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Predictors of quality of life of patients with chronic obstructive pulmonary disease

Prediktori kvaliteta života bolesnika sa hroničnom opstruktivnom bolesti pluća

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Abstract

Background/Aim. Chronic obstructive pulmonary disease (COPD) has a significant impact on quality of life of patients. We investigated which demographic and social characteristics can predict the global quality of life (QoL) of COPD patients. **Methods.** The patients (n = 288) were divided into three groups according to the stage of disease: Group I = stage 0 – at risk; Group II = Stages I and II; Group III = stages III and IV. The patients fulfilled a questionnaire related to the demographic and social characteristics and the validated multidimensional questionnaire – Serbian version of the St. George's Respiratory Questionnaire (SGRQ). The Student's *t* test, χ^2 test, ANOVA, univariate and multivariate logistic regression tests were used for statistical analyses. **Results.** In the group I, prevailed the men, employed persons, with a moderate financial status and no family history of COPD. In the group II dominated women, pensioners, with a moderate financial status, duration of illness up to five years, and no family history of COPD. In the group III prevailed women, unemployed persons, a moderate financial status, COPD duration up to 5 years and no family history of COPD. The predictors of the Symptoms score were grades of COPD and duration of the disease, and the predictors of Activity grades of COPD, sex, age and financial status. All variables were found to have a statistically significant relationship in the Impact score in the pre-analyses, were also significant in the univariate regression model. They were age, employement status, financial status and COPD duration. The same predictors that significantly contributed to the explanation of the Impact score, contributed to the explanation of the Total score on SGRQ. In the multivariate regression model, the predictors of the Activity score, Impacts score and Total score were the COPD grade and financial status; only the COPD grade contributed to the explanation of the Symptoms score. **Conclusion.** Financial status is the most important social factor, and the grade of COPD is the best disease-related predictor of QoL of COPD patients.

Key words:
pulmonary disease, chronic obstructive; quality of life; demography; socioeconomic factors; surveys and questionnaires; serbia.

Apstrakt

Uvod/Cilj. Hronična opstruktivna bolest pluća (HOBP) je progresivna i ireverzibilna bolest sa negativnim uticajem na kvalitet života obolelih. Cilj našeg ispitivanja bio je da odredi demografske i socijalne faktore obolelih koji su prediktori kvaliteta života. **Metode.** Bolesnici (n = 288) bili su podeljeni u tri grupe: I grupa – bolesnici u stadijumu 0 HOBP, u riziku; II grupa – bolesnici u stadijumu I i II HOBP; grupa III – bolesnici u stadijumu III i IV HOBP. Bolesnici su ispunjavali dva upitnika – jedan sa demografskim i socijalnim podacima, a drugi, validiranu srpsku verziju upitnika bolnice "Sveti Đorđe" o respiratornim teškoćama – *St. George's Respiratory Questionnaire for Chronic Obstructive Pulmonary Disease* (SGRQ-C). Podaci su obradjeni pomoću Student *t*-testa, χ^2 testa, ANOVA testa, kao i univariatnom i multivariatnom metodom logističke regresije. **Rezultati.** U grupi I dominirali su muškarci, zaposleni, osrednjeg materijalnog stanja, bez porodične anamneze HOBP. U grupi II je bilo više žena, penzionera, osrednjih prihoda, bolovanja do pet godina, bez HOBP u porodici. Žene, nezaposleni, osrednjih prihoda, trajanja HOBP do pet godina, bez HOBP u porodici,

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dominirali su u III grupi. Prediktori za skor simptoma bili su stadijum bolesti i dužina bolovanja, dok su u skoru aktivnosti prediktori bili stadijum bolesti, pol, starost i finansijska situacija. Sve statistički značajne varijable u skoru uticaja u pre-analizama bile su značajne u univarijantnom regresionom modelu, a to su bili stadijum bolesti, starost, zaposlenje, finansijska situacija i dužina bolovanja. Isti prediktori objašnjavali su i ukupni skor u SGRQ. U multivarijantnom regresionom modelu, prediktori skora aktivnosti, skora uticaja i ukupnog skora bili su stadijum bolesti i finansijska situacija; samo stadijum bolesti učestvovao je u objašnjenju skora simptoma. **Zaključak.** Finansijska situacija je najbolji socijalni prediktor, a stadijum bolesti najbolji od bolesti zavisan prediktor kvaliteta života obolelih od HOPB.

