Association of Health Literacy and Medication Adherence with Quality of Life in COPD Patients

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Objective: To determine the association between health literacy, adherence to treatment with quality of life in patients with chronic obstructive pulmonary disease (COPD).

Methods: This cross-sectional study conducted among adults with COPD between February and March 2023. Sociodemographic characteristics, EuroQol Five-Dimension questionnaire (EQ-5D-5L), Health Literacy Scale, Morisky Medication Adherence Scale (MMAS-8), and COPD assessment test (CAT) were assessed.

Results: A total of 425 patients with COPD were included. Better treatment adherence was positively correlated with better quality of life (p<0.001). There was a negative correlation between the quality of life and age (p<0.001; r=-0.174), COPD duration (p<0.001; r=-0.261), pack-years smoking history (p=0.002; r=-0.162), and CAT score (p<0.001; r=-0.765). There was a positive correlation between quality of life and body mass index (p=0.049; r=0.096), and health literacy scores (p<0.001; r=0.473). Increased health literacy scores were also significantly related to better quality of life (p=0.004).

Conclusion: Treatment adherence and health literacy significantly influenced HRQoL, highlighting the need for interventions focused on enhancing health literacy and adherence in COPD management.

[P R Health Sci J 2025;44(2):116-120]

Key words: Adherence to therapy, COPD Assessment Test, EQ-5D-5L

hronic obstructive pulmonary disease (COPD) is considered to be a significant public health issue affecting 384 million people worldwide, causing 3.2 million deaths annually. According to international health organization reports, COPD will responsible for one third of all deaths globally by 2030 (1).

COPD is a progressive disease. Self-management of chronic diseases, such as adherence to medications regularly, can reduce the frequency of exacerbations and hospitalizations and may have a significant impact on health outcomes (2). Therefore, maintaining a consistent medication regimen is vital in the management of a disease. To control disease and improve quality of life, it is necessary to have an understanding of how COPD medications should be used and the importance of daily use. Unfortunately, previous studies have reported that approximately 72% of patients with COPD do not adhere to medication (3).

Health-related quality of life (HRQoL) includes the subjective evaluation of physical, psychological, and social well-being and functioning (4). As a valid indicator, HRQoL reflects selfperceived well-being in physical and mental health and life satisfaction. Information on HRQoL can guide in designing effective intervention strategies. The EQ-5D-5L is one of the widely used tools to assess HRQoL (5). To date, few studies have addressed HRQoL in patients with COPD using EQ-5D-5L, such information is lacking for COPD patients in Turkey (6).

Health literacy defined as the ability to acquire, process, and comprehend health-related information and make informed decisions about one's health (7). Prior research indicates more than half of COPD patients have inadequate health literacy (8). Low health literacy was associated with poor selfmanagement behaviours, higher disease severity, increased feeling of helplessness, and worse HRQoL (9,10). In addition to increased hospitalization and emergency room visits, COPD patients with poor health literacy are likely to experience problems performing everyday activities, need assistance from others, and have multiple long-term conditions (11). Low health literacy can also affect communication between the patient and the healthcare provider regarding medication management, resulting in the patient's inability to obtain and use medications as prescribed (8,11). Furthermore, patients with inadequate health literacy have worse patient-reported outcomes regardless of disease activity. This imposes a substantial burden on both patients and healthcare systems, in terms of health outcomes and financial costs.

To date, numerous studies conducted to determine the link between health literacy and HRQoL in adults with chronic diseases (8,9). However, there is a knowledge gap regarding health literacy, medication adherence, and HRQoL in COPD. Therefore, this study aimed to investigate the relationship between health literacy, medication adherence and HRQoL in COPD patients.

The authors have no conflict of interest to disclose.

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Materials and Methods

This cross-sectional study was carried out with COPD patients who applied to outpatient chest clinic of a tertiary chest diseases hospital, between February 25 and March 31, 2023. The study followed the criteria set by the Declaration of Helsinki. Following official permission was obtained by e-mail from the EuroQol Research Foundation, the ethical approval was received from Research Ethical Committee (Approval number:4/7, date:24.02.2023).

