



Quality of life and its associated factors for mild chronic obstructive pulmonary disease patients of urban community settings

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Background: Chronic obstructive pulmonary disease (COPD) is a serious disease with impaired quality of life (QoL). Few studies have focused on the QoL for mild COPD patients in Chinese urban communities. This study aimed to evaluate the QoL and explore its associated factors among patients with mild COPD in Shanghai.

Methods: A cross-sectional survey of 275 mild COPD patients was conducted in 6 communities of Pudong New Area in Shanghai, China, in 2016. Data on socioeconomic and health conditions were acquired through a face-to-face interview and a physical examination. EuroQoL five-dimension questionnaire (EQ-5D)-Chinese version was applied to evaluate their QoL. Logistic regression was used to estimate odds ratios (ORs) and their 95% CI for risk factors associated with QoL.

Results: Among 275 subjects, the overall visual analog scale score and utility of QoL were 70.6 and 0.889, respectively. Logistic regression analysis indicated that exacerbation in recent year were negatively associated with the top 25% utility of QoL (OR =2.02, 95% CI: 1.03–3.97), and the worse exercise capacity (distance of 6-minute walking test <525.3 m) was negatively correlated the outcome (OR =2.92, 95% CI: 1.10–7.75) too. In multi-factor logistic regression, the associations were slightly weakened.

Conclusions: The QoL was impaired in mild COPD patients living in urban communities. Exacerbation in the past year and exercise capacity were significantly correlated to QoL. More interventions should be developed to improve the QoL at the early stage of COPD.

Keywords: Quality of life (QoL); chronic obstructive pulmonary disease (COPD); mild

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Introduction

Chronic obstructive pulmonary disease (COPD) is a serious public problem worldwide. In 2010, the prevalence of COPD was 11.7% with total number of living patients as 384 million and average death number as about 3 million

each year globally (1,2). With increasing rate of smoking in developing countries and aging in developed ones, the number of death due to COPD and its related diseases was estimated to be 4.5 million in 2030 (3,4). In 2008, the prevalence of COPD was 8.2% among adults aged over

40 years from a national epidemiological survey in China, and it was estimated that there was nearly 70% increase in the number of Chinese COPD patients from 30.90 million in 1990 to 51.52 million in 2010 (5,6). Airway obstruction is the most important clinical symptom of COPD and frequently impairs the quality of life (QoL) through limiting exercise capacity, sapping social function and inducing mental problems such as anxiety and depression (7-12). In a Korean cohort study, 59.2% of the mild-to-moderate COPD patients and 80.4% of the severe-to-very severe patients suffered from worse QoL (13). Some previous findings suggested that several factors including age, gender, socioeconomic status, body mass index (BMI), exacerbation, severity, exercise capacity and comorbidities were statistically related to the QoL in COPD patients (14-18). In one previous study, there was worse QoL among middle-aged than older-adult participants, which could be attributed to greater dyspnea severity (19). In another previous study including moderate to severe COPD patients, women had worse scores due to dyspnea and oxygenation in QoL (20). Some studies found that as lower socioeconomic status, lower household income was associated with worse QoL (21-23). It was observed that obese cases with COPD had worse QoL than those with the normal-weight (24). Some surveys indicated that COPD exacerbation adversely influenced QoL through increased levels of fatigue, decreased sleep time and sleep efficiency (25-31). A recent research reported that decreasing physical activity was significantly associated with the impairment of QoL among COPD patients at moderate and more severe stage, which could be partly because of their more dyspnea, more comorbidities and declining in lung function (32). In addition, comorbidities, such as chronic bronchitis, musculoskeletal symptoms and depression, were associated with worse QoL among severe and very severe COPD patients (33). However, few focused on the QoL and its influencing factors among mild COPD patients in Chinese community settings (32,34-40). This study was aimed to evaluate the QoL of mild COPD patients and their influencing factors in Shanghai.

