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ORIGINAL PAPER

Social vulnerability and medication adherence in individuals with chronic obstructive pulmonary disease

Sevda Efil , Ceren Mina Bükrük , Ebru Özen

Department of Nursing, Faculty of Health Sciences, Canakkale Onsekiz Mart University, Canakkale, Türkiye

ABSTRACT

Introduction and aim. The association between social vulnerability and medication adherence in individuals with chronic obstructive pulmonary disease is unclear. The aim of this study was to show the correlation of social vulnerability and medication adherence in individuals with chronic obstructive pulmonary disease.

Material and methods. Data collection was conducted by face to face interview in November 2022 and May 2023. Social vulnerability and medication adherence were evaluated using the Social Vulnerability Scale and the Medication Adherence Report Scale respectively.

Results. The mean scores of individuals with chronic obstructive pulmonary disease for social vulnerability and medication adherence were 20.02±6.69 and 22.76±3.29 respectively. Levels of social vulnerability varied according to comorbidity, hypertension, heart failure, visit to emergency service in the last three months due to COPD exacerbation, and using herbal products instead of medication ($p<0.05$). Mean scores for medication adherence were lower in women, never smokers, and those who used herbal products instead of medication ($p<0.05$).

Conclusions. Having a higher level of social vulnerability is associated with worse medication adherence ($r=-0.31$, $p<0.01$). Individuals using herbal products are found to be at risk for social vulnerability and non-adherence to medication ($p<0.05$).

Keywords. chronic obstructive pulmonary disease, frailty, medication adherence, social vulnerability

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic disease in which effective management requires long-term adherence to medication.[1] The increased symptom burden and recurrent hospitalizations negatively impact the Health-Related Quality of Life (HRQOL) in COPD.[2] Pharmacological treatment for COPD patients can alleviate symptoms, improve lung function, and reduce the risk of exacerbations.[3] The findings of a systematic review show that non-adherence to inhaler therapy is common in COPD patients.[4] Achieving good adherence involves a process including the initiation, implementation, and persistence of a treatment plan. In COPD, this means obtaining and taking the first inhaled dose followed by obtaining and taking refills of the medication over time.[5] Medication adherence, defined as the degree to which a patient follows the prescribed timing, dosage, and duration of their medication, is notably linked to various factors.[6] These factors include diminished treatment expectations, perceptions of illness, comorbidities, depression, aging, smoking, an individuals' lack of confidence, and insufficient knowledge, all contributing to non-adherence.[7-9] Difficulty in medication adherence adversely affects health-related quality of life,[10] leading to unfavorable clinical outcomes, increased healthcare utilization,

Corresponding author: Sevda Efil, e-mail: sevda_efil@hotmail.com, drlifes932@gmail.com

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and overall healthcare costs.[6] Frailty is also a significant factor affecting the quality of life in COPD patients.[11-13] Frailty can lead to worsening respiratory function and dyspnea in individuals with COPD, idiopathic pulmonary fibrosis, and asthma.[14] Moreover, it increases mortality and hospitalizations.[15,16] Marengoni et al. identified that individuals with COPD are twice as vulnerable to frailty compared to those without COPD.[17] While the literature predominantly addresses physical frailty in individuals with COPD,[11-13,15,18,19] limited research has explored the social aspects of frailty.[20,21] Social elements like social activities, social support, social networks, loneliness, and solitary living emerge as the predominant social factors across diverse frailty assessment tools.[22] Van Oostrom et al. define social frailty by utilizing measures such as loneliness, inadequate social support, and restricted social engagement.[23]

Social vulnerability is a tendency towards credulity and gullibility. It causes stress exposure in communities and individuals.[24] At the same time, social vulnerability is a significant risk factor for physical frailty; thus, assessing social vulnerability is crucial.[25] Early intervention for fragile individuals can prevent potentially risky situations, improve quality of life, and reduce care costs.[26] Social vulnerability has a strong impact on the future risk of physical disability among elderly individuals in the community.[27] Frailty and COPD are strongly correlated in the elderly population.[19,28,29] Social vulnerability in older individuals can pose a risk of mortality and morbidity.[30] Despite emerging evidence suggesting that frailty begins much earlier than age 65, most studies on frailty have focused solely on individuals over this age threshold.[11,15,20] In individuals with COPD, social vulnerability is a significant risk factor for severe acute exacerbation and unexpected hospitalization.[20] Identification of social vulnerability presents an opportunity to intervene to improve the lives of individuals and communities following an adverse health.[31] As far as we are aware, no existing literature investigates the correlation between social vulnerability and medication adherence in individuals below the age of 65 with COPD. Simultaneously addressing social vulnerability and medication adherence may provide a new framework for improving conditions that could affect individuals at an early stage. Therefore, this study explores the relationship between social vulnerability and medication adherence in individuals under the age of 65 with COPD.