Ključne reči:
pluća, opstruktivne bolesti, hronične; kvalitet života; demografija; socijalno-ekonomski faktori; ankete i upitnici; srbija.

Introduction

The World Health Organization (WHO) recognizes that chronic obstructive pulmonary disease (COPD) is of a major public health importance, causing huge economic burden not only to developed countries but even more to low and middle income countries, and in particular, to the vulnerable population [1]. Since COPD is progressive disorder, it has a significant negative impact on quality of life (QoL) of patients. Today, QoL is very important outcome measure in any chronic disease including COPD. After the importance of QoL in COPD patients has been increasingly recognized, several research groups started to study QoL of these patients [2–4] in more detail.

It is now known that COPD affects QoL by causing numerous physical, functional, psychological and social stigmata [5]. In order to measure health-related QoL in this chronic disease, several instruments were developed [6] and compared [7]. The most commonly used is the St George's Respiratory Questionnaire (SGRQ) [8], which was translated and validated into several languages [9] including Serbian [10].

We investigated the COPD patients-generated data of their social structure and which of these have the greatest impact on their QoL.

Methods

Patients

This investigation was performed from July to December 2016. A total of 288 outpatients suffering from COPD in a stable phase of the disease COPD entered this ethically approved study (Decision of Ethics Committee of Primary Health Center "Zemun" N^{o} 03-887/2). The responders were all the patients of Primary Health center "Zemun". The eligible criteria included confirmed diagnosis of COPD according to the Global Initiative for Obstructive Lung Disease (GOLD) criteria [11, 12]. All participants signed the written informed consent. The patients younger than 18 years, those with bronchial asthma, lung cancer or any other respiratory disease that might induce chronic airflow limitation, were excluded. The patients were divided into three groups according to the severity of their disease: Group I – stage 0 (risk group); Group II included stages 1 (mild) and 2 (moderate); and Group III included stages III (severe) and IV (very severe) airflow limitation.

Method

The respondents were asked to fill out a questionnaire including demographic (sex, age) and social characteristics (employment, self-estimated financial status). The patients also fulfilled the validated multidimensional questionnaire – Serbian version of SGRQ [10], which is designed to measure and quantify health-related status in the patients with chronic airflow limitation. The first part of this questionnaire ("Symptoms") evaluates symptoms (frequency of cough, sputum production, wheeze, breathlessness and the duration and frequency of attacks of breathlessness or wheeze). The second part has two components: "Activity" and "Impacts". The "Activity" section addresses activities that cause breathlessness or are limited because of breathlessness. The "Impacts" section covers a range of factors including influence on employment, being in control of health, panic, stigmatization, the need for medication, side effects of prescribed therapies, expectations for health and disturbances of daily life.

Statistical analysis

All calculations were performed using the Statistical Package for the Social Sciences (SPSS) statistical package, version 21. The baseline quantitative characteristics of patients were expressed as mean, median (M), standard deviations (SD) and rank, while categorical variables were expressed as frequencies and percentages. Statistical significance of differences between the groups was determined using the Student's *t* test, ANOVA and χ^2 test for qualitative variables. The univariate logistic regression test was used for variables found significant in pre-analyses, and those that gave statistically significant contribution to the explanation of dependent variable were tested by the multivariate model. Therefore, both univariate and multivariate models were used for prediction.

All statistical tests were considered significant with probability of 0.05.

Results

A majority of patients were females (54.5%). The women also dominated in the group I and group II of patients. The median age for all patients was 62 years, raising steadily from the group I to the group III (48, 64 and 68, respectively). A half of the patients (50.0%) were retirees, while the employed and unemployed contributed almost equally to the second part (23.6% and 26. 4%, respectively). More than one third (36.8%) of patients considered their financial conditions to be moderate. There were also the patients who thought that it was bad (14.9%) or very bad (24.3). Only one quarter (24.0%) of patients considered their financial status to be good or very good. The COPD duration was up to 4 years in a great majority of patients in stage 0, which is (47.4% of all patients), while the duration up to 10 years and more was observed as dominant in patients from the groups II and III. Family history of COPD was denied by 63.6% of all patients.

Statistically significant differences were found for all characteristics of patients in relation to the stage of the disease.

