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Health-Related Quality of Life in Patients with Non-Cystic Fibrosis Bronchiectasis: A Cross-Sectional Observational Study.

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ABSTRACT

Background: Bronchiectasis is a chronic, progressive lung disease causing irreversible bronchial dilatation, impaired mucociliary clearance, and recurrent infections, leading to physical and psychosocial limitations. Assessing health-related quality of life (HRQoL) is crucial for understanding the disease burden.

Methods: A cross-sectional study was conducted on 100 HRCT-confirmed non-cystic fibrosis bronchiectasis patients aged 45–80 years at Gulab Devi Educational Complex, Lahore. HRQoL was assessed using the SF-36 questionnaire, and data were analyzed in SPSS 26 using descriptive statistics and chi-square tests.

Results: The mean age was 58.10 ± 8.86 years; 54% were male. Overall, 92% reported poor general health, and 64% reported deterioration compared to the previous year. Physical limitations were common, with 97% unable to perform vigorous or moderate activities, 95% limited in work, and 93% having difficulty performing daily tasks. Social activities were restricted in 62%, and 89% reported significant emotional distress. Most (99%) could not walk more than a mile, with substantial limitations in climbing stairs, carrying groceries, and self-care. No significant associations were observed between gender and HRQoL domains ($p > 0.05$).

Conclusion: Bronchiectasis markedly reduces HRQoL across physical, social, and emotional domains, irrespective of gender. These findings highlight the need for multidisciplinary interventions to improve functional status and well-being.

Keywords: Bronchiectasis, Health-related quality of life, Physical limitations, Emotional health, and Short Form-36.

INTRODUCTION

Bronchiectasis is a chronic, progressive respiratory disease characterized by irreversible bronchial dilatation and impaired mucociliary clearance resulting from a process of alternating infection and inflammation (1). The underlying etiology in bronchiectasis could involve cystic fibrosis (CF), alpha-1-antitrypsin deficiency, primary ciliary dyskinesia, allergic bronchopulmonary aspergillus, connective tissue disorders, inflammatory bowel diseases, congenital malformations, aspiration, humoral immunodeficiency, post-infectious, and idiopathic causes (2).

CF and non-CF bronchiectasis (NCFB), both interlinked between inflammation and infection, sustains pro-inflammatory vicious cycle that increases the production of bronchiectasis and pulmonary structural destruction (3). Inflammatory immune cells (essentially activated macrophages and neutrophils) are the predominant infiltrating cell population in a disease state complicated by bronchiectasis and a significant cause of tissue damage and bronchiectasis production via discharge of their cytotoxic cellular contents (4). Specifically, proteases derived from cells and reactive oxygen species are crucial mediators of the degradation and destruction of extracellular pulmonary tissue that results in the development of bronchiectasis. The exact early immune-mediated processes of initiating and sustaining the development of bronchiectasis are still poorly understood (5). Regulated immune homeostasis appears to be critical, as both immune deficiencies and hyper-reactive immune responses are linked to bronchiectasis (6).

NCFB patients were estimated to be chronically colonized with *Pseudomonas aeruginosa* in about 25% of cases (7). Along with *Pseudomonas, Haemophilus, Streptococcus, Staphylococcus, Veillonella, Prevotella,* and *Achromobacter* make up the core of the bronchiectasis microbiota (8). Interestingly, *Pseudomonas aeruginosa* and *Haemophilus influenzae* are known to inhibit each other and so alter the core microbiota in the airway of NCFB patients. Another significant group of pathogens colonizing CF and non-CF airways is *Tuberculous Mycobacterium* (NTM). With CF, *Mycobacterium avium complex* and *Mycobacterium abscessus* are the most frequently isolated and these organisms have high rates of multidrug resistance, which makes treatment incredibly difficult (9).

Colonization by *Pseudomonas aeruginosa* was correlated with unfavorable outcomes in patients with bronchiectasis, which included more extensive and severe bronchiectatic changes on imaging, a decline in lung function, and increased hospitalization stay. The severity of NCFB was classified using two validated scores: the age, forced expiratory volume in 1 second (FEV1), colonization, extension, dyspnea (FACED) score, and the bronchiectasis severity index (BSI) (10).
Pseudomonas aeruginosa Colonization is also a component of BSI and FACED scores, which are predictive of future prognosis and hospitalization. BSI is made up of the clinical history of hospitalization and exacerbation, body mass index (BMI), and Medical Research Council Dyspnea Scale score (MMRC).