Study sample

Patients eligible for the study were older than 40 years, diagnosed with COPD, under medication treatment for COPD for at least 12 months, had no changes in COPD medication over the past three months, could speak and understand Turkish and were willing to participate in the study. Those who were pregnant, under 40 years old, had neurological or psychological problems that affected cognition and were suffering from any diseases that could affect respiratory functions were excluded.

Measures

A five-part questionnaire used to collect data, which included sociodemographic and clinical information, EuroQol Five-Dimension questionnaire (EQ-5D-5L), the Health Literacy Scale, medication adherence scale (MMAS-8), and COPD assessment test (CAT).

The EQ-5D-5L Questionnaire was used to measure healthrelated quality of life (HRQoL). The Turkish version of the scale was translated into 171 languages by the EuroQoL group. The EQ-5D-5L index was utilized to calculate the health status, ranging from zero to one. The coefficients describing the health status of each patient were evaluated using UK values, as they were not available for Turkey (12).

Health literacy was assessed using a short-form of Turkish version of the European Health Literacy Survey Questionnaire (HLS-EU-Q) (13). The scale was comprised of 12 items and rated on a 5-point Likert like scale, with higher scores representing higher levels of health literacy.

Medication adherence was assessed using the Turkish version of the validated eight-item MMAS-8 (14). The scale minimizes "yes-saying" bias, with Item 5 designed to counteract uniform responses. Items 1-7 offer "yes" or "no" options, while Item 8 uses a five-point Likert scale. "No" responses score 1, and "yes" responses score 0, except for Item 5, which is reversed. Item 8's score (0-4) is standardized by dividing by 4. Total MMAS-8 scores range from 0 to 8, with 8 indicating high adherence, 6-7 medium adherence, and below 6 low adherence.

The CAT was employed to assess the impact of COPD on health status. Each item on the test is scored on a scale from 0 to 5, resulting in a total score that ranges from 0 to 40. This score reflects the extent to which COPD affects the patient's health status (15).

Statistical analysis

Statistical analysis was conducted using the SPSS 25.0 software, including Pearson's correlation, one-way analysis of variance (ANOVA), and multiple linear regression. The results were

presented in the form of frequency and percentage values for qualitative variables, and arithmetic mean and standard deviation values for quantitative variables. The factors affecting the HRQoL were analyzed using multiple linear regression, with P-values less than .05 considered significant.

Results

The study included 425 COPD patients, primarily male (79.3%) with a mean age of 66.48 (8.5) years and mean BMI of 27.1kg/m². Of the participants, 87.5% were primary and secondary school graduates, 96.2% were married, 96.7% lived with their family, 99.1% had no caregiver, 45.6% had comorbidities, and 34.7% had a monthly income equal to expenses. The mean disease duration was 8 (ranging 1-40) years. The majority (73.2%) were ex-smokers, and 12.9% were current smokers. Compared to the previous year, 54.1% of the participants perceived their health as the same (n=168) and 23.8% (n=299) as worse. The most used source for obtaining health information was newspapers, magazines or books (99.3%). The Health Literacy Scale (HLS-EU-Q) analysis of 425 participants revealed that 42.4% demonstrated high health literacy, 47.1% exhibited adequate health literacy, and 10.6% were classified as having low health literacy,

Of the surveyed participants, 32% indicated that they had a previously confirmed COVID-19 infection, and 98.6% had at least one dose of COVID-19 vaccine. A total of 37.9% of participants utilized a nebulizer, 16% were dependent on an oxygen cylinder, 20.2% used an oxygen concentrator, and 10.8% employed a BiPAP device for long-term oxygen therapy (LTOT).

The study found that HRQoL had a negative correlation with age, COPD duration, pack-years smoking history, and CAT score (all *P*<.001). It was also determined a positive correlation between HRQoL and BMI and health literacy scores (all *P*<.001) (Table 1).

The participants with high treatment adherence had higher mean scores in the quality of life than the participants with low and moderate treatment adherence (P<.001) (Table 2).

The multiple regression analysis showed that CAT scores (P<.001), treatment adherence level (P<.001), and health literacy scores (P=0.004) remained significant factors for HRQoL. Age (P=.532), BMI (P=.582), duration of COPD (P=.229) and pack-years smoking history (P=.300) were not found to be significant (Table 3).