Taking all together, in the group I (COPD stage 0), men and employed persons dominated, being of moderate financial status and illness duration up to 5 years with no family history of COPD. In the group II (stage I & II) there were dominatly presented women, pensioners, of moderate financial status with the illness duration up to 5 years and no family history of COPD. In the group III (stage III & IV), prevailed women, unemployed persons, of moderate financial status with COPD duration up to 5 years and no family history of COPD (Table 1).

The average values that the responders achieved at the Symptoms score, Activity score, Impacts score and Total score obtained by using the SGRQ instrument, are shown in Figure 1. The highest value was calculated for the Symptoms score (57.18), followed by the Activity score and Impact score (56.06 and 40.26, respectively). The Total score, which measured global quality of life, was 47.86, thus indicating that our patients had moderate QoL (Figure 1). All scores were expressed on the scale ranging from 0–100 (0 = the best; 100 = the worst).

In relation to the severity of disease, the groups differed significantly ($p < 0.001$) regarding all four scores of the questionnaire. The responders in the stadium III and IV had the highest values of all scores (Symptoms score: 58.1 ± 4.0; Activity score: 74.2 ± 29.5; Impacts score: 55.1 ± 22.5; Total score: 61.4 ± 19.5). The women had higher Activity score than men (59.6 ± 31.2 versus 51.8 ± 32.4). The eldest category (aged 71–95 years) had the highest Activity, Impact and Total scores (67.1 ± 32.4, 48.6 ± 25 and 55.7 ± 21.6 respectively). This difference among the categories was statistically significant ($p < 0.001$). On the contrary, no significant difference among the different categories regarding Symptoms score was found.

The responders having different employment status differed in the Impacts score and Total score ($p < 0.05$). The retired people had the highest values in both dimensions (Impacts score: 43 ± 25.3; Total score: 50 ± 22.8). The responders of the worst financial status had the highest values of the Activity score (75.9 ± 30.70), Impacts score (58.8 ± 22.4) and Total score (63.9 ± 20.3), the differences in these scores were statistically significant ($p < 0.001$). The patients with the longest history of disease had the highest values of the Symptoms score: (58.8 ± 4.2), Impacts score (46.3 ± 27.1) and Total score (52.3 ± 24.2), and these differences were statistically significant ($p < 0.001$). There was no difference between the patients with and without family history of disease (Table 2).

Table 1

Demographics and social characteristics of chronic obstructive pulmonary disease (COPD) patients

Parameters	Stage 0 (n = 80)	Stage I & II (n = 131)	Stage III & IV (n = 77)	*p*	All (n = 288)
Sex, n (%)					
male	50 (62.5)	54 (41.2)	27 (35.1)	< 0.001[a]	131 (45.5)
female	30 (37.5)	77 (58.8)	50 (64.9)		157 (54.5)
Age, (years) median (range)	48 (19–82)	64 (21–90)	68 (35–95)	< 0.001[b]	62 (19–95)
Employment, n (%)					
yes	33 (41.2)	28 (21.4)	7 (9.1)	< 0.001[a]	68 (23.6)
no	32 (40.0)	32 (24.4)	12 (15.6)		76 (26.4)
pensioner	15 (18.8)	71 (54.2)	58 (75.3)		144 (50.0)
Financial status, n (%)					
bad	3 (3.8)	14 (10.7)	26 (33.8)		43 (14.9)
very bad	25 (31.2)	37 (28.2)	8 (10.4)	< 0.001[a]	70 (24.3)
moderate	29 (36.2)	47 (35.9)	30 (39.0)		106 (36.8)
good and very good	23 (28.8)	33 (25.2)	13 (6.9)		69 (24.0)
Duration of COPD n (%)					
up to 5 years	71 (89.9)	52 (40.0)	12 (15.8)	< 0.001[a]	135 (47.4)
5 to 10 years	6 (7.6)	38 (29.2)	27 (35.5)		71 (24.9)
more than 10 years	2 (2.5)	40 (30.8)	37 (48.7)		79 (27.7)
Family history of COPD, n (%)					
yes	35 (44.3)	46 (36.2)	21 (28.4)	< 0.001[a]	102 (36.4)
no	44 (55.7)	81 (63.8)	53 (71.6)		178 (63.6)

Note: Stage I&II = Stage I Forced expiratory volume in the first second (FEV1 > 80%) + Stage II (FEV1 50–80%); Stage III & IV = Stage III (FEV1 30–50%) + Stage IV (FEV1 < 30%); [a]χ^2 test; [b]ANOVA test.