Methods

Study site and population

During June to August in 2016, a cross-sectional study was carried out in Pudong New Area of Shanghai, China, and 300 cases with mild COPD were recruited into this study

from six, randomly selected from 46 communities. At the enrollment, all subjects received spirometry function test to verify their COPD severity. The inclusion and exclusion criteria of subjects were detailed previously (41,42). Finally, 275 (91.7%) of 300 patients met all the criteria and were included in this analysis.

Data collection and quality control

All information was collected by using a structured questionnaire and a physical examination. Demographic information included age, gender, alcohol drinking history (Yes/No), smoking history (Yes/No), years of education (<9 years/≥9 years), monthly household income (<3,000 RMB/≥3,000 RMB), and BMI (kg/m²) (BMI≤18.5: underweight; 18.5< BMI ≤23.9: normal; BMI ≥24.0: overweight/obesity). Clinical information collected included six-minute walking test, regular use of COPD medications in the past 12 months (Yes/No), and chronic comorbid conditions (hypertension, diabetes, kidney disease, stroke, cardiovascular diseases and/or others). Specific training and double check for all data were used to improve the research quality. Details have been presented elsewhere (42).

Measurements of QoL

EuroQoL five-dimension questionnaire (EQ-5D) was developed by the EuroQoL Group to evaluate QoL from multiple dimensions (43-45), and this scale comprises descriptive system of health status and a visual analog scale (EQ-VAS). The descriptive system of health status contains five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) and each dimension has three levels (no problem, moderate problem, and severe problem). Utility index score was calculated with Chinese time trade-off values for EQ-5D health states, and the score ranges from -0.149 to 0.887 (46). EQ-VAS was used to assess health status by participants themselves, and the score of scale indicates health states from the worst [0] to the best [100]. EQ-5D-China, as a self-administered scale, has been widely applied into assessing the QoL among Chinese population (47-50).

Spirometry function test and physical examination

Spirometry function test was performed according to a standard procedure (42). The 6-minute walking test was performed with a long straight corridor with 30 m in

length on a flat and hard ground, and every three meters of corridor was marked with a horizontal line. Patients were required to walk as far as possible in six minutes after standardized instructions, and received appropriate encouragement during the test (38-40).

Statistical analysis

Data analysis was performed by using SAS 9.2 for Windows (SAS Institute, Inc, Cary, NC). Categorical variables were compared with Pearson Chi square test or Fisher exact test. Continuous variables with and without normal distribution were tested by using Student *t*-test and Wilcoxon test for two group comparisons. Utility of QoL, as dependent variable, was grouped into the top quarter (top 25%) with a score of ≥ 0.847 and the low three quarter (low 75%) with a score of < 0.847 . Logistic regression analysis was used to estimate crude odds ratio (cOR), adjusted OR (aOR) and their 95% CI for factors associated with utility of QoL. The P value of < 0.05 was considered statistically significant.

Written informed consent was obtained from all participants. They were permitted to withdraw from the study at any time without negative consequences. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Ethical approval for this study was issued by the Institutional Review Board of the Fudan University School of Public Health (No.2016-07-0597).

Results

Basic characteristics of subjects

Among 275 subjects, the average age was 61.5 ± 6.0 years old and nearly half (48.7%) were male. Most (83.3%) of them received education less than 9 years, and about half (48.7%) earned monthly household income per capita of 3,000 RMB or more. Nearly two fifth and one fifth of them had a history of smoking and alcohol drinking, respectively. The participants had average BMI of 25.1 ± 4.0 (kg/m^2), and younger patients (< 65 years) had a higher proportion of normal weight than the older (42.6% *vs.* 28.3%/37.8, $P=0.017$), and the former finished longer length of distance during 6-minute walking test than older patients. More than half had comorbidity and approximately 30% experienced exacerbation in the past year, respectively (Table 1).