Aim

The following research questions were proposed for this purpose: What are social vulnerability and medication adherence scores in persons with COPD? Do social vulnerability and medication adherence differ by sociodemographic and disease-related characteristics? Is there a relation between social vulnerability and medication adherence scores in persons with COPD?

Material and methods

Design and sample

The research had a descriptive and relational design. The study population consisted of patients presenting to a university hospital's chest disease outpatient clinic. The minimum sample size in the population was determined by power analysis with the program G*Power (v3.1.9.7). In the calculation performed to obtain a .05 significance level (α), and an 95% statistical test power (1-β), effect size was calculated as 0.3 and a minimum sample size of 134 was found according to the standard deviation value.

Inclusion criteria

Eligible for participation in this study were:

- age between 40 and 65,
- diagnosis of COPD for at least one year (The participants with hospital data confirming a post-bronchodilator forced expiratory volume in 1 s (FEV1)/ forced vital capacity (FVC) ratio of less than 70% for COPD according to the GOLD)[1],
- use of inhalers in accordance with their COPD diagnosis,
- no exacerbation or respiratory tract infection at the time of data collection
- ability to speak, read, and write in Turkish,
- having the cognitive capacity to provide informed consent (no psychiatric or cognitive problems as confirmed by medical record review),
- volunteering to participate in the study,

Exclusion criteria

Excluded from participation in this study were:

- patients were excluded from the study who had had COPD for less than one year,
- who answered the questions incompletely,
- who were over 65 years old,
- who had an exacerbation and/or a respiratory tract infection when data was collected,
- who did not have the cognitive capacity to provide informed consent,
- or who were unwilling to participate in the study.

Data collection and instruments

Data were collected between November 2022 and May 2023. The patients who met the inclusion criteria were first explained the content (the aim of the research, what it covered, and its duration) of the study and asked to sign an informed consent form. The patients were told that they could withdraw from the study at any time. Researchers collected data within an average of 15 minutes through face-to-face interviews on weekdays when the patients and the researchers were available. The participants were asked to answer the questions in the data collection instruments in a way that they thought suitable

and to answer all the questions. All data were collected following the instructions given by the first author of the study. Socio-demographic and clinical characteristics of patients were obtained through interviews with researchers, patient records, and the hospital's electronic medical record system. The data collection tools included:

Data gathering form

The data-gathering form was prepared by the researchers in light of the literature review. The form consists of 20 questions encompassing participants' socio-demographic and disease-related characteristics.[7,18,20,21,24,27,30,32,33]

Social vulnerability scale

The Social Vulnerability Scale was developed by Pinsker et al. and adapted to the Turkish language by Saricam.[24,34] This scale, consisting of 15 items on a 5-point Likert scale, encompasses two subscales: "gullibility" and "credulity." Credulity is as inclination to believe things that are untrustworthy or unlikely to be true or real. Gullibility relates to a tendency to being manipulated or deceived, either over and over again or in the presence of obvious warning signs. The scores obtained from the scale range from 15 to 75. The scores on the subdimensions of the scale are 8-40 for gullibility (items 1–8.), and 7–35 for credulity (items 9–15.). The scale has no cutoff point. Higher scores, indicate greater social vulnerability. Cronbach's alpha for Turkish version was 0.94.[24] The Cronbach's alpha for the current total sample was 0.85.

Medication Adherence Report Scale (MARS)

The Medication Adherence Report Scale was developed by Horne and Weinman to assess drug compliance in chronic diseases and was adapted to the Turkish language by Temeloglu Sen et al.[33,35] Medication adherence was assessed using the MARS, which is a five-item, structured, self-reported questionnaire, to identify a variety of non-adherent behaviors, including a tendency to avoid, forget or stop taking medication and a tendency to adjust or alter the dose prescribed by the clinician. The participants were asked about their adherence to inhaler drugs, prescribed for COPD treatment.This 5-item Likert scale was employed to assess medication adherence. The total test score is determined by summing the scores obtained from the items. The scores obtained from the scale range from 5 to 25. The scale has no cutoff point. Higher total scores indicate better medication adherence and lower total scores indicate poor medication adherence. Cronbach's alpha for Turkish version was 0.78.[33] The Cronbach's alpha for the current total sample was 0.87.

