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# Assessment of Physical Activity and Quality of Life in Adults with Asthma and COPD, Who Underwent Pulmonary Function Studies

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***Abstract:*** *Asthma and Chronic Obstructive Pulmonary Disease (COPD) are very common diseases in all age groups throughout the world, as well as impairing the quality of life and physical activity of the affected patients. Pulmonary function tests provide important data on the diagnosis, follow-up of the disease course and evaluation of treatment outcomes. In this study, which aimed to assess physical activity and quality of life in adult subjects with asthma and COPD who underwent pulmonary function studies, 59.2% of the patients were female, the majority (79.4%) were married, and the general part of these patients (93.6%) has a very active level of physical activity. With worsening of COPD stage, there was a deterioration in the results of pulmonary function tests (FEV1, FVC, FEV1/FVC) with a statistically significant difference (p = .000). Except for the presence of chronic diseases and the 'social functioning' and 'mental health' sub-dimensions of SF-36 scale, there was statistically significant difference in the sub-dimensions of 'Pain', 'General Health Perception', 'energy/vitality', 'role limitation due to emotional problems (role-emotional)', 'role limitation due to physical problems (role-physical)' and 'physical functioning' (p <.05) . It has been determined that there is no correlation between all sub-dimensions of the SF-36 quality of life scale and the parameters of pulmonary function test*

***Keywords:*** *COPD, Asthma, SF-36 quality of life, Physical activity*

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## I. Introduction

Asthma and Chronic Obstructive Pulmonary Disease (COPD) are pulmonary diseases, which are quite common in all age groups throughout the world, have chronic respiratory symptoms that cause reduction in effort capacity, restriction of daily physical activity and deterioration of quality of life in affected patients, cannot be fully cured, cause a serious burden on health costs in countries, and characterized by chronic inflammation. Disabilities related to these diseases lead to increasing socioeconomic burden due to the loss of labor and the health expenditures. [1,2] It is stated that approximately 65 million people worldwide have COPD. [3]

Many conditions such as long-term smoking, asthma, chronic obstructive pulmonary disease (COPD), cancer cause deterioration in some physiological functions of the respiratory system and impairment of lung volume and capacities [4]. Pulmonary function tests (PFT), an objective measure of pulmonary functions, is a good measurement technique for screening of individuals at high risk for various pathological conditions that may occur in the respiratory tract and for diagnosing pulmonary-related diseases, especially COPD [5].

The Pulmonary Function Test (PFT) plays a role in the differential diagnosis, follow-up of the disease course and evaluation of treatment outcomes by determining the current functional impairment and its extent and illuminating the physiopathological mechanisms responsible for this impairment [6]. PFT has become a widely used laboratory method in clinical evaluations of respiratory diseases, especially in the last 30 years, rather than an instrument used in physiological studies [4].

Diseases such as asthma and COPD affect daily activity tolerance and impair the quality of life. The goals of treatment for such respiratory diseases are to minimize the symptoms and increase exercise capacity and quality of life[7]. Therefore, scales used to assess the quality of life of COPD patients are of particular importance in assessing the response to treatment, as they reflect subjective values related to patient complaints. Determination of physical activity, quality of life and individual needs of patients is important in terms of ensuring a proper care. The aim of this study was to evaluate the physical activity levels and quality of life of the patients referred to the pulmonary function test unit from the related outpatient clinics.

## II. Material And Methods

The study was carried out with 622 adult subjects aged 18 to 65 years diagnosed with asthma and COPD, who applied to the pulmonary function test unit of a State Hospital in Uşak between April 2016 and June 2016. The outpatient clinicians requested the PFT from the pulmonary function test unit of this hospital to evaluate pulmonary function in patients with asthma and COPD, and these test results were used in the study. All cases were patients who had been diagnosed with COPD and Asthma according to the criteria of the American Thoracic Society based on the medical history, physical examination, radiological examinations and pulmonary function test results during previous hospitalizations or outpatient clinic visits, Pulmonary Function Tests and Spirometric tests were performed according to ERS standards (SensorMedics Vmax spectra 229, Bilthoven, The Netherlands) [8].

We excluded the patients, who were not cooperative, cannot communicate in Turkish, had a physical illness or cognitive impairment that would prevent them from interviewing or filling out questionnaires, were still being treated for a psychiatric illness, had an accompanying disease such as untreated heart or kidney disease, and with impaired general status.