The FACED score used to measure mortality prediction involves FEV1, age, *Pseudomonas aeruginosa* colonization, radiological extension, and dyspnea. *Pseudomonas aeruginosa* colonization is a valuable predictive factor for adverse prognosis, additionally helping to increase the risk of hospitalization and increased mortality rate (11).

Repeated chronic inflammatory damage to the airways leads to tissue breakdown, dilation of affected airways, mucociliary clearance inefficiency, and endogenous antimicrobial immunity, allowing survival of bacteria within the airways. The presence of bacteria causing continuously damages the airway structure, and the key clinical symptoms are chronic productive cough and shortness of breath (12). Bronchiectasis is characterized by an incessant and excessive discharge of purulent sputum. Dyspnea is variable and depends on the extent of involvement and the underlying disease. Mild hemoptysis is common; however, more severe forms are also possible. These symptoms impact HRQL (2, 13).

Bronchiectasis has three major anatomical patterns. In cylindrical bronchiectasis, the airway wall is regularly and uniformly dilated. In varicose bronchiectasis, there is irregular pattern with alternating areas of constriction and dilation. In cystic bronchiectasis, there is progressive, distal enlargement of the airways that results in saclike dilation. Bronchial dilation progresses and results in ballooning of bronchi that end in fluid or mucus-filled sacs (14). Radiographic studies confirm the diagnosis by showing airway dilation. A chest radiograph may show cystic spaces.

The gold standard for confirming the diagnosis is a high-resolution computed tomography scan (HRCT) of the chest, ideally done when the patient is clinically stable (15). HRCT is the diagnostic standard. Bronchoscopy is sometimes required to evaluate the cause of hemoptysis (16).

The worldwide prevalence has continued to rise over the years. The effect could be at least partly attributed to rising awareness of disease and improvements in imaging modalities. When we look at bronchiectasis on a global scale, it turns out that women are more affected, with reports showing a prevalence rate between 51.6% and 68.0%. Additionally, this condition tends to become more common as people age, jumping from 4.2 to 43.4 cases per 100,000 individuals in the 18 to 34 age group, all the way up to 153 to 1,365 cases per 100,000 for those aged 65 to 75 and older (17).

Bronchiectasis is a distinct, heterogeneous condition. Quality of life is deeply personal and specific to an individual. For patients, their quality of life is not just about the number of physical symptoms they experience or how often they occur; it's also shaped by social, psychological, and other individual factors. Some of the significant ways bronchiectasis influences patients' quality of life include feelings of social embarrassment, disruptions in sleep, changes to daily routines, alterations in holiday plans, and anxiety regarding flare-ups (18).

Due to symptoms, the patient is unable to go out as the patient has severe hemoptysis and breathlessness, and he or she is restricted at home. Nighttime symptoms interfere with sleep significantly. Uncertainty of an exacerbation is a major cause of anxiety and depression for the patient and his or her family, especially around organizing travel and family activities. Anxiety and fear of exacerbation greatly affect the quality of life, as patients have no objective measurements of their symptoms (19).

HRQoL is a more inclusive, patient-focused evaluation; however, there is limited data available in South Asian populations where healthcare and cultural factors could impact the outcome. This study intends to evaluate HRQoL in patients of NCFB and investigate its correlation with demographic, clinical, and functional parameters, thus informing evidence-based, targeted interventions and enhancing patient-focused care.

METHODOLOGY

An Observational cross-sectional study conducted at the Pulmonology Department of Gulab Devi Educational Complex, Lahore, from February 10, 2025, to August 9, 2025, A total of **100 patients** diagnosed with NCFB were included in the study.

sample size= $\boldsymbol{n} = \frac{Z^2\frac{\alpha}{2}pq}{\rho^2}$ (Cochrane-equation)

Where n = required sample size
Z = standard normal variate at 95% confidence level (Z = 1.96)
p = estimated prevalence of the attribute (assumed as 0.50 due to lack of prior local data)
q = 1 − p (0.50)
d = margin of error (0.10)

$$n = \frac{(1.96)^2 \times 0.50 \times 0.50}{(0.10)^2} = 96$$

Participants were recruited using a **non-probability purposive sampling technique** over a six-month period. Ethical approval was obtained prior to data collection, and all patient information was handled confidentially.