Statistical analysis

The data in this study were analyzed using SPSS 22.0 (IBM Corp., Released 2013, IBM SPSS Statistics for Windows, Version 22.0, Armonk, NY: IBM Corp.). Categoric variables were expressed as numerical values and percentages, and continuous variables were expressed as means, standard deviations, mediums, and maxima and minima. The Kolmogorov-Smirnov test was used for conformity to normal distribution. The Mann-Whitney and Kruskal-Wallis tests were used to compare variables which did not show normal distribution. The association between numerical variables was assessed by Spearman correlation analysis. Statistical significance was taken as $p<0.05$.

Ethics approval

This research was conducted in conformity with ethical principles and the Helsinki Declaration. Before beginning the study, permission was obtained from the Ethics Committee of the Postgraduate Education Institute of Çanakkale Onsekiz Mart University, decision No. 20/16, dated 24 November 2022. Appropriate permissions were obtained from the institution where the study was conducted (dated 29 November 2022, No. E-78179085-199-2200284102). Written permission was obtained by e-mail from the researchers to use the scales in the collection of data. Informed written approval was obtained from the participants concerning their willing and voluntary participation.

Results

The eligible sample size was 134. Thirty-one were excluded based on the exclusion criteria. Patients were excluded from the study who had had COPD for less than one year (n=4), who answered the questions incompletely (n=7), who over 65 years old (n=12), and who did not agree to participate in the study (n=8). After applying the inclusion and exclusion criteria, the study included 136 voluntary participants.

The mean age of the patients included in the study was 59.29 (SD=5.42) years, and the duration of the COPD was 8.02 (SD=5.20) years. The mean scores of individuals with COPD for social vulnerability and medication adherence were 20.02 (SD=6.69) and 22.76 (SD=3.29) respectively (Table 1). Of the participants, 41.2% scored 25 points on the Medication Adherence Scale, while 58.8% scored less than 25.

Average medication adherence scores were lower in females (p=0.02), non-smokers (p=0.01), and those using herbal products instead of medication (p=0.01) (Table 1, Table 3).

Average social vulnerability scores were higher in individuals with comorbidities (p=0.01), hypertension (p=0.01), heart failure (p=0.03), those who visited the emergency service in the last three months once due to COPD exacerbation (p=0.03), and those using herbal products instead of medication (p=0.00) (Table 2, Table 3).

Social vulnerability was higher in individuals using herbal products instead of medication to expectorate mucus (p=0.04) (Table 4). The herbal products used in-

stead of medication were chamomile (64.4%), sage tea (59.3%), ginger (59.3%), garlic (28.8%), pine cone syrup (20.3%), and licorice root (16.9%).

Table 1. Comparison of social vulnerability scale and MARS scores according to socio-demographic characteristics*

n=136	Mean±SD (Min–Max)
Age	59.29±5.42 (42–65)
Time since COPD diagnosis	8.02±5.2 (1–20)
Total number of medications used 5.10±2.88 (1–15)	
Social vulnerability	20.02±6.69 (15–43)
Gullibility	9.43±2.26 (8–18)
Credulity	10.57±5.10 (7–30)
Medication adherence	22.76±3.29 (5–25)

