Health-related quality of life of elderly with chronic obstructive pulmonary disease from selected government institutions

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ABSTRACT

Introduction: It is widely recognised that health-related quality of life (HRQOL) is impaired in chronic obstructive pulmonary disease (COPD) patients. Most previous studies were conducted among the younger adult population and there is limited information on the elderly population. This study aimed to determine the COPD assessment test (CAT) score in the elderly with COPD. **Methods:** This was a cross-sectional study involving 140 elderly patients who had been diagnosed with COPD at two selected government institutions. Data on socio-demographic and health status were collected by interviewing patients and reviewing their medical records. The HRQOL was measured using CAT. The independence sample t-test and one-way ANOVA were conducted to compare the CAT scores with socio-demographic and health status. **Results:** The socio-demographic and health characteristics of the patients were as follows: majority (54%) were aged 60-70 years, male (97%), Malay (59%), married (75%), ex-smokers (72%), had attained primary education (48%), had co-morbidities (54%), no history of hospitalisation or visits to the emergency department due to COPD (57%), and were in moderate stage of airflow obstruction (53%). The mean of CAT score was 21.87±6.85 and the majority of the patients were classified as having worst symptoms of COPD (93%) as they had high CAT score which was ≥ 10. **Conclusion:** Majority of the patients in this study had high scores of CAT, which indicated poor HRQOL. Ex-smokers had higher scores compared to non-smokers. More attention need to be given to these subgroups in order to increase their quality of life.

Keywords: HRQOL, elderly, COPD, CAT score

INTRODUCTION

Aging is the process related to a variety of molecular and cellular damage that has accumulated as age increases (Steves, Spector & Jackson, 2012). This damage will lead to an increased risk of diseases as a result of the decline of physiological reserves (WHO, 2015). Chronic Obstructive Pulmonary

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Disease (COPD) is a common disease among elderly, characterised by a slow progressive obstruction of the airway leading to the interference of normal breathing (WHO, 2018).

According to Global Burden of Disease Study, about 174 million cases of COPD were reported in 2015, which increased to 251 million in 2016 (WHO, 2018). The increasing number of COPD cases makes it a leading cause of mortality and morbidity in the world (Rabe & Watz, 2017). Apart from that, COPD is classified as one of the top ten diseases causing a high burden to patient's life (Institute for Health Metrics and Evaluation, 2010). Cough, sputum production and shortness of breath are the main causes of the high burden, resulting in a decline of the health-related quality of life (HRQOL) (Martín *et al.*, 2008). HRQOL is a subjective evaluation of an individual's or a group's perceived physical and mental health over time. It goes beyond direct measures of population health, life expectancy, and causes of death, and focuses on the impact health status has on quality of life (CDC, 2016).

HRQOL can be measured using generic and disease-specific instruments. The generic instrument covers a broader view of health while the disease-specific instrument concentrates on symptoms and function impairments related to COPD (Jones, 2013). The disease-specific instrument was commonly used to measure HRQOL in COPD patients as it is more sensitive toward changes in the impact of the disease (Glaab, Vogelmeier & Buhl, 2010).

Impact of COPD on HRQOL has been well established in many countries (Agrawal, Joshi & Jain, 2015; Kim *et al.,* 2013; Sundh *et al.,* 2015). In Malaysia, a study that investigated HRQOL in COPD patients showed that lung function was related to HRQOL (Draman *et al.,* 2013). An earlier local study also found that ethnicity, marital status, educational level, economic status, smoking and severity of the disease was related to HRQOL (Maria *et al.,* 2010). However, most of the studies were conducted among the adult population and used the generic questionnaire to assess HRQOL.

HRQOL is important in managing COPD whether in primary or secondary health care (Arne *et al.,* 2009). The Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommended an assessment on the impact of the disease toward patients as part of COPD assessment (GOLD, 2018). Studies to determine HRQOL among the elderly with COPD are therefore indicated. The main objective of the present study was to determine the COPD assessment test (CAT) score in elderly patients with COPD while the specific objective was to compare CAT score with the socio-demographic and health status of the patients.

MATERIALS AND METHODS

Study design

In this cross-sectional study, 140 elderly patients with COPD were recruited from the Respiratory Clinic of Institute of Respiratory Medicine and the Serdang Hospital. The data collection was undertaken from August 2017 to January 2018. Those included were aged $\geq$ 60 years, diagnosed with COPD, Malaysian citizens and able to stand properly without aid.

