

The Severity of Chronic Obstructive Pulmonary Disease Affect Lower Urinary Tract Symptoms and Sexual Function

Kronik Obstrüktif Akciğer Hastalığının Şiddeti Alt Üriner Sistem Semptomlarını ve Cinsel Fonksiyonu Etkilemektedir

^{id} Mahir KOTUK^a, ^{id} Mehmet SOLAKHAN^b

^aClinic of Chest Diseases, Gaziantep NCR Hospital, Gaziantep, TURKEY

^bDepartment of Urology, Bahçeşehir University Faculty of Medicine, İstanbul, TURKEY

ABSTRACT Objective: The present study aimed to investigate the incidence of lower urinary tract symptoms, overactive bladder (OAB) syndrome, and erectile dysfunction (ED) in chronic obstructive pulmonary disease (COPD) patients. **Material and Methods:** The study included a total of 707 male patients with COPD. The Overactive Bladder Questionnaire, the International Prostate Symptom Score (IPSS), and the International Index of Erectile Function (IIEF) were administered to each patient. Additionally, each patient was also queried as to whether they had any loss of libido. Pulmonary examination was performed based on physical examination findings, spirometric measurements, and arterial blood gas analyses. **Results:** Mean age of the patients was 52.5±10.6 years and a significant relationship was found between patient age and ED and lower urinary tract symptoms (p=0.01). Mean body mass index (BMI) was 33.2±5.6 kg/m². A significant relationship was found between BMI >35 kg/m² and ED (p=0.042). Mean OAVB-V8 score was 7.71±4.44. Mean IPSS score was 10.3±5.7 and mean IIEF score was found to be 11.6±6.44. A significant relationship was established between severe and most severe COPD and lower urinary tract symptoms including urgency and urge incontinence (p=0.035 and p=0.021, respectively). A significant relationship was detected between COPD severity and ED (p=0.001). Moreover, the incidence of ED was higher in patients with oxygen saturation of ≤90 (p=0.044). Normal libido was reported by 91% of the patients. **Conclusion:** Our results indicated that the prevalence of ED is increased in patients with severe and most severe COPD and that the prevalence of lower urinary tract symptoms (especially urge incontinence and urgency) is higher in COPD patients.

Keywords: Pulmonary disease; chronic obstructive erectile dysfunction; lower urinary tract symptoms; libido; urinary bladder, overactive

ÖZET Amaç: Bu çalışmada, kronik obstrüktif akciğer hastalığı (KOAH) olan hastalarda alt üriner sistem semptomları, aşırı aktif mesane [overactive bladder (OAB)] sendromu ve erektil disfonksiyon (ED) görülme sıklığı araştırıldı. **Gereç ve Yöntemler:** Çalışmaya KOAH'lı toplam 707 erkek hasta dâhil edildi. Her hastaya Aşırı Aktif Mesane Anketi, Uluslararası Prostat Semptom Skoru [International Prostate Symptom Score (IPSS)] ve Uluslararası Erektıl Fonksiyon İndeksi [International Index of Erectile Function (IIEF)] formu dolduruldu. Ek olarak, her hasta libido kaybı olup olmadığı konusunda da sorgulandı. Akciğer muayenesi; fizik muayene bulguları, spirometrik ölçümler ve arteriyel kan gazı analizleri ile yapıldı. **Bulgular:** Hastaların ortalama yaşı 52,5±10,6 yıl idi ve hasta yaşı ile ED ve alt üriner sistem semptomları arasında anlamlı bir ilişki bulundu (p=0,01). Ortalama beden kitle indeksi (BKİ) 33,2±5,6 kg/m² idi. BKİ> 35 kg/m² ile ED arasında anlamlı bir ilişki bulundu (p=0,042). Ortalama OAVB-V8 skoru 7,71±4,44, ortalama IPSS skoru 10,3±5,7 ve ortalama IIEF skoru 11,6±6,44 bulundu. Şiddetli ve ileri KOAH ile acil ve idrar kaçırma da dâhil olmak üzere alt üriner sistem semptomları arasında anlamlı bir ilişki bulundu (sırasıyla p=0,035 ve p=0,021). KOAH şiddeti ile ED arasında anlamlı ilişki saptandı (p=0,001). Ayrıca, oksijen saturasyonu ≤90 olan hastalarda ED insidansı daha yüksek bulundu (p=0,044). Hastaların %91'inde normal libidonun normal olduğu görüldü. **Sonuç:** Sonuçlarımız şiddetli ve ileri şiddetli KOAH'lı hastalarda ED prevalansının arttığını ve KOAH hastalarında alt üriner sistem semptomlarının (özellikle urge inkontinans ve urgency) prevalansının daha yüksek olduğunu göstermiştir.