	Gullibility		Credulity		Social vulnerability		Medication adherence	
	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p
MW Gender, n (%)								
Female, 45 (33.1)	9.96±2.31 (8–16)	0.01	11.04±5.66 (7–30)	0.39	21±7.34 (15–43)	0.21	21.73±3.83 (10–25)	0.02
Male, 91 (66.9)	9.16±2.21 (8–18)		10.34±4.82 (7–28)		19.54±6.33 (15–41)		23.26±2.88 (5–25)	
KW Age, n (%)								
40–49 Years, 12 (8.8)	10.25±2.73 (8–16)	0.52	12.17±6.9 (7–30)	0.62	22.42±9.10 (15–43)	0.70	22.08±5.7 (5–25)	0.25
50–59 Years, 41 (30.1)	9.44±2.42 (8–18)		9.66±3.61 (7–21)		19.10±5.32 (15–36)		22.39±3 (14–25)	
60–65 Years, 83 (61)	9.30±2.11 (8–18)		10.80±5.41 (7–28)		20.13±6.89 (15–41)		23.04±2.98 (10–25)	
MW Marital status, n (%)								
Married, 97 (71.3)	9.32±2.21 (8–18)	0.34	10.72±5.52 (7–30)	0.60	20.07±7.17 (15–43)	0.40	22.57±3.63 (5–25)	0.76
Single, 39 (28.7)	9.69±2.40 (8–18)		10.21±3.92 (7–24)		19.90±5.38 (15–36)		23.23±2.23 (15–25)	
KW Education level, n (%)								
Primary school, 12 (8.8)	9.70±2.58 (8–18)	0.49	11.36±6.17 (7–30)	0.24	21.07±7.94 (15–43)	0.18	22.53±4.04 (5–25)	0.69
Middle school, 41 (30.1)	9.33±2.06 (8–18)		10.18±3.25 (7–20)		19.58±4.61 (15–38)		23.06±2.22 (16–25)	
High school/ university, 83 (61.0)	8.94±1.6 (8–13)		9.3±3.75 (7–24)		18.24±5.05 (15–36)		22.94±2.32 (17–25)	
MW Residential area, n (%)								
Rural area, 44 (32.4)	9.48±2.73 (8–18)	0.42	10.3±4.2 (7–26)	0.84	19.82±6.27 (15–41)	0.99	23.18±2.55 (14–25)	0.52
Urban area, 92 (67.6)	9.40±2.02 (8–18)		10.71±5.5 (7–30)		20.12±6.91 (15–43)		22.55±3.59 (5–25)	
KW Employment status, n (%)								
Employed, 30 (22.1)	9.27±2.6 (8–18)	0.25	10.07±4 (7–22)	0.85	19.33±5.82 (15–37)	0.88	22±4.36 (5–25)	0.88
Unemployed, 37 (27.2)	9.62±2.16 (8–16)		11.00±5.76 (7–30)		20.62±7.25 (15–43)		22.57±3.51 (10–25)	
Retired, 69 (50.7)	9.39±2.18 (8–18)		10.57±5.20 (7–28)		20.00±6.79 (15–41)		23.19±2.54 (15–25)	

* MW – Mann-Whitney U test, KW – Kruskal-Wallis H test

A weak negative correlation was observed between medication adherence and gullibility scores (r=-0.31, p<0.01), while a moderate negative correlation was found between social vulnerability (r=-0.43, p<0.01) and credulity scores (r=-0.43, p<0.001) (Table 5).

Table 2. Comparison of social vulnerability scale and MARS scores according to clinical characteristics*

n=136	Gullibility		Credulity		Social vulnerability		Medication adherence	
	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p
KW COPD stage, n (%)								
GOLD 1, 19 (14)	9.79±2.44 (8–16)	0.65	11.05±5.81 (7–30)	0.2	20.84±7.57 (15–43)	0.24	22.47±4.77 (5–25)	0.8
GOLD 2, 62 (45.6)	9.21±2.1 (8–18)		9.69±4.07 (7–24)		18.92±5.77 (15–37)		22.89±3.04 (12–25)	
GOLD 3, 55 (40.4)	9.55±2.39 (8–18)		11.40±5.79 (7–28)		20.98±7.25 (15–41)		22.71±3 (10–25)	
MW Coexisting diseases, n (%)								
Yes, 87 (64)	9.79±2.43 (8–18)	0.01	11.22±5.25 (7–30)	<0.001	21.05±6.88 (15–43)	<0.001	22.53±3.21 (10–25)	0.13
No, 49 (36)	8.78±1.77 (8–18)		9.43±4.66 (7–28)		18.20±5.97 (15–38)		23.16±3.44 (5–25)	
MW Hypertension, n (%)								
Yes, 60 (44.1)	9.98±2.47 (8–18)	<0.001	11.6±5.92 (7–30)	0.04	21.63±7.52 (15–43)	0.01	22.45±3.52 (10–25)	0.52
No, 76 (55.9)	8.99±2 (8–18)		9.76±4.22 (7–28)		18.75±5.68 (15–38)		23±3.1 (5–25)	
MW Coronary artery disease (CAD), n (%)								
Yes, 22 (16.2)	8.82±1.74 (8–15)	0.13	10.55±5.99 (7–27)	0.40	19.36±7.10 (15–37)	0.27	21.86±4.57 (10–25)	0.92
No, 114 (83.8)	9.54±2.34 (8–18)		10.58±4.94 (7–30)		20.15±6.63 (15–43)		22.93±2.98 (5–25)	
MW Heart failure, n (%)								
Yes, 20 (14.7)	10.25±2.47 (8–18)	0.02	11.15±4.04 (7–24)	0.051	21.45±5.92 (15–36)	0.03	22.95±2.63 (15–25)	0.85
No, 116 (85.3)	9.28±2.21 (8–18)		10.47±5.27 (7–30)		19.78±6.81 (15–43)		22.72±3.4 (5–25)	
MW Diabetes, n (%)								
Yes, 34 (25)	9.71±2.02 (8–15)	0.12	11.76±5.76 (7–30)	0.06	21.74±7.17 (15–43)	0.07	22.68±2.79 (16–25)	0.54
No, 102 (75)	9.33±2.34 (8–18)		10.18±4.83 (7–28)		19.54±6.49 (15–41)		22.78±3.45 (5–25)	