The number of patients who were involved in this study was estimated using the two proportion formula as below:

$$n = \frac{Z^2_{1-\alpha/2} \, [P1 \, (1-P1) + P2 \, (1-P2)]}{d^2}$$

$$n = \frac{1.96^2 \, [0.96 \, (1-0.96) + 0.051 \, (1-0.051)]}{0.05^2}$$

$$n = 133 \text{ patients}$$

n = sample size
Z1-α/2 = z score at 1-α/2 confidence level (Z1-α/2 = 1.96)

P1 = prevalence for non-COPD group
(P1 = 0.96) (Loh *et al.*, 2016)
P2 = prevalence for COPD group
(P2 = 0.051) (Lim *et al.*, 2015)
d2 = desire precision (d = 0.05)

Based on the calculation, at least 133 patients were required for this study. Using convenience sampling, all elderly patients with COPD who were available during data collection period were screened based on the inclusion criteria. About 197 patients met the criteria but only 140 of them agreed to participate in the study.

Permission to conduct data collection at the Institute of Respiratory Medicine and the Serdang Hospital was obtained from both institutions. Ethical approval was granted by the Ethics Committee for Research Involving Human Subjects of Universiti Putra Malaysia (JKEUPM) and the Medical Research & Ethics Committee (MREC) with registration no. NNMR-17-589-34392. A written informed consent was obtained from the patients. If patients were unable to respond due to language barrier, the primary care-giver was appointed as the proxy respondent for the questionnaire and the interview.

Measurements
This study consisted of three parts, namely socio-demographic, health status and HRQOL. An interviewer-administered structured questionnaire was used for the socio-demographic and HRQOL parts, while the health status was determined using both interview and a review patient's medical record.

Socio-demographic
The socio-demographic data that was collected included the age, sex, race, educational level and marital status of the patient. In addition, their smoking habits were recorded based on their admission.

Health status
Data on co-morbidities, history of hospitalisation or emergency department due to the COPD and severity of airflow obstruction were obtained from the medical records of the patients. For co-morbidities, this study focused on the diseases that are commonly observed in COPD patients such as cardiovascular disease, type 2 diabetes mellitus, chronic kidney disease and hypertension. The history of hospitalisation or visits to the visits to the emergency department due to COPD in previous one year was recorded. The severity of airflow obstruction was assessed using the spirometry test and was classified according to forced expiratory volume in one second (FEV_1) value: GOLD 1 (Mild), $FEV_1 \geq 80\%$ predicted; GOLD 2 (Moderate), $50\% \leq FEV_1 < 80\%$ predicted; GOLD 3 (Severe), $30\% \leq FEV_1 < 50\%$ predicted; GOLD 4 (Very severe), $FEV_1 < 30\%$ predicted (GOLD, 2018).

Health-related quality of life
CAT is a disease-specific instrument that was used in this study to measure HRQOL. This instrument was selected as it has fewer items and is therefore less time consuming and more convenient for clinical application (GOLD, 2018). Besides that, it is a validated questionnaire for use with COPD patients (Jones *et al.,* 2009). There are eight questions in CAT covering cough, phlegm, chest tightness, breathlessness when going up an elevation (e.g. hills/stairs), activity limitation at home, self-confidence about leaving home, sleep and energy. The patients needed to answer based on a 6 Likert scale, 0 describing the best state or condition and 5 the worst. The patients were required to choose one answer for each question. The scores of the individual questions were added to obtain the total score. The total score ranged from 0-40 indicating the best to the worst condition (Jones *et*

Table 1. Demographic and health characteristics of the patients with COPD (*n*=140)

Characteristics	n (%)	Mean±SD
Socio-demographic		
Age (years)		70±7
60-70 years	76 (54)	
>70 years	64 (46)	
Gender		
Male	136 (97)	
Female	4 (3)	
Race		
Malay	82 (59)	
Chinese	37 (26)	
Indian	21 (15)	
Educational level		
None	16 (11)	
Primary schooling	67 (48)	
Secondary schooling	42 (30)	
Tertiary schooling	15 (11)	
Marital status		
Single	8 (6)	
Married	105 (75)	
Divorced/Widowed	27 (19)	
Smoking habits		
Smoker	30 (22)	
Ex-smoker	101 (72)	
Non-smoker	9 (6)	
Amount of cigarettes/ day[†]		
Less than 1 pack (20 cigarettes/pack)	27 (90)	
1 pack (20 cigarettes/pack)	3 (10)	
More than 1 pack (20 cigarettes/pack)	0 (0)	
Health status		
Co-morbidities		
Not present with co-morbidities	64 (46)	
Present with co-morbidities	76 (54)	
Hypertension	56 (74)	
Diabetes Mellitus	29 (38)	
Heart disease	18 (24)	
Dyslipidaemia	14 (18)	
Chronic Kidney Disease	6 (8)	
History of hospitalization or visits to emergency department due to COPD		
None	79 (57)	
At least one episode	38 (27)	
More than one episode	23 (16)	
Severity of COPD[‡]		
Mild (FEV_1 ≥ 80% predicted)	14 (13)	
Moderate (50% ≤ FEV_1< 80% predicted)	58 (53)	
Severe (30% ≤ FEV_1< 50% predicted)	34 (31)	
Very severe (FEV_1< 30% predicted)	3 (3)	
Health-related quality of life		
Total score of CAT		21.87±6.85
Less symptoms (< 10)	10 (7)	
More symptoms (≥ 10)	130 (93)	

