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Health-related quality of life in patients with chronic obstructive pulmonary disease: A hospital-based study

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***Background & objectives*: Chronic obstructive pulmonary disease (COPD) adversely affects various functional and structural domains of the lungs, in addition to having an array of extra-pulmonary effects which affect overall well-being of a patient. This study was aimed at measuring the health-related quality of life (HRQOL) in COPD patients and relating the severity of disease and other factors with the degree of impairment of HRQOL.**

***Methods*: This cross-sectional study was conducted on 100 individuals with established COPD aged 45 yr or above. COPD severity was graded based on the Global Initiative for Obstructive Lung Disease (GOLD) staging system. Pulmonary function test was carried out as per the American Thoracic Society and European Respiratory Society task force standardised lung function testing guidelines. The quality of life was measured using the COPD-specific version of the St. George's Respiratory Questionnaire (SGRQ). The three component scores (activity, impact and symptoms) and the total score were compared across the various categories of age, gender and COPD grades. Using multivariable linear regression analysis, the relationship between COPD grades and various component scores, adjusting for age and gender, was determined.**

***Results*: The mean total SGRQ Classification score was found to be 48.5±17.1. There was a significant increase in the symptom, activity and impact component scores and the total scores of the participants with worsening of COPD grade. The activity, impact component scores and total score showed an increasing trend with age. However, the values of these three scores were lower in participants in the age group of 56-65 yr in comparison to those in the 45-55 yr age group. There was a significant increase in the symptom component score with increasing age across the study population. The difference in the various scores between males and females was not significant.**

***Interpretation & conclusions*: HRQOL is impaired in patients with COPD, and it deteriorates with increasing severity of the disease. The onset of COPD at a younger age has a much more significant deterioration of HRQOL, due to the early onset of symptoms and complications. These findings call for better early care and integration of pulmonary rehabilitation programmes into current health policies.**

Key words COPD - HRQOL - St. George's Respiratory Questionnaire - GOLD classification - pulmonary disease

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The Global Initiative for Obstructive Lung Disease (GOLD) describes chronic obstructive pulmonary disease (COPD) as a common preventable and treatable disease, characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases[1]. COPD is one of the major preventable chronic respiratory diseases (CRDs) and is one of the leading non-communicable causes of death globally, as well as in India[2-4]. COPD is reported to have a disease burden of 210 million people worldwide and is estimated to become the third leading cause of death globally in 2030, as the number of deaths owing to the disease is projected to increase by more than 30 per cent over the next 10 years[5].

In addition to being a major cause of mortality, COPD is also a major cause of chronic morbidity. The burden of CRDs in India is disproportionate, having 18 per cent of the world's population, but 32 per cent of the global disability-adjusted life years (DALYs) from these diseases[6]. The number of cases of COPD in India increased from 28.1 million (27.0-29.2) in 1990 to 55.3 million (53.1-57.6) in 2016 – an increase in the prevalence from 3.3 to 4.2 per cent. The DALYs per case of COPD were also found to be 1.7 times higher in India than the global average in 2016, with most States having higher rates compared with other locations, worldwide at similar levels of sociodemographic index[6]. The leading risk factors for COPD in India are air pollution, followed by tobacco use and occupational exposure[3].

Analyzing the mental, physical and social aspects of this disease is vital to improve the quality of life (QOL) of COPD patients. Health-related quality of life (HRQOL) is a unique construct that is different from physiological measures or survival and consists of domains that are related to physical, mental, emotional and social functioning. The St. George's Respiratory Questionnaire (SGRQ) has been used widely and extensively as an instrument for assessing HRQOL in patients with respiratory ailments[7]. The St. George's Respiratory Questionnaire Classification (SGRQ-C) is a shorter version derived from the original version of the SGRQ which has been explicitly designed to measure health impairment in patients with COPD[8].

Keeping in mind the high burden of COPD in low- and middle-income countries such as India, and the impact the disease can potentially have on the QOL of an individual suffering from it, this study was carried out with the aim of measuring the HRQOL in COPD patients.