In the pulmonary function tests, the forced vital capacity (FVC) and the forced expiratory volume in the 1st second (FEV1) were performed, and the FEV1 / FVC ratio was calculated. The inspiratory capacity (IC, L) was measured by the nitrogen washout method and the carbon monoxide diffusion test (DLCO) was measured by the single breath method [9]. The results obtained were expressed as absolute and as a percentage of expected values.

The statistical analyzes were performed using SPSS version 9.0 (SPSS Inc, Chicago, IL, USA). Kruskal–Wallis and Mann–Whitney U tests were used in data analysis, values were expressed as mean ± standard deviation (SS), and a p value of <0.05 was considered statistically significant. In the study, we collected the data on socio-demographic characteristics with "Personal Information Form", on the physical activity variable with "International Physical Activity Questionnaire Short Form (IPAQ Short Form)" and on the quality of life variable with "Quality of Life Scale SF-36".

### Collection of Data

#### 1. Personal Information Form

It was developed by the investigator in accordance with the literature and consists of eight questions about socio-demographic characteristics such as age, gender, marital status, education level, and income status of the patients [5,7].

#### International Physical Activity Questionnaire Short Form (IPAQ Short Form)

This form, developed by Booth (1996), makes an assessment based on the types of physical activity that people perform as part of their daily lives. Questions related to time spent with physical activity over the last 7 days. The form, which consists of 7 questions, provides information about the time spent on walking and moderate-severe and violent activities. The calculation of the total score of the short form includes the sum of walking, moderate activity and severe activity in time (minutes) and frequency (days). From these calculations, a score is obtained in MET- minute. A MET-minute is calculated by multiplying the minutes of activity by the MET score. At the end of the calculations, the results are subjected to a categorical classification [10,11].

Categories:

Category I: Inactive: <600 MET - min/wk

Category II: Minimally active: 600 < - <3000 MET - min/wk

Category III: Very active: >3000 MET - min/wk

#### Quality of Life Scale SF-36

The scale, developed by the Corporation (1992), consists of 36 questions. The scale provides a measure of 8 sub-dimensions: physical functioning (10 items), social functioning (2 items), role limitation due to physical problems (role-physical) (4 items), role limitation due to emotional problems (role-emotional) (3 items), mental health (5 items), energy/vitality (4 items), pain (2 items) and General Health Perception (5 items) [12,13,14].

#### Limitations of the Study

The limitations of the study include the sampling of patients admitted to the hospital where the study was conducted and the inclusion of literate patients into the study.

#### The ethical considerations

This study was approved by the Usak University, Social and Human Sciences / Health Sciences / Science and Engineering Sciences, Scientific Research and Publication Ethics Committee, and informed consent was obtained from the patients included in the study.

## III. Result

Of the cases included in the study, 59.2% were female and 40.8% were male. The majority of the patients were married (79.4%) and 76.4% were living with their spouses and children. Examination of educational status showed that 10.9% were not illiterate, 57.9% were primary school graduates, 22.7% were secondary school graduates and 8.5% were higher education graduates. The majority of patients (65.9%) were not employed, whereas 23.6% of employees were working full-time. The rate of those who were not working due to the disease is 2.1%. Of the individuals participating in this study, 76.4% stated that they live with their spouse and children. The examination of the need for support in fulfilling the daily life functions (feeding, bathing, dressing, etc.) showed that 84% of cases can handle these functions without help. In addition, this study found that the disease status of one of the family members affects the other family members at a rate of 53%. In addition, the questioning of the activity levels of the individuals included in the study with the physical activity questionnaire found that 93% of the participants had a "very active" level of activity. (Table 1)

**Table 1. Socio-demographic characteristics**

| Characteristics | n | % |
|---|---|---|
| **Gender** | | |
| ***Female*** | 368 | 59.2 |
| ***Male*** | 254 | 40.8 |
| **Physical activity level** | | |
| ***Inactive*** | 13 | 2.1 |
| ***Minimally active*** | 27 | 4.3 |
| ***Very active*** | 582 | 93.6 |
| **Income status** | | |
| ***Sufficient*** | 425 | 68.3 |
| ***Insufficient*** | 197 | 31.7 |
| **Do you smoke?** | | |
| ***Yes*** | 114 | 18.3 |
| ***No*** | 508 | 81.7 |
| **Do you have a chronic disease?** | | |
| ***Yes*** | 214 | 34.4 |
| ***No*** | 408 | 65.6 |

The mean scores from the pulmonary function tests of the cases were generally in an acceptable level. In addition, the mean age of onset of smoking was 18.14 ± 3.92, and the average number of cigarettes smoked per day among the smokers was 23.02 ± 16.92 (Table 2). Among the pulmonary function tests, the mean FEV1 was 83.25 ± 24.11, while the mean FEV1/FVC was 91.30 ± 50.83 (Table 2).