Discussion ____

The result of the study indicated that as the health literacy level and medication adherence increased, their HRQoL increased. As the CAT scores of patients increased, their HRQoL decreased. The study found no link between medication adherence and health literacy. Our study demonstrated that higher health literacy scores were associated with higher HRQoL, similar to the results from other studies.

COPD is a debilitating condition that has a significant adverse effect on the HRQoL. This impact has been associated with the disease severity as determined by frequency of exacerbations and the CAT score (16). This also accords with our results, which showed that COPD had a significant negative impact on HRQoL.

Table 1. Comparisons between the quality of life and other variables

		Age	BMI	COPD Duration	Smoking pack-years	CAT score	Health Literacy score
EQ-5D-5L	r	-0.174**	0.096*	-0.261**	-0.162**	-0.765**	0.473**
	P	<.001	.049	<.001	.002	<.001	<.001

**P <.01; *P <.05

Table 2. Comparison of quality of life scores with patients' treatment adherence

	Adhere	ence to treatment		F	р	Difference	
	Low	Medium	High				
EQ-5D-5L index	0.63 (0.15)	0.67 (0.21)	0.77 (0.19)	9.504	<.001	3>1.2	

Table 3. Multiple linear regression analysis of factors affecting the quality of life

	Regression	Standard	Standardized	t	<i>P</i> -value	95% CI		
	coefficients (B)	Error	coefficients (B)			Lower	Upper	
Constant	0.788	0.115		6.864	<.001*	0.562	1.014	
Age	-0.001	0.001	-0.023	-0.626	.532	-0.002	0.001	
Body mass index (BMI) (kg/m²)	0.001	0.001	0.018	0.551	.582	-0.002	0.003	
COPD Duration (year)	-0.001	0.001	-0.041	-1.204	.229	-0.004	0.001	
Smoking pack-years	0	0	-0.034	-1.037	.300	-0.001	0	
CAT score	-0.021	0.001	-0.688	-18.153	<.001*	-0.023	-0.019	
Adherence to treatment score	0.062	0.012	0.162	4.998	<.001*	0.038	0.087	
Health Literacy score	0.006	0.002	0.116	2.926	.004*	0.002	0.01	
*P<.05 ANOVA P<.001 R²=0.635								

Prior studies have noted that many patients with chronic conditions do not take their medication as prescribed (17,18). A comprehensive study by Ingebrigtsen et al. in Copenhagen showed that adherence levels in patients with COPD varied from 25% to 68%, depending on the treatment regimen (19). Another study conducted in the USA found that 58% of patients did not use their COPD medications as recommended (17). The ADCARE study also reported that non-adherence to treatment was negatively correlated with HRQoL in patients with COPD

(18). In another study, Corden et al. (20) found that patients with COPD who had a lower treatment adherence had reduced HRQoL, which aligns with the findings of this study.

Our study found no link between medication adherence and health literacy, contradicting existing literature that suggests inadequate health literacy negatively affects adherence, especially in chronic conditions like COPD. This may be due to other significant factors, such as socio-economic status, treatment complexity, and patient motivation. Further investigation into the multifactorial nature of medication adherence is needed to understand the dynamics involved.

The present study also found that patients with inadequate health literacy had significantly lower EQ-5D-5L utility values, indicating a correlation between health literacy and HRQoL. An association between health literacy and health outcomes has been reported in the literature. Some studies have found that inadequate health literacy have been related to higher mortality rates (8). Some research showed an association between low health literacy and worse COPD severity, increased helplessness, and poor HRQoL (8,9). Therefore, it would be beneficial to address the effects of health literacy on COPD for improved outcomes in patients living with this disease.

Several limitations of the study should be acknowledged. First, there was an inherent risk of recall bias and inaccuracy exits as the study was based on interview data. Second, this study relies on self-reporting, which may lead to an overestimation of medication adherence. As there are no country-specific reference values for Turkey, UK tariffs were used to generate utility values for Turkey. It would be beneficial to conduct further research to derive utility values based on country-specific preferences. Another limitation of this study is that the Turkish short version of the health literacy

scale was previously validated with university students, raising concerns about its applicability to our COPD patient population. Demographic differences may affect the scale's sensitivity and relevance to the diverse education and health literacy levels in our cohort. Notwithstanding these limitations, this study is one of the few to thoroughly examine the association between health literacy and adherence to treatment with HRQoL using EQ-5D-5L. We believe that the results presented here provide a benchmark for future studies.

