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Factors influencing health-related quality of life in patients with chronic obstructive pulmonary disease: insights from the Burden of Obstructive Lung Disease Study in Fez, Morocco

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Abstract

The respiratory symptoms experienced by patients with chronic obstructive pulmonary disease (COPD) are a burden on daily life. The objective of this study was to measure health-related quality of life (HRQoL) and comprehensively identify its associated factors in Moroccan COPD patients. A cross-sectional, randomized study was carried out in the city of Fes, Morocco, as part of the large multicenter Burden of Obstructive Lung Disease Study on people with COPD. Data collection was carried out using a questionnaire containing sociodemographic, clinical, and quality-of-life data. The diagnosis of COPD was based on spirometry, and quality of life was measured by the Short Form Survey (SF-12) questionnaire. Using multiple linear regression, we assessed the relationship between several sociodemographic and clinical factors and SF-12 mental and physical quality-of-life scores.

A total of 107 patients were included, with a male predominance (63.6%) and the most common age category being 60 years and older (51.4%). Additionally, 46.7% of participants were classified as Global Initiative for Obstructive Lung Disease (GOLD) stage 1. The mean SF-12 mental component score was 41.32±9.18, and the mean SF-12 physical component score was 41.91±11.93. Multivariate analysis revealed that a greater mental HRQoL was associated with the male gender, a body mass index of 25 or higher, and GOLD stage 1, while a greater physical HRQoL was associated with the male gender, an age less than 60 years, absence of respiratory comorbidities, and GOLD stage 1. Our results show low scores of the mental and physical components of HRQoL in COPD patients in Morocco, suggesting the implementation of measures to reduce first the prevalence of the disease and then adopt an appropriate COPD management strategy to improve those people's quality of life.

Key words: COPD, quality of life, SF-12, Morocco.

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic respiratory condition that advances slowly and has been defined by an obstructive ventilatory pattern that is typically irreversible, frequently associated with tobacco smoking, and can lead to chronic respiratory failure [1,2]. COPD develops mostly from smoking, biomass fuel, and exposure to pollutants. The most of cases (45–50%) are caused by smoking, while the remaining 25–45% are induced by infections, asthma, lung expansion, and poverty [3].

COPD represents a major public health problem [4], ranking as the third-leading cause of death worldwide with 3.23 million deaths in 2019 [5]. According to the Global Burden of Disease Study, in 2019, there were 212.3 million prevalent cases of COPD globally [5]. The prevalence of COPD ranges between 15% and 20% of the adult population in Europe aged over 40 years, and it is projected to increase globally, especially among females and in low- and middle-income regions, reaching 600 million cases by 2050 [6]. COPD will have increasing economic and social consequences in the coming decades [7]. In Morocco, the prevalence of COPD was 12.6% and is estimated to increase with the number of pack-years smoked [8].

Several epidemiological studies have shown a deterioration of the quality of life in COPD patients. A large observational primary care study conducted in seven European countries showed that health status was significantly impaired in COPD patients, with minimal differences between countries [9]. Another study from Austria showed a deterioration in quality of life and that the burden of disease in ambulatory patients with mild COPD and fewer exacerbations tends to be underestimated and overestimated in patients with severe COPD and frequent exacerbations [10].

In Morocco, quality of life indicators for COPD patients are notably lacking; most studies have focused on the study of impairment and disability through respiratory function tests at rest and during exercise [11-13].

By focusing on the quality of life of COPD patients in Morocco, this study fills an important gap in respiratory health research. The results expected from this study will provide a better understanding of the determinants of quality of life in COPD patients in a specific Moroccan context, thus offering valuable perspectives for improving care and management strategies for this disease.

The aim of this study is to evaluate the quality of life of COPD patients in the Moroccan community and identify the factors that influence it.

Materials and Methods

Study design

A cross-sectional study carried out in the city of Fes, Morocco, as part of the Burden of Obstructive Lung Disease I (BOLD I) study, a multicenter, epidemiological which quantified the prevalence of obstructive lung disease and identified its risk factors in various countries of the world mostly in low- and middle-income countries [14].