**Table 2. Some data on the pulmonary function tests**

| Parameters | Results (Mean ± SD) |
|---|---|
| ***FEV1*** | 83.25±24.11 |
| ***FEV1/FVC*** | 91.30±50.83 |

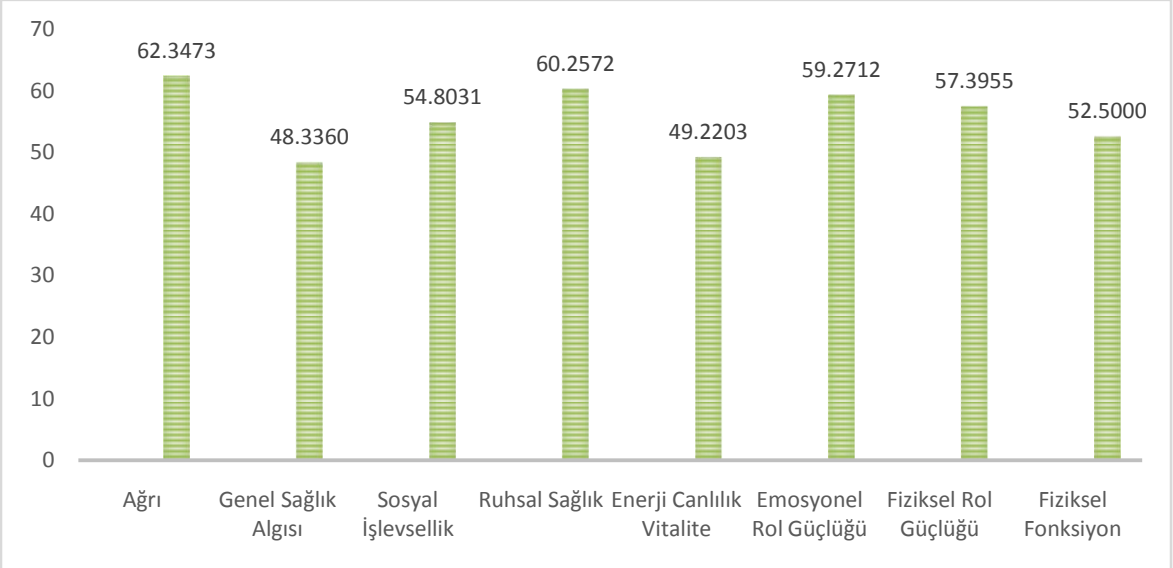
In our cases, FEV1 values vary according to individual COPD stages. With worsening of COPD stage, there was a decrease FEV1 values with a statistically significant difference (p = .000) (Table 3). FVC equals vital capacity, but is lower in obstructive diseases. (Table 3). With worsening of COPD stage, there was a deterioration in FEV1, FVC and FEV1/FVC values with a statistically significant difference (p = .000). A FEV1 / FVC (%) ratio above 70% is considered normal, while a value below 45% indicates an advanced obstruction.
In male patients, FEV1, FVC, FEV1 / FVC and PEF values were statistically lower than female patients (Table 3).

**Table 3. Comparison of COPD Stage and Gender with Some Results of Pulmonary Function Test**

| COPD group | FEV1 | FVC | FEV1/FVC | PEF |
|---|---|---|---|---|
| ***Mild (n = 9)*** | 106.33±6.35 | 94.55±6.48 | 116.81±10.52 | 80.11±7.65 |
| ***Moderate (n = 462)*** | 90.47±0.92 | 94.62±0.98 | 94.02±2.35 | 68.49±0.96 |
| ***Severe (n = 126)*** | 64.23±1.62 | 83.50±1.93 | 82.73±4.88 | 49.72±1.48 |

| | | | | |
|---|---|---|---|---|
| ***Very severe (n = 24)*** | 35.45±3.08 | 61.00 ±2.93 | 74.52±3.91 | 26.66±2.52 |
| ***Test value*** | Z=196.414 | Z=69.677 | Z=42.992 | F=60.881 |
| ***p*** | p=.000 | p=.000 | p=.000 | p=.000 |
| **Gender** | | | | |
| ***Female*** | 87.29±1.12 | 94.35 ±1.09 | 91.40±2.69 | 63.23±1.07 |
| ***Male*** | 77.37±1.65 | 86.29 ±1.45 | 91.16±3.12 | 63.24±1.54 |
| ***Test value*** | Z=-.745 | Z=-4.505 | Z=-4.810 | F=9.654 |
| ***p*** | p=.000 | p=.000 | p=.456 | p=.974 |

The mean score of the SF-36 Quality of Life Scale of all patients is shown in Figure 1.