Evaluation of QoL

The overall VAS scores and utility of QoL were 70.6 ± 14.3 and 0.889 ± 0.082 , respectively. "No problem" was the most frequent response for all five dimensions, including mobility (93.5%), self-care (98.5%), pain/discomfort (95.3%), usual activities (78.5%), and anxiety/depression (85.4%). Table 2 shows that subjects who were elder (≥ 65 years) or female were more likely to have a moderate problem in mobility. Subjects with poor exercise capacity (shorter distance of 6MWT < 525.3 m) had a lower VAS score than those with relatively better exercise performance. In addition, subjects with any exacerbation in the last year had significantly higher proportions of moderate problem in mobility, self-care, and usual activities, lower VAS score and poorer utility of QoL.

Factors associated with QoL

Single-factor logistic regression model showed that both exacerbation in the past year and poorer exercise capacity (distance of 6MWT < 525.3 m) were negatively associated with utility of QoL (aOR_{exacerbation} = 2.02, 95% CI: 1.03-3.94; aOR_{distance} = 2.92, 95% CI: 1.10-7.75). In multi-factor logistic regression, the associations were slightly weakened (Table 3).

Discussion

In this cross-sectional study, the overall VAS score and utility of QoL were 70.6 and 0.889 among mild COPD patients on average, which was similar to that of mild COPD patients in another Chinese study (VAS = 70.0, utility = 0.848) (50). The VAS score in this study was lower than that among general populations of China (80.1), South Korea (79.4), Poland (79.3), and the USA (79.2) (51-54). The utility of QoL was also lower than that from China (0.951), but similar to that from Poland (0.897) and the USA (0.866) among general populations (51,53,54). The utility of QoL among Chinese population with or without hypertension (0.9212-0.9787) was higher than that of this study (46). There are two major reasons for the observed differences: (I) different time trade-off values for EQ-5D health states caused by innate variance among the studies (55-57); and (II) different age distribution for the study

Table 1 Basic characteristics of mild COPD patients

Characteristics	Age <65	Age ≥65	Total	P value
Number, n (%)	183 (66.6)	92 (33.4)	275	
Gender, n (%)				
Male	88 (48.1)	46 (50.0)	134 (48.7)	0.765
Female	95 (51.9)	46 (50.0)	141 (51.3)	
Education level, n (%)				
<9	149 (81.4)	80 (87.0)	229 (83.3)	0.246
≥9	34 (18.6)	12 (13.0)	46 (16.7)	
Household income (RMB) per capita, n (%)				
<3,000/month	92 (50.3)	49 (53.3)	141 (51.3)	0.640
≥3,000/month	91 (49.7)	43 (46.7)	134 (48.7)	
BMI (kg/m ²), n (%)				
Normal	78 (42.6)	26 (28.3)	104 (37.8)	0.017
Underweight	10 (5.5)	2 (2.2)	12 (4.4)	
Overweight/obesity	95 (51.9)	64 (69.6)	159 (57.8)	
Smoking, n (%)				
Never	110 (60.1)	50 (54.4)	160 (58.2)	0.632
Current smoking	35 (19.1)	19 (20.6)	54 (19.6)	
Smoking cessation	38 (20.8)	23 (25.0)	61 (22.2)	
Drinking, n (%)	37 (20.2)	16 (17.4)	53 (19.3)	0.575
6-minute walking test, mean (SD)	463.5 (95.1)	440.5 (88.5)	455.7 (93.4)	0.016
Comorbidity, n (%)				
0	85 (46.5)	37 (40.2)	122 (44.4)	0.077
1	74 (40.4)	33 (35.9)	107 (38.9)	
≥2	24 (13.1)	22 (23.9)	46 (16.7)	
Exacerbation in recent year, n (%)	52 (28.4)	25 (27.2)	77 (28.0)	0.829

COPD, chronic obstructive pulmonary disease; BMI, body mass index.

populations. The population in our study was aged over 40 years, while the US study 41% of people aged less than 40 years.