* MW – Mann-Whitney U test, KW – Kruskal-Wallis H test

Discussion

As far as our knowledge extends, this study marks the inaugural attempt to explore the correlation between social vulnerability and medication adherence in individuals under the age of 65 diagnosed with COPD. The findings reveal that higher levels of social vulnerability are associated with poorer medication adherence. Medication adherence is an integral part of chronic disease management, and it has been defined by the World Health Organization as the degree to which the patients accept and follow the treatment organized by health care professionals. Advanced age has been shown to be an important factor for poor adherence to medical therapies.[1] Advanced age has been shown to be an important factor for poor adherence to medical therapies.[36] Social

vulnerability is also known to increase with age.[30] Frailty represents an increased vulnerability to adverse health outcomes.[12,16] Vulnerable patients experience frequent exacerbation and/or admissions to hospital, which limits their rehabilitation.[15,19] It is known that in COPD patients with dispnea, widespread vulnerability not only does not affect health-related quality of life, but also increases the frequency of use of medical services.[11] Difficulty in medication adherence among individuals with COPD can adversely impact disease management.[7] Similarly, this study reports that the majority of individuals with COPD struggle to achieve optimal levels of medication adherence. COPD and aging can increase the risk and severity of frailty.[17,19]

Table 3. Comparison of social vulnerability scale and MARS scores according to descriptive characteristics*