Anahtar Kelimeler: Pulmoner hastalık; kronik obstrüktif sertleşme bozukluğu; alt üriner sistem semptomları; libido; mesane, aşırı aktif

Chronic obstructive pulmonary disease (COPD) is the most common chronic respiratory disease, which is a slowly progressive, partially irreversible but preventable and treatable chronic disease.¹ The

pathophysiological complications in COPD lead to a significant impairment in respiratory activity and individuals with COPD experience serious difficulty in performing their daily life activities due to dyspnea,

Correspondence: Mehmet SOLAKHAN

Department of Urology, Bahçeşehir University Faculty of Medicine, İstanbul, TURKEY/TÜRKİYE

E-mail: msolakhan@hotmail.com



Peer review under responsibility of Journal of Reconstructive Urology.

Received: 07 Dec 2020

Received in revised form: 02 Mar 2021

Accepted: 03 Mar 2021

Available online: 08 Mar 2021

2587-0483 / Copyright © 2021 by Türkiye Klinikleri. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

fatigue, and sleep deprivation.² COPD is directly or indirectly associated with numerous clinical conditions including coronary artery diseases, musculoskeletal diseases, malnutrition, anemia, osteoporosis, lung cancer, diabetes mellitus, reflux, metabolic syndrome, depression, obstructive sleep apnea syndrome and anxiety disorder.³

Systemic disorders are known to affect patients' sexual function, leading to reduced libido and erectile dysfunction (ED). Moreover, the hormonal imbalances in systemic disorders are considered to be associated with testicles or hypothalamic-pituitary-gonadal axis.⁴ Males with respiratory diseases have been shown to have ED and low levels of testosterone.⁵ Dyspnea, chronic cough, decreased physical activity and muscle weakness are among the major causes of reduced sexual function in COPD patients.⁶ The prevalence of ED in COPD patients has been investigated in several studies. Accordingly, the aim of this study was to investigate the causes and incidence of ED in COPD patients and to shed light on this issue.

Urinary symptoms such as urinary incontinence (UI) lead to reduced quality of life in COPD patients. Nevertheless, this issue remains an underresearched area of enquiry among both clinicians and researchers.⁷ Although the exact pathophysiology of UI in COPD remains unknown, several pathophysiological mechanisms involving age-related changes in smooth muscle have been proposed, which have been shown to cause hyper-excitability of muscarinic receptors in the urothelium, detrusor smooth muscle and neurovascular structures, denervation at the cortical and spinal levels, and hypersensitivity and elevated afferent nerve activity of other ion channels.⁸ On the other hand, it has been reported that in patients with COPD characterized by continuous cough, the increased abdominal pressure during cough could be responsible for stress urinary incontinence (SUI). Additionally, the urination control in dyspneic individuals may be altered at the sphincter level.⁹ Nevertheless, there is little or no information in the literature regarding the specific mechanisms responsible for user interface, which include anatomical, mechanical, pathophysiological, and pharmacological factors.

The present study aimed to investigate the incidence of overactive bladder (OAB) syndrome, lower urinary tract symptoms (LUTS) and ED in COPD patients.