Our study indicated that exacerbation in the past year was negatively associated with QoL, which was similar to the results from other studies (58-61). Wang *et al.* found that after 24 months, exacerbation was still significantly correlated with aggravation in symptoms (60), and caused progressive deterioration of QoL for COPD patients (27). In addition, frequent exacerbation was correlated with worse declining of health status (62). However, majority

of patients attained apparent improvements in QoL and breathless after short-term treatment for exacerbation (27). Our study also suggested that poorer exercise capacity (distance of 6MWT <525.3 m) acted in similar way, which was also observed in another study (63). 6MWT can reflect the level of daily activities, and measure functional status of patients (40,64). Improvement on distance of 6-minute walking after medical treatment was associated with the alleviation of dyspnea symptom (65). Besides, the distance of 6MWT decreased with increasing number of comorbidities of COPD patients, which in return

Table 2 Quality of life as measured by the EQ-5D score in mild COPD patients

Characteristics	Mobility (%)			Self-care (%)			Usual activities (%)			Pain/discomfort (%)			Anxiety/depression (%)			VAS score (SD)	Utility (SD)
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
Age, Years																	
<65	176 (96.2)	7 (3.8)	0 (0.0)	181 (98.9)	1 (0.6)	1 (0.6)	176 (96.2)	7 (3.8)	0 (0.0)	137 (74.9)	45 (24.6)	1 (0.5)	156 (85.7)	26 (14.3)	0 (0.0)	71.3 (14.4)	0.893 (0.073)
≥65	81 (88.0)	11 (12.0)	0 (0.0)	89 (96.7)	3 (3.3)	0 (0.0)	86 (93.5)	6 (6.5)	0 (0.0)	69 (75.0)	22 (23.9)	1 (1.1)	78 (84.8)	14 (15.2)	0 (0.0)	69.0 (14.1)	0.881 (0.098)
P	0.01			0.176*			0.370*			1.000*			0.8366			0.197	0.54
Gender																	
Male	128 (95.5)	6 (4.5)	0 (0.0)	134 (100.0)	0 (0.0)	0 (0.0)	131 (97.8)	3 (2.2)	0 (0.0)	101 (75.4)	33 (24.6)	0 (0.0)	115 (86.5)	18 (13.5)	0 (0.0)	70.1 (14.6)	0.897 (0.066)
Female	129 (91.5)	12 (8.5)	0 (0.0)	136 (96.4)	4 (2.8)	1 (0.8)	131 (92.9)	10 (7.1)	0 (0.0)	105 (74.5)	34 (24.1)	2 (1.4)	119 (84.4)	22 (15.6)	0 (0.0)	71.0 (14.1)	0.882 (0.095)
P	0.177			0.123*			0.058			0.629			0.6278			0.645	0.454
BMI (kg/m²)																	
Normal	99 (95.2)	5 (4.8)	0 (0.0)	103 (99.0)	1 (1.0)	0 (0.0)	101 (97.1)	3 (2.9)	0 (0.0)	80 (76.9)	24 (23.1)	0 (0.0)	85 (81.7)	19 (18.3)	0 (0.0)	71.5 (13.6)	0.894 (0.079)
Underweight	11 (91.7)	1 (8.3)	0 (0.0)	12 (100)	0 (0.0)	0 (0.0)	10 (83.3)	2 (16.7)	0 (0.0)	8 (66.7)	4 (33.3)	0 (0.0)	10 (83.3)	2 (16.7)	0 (0.0)	66.7 (17.6)	0.873 (0.082)
Overweight/obesity	147 (92.5)	12 (7.5)	0 (0.0)	155 (98.1)	3 (1.9)	1 (100)	151 (95.0)	8 (5.0)	0 (0.0)	118 (75.2)	39 (24.8)	2 (100)	139 (88.0)	19 (12.0)	0 (0.0)	70.3 (14.6)	0.887 (0.085)
P	0.658			1.000*			0.107*			0.682*			0.367			0.728	0.459
Smoking, n (%)																	
Never	147 (91.9)	13 (8.1)	0 (0.0)	155 (96.9)	4 (2.5)	1 (0.6)	150 (93.7)	10 (6.3)	0 (0.0)	123 (76.9)	35 (21.9)	2 (1.2)	134 (84.3)	25 (15.7)	0 (0.0)	70.5 (14.2)	0.885 (0.092)
Current smoking	52 (96.3)	2 (3.7)	0 (0.0)	54 (100.0)	0 (0.0)	0 (0.0)	53 (98.1)	1 (1.9)	0 (0.0)	39 (72.2)	15 (27.8)	0 (0.0)	48 (88.9)	6 (11.1)	0 (0.0)	70.1 (13.7)	0.899 (0.065)
Smoking cessation	58 (95.1)	3 (4.9)	0 (0.0)	61 (100.0)	0 (0.0)	0 (0.0)	59 (96.7)	2 (3.3)	0 (0.0)	44 (72.1)	17 (27.9)	0 (0.0)	52 (85.3)	9 (14.7)	0 (0.0)	71.1 (15.4)	0.893 (0.070)
P	0.560*			0.704			0.422*			0.7185*			0.709			0.753	0.847