Population sample

The specific population sample was randomly selected from 10 districts in the northern Moroccan city of Fez, representing a total of 760 participants aged 40 years and over [8]. Among them, only those diagnosed with Chronic Obstructive Pulmonary Disease (COPD) stage GOLD 1 or higher were selected to participate in the study. The methodology of the BOLD study has been described in detail in other publications [14].

Data collection

Data collection for this study was carried out using a meticulously designed questionnaire [15]. The questionnaire included sociodemographic variables such as age and gender, socio-economic status using a wealth index (Mokken scale), Body Mass Index (The BMI calculation divides participant's weight in kilograms by their height in meters squared), smoking habits, as well as comorbid conditions such as diabetes, hypertension and heart disease, as well as respiratory comorbidities including COPD, asthma and chronic bronchitis. In addition, disease severity was assessed using the GOLD (Global Initiative for Chronic Obstructive Lung Disease) classification from spirometry. Quality of life was also assessed using the Arab Moroccan version of the Short Form Health Survey (SF-12) [16].

In the context of socio-economic status, the Mokken scale, an international scale based on household assets [17], was utilized as one of the sociodemographic variables. This scale, known for its reliability, was integrated into the questionnaire. We selected 10 items representing household assets to calculate the wealth index score. The scoring system ranged from 0 (indicating no assets) to 10 (representing ownership of all assets). Detailed information about the 10 selected items for score calculation, along with the percentage of ownership for each item among the study participants, has been previously published [17,18]. This comprehensive approach ensures a thorough understanding of both health-related and socio-economic aspects within the scope of our study.

The SF-12 health survey was used to measure the participants quality of life. It was originally developed in the United States to provide a shorter alternative to the SF-36 for use in large-

scale health measurement and surveillance efforts [19]. This instrument has been subject to extensive validation studies, and can probably be considered the most valid instrument of its kind currently available [20]. The SF-12 questionnaire comprises 12 items, divided into eight subscales: Physical Functioning (PF), Physical Role (RP), Body Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Emotional Role (RE) and Mental Health (MH). The subscales contribute to the development of summary measures for the physical and mental components (PCS-12 and MCS-12) [19].

Spirometry

Spirometry tests were carried out as a central part of the evaluation process. All eligible persons were subjected to spirometry tests. Using a standardized BOLD protocol, spirometry tests were carried out carefully by trained and certified technicians to maintain accuracy. Each spirogram underwent rigorous examination and quality assessment by the BOLD Pulmonary Function Reading Centre at Imperial College London, UK [8]. This meticulous process ensured that the spirometric data were of the highest accuracy and reliability, reinforcing the robustness of the study results. Irreversible airflow obstruction was defined according to the Global Initiative for Obstructive Lung Disease (GOLD) guidelines as a post-bronchodilator FEV1/FVC ratio of less than or equal to 70% for COPD stage 1 or higher [21]. Additionally, participants were classified into four groups (stages 1, 2, 3, and 4) based on the GOLD classification. In order to increase statistical power, the last three stages have been grouped together. Participants who had a GOLD stage 1 or higher were selected to participate in this study.

Statistical analysis

The process of calculating the SF-12 Physical (PCS-12) and Mental (MCS-12) scores involves four distinct steps. First, values beyond the acceptable range for item responses are corrected, and four items are scored in reverse to ensure that a higher score corresponds to a better state of health. Next, indicator variables are generated, each assigned a score of 1 or 0 according to the categories of responses to the questions. These indicator variables are then weighted using regression coefficients derived from the general US population. They are then aggregated, incorporating a constant (regression intercept). The resulting aggregate PCS-12 and MCS-12 scores are standardized to match the mean values of the SF-36 versions in the general US population [22]. For consistency, in line with recommended scoring protocols, all subscale scores are transformed into a uniform 0-100 scale. A higher score on this scale indicates a reduction in dysfunction, impairment or pain, thus adhering to the SF-36 standard [19].

In order to describe sociodemographic factors, smoking, health-related factors, and quality-of-life scores (subscales, MCS-12, and PCS-12), percentages were utilized for qualitative variables and means with standard deviation for quantitative variables.

