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REVIEW ARTICLE

A Systematic Review on Factors Associated with Health-Related Quality of Life among Chronic Obstructive Pulmonary Disease Patients

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ABSTRACT

Health-Related Quality of Life (HRQOL) is an important data in managing Chronic Obstructive Pulmonary Disease (COPD). Therefore, it is essential to determine factors that associated with HRQOL and identify the gaps for future research. A systematic search using PubMed, Science Direct and Scopus was performed to discover factors that could impact HRQOL among COPD patients. Socio-demographic factors like age, gender, educational level, smoking status, income were found associated with HRQOL. Other factors included Body Mass Index (BMI), comorbidities, sleep quality and exercise capability also could influence HRQOL of COPD patients. Other than that, lung function, dyspnea and exacerbation also found closely related with HRQOL. However, future study is needed to explore more factors such as nutritional status. Besides that, the finding only focused on general population and very little information on elderly population.

Keywords: Health-related quality of life, Chronic obstructive pulmonary disease, Elderly, Dietetics, Systematic review

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a slow progressive obstruction of the airway, interfering normal breathing (1). There are two main forms of COPD namely chronic bronchitis and emphysema (1). COPD also leads to a burden in life. COPD is known as one of top 15 diseases leading to Disability-adjusted Life Years (DALYs) in 2005 and increased to the top ten in 2010 (2). In 2030, COPD is estimated to account for seven of the ten leading causes of burden of disease (3).

The burden of the disease is expressed as the severity of the disease and how it impacts the daily life of the person (4). There are many ways to indicate the burden of the disease; assessing the Health-Related Quality of Life (HRQOL) is one such indicator (4). Based on the Center for Disease Control (CDC), quality of life is a subjective evaluation of life in both negative and positive aspects. HRQOL is indicating the quality of life that involves physical and mental health (5).

COPD patients are usually presented with poor HRQOL (6,7). This issue is also related to mortality (8,9). A study found that HRQOL is an important data in managing COPD whether in primary or secondary health care (10). Therefore, the aim of this systematic review is a) to determine factors associated with HRQOL and b) to identify the gaps for future research.

METHODS

Journal articles were identified through online databases searching engines. A few prominent electronic search engines namely PubMed, Science Direct and Scopus were used. Keywords of "Health-Related Quality of Life", "Exacerbation", "Comorbidity", "Dyspnea", "Body Mass Index", "Depression", "Anxiety", "Functional Status", "Age", "Gender", "Smoking" and "Severity" were used. In addition, keywords of "Chronic Obstructive Pulmonary Disease" and "COPD" were used to specify

the disease only.

All unrelated studies were excluded, and duplicated studies removed. The remaining journal articles were reviewed one by one in full text. The inclusion criteria applied for eligibility assessment of full-text articles were: a) those journal articles which were written in English language, b) cross-sectional design and published between January 2007 and December 2017, c) studies that used general health status questionnaire like Multidimensional Index of Life Quality (MILQ), Short Form 12 Health Survey Questionnaire (SF-12), European Quality of Life questionnaire (EQ-5D) and d) studies that used specific health status questionnaire such as COPD Assessment Test (CAT) and St. George's Respiratory Questionnaire (SGRQ). Journal articles on experimental studies and studies on the comparison of HRQOL between diseases were excluded. Figure 1 illustrates the PRISMA chart for the journal articles