MATERIAL AND METHODS

The study included a total of 707 male patients with COPD aged 33-75 years who presented to our clinic in between 2019 and 2020. The patients were evaluated first in the department of chest diseases and then in the urology clinic. Local ethics committee approval was obtained for this research (Sanko University 2019-no: 2019/14-01 date: 17.10.2019). Written consent was obtained from the volunteers who participated in the study. Demographic and clinical characteristics including body mass index (BMI), age and comorbidities were evaluated for each patient. Patients using medication due to lower urinary complaints (except patients with non-symptomatic BPH), patients with diabetes mellitus, stenosis in any part of the lower urinary system, urinary tract stones, patients using diuretics or alcohol, symptomatic infections, neurogenic bladder, patients who have previously been operated due to lower urinary system complaints, patients with heart failure (ejection fraction of less than 30%) and over 75 years of age were excluded. The Overactive Bladder Questionnaire (OAB-V8), International Index of Erectile Function (IIEF), and International Prostate Symptom Score (IPSS) were administered to each patient. In the evaluation of IPSS scores, a score of 20-35 was accepted as severely symptomatic, 8-19 as moderately symptomatic and 1-7 as mildly symptomatic. The possible scores for IIEF range from 1 to 25 and ED was classified into five categories based on the scores [severe (1-7), moderate (8-11), mild to moderate (12-16), mild (17-21), and no ED (22-25)].¹⁰ Additionally, each patient was also queried as to whether they had any loss of libido.

Pulmonary examination was performed based on physical examination findings, spirometric measurements, and arterial blood gas analyses. In addition, minimum oxygen saturation (minSaO₂), mean oxygen saturation (meanSaO₂), and mean oxygen desaturation (meanSaO₂) values were recorded for each patient. Spirometric parameters included forced ex-

piratory volume in one second (FEV₁), forced total capacity (FVC), vital capacity (VC). Arterial blood gas analysis included pH and partial arterial carbon dioxide and oxygen pressures (PaCO₂ and PaO₂, respectively). COPD severity was recorded according to Global Initiative for Chronic Obstructive Lung Disease criteria 2020.¹¹

Data were analyzed using SPSS for Windows version 20.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Variables were compared using Kruskal-Wallis test, Pearson's correlation coefficient, and Chi-square test as appropriate. Groups were compared using Student's t-test. A *p* value of <0.05 was considered significant.

RESULTS

A significant relationship was found between patient age and ED and LUTS (*p*=0.01). Mean BMI was 33.2±5.6 kg/m² (Table 1). A significant relationship was found between BMI >35 kg/m² and ED (*p*=0.042). Mean OAVB-V8 score was 7.71±4.44 and the OAVB-V8 score was ≥8 in 324 (45.8%) and ≤8 in 383 (54.2%) patients (Table 1). Mean IPSS score was 10.3±5.7 and the IPSS score was 1-7 in 445 (62.9%), 8-19 in 189 (26.7%) and 20-35 in 73 (10.4%) patients. Mean IIEF score was 11.6±6.44 and the severity of ED was severe in 85 (12%), moderate in 67 (9.4%), mild to moderate in 129 (18.2%), mild in 88 (12.4%), and no ED was detected in 338 (47.8%) patients (Table 1).

The average MinSaO₂ level was 74 (range, 28-90) and the average Mean SaO₂ level was 92 (range, 65-92). In spirometric measurements, mean FEV₁ was 45 (range, 12-62), mean FVC was 72 (range, 29-96), and mean FEV₁/FVC ratio was 62 (range, 37-69). Patients were divided into four groups based on the severity of COPD, whereby 119 (16.8%) patients were classified as having mild COPD, 389 (55%) as having moderate COPD, 137 (19.3%) as having severe COPD, and 62 (8.7%) as having most severe COPD (Table 2).¹¹

An analysis of LUTSs revealed that urgency (n=375; 53%) was the most common problem declared by the patients, followed by pollachiuria (n=285; 40.3%), nocturia (n=244; 34.5%), urinary

TABLE 1: Demographic and clinic characteristics of patients.