In the univariate analysis, the T-test was used to investigate associations between sociodemographic factors, body mass index (BMI), smoking, and health-related factors (general comorbidities, respiratory comorbidities, and GOLD classification) and HRQoL (MCS-12, PCS-12), while simple linear regression was used to investigate associations between wealth index (Mokken scale) and HRQoL. In the multivariate analysis, multiple linear regression models were used, taking mental and physical quality of life scores (MCS-12, PCS-12) as quantitative dependent variables, and age, gender, Mokken scale, BMI, smoking, general comorbidities, respiratory comorbidities and GOLD classification as explanatory variables, by introducing into the initial linear model for each dependent variable the explanatory variables that were significantly associated with them in the univariate analysis, or those that had a significance p less than 0.20. P values below 0.05 were considered statistically significant. The statistical software SPSS 26 was used for the statistical analyses.

Ethical approval was obtained from the ethics committee of University Hospital Center Hassan II, Fez, Morocco. Written informed consent was provided by all participants.

Results

Sample characteristics

The study involved a total of 107 participants with chronic obstructive pulmonary disease (COPD), the majority of whom were men (63.6%). In terms of age distribution, 48.6% were under 60, while 51.4% were aged 60 or above. The Mokken mean score was 7.30 ± 1.62. Body mass index (BMI) showed that 44.9% had a BMI under 25, while 55.1% had a BMI of 25 or more. Smoking habits were reported by 40.2% of participants, while 59.8% were non-smokers. Regarding comorbidities, 42.1% of participants reported having general comorbidities. As well, 19.6% had respiratory comorbidities. The classification of GOLD stages revealed that 46.7% of participants were classified as GOLD stage 1, and 53.3% as GOLD stage 2 or higher. Table 1 summarizes the participant's sociodemographic and clinical characteristics.

Data on socio-demographic characteristics and co-morbidities according to sex are presented in Table 1. There were significant differences in smoking habits (P <0.001) and Pack-year smoking history (P <0.001) between women and men. Among comorbid conditions, diabetes and hypertension were significantly more frequent in women with COPD than in men with COPD (p = 0.028 and p = 0.037 respectively).

Quality of life

The mean scores for the mental and physical components of quality of life and the eight dimensions of the sample are presented in Table 2. Quality of life scores fluctuate from dimension to dimension. The vitality (VT) and social functioning (SF) dimensions show relatively high scores (45.8 ± 10.2 and 42.6 ± 10.3), while physical role (RP) and general health (GH) dimensions show relatively low scores (39.4 ± 10.0 and 37.7 ± 14.3). Mental and physical components of QoL (MCS-12, PCS-12) scores are in a similar range (41.3 ± 9.1 and 41.9 ± 11.9).

Factors associated with mental health-related quality of life

In univariate analysis, the factors significantly associated with quality of life in its mental component (MCS-12) were: wealth index (Mokken scale) (β: 2.22; 95% CI: 1.22 – 3.22); body mass index (BMI) (43.1 ± 9.16 among patients with a BMI over or equal to 25 vs 39.14 ± 8.8 in those with a BMI less than 25, p = 0.026); respiratory comorbidities (42. 81 ± 8.35 among patients with no comorbidities vs 38.72 ± 10.05 among persons with respiratory comorbidities, p = 0.026); and severity of COPD (43.47 ± 9.45 among patient classed as GOLD stage 1 vs 39.44 ± 8.57 among those classified as GOLD stage 2 or higher) (Table 3).

In the multivariate analysis, the male gender (Adjusted β: 3.71; 95% CI: 0.25 - 7. 18), having a BMI greater than or equal to 25 (Adjusted β: 4.10; 95% CI: 0.75 - 7.45) and having a GOLD stage 1 classification (Adjusted β: 3.92; 95% CI: 0.59 - 7.26) were identified as independent associated factors of better quality of life in its mental component (MCS-12) (Table 3).