Material & Methods

This study was conducted on an outpatient basis in the department of Pulmonary Medicine at Kasturba Medical College Hospital Attavar, Mangalore, Karnataka, India. The patients were established patients of COPD, as diagnosed by the GOLD criteria[1], aged 45 yr or above of either sex. Patients suffering from other chronic lung diseases, tuberculosis, asthma, diabetes or myopathies were excluded.

A sample size of 75 was calculated. The study power was calculated at 90 per cent.

The following formula[9] was used:

$$n=\frac{(Z_a+Z_b)^2+3}{C^2}$$

Where n=sample size, Z_a=1.96 at 95 per cent confidence limit and Z_b=1.28 at 90 per cent power.

Assuming 50 per cent correlation (r=0.5) between QOL score and disease severity, $C=\frac{0.5\times\ln(1+r)}{(1-r)}$.

The study was initiated following approval from the institutional ethics committee. Written informed consent was obtained from all the participants. A total of 100 patients who met the study criteria were included. Majority (n=86) of the participants were male, and most (n=59) of the participants belonged to the age group of 66-75 yr. The severity of disease was graded using the GOLD staging system which classifies people with COPD based on their degree of airflow limitation (obstruction). The airflow limitation was measured during pulmonary function tests. Airflow limitation severity was established as per the GOLD criteria. Pulmonary function testing was carried out as per the American Thoracic Society and European Respiratory Society task force standardised lung function testing guidelines[10]. The QOL was measured using the SGRQ. Prior permission was obtained from The St. George's University of London/St. George's Hospital Medical School to use this questionnaire. The SGRQ is a 50-item disease-specific questionnaire designed to measure the impact on overall health, daily life and perceived well-being in patients with obstructive airway disease. It consists of two parts, with Part 1 covering the symptoms component (frequency and severity) and Part 2 covering the activities that cause or are

limited by breathlessness and impact components (social functioning and psychological disturbances), resulting from airway disease[11]. The scores range from 0 to 100, with higher scores indicating more limitations.

The Hindi translation of SGRQ was found to perform adequately well as an HRQOL instrument in Indian patients with COPD. Aggarwal *et al*[12] validated the HRQOL instruments for use in Indian patients with COPD. Accordingly, in our patients, the local language translations (Kannada, Malayalam and Hindi) of the SGRQ-C were used.

Data management and statistical analysis: Data were recorded on the SGRQ-C questionnaire and managed on an excel spreadsheet. The total and three component scores from the questionnaires were calculated as per the guidelines stated under the SGRQ-C manual[8]. Categorical variables were summarized as frequency (%); quantitative variables were assessed for approximate normality. All the quantitative variables were following normal distribution; therefore, these were summarized as mean±standard deviation. Bartlett's test was used to compare equality of variances between the groups. Student's t test was used to compare the component scores between males and females. One-way ANOVA followed by Bonferroni correction in *P* value was used to compare the various component scores between COPD grades and age categories. Multiple regression analysis was used to compute partial regression coefficients and its 95 per cent confidence interval. Multiple linear regression model was used to adjust for age and gender[13]. The data were analyzed using statistical software Stata 14.0 (StataCorp LLC., Texas, USA).

Results

The mean age of the participants was 70.5 yr, with an average age of the female participants (74.1 yr) being higher than that of the male participants (69.9 yr). Majority (40%) of the participants within the study sample suffered from moderate COPD and were classified under Stage 2 COPD as per the GOLD criteria. The mean total SGRQ-C score was calculated as 48.5±17.1.

As the grade of COPD worsened, the symptom, impact and, activity component scores and total score increased. The activity and, impact component scores and total score showed an increasing trend with age ($P<0.001$). However, the values of these three scores were lower in the participants in the age group of 56-65 yr in comparison to those in the 45-55 yr age group ($P<0.001$). Females were found to have slightly higher impact component score, activity component score and total score. The mean symptom component score, impact component score and total score of the patients >76 yr of age were significantly higher than patients belonging to the age groups 45-55, 56-65 and 66-75 yr. However, the activity component score for the same group was significantly higher than the age group of 56-65 and 66-75 yr only. The mean impact component score and total score of patients in the age group 66-75 yr were also higher than in the age group of 56-65 yr. The mean symptom, activity and impact component scores and total score of patients with grade 4 COPD were significantly ($P<0.001$) higher than grade 1, grade 2 or grade 3 COPD patients. The symptom component score, impact component score and total score for patients with grade 3 COPD were also significantly higher from those with grade 1 and grade 2 COPD (Table I).

