The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
19(3): 254-258, 2024
www.thebioscan.com

Nutritional Status in Bronchiectasis Patients Before and After Pulmonary Rehabilitation: A Retrospective Study

Mrs. G. Malathi [1]*, Dr. Sathiyalatha Sarathi [2], Dr. V. Hemavathy [3]

[1]*Ph.D. Scholar (Nursing), Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India.

[2] Research Guide, Vice Principal cum HOD of Obstetrics and Gynaecological Nursing,

Sree Balaji college of Nursing, Chennai

[3] Research Co-Guide, Principal, Department of psychiatric Nursing, Sree Balaji college of Nursing, Chennai

Corresponding Author: Mrs. G. Malathi

DOI: https://doi.org/10.63001/tbs.2024.v19.i03.pp254-258

KEYWORDS
Nutritional status, bronchiectasis, pulmonary rehabilitation

Received on:

11-08-2024

Accepted on:

12-09-2024

Published on:

16-10-2024

ABSTRACT

Background: Nutritional status is a critical aspect of patient management in bronchiectasis, a chronic airway disease shaped by recurrent pulmonary infections and inflammation.

Aim: The aim of the study was to evaluate the impact of pulmonary rehabilitation on the nutritional status and clinical outcomes of patients with bronchiectasis.

Methodology: This retrospective cohort study included 75 patients with bronchiectasis who underwent pulmonary rehabilitation at our institution. Patients were eligible if they were 18 years or older, had a confirmed diagnosis of bronchiectasis, and had pre- and post-rehabilitation clinical data available. The pulmonary rehabilitation program, lasting 6-8 weeks, included exercise training, education on bronchiectasis management, and nutritional counselling.

Results: Pulmonary rehabilitation significantly improved the nutritional status and clinical outcomes of 75 bronchiectasis patients. BMI increased from 22.4 to 23.0 kg/m² ($p = 0.03$), serum albumin rose from 36.5 to 38.2 g/L ($p = 0.02$), and handgrip strength improved from 26.5 to 29.0 kg ($p = 0.04$). Exacerbation frequency decreased from 3.2 to 2.4 per year ($p = 0.01$). However, changes in caloric and protein intake were not statistically significant.

Conclusion: The study concluded that pulmonary rehabilitation improves nutritional status, muscle strength, and reduces exacerbation frequency in bronchiectasis patients, enhancing overall disease management and quality of life.

INTRODUCTION

Nutritional status is a critical aspect of patient management in bronchiectasis, a chronic airway disease shaped by recurrent pulmonary infections and inflammation. The importance of proper nutrition becomes evident as malnutrition not only exacerbates respiratory symptoms but also complicates the overall management of the disease. A growing body of evidence highlights how pre-existing nutritional deficits can lead to poorer clinical outcomes, including increased exacerbation rates and prolonged recovery times following acute episodes in bronchiectasis patients (Wang et al., 2024; , Yang et al., 2021). Studies indicate that bronchiectasis itself can result in a state of systemic inflammation, manifested as decreased nutritional intake and altered metabolism, further complicating the nutritional status of affected individuals (Wang et al., 2024; , Yang et al., 2021).

Several studies underline the impact of nutritional status on immediate and long-term outcomes for patients with bronchiectasis. For instance, Cai et al. underline those preoperative nutritional statuses, evaluated through the controlling nutritional status score (CONUT), serve as independent predictors of postoperative complications in patients undergoing lung resections due to bronchiectasis (Cai et al., 2023). This connection suggests that nutritional interventions could be vital in optimizing surgical outcomes. In line with this, it has been observed that patients with lower body mass index (BMI) face higher mortality risks, conveying the essential relationship between adequate nutrition and overall survival in this cohort (Wang et al., 2024). Additionally, being underweight has been indicated as a clear risk factor for developing bronchiectasis, highlighting the intricate links between nutritional status and disease manifestation (Yang et al., 2021).

The post-rehabilitation phase presents an opportunity to re-evaluate and, where necessary, enhance nutritional strategies. Emerging research indicates that pulmonary rehabilitation programs that incorporate nutritional counseling may improve both muscle mass and functional outcomes for bronchiectasis patients. For example, Seo et al. reported that integrating nutritional supplementation within rehabilitation programs significantly improved handgrip strength and mid-arm muscle circumference, which are markers of skeletal muscle mass and overall physical function (Seo et al., 2024). Moreover, following rehabilitation, a more significant portion of patients displayed favorable changes in their serum prealbumin levels, a sensitive marker of nutritional status (Li et al., 2020).