Factors associated with physical health-related quality of life

In univariate analysis, the factors significantly associated with quality of life in its physical component (PCS-12) were: gender (43.99 ± 12.03 in male vs 38.28 ± 10.98 in women, p = 0.017); age (44.93 ± 9.93 among patients aged under 60 vs 39. 05 ± 13.01 among patients aged over 60, p = 0. 010); wealth index (Mokken scale) (β: 1.41; 95% CI: 0.25 – 2.81); respiratory comorbidity (44.06 ± 10.81 among patients without respiratory comorbidities vs 38.15 ± 12.98 among patients with respiratory comorbidities, p = 0.013), and severity of disease (45.80 ± 11.44 among patients classified as GOLD stage 1 vs 38.50 ± 11.38, p=0.001 among those classified as GOLD stage 2 or higher).

In the multivariate analysis, male gender (Adjusted β: 5.94; 95% CI: 1.75 - 10.13), aged under 60 years (Adjusted β: 6.80; 95% CI: 2. 72 - 10.88); having respiratory comorbidities (Adjusted β: 5.62; 95% CI: 1.20 - 10.04) and having a GOLD stage 1 classification (Adjusted β: 5.79;

95% CI: 1.59 - 10.01) were identified as independent associated factors of better quality of life in its physical component (PCS-12) (Table 4).

Discussion

This is the first study to describe quality of life and identify its determinants of people with COPD in Morocco, a country with a relatively high prevalence of COPD [8]. The findings revealed that the QoL in Moroccan COPD individuals was impaired, with low mean mental and physical quality-of-life scores (MCS-12 and PCS-12), indicating substantial deterioration in both mental and physical health domains. Factors associated with lower mental health-related quality of life include female gender, normal weight, and advanced GOLD stage, while for physical quality of life, they include female gender, advanced age and more advanced GOLD stages.

The mean scores for the mental and physical HRQoL and their eight dimensions were low. These scores provide insight into the various aspects of QoL experienced by the participants. Notably, the mean SF-12 physical and mental components scores were lower than those reported in a French study [23]. The differences observed may arise from cultural, socioeconomic, and environmental factors unique to each population. Access to healthcare and support systems may also significantly impact the quality of life (QoL), particularly given that our study population was unaware of their condition until the study began, resulting in varied COPD management and treatment approaches between populations, thereby affecting their overall well-being differently. Despite these disparities, numerous studies consistently indicate impaired QoL in COPD patients [24,25].

In the present study, mental and physical quality of life scores were significantly higher for men than for women. Reports from various authors suggesting that women typically experience more respiratory symptoms than men may help to explain this observation in part [26,27].

Regarding age-related disparities, statistically significant differences in health-related quality of life were evident only for the physical component, where physical HRQoL scores decreased with age. This result is consistent with the findings of a Spanish study, which highlighted the impact of advancing age on HRQoL in COPD patients [28].

The study also revealed an association between the deterioration of HRQoL in its mental and physical components and the presence of respiratory comorbidities in the univariate analysis. After adjusting for other explanatory variables, the degradation of HRQoL was significant only for the physical component. In contrast, the author reported similar associations between HRQoL and the presence of general comorbidities rather than specifically respiratory comorbidities [29,30]. Additionally, a study conducted in Vietnam investigated the effects of

different comorbidities on HRQoL among respiratory patients, highlighting the significant impact of chronic illnesses on HRQoL [31]. This association with respiratory comorbidities could be attributed to the intensification of respiratory symptoms in the presence of these specific comorbidities, while other studies had focused principally on general comorbidities.

The current study discovered a statistically significant association between a greater mental HRQoL and obesity, as measured by a BMI of 25 or higher. This is consistent with the results of Bensassi et al., who found that obesity was related to a less severe airway obstruction in people with COPD [32].

COPD severity, as represented by GOLD stages, was also associated with Mental HRQoL, was better in individuals with GOLD stage 1 than in those with GOLD stage 2 or above. Similarly, a greater Physical HRQoL was identified in patients with GOLD stage 1 than in those with GOLD stage 2 or above. Studies carried out in different levels of health care institutions have confirmed this negative impact on the HRQoL scores of COPD severity assessed by the GOLD classification [33,34].

It is important to note that impaired mental quality of life, as well as impaired physical quality of life, is observed in patients with COPD due to the debilitating nature of the disease. It is possible to make the link between impaired mental quality of life and cognitive dysfunction in patients with COPD, as suggested by a previous study [35] on the prevalence of cognitive impairment in subjects with chronic airflow limitation, including subjects with COPD.