In multivariate analysis (Table II), positive relationship between COPD grade and each of the component scores and total score was observed. The symptom component scores and total scores of patients with grades 2, 3 and 4 COPD were significantly higher in comparison to patients with grade 1 COPD when adjusted for gender and age ($P<0.001$). Similarly, the impact component score of patients with grades 3 and 4 COPD and the activity component score of grade 4 COPD alone were observed to be significantly higher when compared to patients with grade 1 COPD after adjusting for gender and age ($P<0.001$).

Discussion

This study showed an impaired HRQOL among the COPD patients using the SGRQ-C. The benefit of showing the best discrimination between COPD grades and its results being least influenced by the presence of co-morbidities[14].

In our study, the mean total SGRQ-C score was found to be 48.5±17.1. This score was comparable to a study conducted in India[15], which observed a mean total SGRQ-C score of 52.7±12.9. The reduction of HRQOL in COPD patients with increasing disease severity was comparable to earlier studies conducted globally[16-18]. The increase in all the three component scores in addition to the total scores with worsening grade of COPD could also indicate a decrease in

Table I. Comparison of the various component scores and total scores of the St. George's Respiratory Questionnaire for chronic obstructive pulmonary disease (COPD) with gender, age and COPD grade

Parameter	n	Symptom component score	Activity component score	Impact component score	Total score
Gender					
Male	86	58.6±21.4	49.4±17.9	43.4±18.9	47.9±16.7
Female	14	56.6±25.0	59.7±20.6	46.6±22.0	52.4±19.8
P	-	<0.752	<0.053	<0.567	<0.364
Age (yr)					
45-55	5	42.1±10.5	46.8±18.7	35.1±12.5	39.9±10.7
56-65	13	48.7±15.1	36.1±16.5	24.6±11.0	32.4±10.9
66-75	59	56.0±21.3	48.5±16.0	42.7±17.2[b]	46.9±14.7[b]
≥76	23	73.3±20.6[a,b,c]	66.0±16.5[b,c]	59.3±17.4[a,b,c]	63.8±15.6[a,b,c]
P	-	<0.001	<0.001	<0.001	<0.001
COPD grade					
1	20	41.6±15.1	41.3±12.9	28.9±12.4	34.9±8.0
2	40	51.9±16.5	45.4±16.1	36.4±14.2	41.9±12.1
3	21	65.3±20.1[x,y]	53.6±19.3	52.5±16.9[x,y]	55.1±15.6[x,y]
4	19	81.9±16.8[x,y,z]	69.3±14.7[x,y,z]	65.5±12.9[x,y,z]	69.6±11.8[x,y,z]
P	-	<0.001	<0.001	<0.001	<0.001
Total	100	58.4±21.8	50.8±18.6	43.8±19.2	48.5±17.1
P	-	<0.001	<0.001	<0.001	<0.001

Values are expressed as mean±SD. [a]significant difference from age 45-55; [b]significant difference from age 56-65; [c]significant difference from age 66-75; [x]significant difference from grade 1; [y]significant difference from grade 2; [z]significant difference from grade 3

Table II. Role of chronic obstructive pulmonary disease (COPD) grade on the various component scores and total score of St. George's Respiratory Questionnaire for COPD: Results of regression and multiple regression analysis

COPD grade	Symptom component score		Activity component score		Impact component score		Total score	
	Partial β* (95% CI)	*P*	Partial β* (95% CI)	*P*	Partial β* (95% CI)	*P*	Partial β* (95% CI)	*P*
1	Ref	-	Ref	-	Ref	-	Ref	-
2	11.8 (1.8-21.8)	0.021	4.5 (−4.5-13.4)	0.323	7.6 (−0.4-15.5)	0.062	7.4 (0.6-14.1)	0.032
3	23.4 (11.8-34.9)	<0.001	8.72 (−1.6-19.1)	0.098	20.6 (11.3-29.8)	<0.001	17.4 (9.6-25.2)	<0.001
4	36.8 (24.6-49.0)	<0.001	22.6 (11.7-33.5)	<0.001	30.6 (20.8-40.3)	<0.001	29.2 (21.0-37.5)	<0.001
R^2 (%)	40.7		30.5		48.5		53.0	

*Adjusted for gender and age. Ref, reference category; β, regression coefficient; R^2, multiple correlation coefficient; CI, confidence interval

HRQOL with duration of disease, as the symptoms tend to worsen with disease progression over time. The direct negative impact of disease duration in addition to disease severity on HRQOL in Indian COPD patients has been observed previously[16,19].