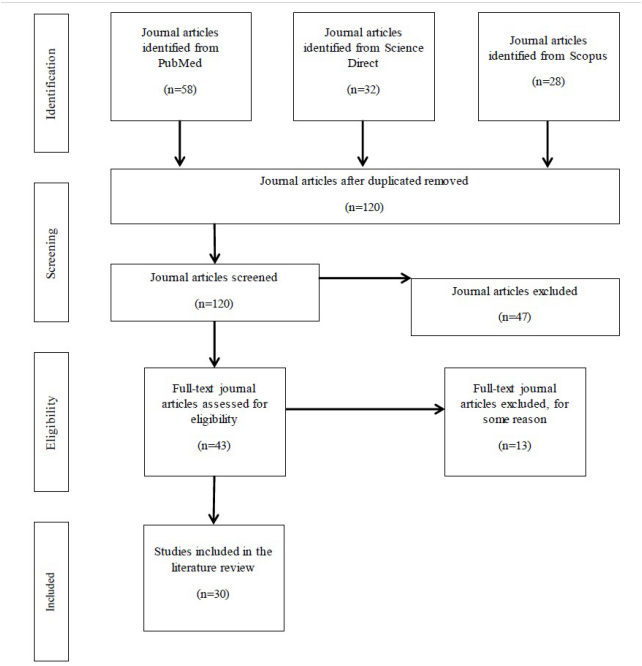

Figure 1: PRISMA flow chart of search process

search process. The questions used to guide the review were listed as follows: (1) What is the instrument use to measure HRQOL? (2) What analyses were used to determine the association with HRQOL? (3) What are the factors included in the analyses? (4) What are the factors that associated with HRQOL? (5) What limitations were identified in the study by the authors? (6) What conclusions were drawn about factors associated with HRQOL?

RESULTS

A total of 190 journal articles were found through online databases searching using the chosen keywords. Then, 70 journal articles found unrelated and duplicated were removed from the searching result followed by another 47 journal articles excluded because of not meeting the inclusion criteria. After the screening process, only 43 journal articles could be reviewed in full text. Then, after another screening process, only 30 journal articles were selected.

There were many factors associated with HRQOL among COPD patients. These factors can be divided into several categories namely socio-demographic, health status, nutritional status, symptoms, functional status and sleep quality factors. The summary of factors associated with HRQOL among COPD patients was shown in Table I.

SOCIO-DEMOGRAPHIC FACTOR

The previous study reported that there was no association between HRQOL and age (11–13). However, another study found that younger patients had a worse HRQOL compared to the older ones (14). This contradicted with other studies which found that older age impacted HRQOL (15–19). This finding was supported by other studies which found that most of the COPD patients who attended secondary care were elderly group compared to others (20).

Most of the studies found that women had a poor HRQOL compared to men (17,21–24). However, this finding was contested by another study which claimed that men scored more than women on HRQOL (19). While another study reported that there was no relationship between HRQOL and gender (11,15).

For education level, a few studies found that people with lower education level had poor HRQOL (17,19,25). This contradicted with other studies which stated that there was no association between HRQOL with educational level (15,16). For marital status, as indicated by a few studies, there was no association between marital statuses and HRQOL, while for income, other study found that people with lower income had a poor quality of life (16,17,21). This statement was supported by another study which claimed that there was an association between socioeconomic and HRQOL (15). For the living area, the previous study found no difference between urban and rural areas for HRQOL (15).

The relationship between smoking and HRQOL is controversial. The previous study found no relationship between smoking statuses with HRQOL (11). Conversely, as stated by other study, ex-smokers had a worse quality of life compared to others and most of them were men patients (19). For smoking pack in a year, as mentioned by other studies, HRQOL worsened as the smoking pack in a year increased (15). However, other studies claimed that there was no association between the smoking pack in a year and HRQOL (12,26,27).