	Patients (n=707)
Age (years)	52.5±10.6
BMI (kg/m ²)	33.2±5.6
≥30	348 (49.2%)
<30	359 (50.8%)
Comorbidities	
-Diabetes mellitus	112 (15.8%)
-Hypertension	173 (24.4%)
-Coronary artery disease	85 (12%)
-Rheumatic diseases	69 (9.7%)
OAB-V8 symptom score	7.71±4.44
≥8	324 (45.8%)
<8	383 (54.2%)
IPSS score	10.3±5.7
1-7	445 (62.9%)
8-19	189 (26.7%)
20-35	73 (10.4%)
IIEF score	11.6±6.44
1-7	85 (12%)
8-11	67 (9.4%)
12-16	129 (18.2%)
17-21	88 (12.4%)
22-25	338 (47.8%)

BMI: Body mass index; OAB-V8: The Overactive Bladder Questionnaire; IPSS score: The International Prostate Symptom Score; IIEF score: The International Index of Erectile Function.

TABLE 2: Respiratory characteristics.

	Patients (n=707)
Mean O ₂ saturation	92 (65-92)
FEV ₁	45 (12-62)
FVC	72 (29-96)
FEV ₁ /FVC ratio	62 (37-69)
COPD severity	
Mild	119 (16.8%)
Moderate	389 (55%)
Severe	137 (19.3%)
Most severe	62 (8.7%)

FEV₁: Forced expiratory volume in one second; FVC: Forced total capacity; COPD: Chronic obstructive pulmonary disease.

dribbling or poor stream (n=204; 28.8%), weak urine flow (n=194; 27.4%), post-micturition dribble (n=180; 25.4%), urge incontinence (n=113; 15.9%), dysuria (n=110; 15.5%), urinary retention (n=98; 13.8%), and SUI (n=32; 4.5%). A significant relationship was established between severe and most severe COPD and LUTS; including urge incontinence and urgency (*p*=0.035 and *p*=0.021, respectively). On

the other hand, ED was detected in 11 (9.2%) patients with mild COPD, in 45 (11.5%) patients with moderate COPD, in 69 (50.3%) patients with severe COPD, and in 47 (75.8%) patients with most severe COPD. A significant relationship was detected between COPD severity and ED ($p=0.001$). Moreover, the incidence of ED was higher in patients with oxygen saturation of ≤ 90 ($p=0.044$). Normal libido was reported by 91% of the patients.

DISCUSSION

The results indicated a significant relationship between COPD severity and ED and LUTSs. Of particular importance, patients with severe and most severe COPD were found to have an increased incidence of ED, urgency, and urge incontinence.

Sexual health is an important measure of quality of life. Moreover, age and general health condition are the most important indicators of normal male sexual functioning. Chronic diseases do not only limit daily life activities but also lead to sexual dysfunction and it is commonly known that the prevalence of ED increases with age. A previous study indicated that the incidence of ED was 7.6% in individuals aged 40-49 years, 33.3% in individuals aged 50-59 years, 70.2% in individuals aged 60-69 years, and 90.1% in individuals aged 70 years and older.¹² Similarly, in our study, a significant relationship was found between age and ED ($p=0.01$).

Sexual activity in COPD patients can be limited by the patients' fear of dyspnea and decreased exercise tolerance.¹³ Additionally, the physical and psychological problems overlooked in this patient population may contribute to sexual dysfunction.¹⁴ Sexual activity leads to an increase in tidal volume and breathing frequency due to an increased cardiopulmonary load. Additionally, sexual activity may exceed the respiratory capabilities of patients with severe airway obstruction, thereby distracting them from sexual activity.⁶ COPD is a chronic disease that affects many organs and presents with various comorbidities (such as hypertension, muscle/joint diseases, cardiovascular, gastrointestinal and neurological diseases).⁵