Conclusions

The findings of this study indicate a significant correlation between higher health literacy and better medication adherence with improved health-related quality of life (HRQoL) in patients with COPD. Therefore, improving health literacy and adherence to treatment should be key policies to reduce the burden of COPD.

Resumen_

Objetivo: Determinar la asociación entre la alfabetización en salud, la adherencia al tratamiento con la calidad de vida en pacientes con enfermedad pulmonar obstructiva crónica (COPD). Métodos: Este estudio transversal realizado entre adultos con COPD entre febrero y marzo de 2023. Se evaluaron las características sociodemográficas, el cuestionario EuroQol de cinco dimensiones (EQ-5D-5L), la escala de alfabetización sanitaria, la escala de adherencia a la medicación de Morisky (MMAS-8) y la prueba de evaluación de la COPD (CAT). Resultados: Se incluyeron un total de 425 pacientes con COPD. Una mejor adherencia al tratamiento se correlacionó positivamente con una mejor calidad de vida (p<0,001). Hubo una correlación negativa entre la calidad de vida y la edad (p<0,001; r=-0,174), la duración de la COPD (p<0,001; r=-0,261), los años-paquete de tabaquismo (p=0,002;r=- 0,162) y la puntuación CAT (p<0,001; r=-0,765). Hubo una correlación positiva entre la calidad de vida y el índice de masa corporal (p=0,049; r=0,096), y las puntuaciones de alfabetización sanitaria (p<0,001; r=0,473). El aumento de la puntuación en alfabetización sanitaria también se relacionó significativamente con una mejor calidad de vida (p=0,004). Conclusión: La adherencia al tratamiento y la alfabetización sanitaria influyeron de manera significativa en la HRQoL, lo que pone de relieve la necesidad de llevar a cabo intervenciones centradas en mejorar la alfabetización sanitaria y la adherencia al tratamiento de la COPD.

Acknowledgments _

The authors would like to thank the study participants for their contribution. Ethical approval for this research was provided by the Health Sciences University Hamidiye Scientific Research Ethics Committee (24.02.2023- 4/7). The database management under privacy legislation and the presented study per the ethical principle of the declaration of Helsinki. Official permission was obtained from the EuroQol Research Foundation. All participants gave informed consent before taking part in the study. Availability of data and materials. The dataset used and analyzed in the study is available from the corresponding author on reasonable request. Authors' contributions: All authors attest they meet the International Committee for Medical Journal Editors (ICMJE) criteria for authorship. GB: Conceptualization, Writing – Original Draft, Writing –Review & Editing. MC: Data Curation, Writing - Original Draft, Writing -Review & Editing. EK: participated in the interpretation of findings and drafting of the manuscript. KNB: Formal analysis, Writing - Original Draft, Writing – Review & Editing. All authors participated in the review of the final manuscript. All of the authors have read and approved

the final version of this manuscript. All authors participated in the revision of the manuscript, and revised the manuscript critically for important intellectual content. All of the authors have read and approved the final version of this manuscript.