Table I: Summary of factors that associated with HRQOL among COPD patients

Author & Year	Methodology	Factors that associated with poor HRQOL among COPD patients
Katsura *et al* 2007	Study design: Cross-sectional study Study location: Japan Subjects: 156 of COPD patients from outpatient clinic Primary measurements: SGRQ	1. Women ↓ HRQOL compared to men 2. Men- ↑ dyspnoeic, presence of anxiety and depression, ↓ exercise capacity and ↓ FEV_1 % predicted value 3. Women- ↑ dyspnoeic, presence of anxiety and depression and ↓ exercise capacity 4. No association- FEV_1 value in women
Cleland *et al* 2007	Study design: Cross-sectional study Study location: Scotland Subjects: 106 of COPD patients from primary care Primary measurements: EQ-5D	1. Presence of depression and anxiety 2. ↑ symptom of COPD, 3. ↓ functional status
Medinas-Amoros *et al* 2008	Study design: Cross-sectional study Study location: Spain Subjects: 64 of COPD patients from outpatient clinic Primary measurements: SGRQ and NHP	1. ↑ severity of COPD by BODE index (SGRQ) 2. ↑ severity of COPD by BODE index (NHP)
Rodriguez-Gonzalez Moro *et al* 2009	Study design: Cross-sectional study Study location: Spain Subjects: 1786 women and 1661 men with COPD from outpatient clinic Primary measurements: SF-12 and NHP	1. Women ↓ HRQOL compared to men 2. ↑ dyspnoeic 3. ↓ FEV_1 % predicted value
Mangueira *et al* 2009	Study design: Cross-sectional study Study location: Brazil Subjects: 30 of COPD women patients from outpatient clinic Primary measurements: SGRQ	1. ↓ exercise capacity 2. Younger age 3. ↓ lung function test 4. ↑ dyspnea and fatigue 5. No association- BMI
Nunes *et al* 2009	Study design: Cross-sectional study Study location: Brazil Subjects: 30 COPD patients from outpatient clinic Primary measurements: SGRQ	1. ↓ sleep quality 2. ↑ dyspnoeic 3. ↓ FEV_1 % predicted value 4. No association- smoking history, exercise capacity and BMI
Medinas-Amoros *et al* 2009	Study design: Cross-sectional study Study location: Spain Subjects: 64 of COPD patients from outpatient clinic Primary measurements: SGRQ and NHP	1. ↑ severity of COPD by BODE index (SGRQ and NHP) 2. ↑ severity of COPD by GOLD classification (SGRQ)
Izquierdo *et al* 2009	Study design: Cross-sectional study Study location: Spain Subjects: 3619 of COPD from outpatient clinic Primary measurements: CCQ	1. Male 2. Older age 3. ↑ number of admission 4. Ex-smoker 5. ↑ dyspnoeic 6. ↑ severity of COPD 7. ↓ education 8. ↓ physical activity 9. ↑ duration diagnosed with COPD 10. Treated by specialist 11. ↑ frequency of exacerbation
Blinderman *et al* 2009	Study design: Cross-sectional study Study location: United State Subjects: 100 of COPD from outpatient clinic Primary measurements: MILQ	1. Female 2. ↓ psychological 3. ↓ functional status 4. ↑ symptoms of distress 5. No association- age, marital status, lives alone, race, FEV_1, comorbidities and cognitive status
Balcells et al 2010	Study design: Cross-sectional study Study location: Spain Subjects: 337 COPD patients from primary care Primary measurements: SGRQ	1. Patients Stage IV had ↓ HRQOL 2. ↑ dyspnoeic 3. ↓ FEV_1 % predicted value 4. ↓ functional status 5. Presence of two or more comorbidity 6. Presence of anxiety and depression
Scharf et al 2011	Study design: Cross-sectional study Study location: Israel Subjects: 180 COPD patients from outpatient clinic Primary measurements: SGRQ	1. ↓ education 2. ↓ health status 3. ↓ sleep quality
Sundh et al 2011	Study design: Cross-sectional study Study location: Sweden Subjects: 639 COPD patients from selected primary health care centres and 280 COPD patients from hospital clinics Primary measurements: CCQ	1. Patients at secondary care had ↓ HRQOL 2. Primary and secondary care –presence with depression and ↓ BMI

(table continues)

Table I: Summary of factors that associated with HRQOL among COPD patients *(continued)*