Inclusion criteria:

1. Either gender of Age 45-80 years (20).
2. Confirmed diagnosis of bronchiectasis by HRCT and clinical assessment.
3. Clinically stable (no exacerbations in the last 4 weeks).

Exclusion criteria:

1. Acute exacerbation at the time of recruitment.
2. Bronchiectasis patients with significant co-morbidities such as Cardiovascular diseases, Cystic fibrosis, Malignancy, Asthma, Chronic obstructive pulmonary disease.
3. Significant cognitive impairment affecting questionnaire response.

Data Collection

Data was collected through **face-to-face interviews**, anthropometric and clinical measurements (weight, height, BMI, vital signs, and pulmonary function test parameters), and review of patient medical records. Health-related quality of life was assessed using the **SF-36 questionnaire.** Study variables included age, gender, cough, dyspnea, physical limitation, and anxiety.

Statistical Analysis

Data were analyzed using **SPSS version 26**. Descriptive statistics were applied, with means and standard deviations calculated for continuous variables (age, BMI, and SF-36 domain scores), while frequencies and percentages were used for categorical variables (gender, cough, dyspnea, and physical limitations). The **Chi-square test** was employed to assess differences in physical functioning, emotional health, and social activity across gender categories. Results were presented using tables, graphs, and charts. A **p-value < 0.05** was considered statistically significant.

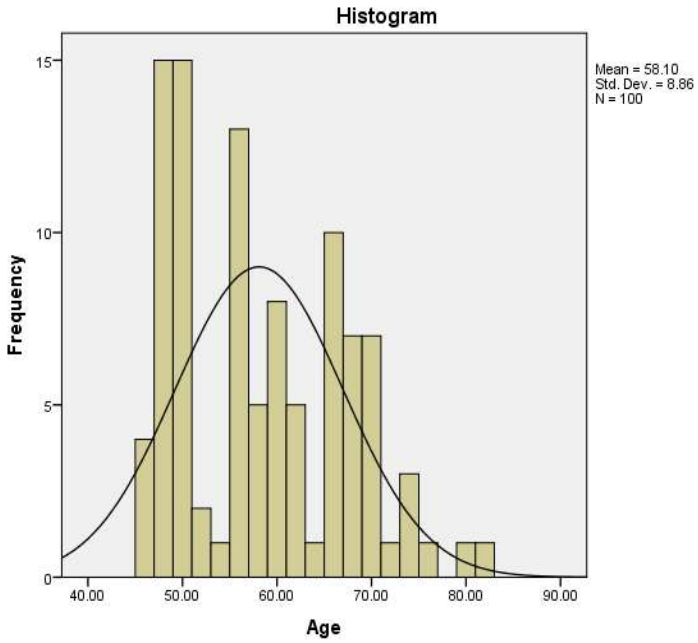

Figure 1: Frequency distribution of age

In this study, 54(54%) were male and 46(46%) were female.