Another factor that could be associated with sexual dysfunction in COPD patients is SaO_2 level. A

previous study suggested that the incidence of ED increases as the SaO_2 level decreases in healthy individuals. Additionally, it has also been shown that serum testosterone levels are increased in patients undergoing oxygen therapy.¹⁵ In our study, a significant difference was found between low oxygen levels and ED ($p=0.044$). On the other hand, in previous studies, a wide range of rates have been reported for the prevalence of ED in COPD patients.^{16,17} Oh et al. surveyed 49 COPD patients and their wives and published that the prevalence of sexual dysfunction in their patients (67%) was higher than the incidence of sexual dysfunction reported in other studies in general population. The authors also noted that 94% of the wives indicated that the changes at sexual level resulted from the patient's disease.¹⁷ Shen et al. reported that the incidence of ED in their COPD patients was 75.5% and also indicated that sexual desire was not affected by COPD and that 90% of the patients had normal libido regardless of age and disease severity.¹⁶ Taken together, these findings implicate that COPD patients desire a healthy sexual life and that hypoxemia can be a cause of ED not only in depressive patients but also in COPD patients. Meaningfully, no serious loss of libido was reported by the patients included in our study.

Literature reviews indicate that there is no study investigating LUTS in COPD patients and that there are several studies that have only examined UI in COPD patients. Battaglia reported that the incidence of UI in men and women with COPD was 49% and 30%, respectively, and that BMI was higher in women and men with UI compared to women and men without UI. The authors also indicated that the most common type of UI in women was SUI (52.4%) as opposed to postmicturition dribbling in men (66.3%). Additionally, it was also revealed that women with UI had a higher prevalence of a chronic cough compared to women without UI.⁷ Burge et al. evaluated men with COPD and reported that the most common LUTS was urge incontinence (59%).¹⁸ In our study, only men with COPD were evaluated and UI was detected in a total of 145 (20.5%) patients, including 113 (15.9%) patients with urge incontinence and 32 (4.5%) patients with SUI. Additionally, we also found a significant difference between BMI and IU

($p=0.031$) and between COPD severity and urgency and urge incontinence ($p=0.035$ and $p=0.021$, respectively). However, no significant relationship was found between COPD severity and the other LUTSs.

Our study was limited since it had no control group and no detailed urological examination of the patients. Additionally, the study evaluated patients with systemic diseases and active drug use together with other patients.

CONCLUSION

Our results indicated that the prevalence of ED is increased in patients with severe and most severe COPD and that the prevalence of LUTSs is higher in COPD patients. Additionally, it was also revealed that COPD severity is mostly associated with urgency and urge incontinence. Based on these findings, we suggest that COPD patients should be queried about these issues during their follow-up visits so as to allow them improve their quality of life and to increase their satisfaction levels.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Mehmet Solakhan, Mahir Kotuk; **Design:** Mehmet Solakhan; **Control/Supervision:** Mehmet Solakhan, Mahir Kotuk; **Data Collection and/or Processing:** Mahir Kotuk; **Analysis and/or Interpretation:** Mehmet Solakhan; **Literature Review:** Mahir Kotuk; **Writing the Article:** Mehmet Solakhan; **Critical Review:** Mehmet Solakhan, Mahir Kotuk; **References and Fundings:** Mahir Kotuk; **Materials:** Mahir Kotuk.