There was a significant difference between the smokers and non-smokers in terms of the SF-36 Quality of Life Scale's General Health Perception and Physical Functioning sub-dimensions (p <.05). The analysis of the differences between the mean scores of SF-36 scale according to income level variable showed that there were significant differences between mental health, role-emotional and physical functioning sub-dimensions. There was a difference at a significance level of p <.0001 between the mean scores of Mental Health sub-dimension, this difference was found at a significance level of p <.05 for role-emotional and physical functioning sub-dimensions.

**Table 3. Comparison of the Mean Scores of Sub-dimensions According to Smoking Status and Income Level**

| ***Sub-dimensions*** | **Smokers (n = 114) Mean ± SD** | **Non-smokers (n = 508) Mean ± SD** | **Z** | **p** |
|---|---|---|---|---|
| ***General Health Perception*** | 51.00 ± 15.09 | 47.73 ± 13.32 | -2.393 | .017 |
| ***Physical Functioning*** | 57.71 ± 24.81 | 51.32 ± 22.86 | -2.313 | .021 |
| **Sub-dimensions** | **Sufficient Income Level (n = 114) Mean ± SD** | **Insufficient Income Level (n = 508) Mean ± SD** | **Z** | **p** |
| ***Mental*** | 62.67±16.04 | 55.04 ± 15.12 | - | . |

| | | | | |
|---|---|---|---|---|
| ***Health*** | | | 5.961 | 0<br>0<br>0 |
| ***Role-Emotional*** | 61.25±34.33 | 54.99±33.90 | -<br>2.213 | .<br>0<br>2<br>7 |
| ***Physical Functioning*** | 53.92±23.41 | 49.41 ± 22.94 | -<br>2.115 | .<br>0<br>3<br>4 |

No significant difference was found between the mean scores of sub-dimensions of SF-36 quality of life scale and COPD stage (p> .05) The comparison of the sub-dimensions of the SF-36 scale and the educational status showed a statistically significant difference in terms of pain, role-physical and physical functioning sub-dimensions (p <.05), whereas no significant difference in terms of general health perception, social functioning, mental health, energy/vitality, and role-emotional sub-dimensions. No statistically significant difference was found between physical activity level of individuals and the mean scores of SF-36 scale (p> .05).

The comparison of the mean scores of the SF-36 scale and the educational status showed that the higher educational level of the individuals, the higher the scores of pain, general health perception and physical functioning sub-dimensions, with a statistically significant difference (p <.05). Except for the presence of chronic diseases and the 'social functioning' and 'mental health' sub-dimensions of SF-36 scale, there was statistically significant difference in the pain, general health perception, energy/vitality, role-emotional, role-physical and physical functioning sub-dimensions (p <.05) (Table 5). The comparison of the mean scores of the SF-36 scale and the educational status showed a statistically significant difference in role-physical and physical functioning sub-dimensions (p <.05).