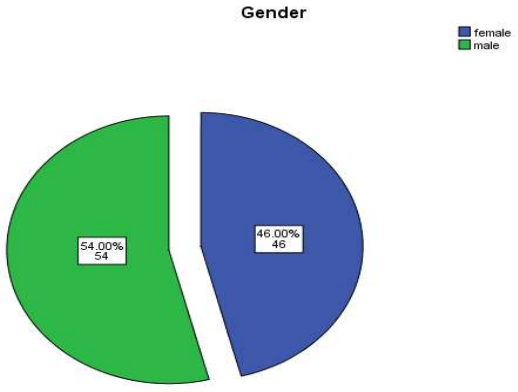

Figure 2: Frequency distribution of gender

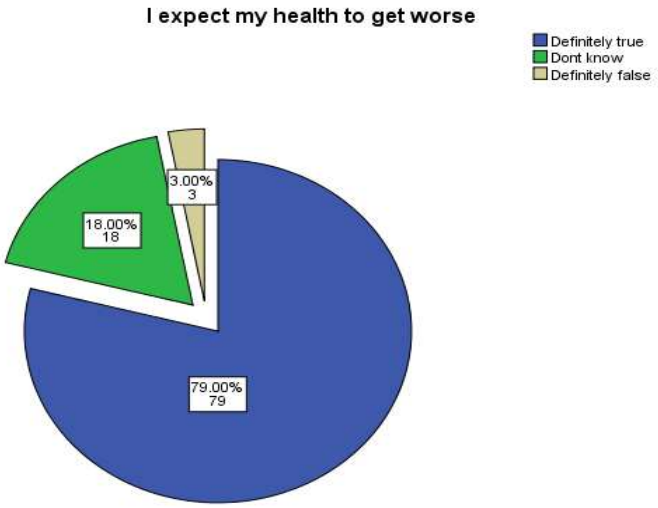

Figure 3: Frequency distribution of health worsening

In this study, most patients, 79 (79%), perceived worsening health status, whereas 18 (18%) were unsure about their health status, and 3 (3%) reported good health.

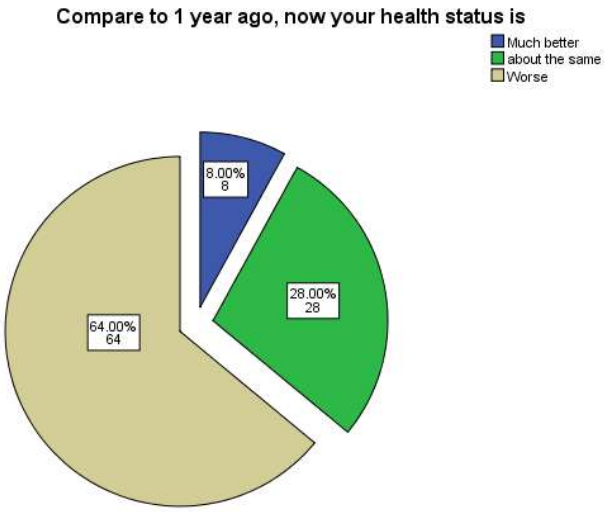

Figure 4: Frequency distribution of health status comparison

Relative to one year prior, health status had worsened in 64 (64%) patients, remained unchanged in 28 (28%), and improved in 8 (8%).

Table 1: Association between Gender and Perceived Future Health Status in Patients with NCFB

Gender		I expect my health to get worse			P-value
		Definitely true	Don't know	Definitely false	
	Female	37	8	1	0.861
	Male	44	8	2	
Total		81	16	3	

The chi-square test revealed no statistically significant association between gender and the response to the statement "I expect my health to get worse" $p > 0.05$ (Table 1).

The chi-square test showed that there was no statistically significant correlation between gender and the feeling of worsening health ($p = 0.861$, > 0.05). It indicates that male and female study participants gave the same response when questioned about whether they would experience worsening health in the future. A high percentage of both males (81.5%)

and females (80.4%) responded with "Definitely true," showing a pessimistic attitude toward future health for most participants, irrespective of sex. Few participants chose "Definitely false" (2.2% of females and 3.7% of males), possibly indicating a lack of optimism concerning preserving health in this population. The comparatively high proportion of "Don't know" answers (17.4% among females and 14.8% among males) indicates an extent of uncertainty in predicting personal health outcomes, which may be caused by disease progression, treatment history, or poor health awareness.

In general, findings indicate that in this sample of NCFB patients, negative health expectations are prevalent and are not determined by gender. This emphasizes the necessity for patient education and psychological support to challenge negative health expectations among both men and women.

Table 1.1: Association between Gender and Limitation in Work or Other Activities in Patients with NCFB

Gender		Were limited in the kind of work or other activities		P-value
		No	Yes	
	Female	1	45	0.65
	Male	2	52	
Total		3	97	

Physical functioning was more affected in males than in females, but the association with gender was not statistically significant ($p > 0.05$) (Table 1.1).

Table 1.2: Association between Gender and Limitation in Social Activities among NCFB Patients

Gender		Social activities like visiting with friends		P-value
		Limited a lot	Limited a little	
	Female	26	20	0.298
	Male	36	18	
Total		62	38	

Social activities were more often "limited a lot" in males than females, but the association between gender and social activity limitation was not statistically significant ($p > 0.05$) (Table 1.2).

Out of 100 patients with NCFB, 62% said they had their social activities, like going out to see friends, "limited a lot," and 38% had only "limited a little". Among the females, 26 (56.5%) were "limited a lot" and 20 (43.5%) were "limited a little." For males, there was a higher percentage of "limited a lot" at 36 (66.7%), with 18 (33.3%) reporting "limited a little." The chi-square test identified no statistically significant gender-limitation association in social activities ($p = 0.298$, $p > 0.05$), suggesting that while the males seemed to be slightly more limited in social activity, the difference was not large enough to be statistically significant.