Author & Year	Methodology	Factors that associated with poor HRQOL among COPD patients
Jones et al 2011	Study design: Cross-sectional study Study location: Belgium, France, Germany, Italy, Netherlands, Spain and the United Kingdom Subjects: 1817 of COPD patients from outpatient clinic Primary measurements: SGRQ, SF-12 and FACIT-F	1. ↑ frequency of exacerbation 2. Presence of ≥ three comorbidities 3. Presence of cardiovascular disease (SGRQ and SF-12 PCS)
Kelly et al 2012	Study design: Cross-sectional study Study location: United Kingdom Subjects: 224 of COPD patients from outpatient clinic Primary measurements: CAT	1. ↑ frequency of exacerbation 2. ↑ dyspnoeic 3. ↑ gas trapping 4. No association- age, FEV_1 % predicted value, gas transfer, arterial blood gases, smoking pack in a years, gender, BMI and medication.
Jones et al 2013	Study design: Cross-sectional study Study location: United Kingdom Subjects: 1817 of COPD from outpatient clinic Primary measurements: SGRQ, SF-12, CAT, FACIT-F	1. ↑ dyspnoeic (SGRQ and CAT) 2. ↑ dyspnoeic (SF-12 PCS and FACIT)
Justine et al 2013	Study design: Cross-sectional study Study location: Malaysia Subjects: 100 COPD patients from outpatient clinic Primary measurements: SF-36v2	1. ↑ dyspnoeic 2. ↓ lung function (SF-36 PHCS)
Kim et al 2013	Study design: Cross-sectional study Study location: South Korea Subjects: 257 of COPD patients from outpatient clinic Primary measurements: CAT	1. ↑ dyspnoeic
Burgel et al 2013	Study design: Cross-sectional analyse study Study location: French Subjects: 326 of COPD patients from INITIATIVES BPCO cohort Primary measurements: SGRQ	1. ↑ dyspnoeic 2. ↑ frequency of exacerbations 3. ↓ FEV_1 % predicted value 4. No association -age and smoking pack in a year
Horita et al 2014	Study design: Cross-sectional study Study location: Japan Subjects: 85 of COPD patients from outpatient clinic Primary measurements: CAT	1. ↑ age 2. ↑ severity of COPD by BODE index 3. ↑ dyspnoeic 4. ↑ severity of COPD by ADO Index 5. ↓ FEV_1 % predicted value 6. ↓ exercise capacity 7. ↓ SpO2 Index 8. No association- sex and BMI
Obaseki et al 2014	Study design: Cross-sectional study Study location: Nigeria Subjects: 48 of COPD patients from tertiary care hospital Primary measurements: SGRQ	1. ↓ lung function
Andenaes et al 2014	Study design: Cross-sectional study Study location: Norway Subjects: 67 of COPD patients from rehabilitation programs Primary measurements: SF-12	1. SF-12 PCS-Older age and not being in paid work 2. SF-12 PCS -No relationship- gender, living with partner, education, physical activity and self-efficacy 3. SF-12 MCS- Female, living alone, lower physical activity, lower self-efficacy 4. SF-12 MCS-No association- age, being in paid work and education
Kim et al 2014	Study design: Cross-sectional study Study location: South Korea Subjects: 202 of COPD patients from outpatient clinic Primary measurements: EQ-5D	1. ↓ health status 2. ↓ FEV_1 % predicted
Hong et al 2015	Study design: Cross-sectional study Study location: South Korea Subjects: 1178 of COPD patients and 1178 control subjects Primary measurements: EQ-5D	1. COPD group had ↓ HRQOL compared normal group. 2. EQ-5D utility scores-old age, female, ↓ household income, ↓ level of education, ↑ number of comorbid diseases, and severe degree of airway obstruction 3. EQ-5D VAS score- female, ↓ household income, ↓ level of education, ↑ number of comorbid diseases, and severe degree of airway obstruction
Agrawal et al 2015	Study design: Cross-sectional study Study location: India Subjects: 129 of COPD patients from tertiary care hospital Primary measurements: SGRQ	1. Patients Stage III and IV had ↓ HRQOL 2. ↓ FEV1 value and FEV/FVC ratio 3. ↓ exercise capacity 4. ↓ BMI 5. No association- symptom duration

(table continues)

Table I: Summary of factors that associated with HRQOL among COPD patients *(continued)*