n=136	Gullibility		Credulity		Social vulnerability		Medication adherence	
	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p
KW Smoking status, n (%)								a<b
a. Never smoked, 21 (15.4)	9.95±2.42 (8–16)		10.95±5.39 (7–27)		20.9±6.71 (15–36)		21.1±3.95 (10–25)	
b. Former smoker, 82 (60.3)	9.32±2.41 (8–18)	0.22	10.40±4.89 (7–26)	0.64	19.76±6.75 (15–41)	0.41	23.24±2.79 (12–25)	0.01
c. Currently smoking, 33 (24.3)	9.36±1.73 (8–13)		10.76±5.56 (7–30)		20.12±6.67 (15–43)		22.61±3.72 (5–25)	
KW Visit to emergency service in the last three months due to COPD exacerbation, n (%)				a>d		a>d		
a. Once, 39 (28.7)	10.13±2.75 (8–18)		11.69±5.06 (7–26)		21.87±7.10 (15–41)		22.49±4.19 (5–25)	
b. Twice, 31 (22.8)	9.35±1.82 (8–13)	0.06	10.58±4.86 (7–30)	0.03	19.94±6.16 (15–43)	0.03	22.42±2.51 (16–25)	0.23
c. Three times and more, 22 (16.2)	9.09±2.41 (8–18)		11.36±6.69 (7–27)		20.45±8.31 (15–38)		22.68±3.99 (10–25)	
d. Never, 44 (32.4)	9.02±1.89 (8–16)		9.18±4.16 (7–28)		18.23±5.41 (15–38)		23.27±2.43 (16–25)	
KW Hospitalization in the last three months due to COPD exacerbation, n (%)								
Once, 35 (25.7)	9.83±2.67 (8–18)		12.49±7.00 (7–30)		22.37±8.71 (15–43)		22.97±2.70 (15–25)	
Twice, 14 (10.3)	8.64±1.15 (8–11)	0.35	9.29±4.12 (7–19)	0.19	17.93±5.26 (15–30)	0.17	23.43±3.06 (14–25)	0.41
Three times and more, 11 (8.1)	9.55±3.21 (8–18)		10.36±4.82 (7–20)		19.91±7.77 (15–38)		23.55±2.07 (19–25)	
Never, 76 (55.9)	9.37±2.05 (8–16)		9.96±4.03 (7–27)		19.34±5.43 (15–37)		22.42±3.70 (5–25)	
KW Home oxygen therapy, n (%)								
Yes, 39 (28.7)	9.62±2.76 (8–18)	0.98	10.56±4.82 (7–26)	0.88	20.23±6.93 (15–41)	0.88	22.95±3.02 (14–25)	0.47
No, 97 (71.3)	9.35±2.04 (8–18)		10.58±5.24 (7–30)		19.94±6.63 (15–43)		22.68±3.41 (5–25)	
MW Use of herbal products instead of medication, n (%)								
Yes, 59 (43.4)	9.63±2.12 (8–16)	0.09	11.27±4.58 (7–27)	<0.001	20.93±5.97 (15–37)	<0.001	21.42±4.20 (5–25)	<0.001
No, 77 (56.6)	9.27±2.37 (8–18)		10.04±5.44 (7–30)		19.32±7.15 (15–43)		23.78±1.83 (17–25)	

* MW – Mann-Whitney U test, KW – Kruskal-Wallis H test

Table 4. Comparison of social vulnerability scale and MARS scores according to frequency and reasons for herbal product use

n=59	Gullibility		Credulity		Social vulnerability		Medication adherence	
	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p	Mean±SD (Min–Max)	p
KW Herbal product use frequency, n (%)								
a. Every day, 8 (13.6)	10.13±2.36 (8–15)		13.13±6.56 (7–24)		23.25±8.4 (15–37)		21.38±3.96 (12–24)	
b. Once a week, 13 (22.0)	9.62±1.76 (8–14)	0.75	12.54±5.77 (7–27)	0.36	22.31±6.29 (15–35)	0.34	20.54±5.09 (10–25)	0.86
c. Two or more times a week, 26 (44.1)	9.73±2.49 (8–16)		11.00±3.81 (7–21)		20.73±5.77 (15–36)		21.38±4.41 (5–25)	
d. Occasionally/ Rarely, 12 (20.3)	9.08±1.51 (8–12)		9.25±2.26 (7–14)		18.33±3.23 (15–25)		22.5±2.91 (15–25)	
MW To prevent the progression of the disease, n (%)								
Yes, 24 (40.7)	9.96±2.54 (8–16)	0.64	10.63±4.41 (7–22)	0.20	20.58±6.64 (15–37)	0.32	20.92±5.32 (5–25)	0.69
No, 35 (59.3)	9.40±1.79 (8–14)		11.71±4.71 (7–27)		21.17±5.55 (15–35)		21.77±3.26 (10–25)	
MW Because they believe it is beneficial with minimal side effects, n (%)								
Yes, 24 (40.7)	9.75±2.42 (8–16)	0.96	11.00±3.79 (7–21)	0.99	20.75±5.89 (15–36)	0.84	20.63±4.83 (5–25)	0.29
No, 35 (59.3)	9.54±1.93 (8–15)		11.46±5.10 (7–27)		21.06±6.10 (15–37)		21.97±3.69 (10–25)	
MW Recommended by trusted individuals, n (%)								
Yes, 10 (16.9)	9.80±1.99 (8–13)	0.6	11.20±2.62 (7–15)	0.4	21.00±4.27 (15–28)	0.51	20.80±6.07 (5–25)	0.81
No, 49 (83.1)	9.59±2.17 (8–16)		11.29±4.91 (7–27)		20.92±6.29 (15–37)		21.55±3.79 (10–25)	
MW To avoid respiratory difficulties, n (%)								
Yes, 30 (50.8)	9.73±2.13 (8–15)	0.65	10.53±3.96 (7–21)	0.21	20.33±5.58 (15–36)	0.50	21.93±4.48 (5–25)	0.08
No, 29 (49.2)	9.52±2.15 (8–16)		12.03±5.10 (7–27)		21.55±6.38 (15–37)		20.90±3.90 (10–25)	
MW To alleviate cough, n (%)								
Yes, 40 (67.8)	9.60±2.07 (8–15)	0.93	11.53±4.86 (7–27)	0.54	21.18±6.05 (15–37)	0.50	21.6±4.5 (5–25)	0.29
No, 19 (32.2)	9.68±2.29 (8–16)		10.74±4 (7–21)		20.42±5.93 (15–35)		21.05±3.58 (14–25)	
MW To facilitate the removal of phlegm, n (%)								
Yes, 29 (49.2)	9.97±2.23 (8–16)	0.14	11.9±3.89 (7–24)	0.03	21.86±5.38 (15–36)	0.04	20.9±4.25 (5–25)	0.08
No, 30 (50.8)	9.3±2 (8–15)		10.67±5.16 (7–27)		20.03±6.45 (15–37)		21.93±4.17 (10–25)	

