. Brodnicka et al. conducted research on 196 patients with COPD, 95% of whom had diagnosed comorbidities [25]. In the group of patients examined for the purposes of this study, this percentage was 100%. The study showed significant differences between the number and type of COPD comorbidities in patients at different clinical stages according to GOLD. The presence of comorbidities depended on the degree of airway obstruction. It was observed that as the obstruction progressed, more and more diseases appeared in other systems. In the group where $FEV_1 > 80\%$, the average number of comorbidities was 2, and in the stage where $FEV_1 < 30\%$, the mean increased to 5. In addition, in the group of patients classified as being at a very severe stage according to GOLD, life-threatening conditions occurred, such as pulmonary embolism or renal failure that did not occur in patients in milder stages. It has been noted that as COPD progresses, more and more severe complications affect the survival of patients. Fabbri et al. (2008) showed that vascular diseases are the most common and serious diseases associated with COPD [26]. The same correlation was observed in this study. Based on the analysis of the results of the study group, it was found, as in the studies by Fabbri et al., that the greater the degree of airway obstruction, the more frequent the risk of cardiovascular disease. Circulatory diseases, especially hypertension, played an important role in the study group, regardless of the stage of COPD. However, while patients in the first stage according to GOLD developed only 2 vascular diseases, patients in the last stage had as many as 5 different cardiovascular diseases (including heart failure and venous insufficiency). A similar correlation in the ratio of 1:4 was shown in the study conducted by Brodnicka

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et al. Comparing the number of comorbidities with the subjective assessment of the quality of life among the patients, a clear positive correlation was noticed. In the group of patients struggling with two comorbidities, the average HRQoL score was 58.4 points, and in the group struggling with more than six comorbidities it was as much as 76.3 points on the SGRQ-C scale. The study conducted by Huber et al. showed that the introduction of therapeutic interventions aimed simultaneously, not at COPD itself, but also at comorbidities with which the patient is struggling, should be an important goal to improve HRQoL [27]. Similar conclusions can be drawn from this study.

It is estimated that as a result of the continuous development of civilization, human interference in the natural environment and the increase in air pollution, the number of COPD patients will continue to increase and constitute a serious public health problem. Given the low awareness of this disease at the moment, it is expected that the conducted study will result in increased interest in the development of standards that will improve the health and quality of life of patients with COPD. Body composition disorders constitute an element significantly affecting the subjective assessment of the quality of life of patients, which is confirmed both by the above study and reports by other authors [28]. Therefore, attention should be paid to the fact that appropriate therapy should be conducted by interdisciplinary teams that will be aware of the overall health problems of patients with COPD, including systemic complications that largely determine the natural course of the disease.

Conclusions

1. Patients with COPD experience many medical, psychological and social problems. The most common are shortness of breath, breathing problems and limited functional ability, which excludes them from an active social life.
2. Deterioration of the quality of life in patients with COPD results not only from a decrease in ventilation parameters, but also from systemic complications, including disturbed body composition, loss of fat-free mass and comorbidities.
3. Progression of COPD and long-lasting inflammation contribute to the impoverishment of the body and deterioration of HRQoL, which is particularly visible in people in the last, most severe stage of the disease.
4. Extensive diagnostics should be performed in patients with COPD in order to recognize systemic complications and plan appropriate therapy to improve their comfort of life and prognosis.

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