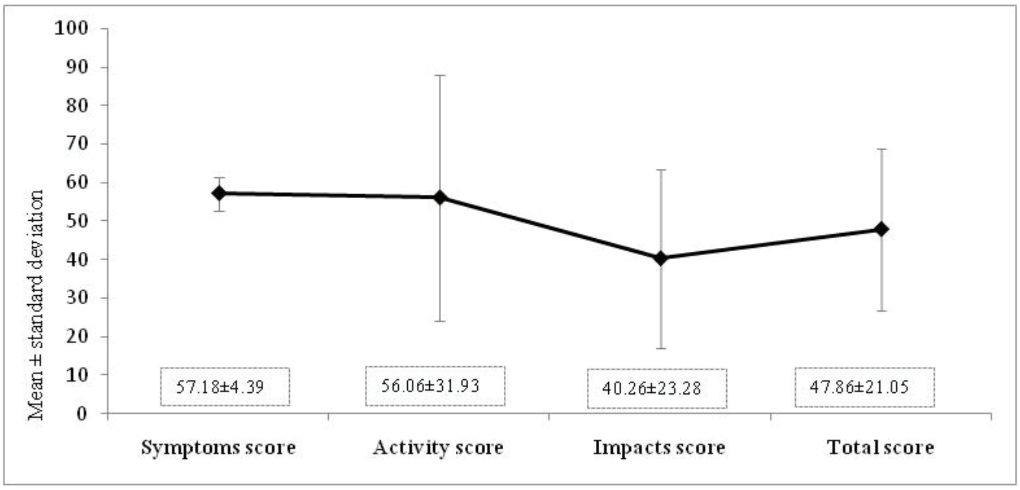

Fig. 1 – Average values obtained on four dimensions of St. George's Respiratory Questionnaire (SGRQ)

Table 2

Differences among the patients with various characteristics in dimensions of the St. George's Respiratory Questionnaire (SGRQ)

Parameters	Symptoms score mean ± SD	p	Activity score mean ± SD	p	Impacts score mean ± SD	p	Total score mean ± SD	p
Stage of COPD								
Stage 0	56.0 ± 4.6	<0.001[b]	42.5 ± 26.5	< 0.001[b]	28.8 ± 17.8	< 0.001[b]	37.5 ± 16.8	< 0.001[b]
Stage I & II	57.3 ± 4.3		53.7 ± 31.7		38.6 ± 22.2		46.3 ± 20.2	
Stage III & IV	58.1 ± 4.0		74.2 ± 29.5		55.1 ± 22.5		61.4 ± 19.5	
Sex								
male	56.9 ± 4.4	0.302[c]	51.8 ± 32.4	< 0.001[c]	38.0 ± 23.1	0.134[c]	45.3 ± 21.4	0.062[c]
female	57.4 ± 4.3		59.6 ± 31.2		42.1 ± 23.3		50.0 ± 20.6	
Age (years)								
19–30	57.1 ± 4.4		36.5 ± 22.4		27.9 ± 17.8		35.4 ± 15.6	
31–40	57.5 ± 4.3		58.5 ± 25.1		39.4 ± 20.3		48.2 ± 18.1	
41–50	56.7 ± 4.5	0.730[b]	55.2 ± 25	< 0.001[b]	39 ± 16.5	< 0.001[b]	46.9 ± 14.8	< 0.001[b]
51–60	56.8 ± 4.6		57.7 ± 32.3		39.7 ± 24		48 ± 21.7	
61–70	56.9 ± 4.5		50.5 ± 34.1		37.6 ± 23.8		44.7 ± 22.2	
71–95	57.8 ± 4.2		67.1 ± 32.4		48.6 ± 25		55.7 ± 21.6	
Employment								
yes	56.6±4.6	0.411[b]	48.3 ± 26.6	0.072[b]	33.1 ± 19.2	< 0.001[b]	41.6 ± 17.5	0.020[b]
no	57.6±4.2		58.7 ± 30.2		41.6 ± 21.6		49.4 ± 19.6	
pensioner	57.2±4.4		58.3 ± 34.6		43 ± 25.3		50 ± 22.8	
Financial status								
very bad	58.5±3.9		75.9 ± 30.7		58.8 ± 22.4		63.9 ± 20.3	
bad	57.1±4.4	0.163[b]	55.7 ± 32.4	< 0.001[b]	38.7 ± 21	< 0.001[b]	46.9 ± 19.9	< 0.001[b]
moderate	57.1±4.3		55.1 ± 31.3		41.1 ± 22.7		48 ± 20.3	
good and very good	56.6±4.6		45.4 ± 27.9		29 ± 19.6		38.6 ± 18.1	
Duration of COPD (years)								
up to 5	56.5±4.6	0.050[b]	51.4 ± 28.7	0.073[b]	34.8 ± 20.1	<0.001[b]	43.4±18.5	< 0.001[b]
5 to 10	57.8 ± 4.2		60.5 ± 32.1		44.2 ± 22.4		51.4±20.7	
More than 10	58.8 ± 4.2		59.9 ± 36.2		46.3 ± 27.1		52.3±24.2	
Family history of COPD								
yes	57 ± 4.5	0.721[c]	57.9 ± 28.6	0.495[c]	41.7 ± 21.7	0.425[c]	49.1 ± 18.7	0.433[c]
no	57.2 ± 4.4		55.2 ± 33.3		39.3 ± 23.8		47.1 ± 22	