* MW – Mann-Whitney U Test, KW – Kruskal-Wallis H Test

Table 5. Relationship between social vulnerability scale and MARS*

n=136		MARS
Social vulnerability	r	-0.43
	p	<0.001
Gullibility	r	-0.31
	p	<0.001
Credulity	r	-0.43
	p	<0.001

* r – Spearman correlation analysis

Determining social vulnerability and non-adherence to medication before old age can provide the possibility of intervention in the early period. In this study, medication adherence was also not optimal for those using herbal products instead of medication. Additionally, medication adherence was poor in females and non-smokers. Similarly, Vetrano et al. found that females exhibited lower levels of medication adherence than males.[37] Humenberger et al. determined no relationship between age and medication adherence.[38] The study's findings support the literature regarding age and gender. In contrast, Müllerová et al. found that individuals aged 40 to 59, currently smoking, and having ≥2 comorbidities experienced difficulties in medication adherence.[39] This discrepancy may be related to non-smokers and those using herbal products having experienced more severe health issues. Also, patients may think that there is no need for prescribed medicines. Adherence to treatment is strongly related to patients' beliefs concerning the need for prescribed drugs and the functional severity of the disease.[40] In contrast to these findings, there are studies which report no correlation between smoking and medication adherence.[10,38]

Although the study did not find a very high average score for social vulnerability, it suggests that individuals aged 42-65 with COPD may experience social vulnerability. Similarly, Hirai et al. found a high incidence of social vulnerability, even at ages 40–59, at a rate of 23.5%.[20] Middle-aged individuals with COPD may be vulnerable to social frailty. Makizako et al. noted that among non-physically frail adults, social frailty has the potential to precipitate physical frailty rapidly.[25] Social vulnerability contributes to the factors which increase the risk of adverse health conditions. Regmi et al. found that social vulnerability factors are associated with an increased risk of 30-day readmission in patients with heart failure.[41] Cognitive impairments have been shown to be an important factor for poor adherence to medical therapies.[36] There have been several studies reporting the impact of social vulnerability on adverse health outcomes, such as cognitive impairment, disability, and mortality.[42,43] Early recognition of frailty is crucial, as interventions introduced at this stage are likely to prevent or delay functional decline, reduce healthcare costs, and minimize the risks of hospitalization, disability, and mortality.[19,44] Tsutsumimoto et al. found that social frailty was associated with cognitive and physical function in older Japanese adults.[30] Hirai et al. found a higher risk of decreased appetite, more severe shortness of breath, severe acute exacerbation, and unexpected hospitalization in individuals with COPD and social vulnerability.[20] Similarly, in this study, the social vulnerability was higher in individuals with comorbidities, hypertension, heart failure, those who visited the hospital/emergency department once due to COPD exacerbation, and those using herbal products instead of medication. Individuals with accompanying chronic illnesses are known to be more vulnerable in terms of social frailty.[25,45] Nguyen et al. found that obesity, depression/anxiety, and cardiovascular diseases were significantly associated with the most socially vulnerable patients with multimorbidity (having at least three chronic conditions).[45]