Table 1.3: Association between Gender and Emotional Well-being among NCFB

Gender		Have you felt so down that nothing could cheer you up		P-value
		No	Yes	
	Female	7	39	0.213
	Male	4	50	
Total		11	89	

Emotional well-being impairment was common in both genders, with no significant association found ($p > 0.05$) (Table 1.3).

In this study, cross-tabulation of gender with emotional health shows male mental health is more affected than female. (P>0.05), hence result shows that emotional health of bronchiectasis patients has no significant association with gender.

DISCUSSION

This study demonstrates that patients with NCFB experience substantial impairments across multiple domains of HRQoL, with physical, social, and emotional limitations being highly prevalent. The overwhelming majority reported poor general health, severe restrictions in daily functioning, and reduced social participation. These findings are consistent with previous studies, which have shown that bronchiectasis imposes a high burden and functional disability due to chronic respiratory symptoms, recurrent infections, and progressive lung damage.

Quality-of-life measures in clinical trials and practices assess the impact of disease and the response to treatment. All questionnaires have their strengths and limitations. By comparing them, we have been able to derive a template for the "ideal" quality-of-life measure for bronchiectasis patients. We found that the Short Form-36 (SF-36) was the most used quality-of-life questionnaire for bronchiectasis patients (21). HRQoL is greatly diminished in bronchiectasis, but there are few standardized and disease-specific instruments available for frequent use. The Bronchiectasis Health Questionnaire (BHQ), however, was developed and validated by Spinou et al. (2017) and is a straightforward 10-item scale that produces a single composite score. It had excellent internal consistency (Cronbach's α=0.85), high validity against the St George's Respiratory Questionnaire (r = -0.82), and marked correlations with clinically significant outcomes such as exacerbations, hospitalizations, bacterial colonization, and radiological disease extent. Its reliability, intra-class correlation coefficients (ICC) = 0.89, also makes it suitable for both clinical monitoring and research. In comparison to the generic measures SF-36, which evaluates general health domains but is insensitive to bronchiectasis-related changes, the BHQ is more sensitive and patient-focused. Likewise, although the Quality of Life - Bronchiectasis (QOL-B) survey is exhaustive, its 37 items constrain utility in busy clinics. The BHQ, with just 10 items, provides a quick, valid, and internationally applicable measurement, and thus represents a useful contribution for assessing HRQoL in bronchiectasis patients. SF-36 is a self-report questionnaire made up of 36 statements in 8 health domains, namely general health, physical functioning, limitation of activities, bodily pain, vitality, social functioning, emotional health problems, and mental health. We chiefly focus on 4 domains, having 21 statements, i.e., general health, physical functioning, limitations of activities, and emotional health problems. It results from a variety of underlying disorders occurring in all ages and with a very variable clinical course (22).

Our study included 100 patients with bronchiectasis, with a mean age of 58.10 ± 8.86 years; 54% were male and 46% female. Overall, 92% patients had poor health status, while 8% patients had good health status. In comparison to 1 year

ago, 64% of the patients had worsened health, 28% had the same, and 8% had much better health. 94% patients became ill a little bit more easily than other individuals, while 6% patients did not. 79% patients feel that their health has been worsening, 18% did not know, and 3% patients feel their condition would improve. 93% patients did not feel as healthy as anyone they know, and 7% did not know. Gender has no significant correlation with general health (P>0.05). These results are consistent with more recent literature indicating that bronchiectasis patients have severely compromised quality of life, especially in physical, role, vitality, emotion, and social aspects, especially in patients with poorer dyspnea scores, frequent exacerbations, and greater disease extent. Compared to literature, our results confirm that bronchiectasis has a strong negative impact on overall health perception. While some studies suggest that specialized care can improve certain quality-of-life domains, most patients still experience poor health status. This highlights the importance of regular quality-of-life assessments, such as the BHQ, in managing the disease effectively (23).