This suggests that the overall management of COPD patients should include assessment of mental and cognitive health, in addition to management of the physical symptoms of the disease. By understanding and treating cognitive dysfunction and improving patients' mental quality of life, healthcare professionals can help to significantly improve the overall well-being and quality of life of people living with COPD. This holistic approach can improve the quality of life of people living with COPD, recognising the crucial importance of their mental and physical health.

This study has certain limitations. First, it's the cross-sectional design restricts the ability to establish a temporal sequence in the relationship between HRQoL and its associated factors. Consequently, the establishment of causal relationships remains beyond the scope of this analysis. To overcome this limitation, a second subsequent BOLD survey is planned to track the evolution of various COPD-related data over time. Furthermore, using self-reported data to assess HRQoL may introduce biases, as participants' mood or emotional state during the study can influence their responses. For instance, individuals may answer differently based on whether they feel positive or negative when rating their quality of life. Despite these biases, self-reported data can still provide valuable insights into participants' realities. Findings

obtained through this method may align with what would be observed using standardized tools like the SF-12 in clinical settings. It's important to note that HRQoL assessment has become a crucial practice in clinical research [34].

This study has several strengths. Firstly, the adoption of a randomized design contributes to the reduction of selection bias, thereby enhancing the likelihood that participant characteristics will be comparable. Secondly, our objective definition of Chronic Obstructive Pulmonary Disease (COPD), based on spirometry results, ensures a robust identification of patients with this chronic respiratory condition. It's crucial to note that in the statistical analysis, we further strengthened the study by adjusting for multiple factors to identify the factors associated with Health-Related Quality of Life (HRQoL).

Moreover, the use of the SF-12, a validated and widely employed tool for assessing quality of life, provides a comprehensive evaluation of this critical aspect of patient health. The incorporation of such a well-established instrument enhances the reliability and validity of our HRQoL assessments.

Additionally, this study stands out as the first of its kind in addressing these specific health concerns in Moroccan population, marking an important contribution to the existing literature. This localized knowledge can contribute to the development of tailored and effective solutions for health challenges in the community.

Conclusions

In conclusion, the results of this study highlight the crucial importance of an integrated approach to improving the quality of life of COPD patients in Morocco, with particular emphasis on the mental component of quality of life. To optimise patients' health outcomes and well-being, it is recommended that personalised strategies be implemented to manage respiratory co-morbidities, raise awareness of the importance of early and ongoing management of the disease, adopt an individualised approach that takes into account both the mental and physical aspects of COPD, ensure regular follow-up and support ongoing research efforts. The aim of these recommendations is to significantly improve the quality of life of COPD patients in Morocco, and to guarantee comprehensive and effective management of this chronic disease.

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Table 1. Sociodemographic, chronic obstructive pulmonary disease-related and comorbidity characteristics of participants.

Characteristics	Overall n=107	Gender		p-value
		Male n=68	**Female** n=39	
Age, y				
<60	52 (48.6)	33 (48.5)	19 (48.7)	1.000
60	55 (51.4)	35 (51.5)	20 (51.3)	
Wealth index (Mokken scale), mean ± SD	7.30±1.62	7.3±1.6	7.18±1.6	0.567
Body mass index				
<25	48 (44.9)	32 (47.1)	16 (41.0)	0.687
25	59 (55.1)	36 (52.9)	23 (59.0)	
Smoking habits				
No	64 (59.8)	25 (36.8)	39 (100)	**<0.001**
Yes	43 (40.2)	43 (63.2)	0	
Pack-year smoking history, mean ± SD	13.5±25.5	21.3±29.4	0	**<0.001**
Comorbid conditions	45 (42.1)	22 (32.4)	23 (59.0)	**0.009**
Diabetes	12 (11.2)	4 (5.9)	8 (20.5)	**0.028**
Blood pressure	40 (37.4)	20 (29.4)	20 (51.3)	**0.037**
Heart disease	9 (8.4)	4 (5.9)	5 (12.8)	0.28
Respiratory comorbidity	39 (36.4)	26 (38.2)	13 (33.3)	0.679
Asthma	17 (15.9)	9 (13.2)	8 (20.5)	0.411
COPD	6 (5.6)	6 (8.8)	0	0.084
Chronic bronchitis	24 (22.4)	18 (26.5)	6 (15.4)	0.233
GOLD stage				
GOLD stage 1	50 (46.7)	32 (47.1)	18 (46.2)	1.000
GOLD stage 2 or more	57 (53.3)	36 (52.9)	21 (53.8)	

SD, standard deviation; COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Obstructive Lung Disease.