Table 2 (continued)

Table 2 (continued)

Characteristics	Mobility (%)			Self-care (%)			Usual activities (%)			Pain/discomfort (%)			Anxiety/depression (%)			VAS score (SD)	Utility (SD)
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
6-minute walking test, n (%)																	
Top 25% (≥525.3 m)	67 (98.5)	1 (1.5)	0 (0.0)	68 (100.0)	0 (0.0)	0 (0.0)	67 (98.5)	1 (1.5)	0 (0.0)	57 (83.8)	10 (14.7)	1 (1.5)	58 (85.3)	10 (14.7)	0 (0.0)	74.2 (12.3) (0.058)	0.907 (0.058)
Low 75% (<525.3 m)	190 (91.8)	17 (8.2)	0 (0.0)	202 (97.6)	4 (1.9)	1 (0.5)	195 (94.2)	12 (5.8)	0 (0.0)	149 (72.0)	57 (27.5)	1 (0.5)	176 (85.4)	30 (14.6)	0 (0.0)	69.4 (14.8) (0.089)	0.884 (0.089)
P	0.052*			0.68*			0.197*			0.051*			1.000*			0.03	0.062
Comorbidity, n (%)																	
0	114 (93.4)	8 (6.6)	0 (0.0)	121 (99.2)	1 (0.8)	0 (0.0)	116 (95.1)	6 (4.9)	0 (0.0)	92 (75.4)	29 (23.8)	1 (0.8)	102 (83.6)	20 (16.4)	0 (0.0)	69.3 (15.6) (0.078)	0.890 (0.078)
1	102 (95.3)	5 (4.7)	0 (0.0)	104 (97.2)	2 (1.9)	1 (0.9)	101 (94.4)	6 (5.6)	0 (0.0)	83 (77.6)	24 (22.4)	0 (0.0)	90 (84.9)	16 (15.1)	0 (0.0)	72.8 (13.0) (0.085)	0.890 (0.085)
≥2	41 (89.1)	5 (10.9)	0 (0.0)	45 (97.8)	1 (2.2)	0 (0.0)	45 (97.8)	1 (2.2)	0 (0.0)	31 (67.4)	14 (30.4)	1 (2.2)	42 (91.3)	4 (8.7)	0 (0.0)	68.6 (13.4) (0.092)	0.884 (0.092)
P	0.364			0.548*			0.651			0.408*			0.445			0.179	0.809
Exacerbation in recent year, n (%)																	
Yes	68 (88.3)	9 (11.7)	0 (0.0)	73 (94.8)	3 (3.9)	1 (1.3)	66 (85.7)	11 (14.3)	0 (0.0)	55 (71.4)	22 (28.6)	0 (0.0)	61 (80.3)	15 (19.7)	0 (0.0)	67.6 (15.3) (0.106)	0.864 (0.106)
No	189 (95.5)	9 (4.5)	0 (0.0)	197 (99.5)	1 (0.5)	0 (0.0)	196 (99.0)	2 (1.0)	0 (0.0)	151 (76.3)	45 (22.7)	2 (1.0)	173 (87.4)	25 (12.6)	0 (0.0)	71.7 (13.8) (0.069)	0.899 (0.069)
P	0.032			0.023*			<0.0001*			0.474*			0.1356			0.026	0.009
Total	257 (93.5)	18 (6.5)	0 (0.0)	270 (98.5)	4 (1.5)	1 (0)	262 (95.3)	13 (4.7)	0 (0.0)	216 (75.8)	67 (23.5)	2 (0.7)	234 (85.4)	40 (14.6)	0 (0.0)	70.6 (14.3) (0.082)	0.889 (0.082)