[†]*N*=30, based on number of smokers
[‡]*N*=109, missing data due to no latest spirometry test for the past one year

Table 2. Mean of CAT score by socio-demographic and health status among elderly with COPD (*N*=140)

Variables	n	CAT score		
		Mean±SD	t/F	p
Socio-demographic				
Age (years)				
60-70	76	21.45±6.78	0.062	0.427
>70	64	22.38±6.95		
Sex				
Male	136	21.79±6.92	-0.852	0.396
Female	4	24.75±3.30		
Race				
Malay	82	21.96±7.13	0.351	0.705
Chinese	37	22.30±6.60		
Indian	21	20.76±6.36		
Educational level				
None	16	22.19±7.28	0.815	0.488
Primary schooling	67	22.57±6.94		
Secondary schooling	42	21.43±6.71		
Tertiary schooling	15	19.67±6.47		
Marital status				
Single/Divorced/Widowed	35	22.37±5.69	0.497	0.620
Married	105	21.70±7.21		
Smoking habits				
Smoker	30	21.90±5.72	3.300	0.040*
Ex-smoker	101	22.36±7.17[a]		
Non-smoker	9	16.33±4.06[a]		
Health status				
Co-morbidities				
Not present	64	22.03±6.48	0.252	0.801
Present	76	21.71±7.19		
History of hospitalization or visit emergency department due to COPD				
None	79	20.77±6.80	2.883	0.059
At least one episode	38	22.63±7.21		
More than one episode	23	24.39±5.76		
Severity of airflow obstruction[†]				
Mild ($FEV_1 \geq 80\%$ predicted)	14	20.50±7.89	0.289	0.833
Moderate ($50\% \leq FEV_1 < 80\%$ predicted)	58	22.38±7.46		
Severe ($30\% \leq FEV_1 < 50\%$ predicted	34	22.47±5.75		
Very severe ($FEV_1 < 30\%$ predicted)	3	22.67±14.64		

Identical superscript letters indicate significant difference
*p<0.050
[†]n=109, missing data due to no latest spirometry test for the past one year

al., 2009). Based on GOLD (2018), the total scores of CAT are classified based on the presence of symptoms, namely, few symptoms (<10) or more symptoms (≥10).

Statistical Analysis

The data collected were analysed using the Statistical Package for Social Sciences (SPSS) version 22 software. Descriptive analysis was used to report the frequency, percentage, mean and standard deviation. The independent-samples t-test and one-way analysis of variance (ANOVA) with the post hoc Turkey test were performed to compare the CAT score with socio-demographic and health status. The level of significance of the *p*-value was set at 0.05 for all the statistical tests.

RESULTS

The socio-demographic and health characteristics of the patients are shown in Table 1. The mean score for CAT was 21.87±6.85 with a range of 4-36. The majority of the patients (93%) had more symptoms of COPD as they had the total score of CAT ≥ 10.

Table 2 shows the mean of CAT score by socio-demographic and health status. The patients who were older (age >70 years), female, Chinese, single and with primary schooling had a higher CAT scores compared to others for these characteristics, but no significant difference was found. In terms of the smoking habit, ex-smokers had a significantly higher CAT score than to non-smokers (*p*<0.05). However, there were no differences between non-smokers and smokers, as well as between smokers and ex-smokers.

Patients without co-morbidities surprisingly had a worse CAT score than patients presented with co-morbidities, but with no significant difference. The patients who had a history of hospitalisation or visits emergency department due to the COPD had a higher CAT score than those who did not. The patients who had very severe stage of airflow obstruction also showed similar results. But differences were not significant for both.