**Table 5. Comparison of Sub-dimensions of SF-36 Scale with Chronic Disease and Educational Status Variables**

| **Characteristics** | Sub-dimensions of the SF-36 Scale | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pain | | General Health Perception | | Social Functioning | | Mental Health | | Energy/Vitality | | Role-Emotional | | Role-Physical | | Physical Functioning | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| **Educational status** | | | | | | | | | | | | | | | | |
| ***Not literate*** | 57.09 | 2.65 | 47.79 | 1.39 | 52.94 | 2.96 | 59.35 | 2.13 | 50.07 | 2.39 | 50.98 | 4.15 | 49.26 | 4.65 | 44.55 | 2.67 |
| ***Primary Education*** | 61.01 | 1.19 | 46.62 | 0.70 | 56.35 | 145 | 60.16 | 0.82 | 48.79 | 0.97 | 60.00 | 1.81 | 56.66 | 2.02 | 51.04 | 1.18 |
| ***Secondary Education*** | 66.02 | 1.85 | 50.92 | 1.20 | 50.53 | 2.66 | 61.27 | 1.41 | 50.31 | 1.53 | 58.86 | 2.87 | 60.63 | 3.21 | 56.73 | 2.03 |
| ***Higher education*** | 68.34 | 3.17 | 53.77 | 2.04 | 58.01 | 4.31 | 59.32 | 2.14 | 48.11 | 2.54 | 66.03 | 4.44 | 64.15 | 5.19 | 61.32 | 3.41 |
| **KwX²** | 14.542 | | 10.749 | | 6.008 | | 1.236 | | 1.856 | | 6.117 | | 6.050 | | 18.171 | |
| **p** | **0.013** | | **0.002** | | 0.111 | | 0.744 | | 0.603 | | 0.106 | | 0.109 | | **0.000** | |
| **Do you have a chronic disease?** | | | | | | | | | | | | | | | | |
| ***Yes*** | 58.79 | 1.70 | 45.56 | 0.87 | 56.48 | 1.77 | 58.41 | 1.11 | 52.14 | 1.33 | 51.86 | 2.38 | 44.62 | 2.45 | 46.33 | 1.61 |
| ***No*** | 64.20 | 1.05 | 49.79 | 0.69 | 53.92 | 1.48 | 61.22 | 0.79 | 47.68 | 0.88 | 63.15 | 1.65 | 64.09 | 1.88 | 55.73 | 1.11 |
| ***Z*** | -3.98 | | -2.33 | | -0.15 | | -1.88 | | -2.52 | | -3.88 | | -6.12 | | -4.74 | |
| **p** | **.000** | | **.019** | | .874 | | .060 | | **.012** | | **.000** | | **.000** | | **.000** | |

**Table 6. Correlation SF-36 quality of life scale and the parameters of pulmonary function test**

| | **Pain**<br>**r** | **General Health Perception**<br>**r** | **Social Functioning**<br>**r** | **Mental Health**<br>**r** | **Energy/Vitality**<br>**r** | **Role-Emotional**<br>**r** | **Role-Physical**<br>**r** | **Physical Functioning**<br>**r** |
|---|---|---|---|---|---|---|---|---|
| **FEV1** | .030 | .044 | -.003 | .062 | -.078 | -.021 | -.040 | .135** |
| **FVC** | .005 | .006 | .003 | .070 | -.066 | -.027 | -.062 | .106** |
| **FEV1/FVC** | .025 | .107** | -.002 | -.021 | .013 | -.010 | .028 | .103* |
| **PEF** | .018 | .072 | -.007 | .046 | -.052 | -.014 | -.026 | .155** |

**p <0.05* p<0.01**.**
**r <0.30: no correlation, 0.30-0.40: very weak, 0.40-0.50: weak, 0.50-0.75: moderate, 0.75-0.80: strong, 0.86-0.95 very strong**

It has been determined that there is no correlation between all sub-dimensions of the SF-36 quality of life scale and the parameters of pulmonary function test. (r <0.30).

## IV. Discussion

In COPD and asthma, there are the thickening of the walls of airways due to narrowing of the lumen of airways and the restriction of air flow due to collapse associated with reduction of elastic retraction pressure of pulmonary tissue surrounding intraparenchymal airways [15,16]. Pulmonary function test is a commonly used, non-invasive and inexpensive method. The most prominent functional outcome in COPD is diffuse airflow restriction and the most important parameters are the FEV1 and FEV1/FVC ratio calculated on the forced expiratory curve. FEV is the volume expired in the first second of forced expiration, and is expressed in 1 or ml. normally 75-80% of the lung volume should be expired in the first second of the expiration. A decrease in FEV1 suggests obstruction of the large airways. In our cases, FEV1 values vary according to individual COPD stages. With worsening of COPD stage, there was a decrease FEV1 values with a statistically significant difference (p=.000). FVC is a volume of air expelled with a forced and rapid expiration after a deep inspiration, expressed in 1 or ml. In healthy subjects, FVC equals vital capacity but is lower in obstructive diseases. Thus, our study showed that this parameter varies depending on the severity of the COPD stage in the individuals, with a statistical significance. A FEV1 / FVC (%) ratio above 70% is considered normal, while a value below 45% indicates an advanced obstruction. Although our study showed a decrease in the FEV1/FVC ratio in proportion to the degree of obstruction, this was not statistically significant (p> .05). Similarly, there was no statistically significant difference in PEF values. Mochizuki et al. and Kuwani et al. have shown that there is a further decrease in the FEV1/FVC ratio as the degree of the emphysema increases [17,18]Kurtulgan et al. reported that patients with COPD who have an FVC below 70% have a higher rate of air entrapment and that FEV1/FVC and FVC values are significantly lower in patients with air entrapment [16].