There was a reduction of HRQOL with increasing age. Others have shown a direct negative relationship between increasing age and HRQOL[16,17,], some have reported no correlation between the two[20,21], while Moy *et al*[22] have shown similar findings to ours.

Onset of COPD at a younger age may result in early onset of symptoms and complications due to the disease, and this may significantly contribute to the deterioration of the HRQOL of younger patients. Many symptoms such as muscle weakness and breathlessness have been found to be present in a high proportion in comparatively younger patients suffering from mild disease[23]. This was also supported by the findings of Watz *et al*[24] that physical activity and steps per day were found to be reduced in those with less severe

disease belonging to a younger age group among COPD patients.

Our study showed no significant difference between the scores among male and female patients. These findings were contrary to a previous study where the HRQOL was found to be reduced more in women with respiratory diseases when compared to men[25]. However, a similar study[16] conducted in north India concluded that gender played no role in the QOL of COPD patients, as was also observed in our study.

The findings of our study should be construed with caution due to small sample size of women participants (N=14). Even though all the patients enrolled into our study happened to be established cases of COPD on treatment, we did not consider the drugs and their combinations, treatment duration and their compliance into account. These could possibly be important variables when determining QOL scores in COPD patients. However, despite these limitations, the study had the strength of having been conducted on proven cases of COPD established using the GOLD criteria and the QOL being evaluated using a standardized questionnaire adapted to the local population.

Due to the irreversible and progressive nature of COPD, medical and surgical care alone results in little improvement of lung function or survival of the suffering individuals. Improving QOL in addition to providing medical care markedly improves the disease outcome[19]. Hence, interventions directed towards improving the QOL of patients need to be incorporated into treatment plans and nursing care to effectively reduce the burden of disease due to COPD in India.

In conclusion, this study concluded that a higher grade of COPD was associated with a significant increase in the symptoms, activity and impact component scores and the total SGRQ-C score of the patients. The onset of COPD at a younger age has a greater deterioration of HRQOL, most likely due to the early onset of symptoms and complications, thus implying that the HRQOL is impaired in patients with COPD, and even though HRQOL deteriorates with increasing severity of the disease, its early onset makes it more detrimental.

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References

1. Global Initiative for Chronic Obstructive Lung Disease; 2019. Available from: *http://www.goldcopd.org*, accessed on May 18, 2019.
2. GBD 2015 Chronic Respiratory Disease Collaborators. Global, regional, and national deaths, prevalence, disability-adjusted life years, and years lived with disability for chronic obstructive pulmonary disease and asthma, 1990-2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet Respir Med* 2017; *5* : 691-706.
3. India State-Level Disease Burden Initiative Collaborators. Nations within a nation: Variations in epidemiological transition across the states of India, 1990-2016 in the global burden of disease study. *Lancet* 2017; *390* : 2437-60.
4. Indian Council of Medical Research, Public Health Foundation of India, and Institute for Health Metrics and Evaluation. India: Health of the Nation's States — The India State-Level Disease Burden Initiative. New Delhi, India: ICMR, PHFI, and IHME; 2017.
5. World Health Organization. *Burden of COPD*. Available from: *http://www.who.int/respiratory/copd/burden/en/*, accessed on May 18, 2019.
6. Salvi S, Kumar GA, Dhaliwal RS, Paulson K, Agrawal A, Koul PA, *et al*. The burden of chronic respiratory diseases and their heterogeneity across the states of India: The global *burden of disease study 1990-2016. Lancet Glob Health* 2018; *6* : E1363-74.
7. Ferrer M, Villasante C, Alonso J, Sobradillo V, Gabriel R, Vilagut G, *et al*. Interpretation of quality of life scores from the St George's respiratory questionnaire. *Eur Respir J March* 2002; *19* : 405-13.
8. Meguro M, Barley EA, Spencer S, Jones PW. Development and validation of an improved, COPD-specific version of the St. George respiratory questionnaire. *Chest* 2006; *132* : 456-63.
9. Hulley SB, Cummings SR. *Designing clinical research*, 2nd ed. Philadelphia PA, USA Lippincott Williams & Wilkins; 2007.
10. Wanger J, Clausen JL, Coates A, Pedersen OF, Brusasco V, Burgos F, *et al*. Standardisation of the measurement of lung volumes. *Eur Respir J* 2005; *26* : 511-22.
11. American Thoracic Society (US). *St. George's Respiratory Questionnaire (SGRQ)*. Available from: *http://www.thoracic.org/assemblies/srn/questionaires/sgrq.php*, accessed on June 17, 2019.
12. Aggarwal AN, Agarwal R, Gupta D, Jindal SK. Validation of a Hindi translation of mini asthma quality of life questionnaire