94% patients at that time, they used to work had lessened, while 6% did work normally. 97% were unable to finish work on time, less than they wanted, while 3% did work normally. Bronchiectasis patients had much physical limitations. 95% patients were restricted in work, while 5% were not restricted in work. 93% were unable to do the work, while 7% patients were unaffected. There is no significant gender association with physical activities (P>0.05). These trends are consistent with recent evidence demonstrating that bronchiectasis results in significant impairment in physical function and daily activity. For example, such patients have significantly lower activity levels and daily steps compared to healthy people, and impaired exercise tolerance is strongly correlated with dyspnea and poor lung function. This emphasizes the profound influence of bronchiectasis on work and activity performance by patients (24).

Physical limitations, particularly in activities requiring endurance or strength, were reported by nearly all participants. This aligns with earlier work indicating that reduced exercise tolerance in bronchiectasis is linked to airflow obstruction, muscle deconditioning, and fatigue. Most patients experienced marked limitations in daily functioning. Specifically, 97% were unable to perform vigorous or moderate activities, and 93% could not climb several flights of stairs, while 87% had major difficulty with one flight of stairs. Walking long distances was highly restricted, with 99% limited in walking more than a mile, 97% in walking several blocks, and 80% in walking a single block. Similarly, 80% reported severe limitations in carrying groceries and in bathing/dressing, while 62% faced major restrictions in social activities. In contrast, 1–20% of patients reported only minimal limitations. No significant association was observed between gender and social activities (P>0.05). Bronchiectasis patients showed substantially lower pulmonary function, muscle strength, exercise capacity, step count, and Physical Activity duration compared with controls ($p < 0.05$). International Physical Activity Questionnaire (IPAQ) underestimated physical activity compared with Sense Wear Armband, and this suggests a requirement for disease-specific Physical Activity assessment tools (25).

89% patients did not do work as carefully as usual, and nothing could cheer them up, whereas 11% patients did not have any effect. There is no significant association of gender with emotional health (P>0.05). A previous study showed 103 patients were enrolled (52.4% male, mean age 49.1 ± 14.4 years). Prior pulmonary tuberculosis was the most common cause (49.5%). Chronic productive cough (95.1%) was the most common symptom, followed by dyspnea (86.4%) and exacerbations (79.6%); half had been hospitalized in the previous year. Anxiety (22.3%) and depression (31.1%) were prevalent and strongly related to severe disease. HRQoL scores were low in all areas and showed a strong negative effect for psychological distress, with anxiety and social interaction being the exceptions (26). Emotional distress was common in our Study, with patients indicating a severe feeling of "being so down that nothing could cheer them up," and gender played no significant role (P>0.05) in impairments in emotion or body, implicating that disease burden, for HRQoL decline in bronchiectasis. Anxiety and emotional stress are independent predictors of health-related quality of life in patients with bronchiectasis. This evidence demonstrating that psychological symptoms like depression and anxiety are very common among bronchiectasis patients and predict poorer HRQoL independently of age, gender, and lung function parameters. In combination, these results attest to the necessity for an integrated, multidisciplinary model of medical management,

pulmonary rehabilitation, and psychosocial intervention to treat the wide-ranging and long-term influence of bronchiectasis on patients' lives (24).

CONCLUSION

Patients with bronchiectasis had lower HRQoL scores. As the disease progresses, impairments in physical functioning worsen, leading to a decline in the ability to perform even routine activities. This not only restricts social participation but also has a considerable negative impact on mental health. The disease burden was high in all aspects and did not vary significantly by gender, indicating that the effect is largely explained by disease severity. These results emphasize the need for comprehensive care, including medical treatment, pulmonary rehabilitation, and psychosocial support, to improve the quality of life in bronchiectasis patients.

RECOMMENDATIONS

Regular follow-up and personalized care strategies might be beneficial in reducing disease-related problems and increasing functional ability in these patients. Moreover, future research should focus on longitudinal and multicenter studies using disease-specific quality-of-life to better evaluate treatment outcomes and disease progression.

LIMITATIONS

This study also has some limitations that need to be mentioned because it is a cross-sectional study in nature; it is not possible to establish causal relationships or identify changes in health-related quality of life. Since it is non-probability purposive sample and it is centred in a single organization, it may affect its generalizability. It did not use disease severity and did not conduct long-term follow-ups; it is limited in terms of interpreting its results.

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CONFLICT OF INTEREST

The authors declare no conflict of interest related to the content, data sources, or affiliations presented in this paper.

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