The goal in these diseases is to reduce the symptoms and improve the quality of life of the patient with treatment and care [19]. It has been reported in the literature that SF-36 is a sensitive scale in determining the quality of life in COPD [20]. In COPD, it is important to examine the sub-dimensions such as physical functioning, emotional state, pain, and vitality in determining general health status and quality of life of the patient. In this study, it is seen that there is a decrease in the parameters that assess the quality of life of the SF-36 quality of life scale (Figure 1). Similar findings exist in the literature [14,21-24]. The mean scores of only general health perception and physical functioning sub-dimensions of the SF-36 quality of life scale were found to be higher in smokers than in non-smokers, whereas there were no significant differences in other sub-dimensions of the SF-36 quality of life scale. (Table 3). This may be related to the fact that the majority of patients (93.6%) had a very active level of physical activity and that the majority of them (81.7%) were not smoking. (Table 1). It has been reported in the literature that smokers have higher pulmonary age than non-smokers [25]. Smoking directly affects the quality of life of individuals with lung diseases. In addition, quitting smoking affects quality of life positively by reducing cough and sputum and reducing annual loss in FEV1 [26].

In our study, the comparison of the subscales of the SF-36 Quality of Life scale with the presence of chronic disease showed that there were significant differences in all sub-dimensions except for social functioning and mental health sub-dimensions (p <0.05) (Table 5). Several studies have found in the literature that the increase in the severity of chronic diseases causes a decrease in the quality of life scores of the individuals [20,23,24]. Comorbidity is one of the most important factors affecting quality of life. Studies have shown that symptoms, demographic data, and accompanying comorbid conditions are important in determining quality of life. In particular, three or more accompanying conditions are associated with impaired quality of life [26, 27]. In a study conducted by Jarab et al. (2012) on patients with COPD, it was reported that more than half of the participants had COPD and concomitant diseases such as diabetes, hypertension, arthritis, osteoporosis and thus their quality of life was adversely affected [28]. A study by Tasci et al. retrospectively reviewed inpatient COPD patients and found that patients with comorbidities were hospitalized for longer periods [29]. This also adversely affects the quality of life of individuals. Another study examining caregiving dependence of COPD patients suggested that the presence of a concomitant disease in individuals with COPD causes an increase in the severity of symptoms and a decrease in the independence of patients in meeting their care needs [30].

From the perspective of respiratory system disorders, a loss of respiratory functions leads toa disorder, reduced exercise performance and deterioration of the quality of life No significant difference was found between the mean scores of sub-dimensions of SF-36 quality of life scale and COPD stage (p> .05) The comparison of the sub-dimensions of the SF-36 scale and the educational status showed a statistically significant difference in terms of pain, role-physical and physical functioning sub-dimensions (p <.05), whereas no significant difference in terms of general health perception, social functioning, mental health, energy/vitality, and role-emotional sub-dimensions.

COPD is a persistent disease that restricts the exercise capacities of patients and causes various impairments in their quality of life. In individuals affected by this disease, there is a weak relationship between the severity of symptoms and the severity of airflow limitation [31]. In this study, although there was no statistically significant difference in the parameters of the SF-36 scale according to the COPD stages between

the groups, there was a significant reduction in all parameters that assessed the quality of life of the SF-36 scale in the study group. These results are consistent with the results of many previous studies [21, 22, 32].

Examination of correlations between respiratory functions and each sub-dimension of SF-36 quality of life scale showed poor correlations with functional parameters in all sub-dimensions. Examination of the literature on this subject has shown the similar results [23, 33, 34]. A study found that physical functioning, social functioning, role-physical, role-emotional, mental health and energy/vitality scores of the SF-36 scale worse than those with moderate dyspnea in those with severe dyspnea [21].

## V. Conclusion

The sub-dimension scores of the SF-36 quality of life scale were found to be affected in COPD and asthmatic patients. It has been determined that there is no correlation between all sub-dimensions of the SF-36 quality of life scale and the parameters of pulmonary function test.

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