DISCUSSION

The mean CAT score for this study was 21.87±6.85, which is almost similar to the findings of previous studies in a developed country, the United Kingdom (Dodd *et al.*, 2012; Kelly *et al.*, 2012). The studies by Dodd *et al.* (2012) and Kelly *et al.* (2012) reported that the mean of CAT score for their studies were 22.1±7.5 and 23.1±8.2, respectively. By contrast, a study in Japan found that the mean CAT for their elderly patients (65-74 years, 5±8; 75-84 years, 8±8; > 85 years, 9±8.5) was better compared to that of the present study and the studies done in the United Kingdom (Kobayashi *et al.*, 2014). The difference might be because the patients from the Japan study had COPD explained to them at the hospital (Kobayashi *et al.*, 2014). Thus, their better knowledge of the disease might have helped them achieve a higher quality of life.

This study found that 93% of the patients had high CAT scores (≥10) that indicated worse symptoms of COPD. This proportion was higher than the 80% found in a local study in Kelantan (Draman *et al.,* 2013). A study conducted in South Korea indicated similar results, which 69% of their patients had high CAT scores (Kim *et al.,* 2013).

The finding of no significant differences for CAT score for age is consistent with that obtained by Sundh *et al.* (2011). This could be because the age of the elderly patients in this study did not vary greatly and hence the CAT score may not vary much as well. No significant differences were found in our study in CAT score for gender, race, educational level and marital status which is inconsistent with the findings of Maria *et al.* (2010). This might be

explained by the small number of female patients in this study. Apart from that, HRQOL may be influenced by other factors which were not being examined in this study such as the body mass index, patient's occupation and income.

Our finding that ex-smokers had poor HRQOL compared to non-smokers is in agreement with that of another study by Sundh *et al.* (2011). As smoking is a risk factor for COPD, it may explain why their lung function was worse compared to the others, leading to their poor quality of life (GOLD, 2018). Thomsen *et al.* (2013) found that non-smokers with COPD had less symptoms and less airflow obstruction compared to COPD patients with smoking history.

The poor quality of life is more common in COPD patients who had co-morbidities (Sundh *et al.,* 2011). HRQOL became worse as the number of co-morbidities increased (Wacker *et al.,* 2016). This could be the result of them seeking for health care more frequently compared to patients with COPD only. However, the present study found no significant difference of HRQOL between patients with and without co-morbidities. This could be due to under reporting of co-morbidities, since our study selected only five common diseases for this purpose. The patients were considered as not having co-morbidities, when they did not suffer from any of these.

The patients who were frequently admitted to hospital due to COPD had worse HRQOL is consonant with the findings of Jones *et al.* (2011). A higher number of hospital admissions was closely related with poor HRQOL (Hong *et al.,* 2015). They were admitted to hospital more frequently as their quality of life decreased. Our finding that quality of life worsened as the severity of the airflow obstruction increased in patients is consistent with that of other studies (Jones *et al.,* 2011; Agrawal *et al.,* 2015; Hong *et al.,* 2015; Wacker *et al.,* 2016).

Other than factors discussed above, poor nutritional status might be another contributor of poor HRQOL. COPD and elderly patients are usually presented with poor nutritional status (King, Cordova & Scharf, 2008; Saka *et al.*, 2010). As a result of this, COPD patients experienced a decline in exercise ability, which then in turn contributed to poor HRQOL (Mostert *et al.*, 2000).

Use of a validated HRQOL questionnaire is the strength of the study. The CAT questionnaire has been used in many studies and validated in several countries. It is the latest disease-specific questionnaire that is used to determine HRQOL in COPD patients. A limitation of this study is that it was dominated by male patients. Apart from that, this study used secondary data from medical records for health status information like co-morbidities, history of hospitalisation or visits to the emergency department due to acute exacerbation and results of the spirometry tests. Thus, data may have been incomplete and insufficient. This could have interfered with the results of study. Besides that, multiple logistic regression could not be performed to predict factors that contributed to the HRQOL, as data for HRQOL was not equally distributed. Future studies should be larger to explore the socio-demographic and health status contributions towards HRQOL.

CONCLUSION

COPD does indeed have a negative impact on elderly patients especially among former smokers as they presented with higher CAT score compared to others. Healthcare professionals should pay closer attention to this group and implement suitable interventions such as providing pulmonary rehabilitation and advice on smoking cessation. Interventions should be carried out early to increase their quality of life and delay the disease progress.

Author's contribution

N-FY, researcher, devised and conducted the study, data analysis and interpretation, prepared the draft of the manuscript; NO, principal investigator, assisted in study and result's interpretation, reviewed the manuscript; SNAA, assisted in the study, the interpretation of the results, and reviewed the manuscript; UND, assisted in study and result's interpretation, reviewed the manuscript; BNMY, assisted in the study, the interpretation of results and reviewed the manuscript.

Conflict of interest

The authors have no conflicts of interest to declare.

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