COPD – chronic obstructive pulmonary disease; SD – standard deviation; [a]χ^2 test; [b]ANOVA test; [c]Student's *t*-test.

Table 3

Quality of life prediction for the patients with chronic obstructive pulmonary disease (COPD)

Dependent variables	Independent variables	Univariate linear regression analysis			Multivariate linear regression analysis		
		OR (95% CI)	*p*	Adjusted R square	OR (95% CI)	*p*	Adjusted R square
Symptoms score	Grade of COPD	0.17 (0.38–1.73)	< 0.001	0.02	0.13 (0.02–1.63)	0.045	0.02
	Duration of COPD	0.13 (0.08–1.29)	0.025	0.01	0.06 (0.39–1.01)	0.386	
Activity score	Grade of COPD	0.36 (11.12–20.47)	< 0.001	0.13	0.34 (9.49–20.56)	< 0.001	0.17
	Sex	0.12 (0.49–15.28)	0.037	0.01	0.09(-6.47–7.56)	0.878	
	Age	0.16 (0.10–0.60)	0.005	0.02	-0.02(-0.32-0.20)	0.657	
	Financial status	-0.26 (-12.07– -4.88)	< 0.001	0.06	-0.21(-10.24– -3.20)	< 0.001	
Impacts score	COPD grade	0.41 (9.78–16.44)	< 0.001	0.17	0.37 (7.58–16.16)	< 0.001	0.24
	Age	0.18 (0.11–0.46)	0.002	0.03	-0.03 (-0.23–0.22)	0.971	
	Employment	0.16 (1.30–7.84)	0.006	0.02	-0.04 (-5.28–2.71)	0.527	
	Financial status	-0.34 (-10.52–5.41)	< 0.001	0.11	-0.28 (-9.19– -4.21)	< 0.001	
	Duration of COPD	0.21 (2.83–9.14)	< 0.001	0.04	0.06 (-3.20–3.51)	0.928	
Total score	Grade of COPD	0.41 (8.91–14.93)	< 0.001	0.17	0.40 (7.67–15.41)	< 0.001	0.23
	Age	0.18 (0.10–0.42)	0.013	0.03	0.05 (-0.20–0.21)	0.950	
	Employment	0.14 (0.84–6.77)	0.012	0.01	-0.05 (-5.13–2.09)	0.409	
	Financial status	-0.32 (-9.21– -4.56)	< 0.001	0.1	-0.27 (-8.01– -3.51)	< 0.001	
	Duration of COPD	0.18 (1.82–7.56)	0.001	0.03	-0.03 (-3.79–2.26)	0.622	

OR – odds ratio; CI – confidence interval.

After testing of differences, the variables found to be statistically significant were tested by univariate regression model, and those that were significant were tested by the multivariate regression model. According to the univariate linear regression model, statistically significant predictors of the Symptoms score were: grade of COPD [odds ratio (OR): 0.17 (0.38–1.73); $p < 0.001$] and duration of the disease [OR: 0.13 (0.08–1.29), $p = 0.025$].

Statistically significant predictors of the Activity score in univariate analysis were: grade of COPD [OR: 0.36 (11.12–20.47); $p < 0.001$], gender [OR: 0.12 (0.49–15.28); $p = 0.037$], age [OR: 0.16 (0.10–0.60); $p = 0.005$], and financial status [OR: -0.26 (-12.07– -4.88), $p < 0.001$].