References

- World Health Organization (WHO). Chronic obstructive pulmonary disease (COPD). 2023. Available at: https://www.who.int/newsroom/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd). Accessed Sept 13, 2023
- Zwerink M, Kerstjens HA, van der Palen J, et al. (Cost-)effectiveness of self-treatment of exacerbations in patients with COPD: 2 years follow-up of a RCT. Respirology 2016;21(3):497-503. https://doi. org/10.1111/resp.12697
- Krigsman K, Moen J, Nilsson JL, Ring L. Refill adherence by the elderly for asthma/chronic obstructive pulmonary disease drugs dispensed over a 10-year period. J Clin Pharm Ther 2007;32(6):603-611. https://doi.org/10.1111/j.1365-2710.2007.00866.x.
- Wang HM, Beyer M, Gensichen J, Gerlach FM. Health-related quality of life among general practice patients with differing chronic diseases in Germany: cross sectional survey. BMC Public Health 2008;8:246. https://doi.org/10.1186/1471-2458-8-246.
- Karimi M, Brazier J. Health, Health-Related Quality of Life, and Quality of Life: What is the Difference? Pharmacoeconomics 2016;34(7):645-649. https://doi.org/10.1007/s40273-016-0389-9.
- Nutbeam D. Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International 2000;15(3):259– 267. https://doi.org/10.1093/heapro/15.3.259
- Berkman ND, Davis TC, McCormack L. Health literacy: what is it? J Health Commun 2010;15 Suppl 2:9-19. https://doi.org/10.1080/1 0810730.2010.499985
- Puente-Maestu L, Calle M, Rodríguez-Hermosa JL, et al. Health literacy and health outcomes in chronic obstructive pulmonary disease. Respir Med 2016;115:78-82. https://doi.org/10.1016/j. rmed.2016.04.016
- Omachi TA, Sarkar U, Yelin EH, Blanc PD, Katz PP. Lower health literacy is associated with poorer health status and outcomes in chronic obstructive pulmonary disease. J Gen Intern Med 2013;28(1):74-81. https://doi.org/10.1007/s11606-012-2177-3
- Sadeghi S, Brooks D, Stagg-Peterson S, Goldstein R. Growing awareness of the importance of health literacy in individuals with COPD. COPD 2013;10(1):72-78. https://doi.org/10.3109/15412555.201 2.727919
- 11. Kale MS, Federman AD, Krauskopf K, et al. The Association of Health Literacy with Illness and Medication Beliefs among Patients with Chronic Obstructive Pulmonary Disease. PLoS One 2015;10(4):e0123937. https://doi.org/10.1371/journal.pone.0123937
- EuroQol Research Foundation. EQ-5D-5L User Guide; 2019. Available from: https://euroqol.org/publications/user-guides. Accessed 13 Feb 2023.
- Sungur MA, Gamsizkan Z, Sungur DH. A short-form suggestion for the Turkish version of the European Health Literacy Survey Questionnaire: a development and validation study in university students. Glob Health Promot 2022;29(1):74-85. https://doi. org/10.1177/17579759211064261
- Hacıhasanoğlu Aşılar R, Gözüm S, Çapık C, Morisky DE. Reliability and validity of the Turkish form of the eight-item Morisky medication adherence scale in hypertensive patients. Anadolu Kardiyol Derg 2014;14(8):692-700. https://doi.org/10.5152/akd.2014.4982
- Yorgancıoğlu A, Polatlı M, Aydemir Ö, et al. KOAH değerlendirme testinin Türkçe geçerlilik ve güvenilirliği [Reliability and validity of Turkish version of COPD assessment test]. Tuberk Toraks 2012;60(4):314-20. https://doi.org/10.5578/tt.4321
- Marvel J, Yu TC, Wood R, Higgins VS, Make BJ. Health Status of Patients With Chronic Obstructive Pulmonary Disease by Symptom Level. Chronic Obstr Pulm Dis 2016;3(3):643-652. https://doi. org/10.15326/jcopdf.3.3.2015.0177

- Krauskopf K, Federman AD, Kale MS, et al. Chronic Obstructive Pulmonary Disease Illness and Medication Beliefs are Associated with Medication Adherence. COPD 2015;12(2):151-164. https://doi.org /10.3109/15412555.2014.922067
- Kokturk N, Polatli M, Oguzulgen IK, et al. Adherence to COPD treatment in Turkey and Saudi Arabia: results of the ADCARE study. Int J Chron Obstruct Pulmon Dis 2018;13:1377-1388. https://doi. org/10.2147/COPD.S150411
- 19. Ingebrigtsen TS, Marott JL, Nordestgaard BG, et al. Low use and adherence to maintenance medication in chronic obstructive pulmonary disease in the general population. J Gen Intern Med 2015;30(1):51-59. https://doi.org/10.1007/s11606-014-3029-0
- 20. Corden ZM, Bosley CM, Rees PJ, Cochrane GM. Home nebulized therapy for patients with COPD: patient compliance with treatment and its relation to quality of life. Chest 1997;112(5):1278-1282. https://doi.org/10.1378/chest.112.5.1278