Bunt et al. characterized social frailty as a complex concept, signifying a spectrum of susceptibility to the potential loss of social resources, deficiency in social behaviors, social activities, and self-management skills necessary to meet fundamental social requirements.[46] Various other studies also have explicitly defined social vulnerability as insufficient participation in social networks (or no participation at all) and the perception of a lack of contacts and support.[20,23,27,46] A low level of social relationships in those with COPD may constitute a risk for solving problems realting to the disease.[47] Inadequate social support can render individuals socially vulnerable and fragile. Chen et al. found that individuals not living alone with COPD perceived a good level of social support, and perceived social support was associated with increased participation in pulmonary rehabilitation.[48] Limpawattana et al. identified determinants of frailty as having accompanying cancer, being hospitalized at least twice in the previous year, higher waist circumference measurement, and the presence of sarcopenia.[28] Chen et al. observed that frailty in individuals with COPD experiencing dyspnea affected health-related quality of life and increased medical service utilization.[11] Van Oostrom et al. found that being female, older age, lower education level, being married, working in a paid job, current smoking, healthy eating, and comorbidity were associated with one or more areas of frailty.[23] In this study, being female was related to a higher risk of gullibility. While socio-demographic factors are essential for frailty, their impact varies across different frailty domains. Unlike findings in the literature, marital status, education level, residential area and employment status were not found to be related to social vulnerability. Also, in this study, no significant difference in social vulnerability and medication adherence was observed based on the stage of COPD. This discrepancy may be attributed to the absence of individuals in the very severe stage and older individuals with COPD in this study. The frailty state is closely linked to the extent of airflow blockage and the frequency of exacerbations. Hence, individuals experiencing severe COPD are at a greater risk of frailty in comparison to those with less severe manifestations of the condition.[15]

Study limitations

The present study has several limitations that should be acknowledged. A limitation of this study is that this was a survey, and as such was prone to selection bias. For

this reason, some participants may have responded in a socially expected way, particularly in measurements related to social vulnerability. Our study is limited by its single-center design and small sample size, which may affect its generalizability. The present study excluded patients with cognitive mental disorder. Therefore, our findings could be affected by the exclusion of patients with cognitive mental disorder. Because studies on social vulnerability in individuals with COPD could not be accessed, it was not possible to conduct a multi-directional discussion of the relation between social vulnerability and medication adherence. Nevertheless, all questionnaires selected in this study had strong validity and reliability that is thoroughly documented in the scientific literature.

Conclusion

This study can provide valuable insights into the early detection of social vulnerability and associated factors in individuals with COPD. The study's results revealed that an increase in social vulnerability level is related to poorer medication adherence in patients with COPD. Social vulnerability has been identified in non-elderly individuals with COPD. Individuals using herbal products are found to be at risk for social vulnerability and non-adherence to medication.

Evaluating social vulnerability in individuals with COPD is crucial for health care professionals this can contribute to enhancing patient medication adherence and reducing complications associated with the disease. Identifying psychosocial factors that may lead to social vulnerability in patients, reducing social vulnerability, and promoting providing adequate social support among the public should be targeted to achieve this goal. While it is clear that adherence to treatment in COPD is a critical issue, and that improving it will certainly take time and require major efforts, it is also obvious that raising awareness of the disease and improving cooperation among specialists, general practitioners, pharmacists, nurses, social workers and patients is the starting point at which this change should immediately begin.

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Author contributions

Conceptualization, S.E., C.M.B. and E.O.; Methodology, S.E., C.M.B. and E.O.; Software, S.E., C.M.B. and E.O.; Validation, S.E., C.M.B. and E.O.; Formal Analysis, S.E.; Investigation, S.E., C.M.B. and E.O.; Resources, S.E., C.M.B. and E.O.; Data Curation, S.E., C.M.B. and E.O.; Writing – Original Draft Preparation, S.E.; Writing – Review & Editing, S.E., C.M.B. and E.O.; Visualization, S.E., C.M.B. and E.O.; Supervision, S.E.; Project Administration, S.E. and C.M.B.

Conflicts of interest

All authors declare that they have no conflicts of interest.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval

This research was conducted in conformity with ethical principles and the Helsinki Declaration. The Scientific Research Ethics Committee approved this research under the decision numbered 20/16, dated 24 November 2022. Participation was voluntary, anonymous, and did not involve any compensation. Informed consent was obtained from all the patients who were willing to participate in the study.

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