Author & Year	Methodology	Factors that associated with poor HRQOL among COPD patients
Sundh et al 2015	Study design: Cross-sectional study Study location: Sweden Subjects: 373 of COPD patients from ward Primary measurements: CAT and EQ-5D	1. EQ-5D index- female, ↑ age, ↓ FEV_1% predicted value, ↑ frequency of exacerbations, presence of chronic bronchitis, musculoskeletal symptoms and depression 2. EQ-5D VAS- ↓ FEV_1% predicted value, presence of chronic bronchitis, and osteoporosis 3. CAT score- female, ↓ FEV_1% predicted value, ↑ frequency exacerbations and presence of chronic bronchitis 4. No association- presence of cardiovascular disease (CAT and EQ-5D)
Sarkar et al 2015	Study design: Cross-sectional study Study location: India Subjects: 114 of COPD from outpatient clinic Primary measurements: SGRQ	1. ↑ severity of COPD by BODE index 2. ↑ severity of COPD by GOLD stages 3. ↓ FEV_1 value 4. ↓ exercise capacity 5. ↓ BMI 6. ↑ dyspnoeic
Ahmed et al 2016	Study design: Cross-sectional study Study location: India Subjects: 124 of COPD patients from community Primary measurements: SGRQ-C	1. ↓ FEV_1 value and FEV/FVC ratio 2. ↑ age 3. ↑ duration of illness 4. ↑ symptoms of COPD 5. ↑ dyspnoeic 6. ↑ smoking pack in a year 7. Standard of living 8. No association-gender, education and area of residence
Deslee et al 2016	Study design: Cross-sectional study Study location: France Subjects: 178 of COPD patients Primary measurements: SGRQ	1. ↓ FEV_1 value 2. ↑ frequency of exacerbation 3. ↑ dyspnoeic 4. Presence of anxiety and depression 5. ↑ symptoms of COPD 6. No correlation -age, sex, smoking, BMI and cardiovascular disease
Pascal et al 2017	Study design: Cross-sectional study Study location: Rome Subjects: 60 of COPD patients from outpatient clinic Primary measurements: CAT	1. ↑ dyspnoeic 2. Presence of anxiety and depression 3. Presence of panic attacks
Akinci et al 2017	Study design: Cross-sectional study Study location: Turkey Subjects: 75 of COPD patients and 50 people without COPD Primary measurements: SF-36	1. ↓ poor sleep quality 2. No association-age, BMI and comorbidities

BMI: Body Mass Index; BODE: Body mass index, airflow Obstruction, Dyspnea and Exercise capacity; CAT: COPD Assessment Test; CCQ: Clinical COPD Questionnaire; COPD: Chronic Obstructive Pulmonary Disease; EQ-5D: European Quality of Life questionnaire; FACIT-F: Functional Assessment of Chronic Illness Therapy Fatigue; FEV/FVC: Forced Expiratory Volume/Forced Vital Capacity; FEV_1: Forced Expiratory Volume1; GOLD: Global Imitative for Obstructive Lung Disease; HRQOL: Health-Related Quality of Life; MILQ: Multidimensional Index of Life Quality; NHP: Nottingham Health Profile; SF-12: Short Form 12 Health Survey Questionnaire; SF-36: 36-Item Short Form Health Survey; SGRQ: St. George's Respiratory Questionnaire; SpO_2: Saturation of Peripheral Oxygen

HEALTH STATUS FACTOR

A few studies reported that higher number of comorbidities was closely related to poor HRQOL (6,17,28). However other study found no association between comorbidities with QOL (13,21). The previous study found that people presented with cardiovascular disease (CVD) as their comorbidities had poor QOL supporting the finding of another study that most of the patients in secondary care had CVD as their comorbidities (6,24). This was in contrast to other studies that there was no association between CVD and HRQOL (11).

People presented with depression and anxiety had poor HRQOL compared to others (11,20,24,28). This was supported by other studies which found that panic attacks were related to HRQOL (29). For exacerbation, most of the studies found that as the number of exacerbation increased, HRQOL worsened (6,11,12,24,26).