in North Indian patients with bronchial asthma. *Indian J Chest Dis Allied Sci* 2010; *52* : 83-9.

13. Altman D. *Practical statistics for medical research*. 1st ed. London: Chapman & Hall; 1991. p. 277-309.
14. Wacker ME, Jörres RA, Karch A, Wilke S, Heinrich J, Karrasch S, *et al*. Assessing health-related quality of life in COPD: Comparing generic and disease-specific instruments with focus on comorbidities. *BMC Pulm Med* 2016; *16* : 70.
15. Negi H, Sarkar M, Raval AD, Pandey K, Das P. Health-related quality of life in patients with chronic obstructive pulmonary disease in North India. *J Postgrad Med* 2014; *60* : 7-11.
16. Ahmed MS, Neyaz A, Aslami AN. Health-related quality of life of chronic obstructive pulmonary disease patients: Results from a community based cross-sectional study in Aligarh, Uttar Pradesh, India. *Lung India* 2016; *33* : 148-53.
17. Miravitlles M, Molina J, Naberan K, Cots JM, Ros F, Llor C, *et al*. Factors determining the quality of life of patients with COPD in primary care. *Ther Adv Respir Dis* 2007; *1* : 85-92.
18. Hajiro T, Nishimura K, Tsukino M, Ikeda A, Oga T. Stages of disease severity and factors that affect the health status of patients with chronic obstructive pulmonary disease. *Respir Med* 2000; *94* : 841-6.
19. Shavro SA, Ezhilarasu P, Augustine J, Bechtel JJ, Christopher DJ. Correlation of health-related quality of life with other disease severity indices in Indian chronic obstructive pulmonary disease patients. *Int J Chron Obstruct Pulmon Dis* 2012; *7* : 291-6.
20. Engström CP, Persson LO, Larsson S, Sullivan M. Health-related quality of life in COPD: Why both disease-specific and generic measures should be used. *Eur Respir J* 2001; *18* : 69-76.
21. de Miguel Díez J, Izquierdo Alonso JL, Rodríguez González-Moro JM, de Lucas Ramos P, Bellón Cano JM, Molina París J. Quality of life with chronic obstructive pulmonary disease: The influence of level of patient care. *Arch Bronconeumol* 2004; *40* : 431-7.
22. Moy ML, Reilly JJ, Ries AL, Mosenifar Z, Kaplan RM, Lew R, *et al*. Multivariate models of determinants of health-related quality of life in severe chronic obstructive pulmonary disease. *J Rehabil Res Dev* 2009; *46* : 643-54.
23. Kharbanda S, Ramakrishna A, Krishnan S. Prevalence of quadriceps muscle weakness in patients with COPD and its association with disease severity. *Int J Chron Obstruct Pulmon Dis* 2015; *10* : 1727-35.
24. Watz H, Waschki B, Meyer T, Magnussen H. Physical activity in patients with COPD. *Eur Respir J* 2009; *33* : 262-72.
25. de Torres Tajes JP, Casanova C, Hernandez C, Abreu J, Montejo de Garcini A, Aguirre-Jaime A, *et al*. Gender associated differences in determinants of quality of life in patients with COPD: a case series study. *Health Qual Life Outcomes* 2006; *4* : 72.

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