Table 2. Mean scores for the mental and physical components of quality of life and the eight dimensions of the sample.

Score	Mean score ± SD	(Min – Max)
Physical functioning	42.9±12.4	22.1-56.4
Role-physical	39.4±10.0	20.3-57.1
Bodily pain	41.8±13.4	16.6-57.4
General health	37.7±14.3	18.8-61.9
Vitality	45.8±10.2	27.6-67.8
Role-emotional	36.9±11.2	11.3-56.0
Social functioning	42.6±10.3	26.2-56.5
Mental health	41.8±10.3	15.7-64.5
Mental component	41.3±9.1	20.4-61.6
Physical component	41.9±11.9	14.4-63.7

SD, standard deviation.

Table 3. Factors associated with Mental component of quality of life among chronic obstructive pulmonary disease people in Morocco in univariate and multivariate analysis.

Characteristics	MCS-12			
	Mean score ± SD	p-value	Adjusted β (CI 95%)	p-value
Gender				
Male	42.60±9.37	0.057	3.71 (0.25-7.18)	0.036
Female	39.09±8.48		Reference	
Age, y				
<60	42.34±9.21	0.265		
60	40.36±9.12		-	-
Wealth index (Mokken scale), β (CI 95%)	2.22 (1.22-3.22)	**< 0.001**	-	-
Body mass index				
<25	39.14±8.80	**0.026**	Reference	0.017
25	43.10±9.16		4.10 (0.75-7.45)	
Smoking habits				
No	40.08±9.42	0.089		
Yes	43.16±8.58		-	-
General comorbidities				
No	42.26±9.22	0.218		
Yes	40.03±9.06		-	-
Respiratory comorbidities				
No	42.81±8.35	**0.026**		
Yes	38.72±10.05		-	-
GOLD stage				
GOLD stage 1	43.47±9.45	**0.023**	3.92 (0.59-7.26)	0.021
GOLD stage 2 or more	39.44±8.57		Reference	

SD, standard deviation; CI, confidence interval; GOLD, Global Initiative for Obstructive Lung Disease; R-deux, 0.131

Table 4. Factors associated with physical component of quality of life among chronic obstructive pulmonary disease people in Morocco in univariate and multivariate analysis.

Characteristics	PCS-12			
	Mean score ± SD	p-value	Adjusted β (CI 95%)	p-value
Gender				
Male	43.99±12.03	**0.017**	5.94 (1.75-10.13)	0.006
Female	38.28±10.98		Reference	
Age, y				
<60	44.93±9.93	**0.010**	6.80 (2.72-10.88)	0.001
60	39.05±13.01		Reference	
Wealth index (Mokken scale), β (CI 95%)	1.41 (0.25-2.81)	**0.046**	-	-
Body Mass Index (BMI)				
<25	41.53±11.23	0.770	-	-
25	42.22±12.56			
Smoking habits				
No	40.72±12.03	0.211	-	-
Yes	43.68±11.70			
General comorbidities				
No	43.54±11.72	0.098	-	-
Yes	39.67±11.98			
Respiratory comorbidities				
No	44.06±10.81	**0.013**	5.62 (1.20-10.04)	0.013
Yes	38.15±12.98		Reference	
GOLD stage				
GOLD stage 1	45.80±11.44	**0.001**	5.79 (1.59-10.01)	0.007
GOLD stage 2 or more	38.50±11.38		Reference	

SD, standard deviation; CI, confidence interval; GOLD, Global Initiative for Obstructive Lung Disease;**R-deux:** 0.256