*, Fisher test. EQ-5D, EuroQoL five-dimension questionnaire; COPD, chronic obstructive pulmonary disease; BMI, body mass index.

Table 3 Possible factors influencing quality of life of mild COPD patients

Variables	Top 25%	Low 75%	cOR (95% CI)	P	aOR (95% CI)	P
Age, Years						
<65	25	158	1		1	
≥65	19	73	1.645 (0.852–3.176)	0.138	1.50 (0.75–3.02)	0.255
Gender						
Male	18	116	1		1	
Female	26	115	1.457 (0.76–2.80)	0.259	1.79 (0.43–7.50)	0.428
BMI (kg/m ²)						
Normal	14	90	1		1	-
Underweight	3	9	2.14 (0.52–0.89)	0.294	1.58 (0.36–6.92)	0.544
Overweight/obesity	27	132	1.315 (0.65–2.65)	0.443	1.23 (0.57–2.67)	0.594
Smoking						
Never	28	132	1		1	
Current smoking	8	46	0.82 (0.35–1.93)	0.649	1.40 (0.28–7.04)	0.685
Smoking cessation	8	53	0.71 (0.31–1.67)	0.431	1.04 (0.22–4.82)	0.962
Comorbidity, number						
0	20	102	1		1	
1	16	91	0.90 (0.44–1.83)	0.765	0.78 (0.37–1.66)	0.518
≥2	8	38	1.07 (0.44–2.64)	0.877	0.70 (0.26–1.89)	0.479
Exacerbation in one recent year						
No	26	172	1		1	
Yes	18	59	2.02 (1.03–3.94)	0.04	1.94 (0.97–3.92)	0.063
6-minute walking test, meters						
Top 25% (≥525.3 m)	5	63	1		1	
Low75% (<525.3 m)	39	168	2.92 (1.10–7.75)	0.03	2.60 (0.95–7.13)	0.063

COPD, chronic obstructive pulmonary disease; cOR, crude odds ratio and was calculated in logistic regression without adjustment; aOR, adjusted odds ratio and was calculated in logistic regression after adjustment for covariance of gender, age, BMI, smoking, number of comorbidity, exacerbation in a recent year, distance of six-minute walking test; BMI, body mass index.

undermined the QoL (66).

There are strengths and limitations in this study. This study was conducted in urban communities and all invited subjects participated in the study. All subjects included in the study were confirmed to be at the mild stage of COPD based on a free pulmonary function test after the inhaled specific bronchodilators (salbutamol, 200 mL). However, a cross-sectional study design provided no evidence for causal associations between risk factors and impaired QoL, which needs to be confirmed in future studies. Moderate and

severe COPD cases were not involved, and the study also excluded inpatients who likely had worse QoL. Moreover, there were also other factors, such as depression and medicine, were associated with impaired QoL in COPD patients, which called to be determined in further research (33,67).

Conclusions

In conclusion, the QoL was impaired in mild COPD

patients living in urban communities and health care services should be provided to these patients. Exacerbation in the past year and exercise capacity were significantly correlated to QoL. More community-based interventions to prevent exacerbation and engage physical activities should be developed to improve QoL at the early stage of COPD.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/apm-19-655>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Ethical approval for this study was issued by the Institutional Review Board of the Fudan University School of Public Health (No.2016-07-0597). Written informed consent was obtained from all participants.

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