All variables found to have statistically significant relationship in the Impacts score in pre-analyses were also significant in the univariate regression model. The Impaets score was explained by the following variables: COPD grade [OR: 0.41 (9.78–16.44); $p < 0.001$], age [OR: 0.18 (0.11–0.46) $p = 0.002$], employement status [OR: 0.16 (1.30–7.84); $p = 0.006$], financial status [OR: -0.34 (-10.52–5.41); $p < 0.001$] and COPD duration [OR: 0.21 (2.83–9.14); $p < 0.001$].

The same predictors that significantly contributed to the explanation of the Impact score, contributed to the explanation of the Total score on SGRQ. These were independent variables: COPD grade [OR: 0.41 (8.91–14.93); $p < 0.001$], age [OR: 0.18 (0.10–0.42); $p = 0.013$], employement status [OR: 0.14 (0.84–6.77); $p = 0.012$], financial status [OR: -0.32 (-9.21–-4.56); $p < 0.001$) and COPD duration [OR: 0.18 (1.82–7.56); $p = 0.001$).

In the multivariate regression model, the predictors of the Activity score, Impacts score and Total score were COPD grade and financial status; these predictors explained 17% of the variance of dependent variable Activity score, 24% of the variance of Impacts score and 23% of the variance of the Total score. In the multivariate regression model, only the COPD grade contributed to the explanation of the Symptoms score (Table 3).

Discussion

Current approach to the investigation of QoL comprises the combination of objective indicators on different life domains with the subjective evaluation given by the individuals, using data on subjective well-being [13]. The subjective evaluation can be the limitation of this approach although such an approach is also recommended for investigations of QoL of patients suffering from COPD [14, 15]. According to these recommendations, we used this approach in our investigation of social factors that can predict QoL of COPD patients.

Several multi-country surveys presented at the 2011's European Respiratory Society's Annual Congress [16], revealed that COPD had the harmful impact on many aspects of quality of life. Our results showed that the financial factor as a social factor emerged in three dimensions that measured quality of life of the COPD patients, while the grade of COPD emerged as a statistically significant predictor of all four dimensions of this questionanaire.

Similarly to our results, it was reported that the decrease of financial status was one of the main reasons for patients' feelings of being unable to fulfill their life goals [17, 18]. It was reported that the lower social class in terms of the financial status had lower levels of QoL [17, 19–21]. A high percentage (39.2%) of our patients described their financial status as bad (14.9%) or very bad (24.3%), and therefore the poverty marked their financial status. Bad financial situation is probably influenced by their employment status since a great majority of our patients were unemployed or retired.

The disease severity (advanced stage of the disease) was also found to have a negative predictive effect on QoL of COPD patients [22]. In our study, the stage of COPD was in a positive correlation with the patients' age – our oldest patients had the most advanced stages of disease. It was shown that older age can also be a predictor of lower QoL of COPD patients [23, 24], although severe COPD may affect negatively QoL of even younger people [2, 7]. In very old people, any chronic disease is the main cause of lower QoL; the gender differences were insignificant [25].

However, it should be noted that the experience of aging may be influenced by some social and cultural factors that characterize different nations [26].

As far as gender is concerned, in our study, the women dominated in medium and advanced stages of disease, and their activity score was higher than that of the men. Several studies revealed that the female gender had poorer QoL than the male [27], especially in relation with a psychological well-being [28]. This was true even if women were younger and in the earlier stages of disease [29].

We conducted this study according to the recommendation that, in order to gain insight into QoL of COPD patients, both demographic and disease-specific impact and general impact of the disease should be used [30]. We found that the most important social factor that predict the QoL of our patients best was their financial status. The other disease-related predictor was the grade of COPD. The knowledge of not only the demographic but also the social characteristics of patient migh help the carers to predict quality of life of their patients. Better QoL of patients could be achieved by higher levels of positive social support, which perhaps may be influenced by efforts of health care providers in this sense. Since the main goal of medical care is to improve and maintain QoL of the patients [31, 32], we believe that our results might contribute to this ultimate goal achievement.

Conclusion

Financial status is the most important social factor that can best predict quality of life (QoL), and the grade of COPD is the best disease-related predictor of QoL of COPD patients.

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