For a lung function test, a few studies reported no association between lung function and HRQOL (12,21). On contrary, many studies stated that Forced Expiratory Volume1 (FEV_1) value was related to poor HRQOL (11,15,18,23,26,27,30–33). Another study found that men had worse lung function than women leading to poor HRQOL (22).

There was also an association between Forced Expiratory Volume/Forced Vital Capacity (FEV/FVC) ratio with HRQOL (15,31). In the same way, other study found a relationship between Maximal Inspiratory Respiratory Muscle Pressure (MIP) and HRQOL but not with Maximal Expiratory Respiratory Muscle Pressure (MEP) (14). The previous study reported that people with poor Saturation of Peripheral Oxygen (SpO2) were usually presented with a poor quality of life (18). This statement supported by the finding of another study that Peak Expiratory Flow (PEF) can impact the quality of life (34).

A few ways are used to determine the severity of COPD which included Global Initative for Obstructive Lung Disease (GOLD), Body mass index, airflow Obstruction, Dyspnea and Exercise capacity (BODE) index and ADO index. Most of the studies found that HRQOL worsened as the severity of the disease increased (18,30,35). Other studies also reported similar results where the GOLD stage increased, HRQOL worsened (17,28). However other studies found no association between GOLD stages with a quality of life measured by Nottingham Health Profile (NHP) (36).

NUTRITIONAL STATUS FACTOR

Many studies found a lower Body Mass Index (BMI) related to poor HRQOL (30,31). The previous study found that most COPD patients in secondary care were underweight patients which explained how COPD impacted body weight patients (20). However, other studies reasserted that there was no association between BMI and HRQOL (11,13,14,18,27).

SYMPTOMS FACTOR

A few ways are used to assess dyspnea such as Oxygen Cost Diagram (OCD), Modified Medical Research Council (mMRC), Baseline Dyspnea Index (BDI) and others. A lot of studies found that dyspnea was impacted HRQOL (12,14,18,26–30,32,37,38). Symptoms of respiratory dysfunction measured by Chronic Lung Disease (CLD) and COPD symptom Control Questionnaire (CCQ) reported the same finding as dyspnea claiming that the presence of respiratory symptoms really impacted HRQOL (15,39). This was supported by other studies which stated that increased production of sputum and cough were related to poor HRQOL (11). Another study also found that people presented with the symptom of chronic bronchitis usually had poor HRQOL (24).

FUNCTIONAL STATUS FACTOR

Most of the studies claimed that poor exercise capability was related to poor HRQOL (14,28,30,31). In contrast, other studies found that there was no association between exercise ability to HRQOL (27). Other study found that musculoskeletal symptoms were related to poor HRQOL (24).

SLEEP QUALITY FACTOR

The previous study found poor sleep quality can impact HRQOL (25). Another study also reported many factors causing poor sleep quality among COPD patients namely cough, dyspnea, ageing, comorbidities and others (27).

LIMITATION

There are several limitations to acknowledge in this review. First, quality of life is a broad concept which covers physical health, psychological state, level of independence, social relationship, environment and personal beliefs while HRQOL is more specific towards health (40). Thus, other factors that also associated with HRQOL were not examined. Apart from that, this review did not include a qualitative study which also could prove information on factors that can influence HRQOL.

CONCLUSION

In conclusion, a few factors do impact HRQOL like age, gender, BMI, educational level, smoking status, income, exercise capability, lung function, dyspnea, comorbidities, exacerbation and sleep quality. All these factors might correlate with poor HRQOL, due to the condition of COPD itself, as it is known as a disease that affects the structure and function of the lungs which then give an effect to the whole body. Other factors like poor nutritional status might be another contribute towards poor HRQOL, as COPD patients usually presented with poor nutritional status but not many studies that explore these factors. Besides that, we found that most of the studies were focused only on COPD patients aged above 40 years old and above but no study that specifically focused on the elderly population over 60 years. Studies focusing on the elderly population and nutrition-related issues are needed.

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