REFERENCES

- Mermit Çilingir B, Günbatır H. Relationship between chronic obstructive pulmonary disease and levels of vitamin D. *Dicle Med J.* 2015;42(2):158-65. [[Crossref](#)]
- Contoli M, Rogliani P, Di Marco F, Braido F, Corsico AG, Amici CA, et al; SAT Study Group. Satisfaction with chronic obstructive pulmonary disease treatment: results from a multicenter, observational study. *Ther Adv Respir Dis.* 2019;13:1753466619888128. [[PubMed](#)] [[PMC](#)]
- Tolga Önder, Turgut Anuk, Şahin Kahramanca, Ali Cihat Yıldırım. Evaluating sociodemographic and medical conditions of patients under home care service. *Dicle Med J* 2015;42(3): 342-5. [[Crossref](#)]
- Lauretti S, Cardaci V, Barrese F, Calzetta L. Chronic obstructive pulmonary disease (COPD) and erectile dysfunction (ED): Results of the BRED observational study. *Arch Ital Urol Androl.* 2016;88(3):165-70. [[Crossref](#)] [[PubMed](#)]
- Kahraman H, Sen B, Koksall N, Kiliç M, Resim S. Erectile dysfunction and sex hormone changes in chronic obstructive pulmonary disease patients. *Multidiscip Respir Med.* 2013;8(1):66. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Luo L, Zhao S, Wang J, Liu Y, Zhu Z, Xiang Q, et al. Association between chronic obstructive pulmonary disease and risk of erectile dysfunction: a systematic review and meta-analysis. *Int J Impot Res.* 2020;32(2):159-66. [[Crossref](#)] [[PubMed](#)]
- Battaglia S, Benfante A, Principe S, Basile L, Scichilone N. Urinary Incontinence in Chronic Obstructive Pulmonary Disease: A Common Co-morbidity or a Typical Adverse Effect? *Drugs Aging.* 2019;36(9): 799-806. [[Crossref](#)] [[PubMed](#)]
- Chung E, Katz DJ, Love C. Adult male stress and urge urinary incontinence - A review of pathophysiology and treatment strategies for voiding dysfunction in men. *Aust Fam Physician.* 2017;46(9):661-6. [[PubMed](#)]
- Swenson CW, Kolenic GE, Trowbridge ER, Berger MB, Lewicky-Gaup C, Margulies RU, et al. Obesity and stress urinary incontinence in women: compromised continence mechanism or excess bladder pressure during cough? *Int Urogynecol J.* 2017; 28(9):1377-85. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Neijenhuijs Kl, Holtmaat K, Aaronson NK, Holzner B, Terwee CB, Cuijpers P, et al. The International Index of Erectile Function (IIEF)-A systematic review of measurement properties. *J Sex Med.* 2019;16(7): 1078-91. [[Crossref](#)] [[PubMed](#)]
- Balkissoon R. Journal Club-COPD2020 Update. Global initiative for chronic obstructive lung disease 2020 report and the Journal of the COPD foundation special edition, moving to a new definition for COPD: "COPDGene® 2019". *Chronic Obstr Pulm Dis.* 2019;6(4):64-72. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Çayan S, Kendirci M, Yaman Ö, Aşçı R, Orhan İ, Usta MF, et al. Prevalence of erectile dysfunction in men over 40 years of age in Turkey: Results from the Turkish Society of Andrology Male Sexual Health Study Group. *Turk J Urol.* 2017;43(2):122-9. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Turan O, Ure I, Turan PA. Erectile dysfunction in COPD patients. *Chron Respir Dis.* 2016;13(1):5-12. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Lauretti S, Cardaci V, Barrese F, Calzetta L. Chronic obstructive pulmonary disease (COPD) and erectile dysfunction (ED): Results of the BRED observational study. *Arch Ital Urol Androl.* 2016;88(3):165-70. [[Crossref](#)] [[PubMed](#)]
- Deng JK, Tan Y. [Microstructural changes of the corpus cavernosum in hypoxia-induced erectile dysfunction]. *Zhonghua Nan Ke Xue.* 2016;22(10): 932-7. [[PubMed](#)]
- Shen TC, Chen WC, Lin CL, Chen CH, Tu CY, Hsia TC, et al. The risk of erectile dysfunction in chronic obstructive pulmonary disease: a population-based cohort study in Taiwan. *Medicine (Baltimore).* 2015;94(14):e448. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Oh EG, Yoo JY. Progression of erectile function in men with chronic obstructive pulmonary disease: a cohort study. *BMC Pulm Med.* 2019;19(1):139. [[Crossref](#)] [[PubMed](#)] [[PMC](#)]
- Burge AT, Lee AL, Kein C, Button BM, Sherburn MS, Miller B, et al. Prevalence and impact of urinary incontinence in men with chronic obstructive pulmonary disease: a questionnaire survey. *Physiotherapy.* 2017;103(1):53-8. [[Crossref](#)] [[PubMed](#)]