In the context of nutritional biomarkers, serum albumin and prealbumin emerge as prominent indicators. Low levels of serum albumin not only indicate poor nutritional status but also correlate with higher rates of hospitalization among bronchiectasis patients (Ju et al., 2021). Such findings emphasize the need for continuous monitoring of these nutritional markers alongside routine clinical assessments in this patient group. Furthermore, the implications of systemic inflammation cannot be overstated; the inflammatory milieu associated with bronchiectasis can deplete vital nutrients and proteins that are crucial for an effective immune response, thus perpetuating a cycle of exacerbation and malnutrition (Cai et al., 2023).

Moreover, the nuanced relationship between gender and nutritional statuses in bronchiectasis patients offers additional layers to this discourse. Wang et al. conducted a study that elucidated differences in nutritional status and inflammatory biomarkers between genders, revealing that female patients often had distinct nutritional challenges compared to their male counterparts, which may necessitate gender-tailored nutritional interventions (Wang et al., 2021). These findings were echoed in various studies that indicated females with bronchiectasis might present with certain immunologic and nutritional profiles that heighten their disease susceptibility and exacerbate their overall health status (Wang et al., 2021).

In the course of managing bronchiectasis, the role of comprehensive and individualized nutritional assessments cannot be ignored. Nutritional screening tools such as the Mini Nutritional Assessment (MNA) or the Subjective Global Assessment (SGA) take on added significance. Utilizing these tools can help identify at-risk patients earlier in their clinical journey, subsequently guiding tailored nutritional interventions (Seo et al., 2024). Ensuring a multidisciplinary approach that includes dietitians alongside respiratory therapists can yield substantial benefits, fostering better adherence to dietary recommendations and enhancing rehabilitation outcomes in bronchiectasis patients.

Physical activity, a cornerstone in pulmonary rehabilitation, is significantly influenced by nutritional status. The role of adequate nutrition in supporting exercise capacity has been emphasized in studies investigating exercise tolerance in bronchiectasis (Bar-Yoseph et al., 2019). Poor nutritional status can limit muscle function, fatigue, and stamina, thereby reducing a patient's ability to participate fully in rehabilitation. Therefore, it is vital that pulmonary rehabilitation integrates nutritional optimization alongside exercise to enhance physical performance and quality of life for bronchiectasis patients (Seo et al., 2024).

Patients exhibiting significant muscle wasting, or sarcopenia, are particularly vulnerable, requiring focused nutritional strategies to mitigate losses in muscle mass and strength (Seo et al., 2024). A cohort study reported substantial improvements in physical performance when nutritional interventions, particularly those enhancing protein intake, were integrated into rehabilitation programs (Seo et al., 2024). Following rehabilitation, many patients demonstrate improvements in both their pulmonary function and nutritional statuses, indicating the necessity of such programs in managing chronic lung diseases like bronchiectasis (Yang et al., 2021).

In conclusion, the intersection of nutritional status and bronchiectasis management is multifaceted and warrants attention from healthcare providers. Regular surveillance of nutritional parameters, integrated rehabilitation efforts, and individualized dietary strategies can substantially improve clinical outcomes and enhance the quality of life for these patients. A dynamic and patient-centered approach is crucial, considering the varying needs inherent in this diverse patient population.

MATERIALS AND METHODS

This retrospective cohort study included 75 patients with bronchiectasis who underwent pulmonary rehabilitation at our institution. Patients were eligible if they were 18 years or older, had a confirmed diagnosis of bronchiectasis, and had pre- and post-rehabilitation clinical data available. The pulmonary rehabilitation program, lasting 6-8 weeks, included exercise training, education on bronchiectasis management, and nutritional counselling.

Nutritional status was assessed by measuring body mass index (BMI), serum albumin levels, handgrip strength, and dietary intake (via 24-hour food recall). Data were collected at two time points: before and after rehabilitation. Paired t-tests and Chi-square tests were used for statistical analysis, with a significance threshold of $p < 0.05$.

RESULTS

Demographic variables:

The Demographic table provides an overview of the baseline characteristics of 75 bronchiectasis patients before pulmonary rehabilitation. The average age was 62.3 years, with a fairly balanced gender distribution (40 males, 35 females). Most patients were former smokers (46.7%) or current smokers (37.3%). Comorbidities were common, with hypertension (42.7%) and cardiovascular disease (29.3%) being the most prevalent. The leading causes of bronchiectasis were post-infectious (53.3%) and idiopathic (24%). A majority (69.3%) had chronic exacerbations, and 84% had not previously participated in pulmonary rehabilitation.

Clinical and nutritional characteristics

The Nutritional Status Table compares key nutritional and clinical parameters before and after pulmonary rehabilitation. BMI, serum albumin, and handgrip strength significantly improved after rehabilitation ($p < 0.05$), indicating better nutritional and muscle status. There was a slight, but not significant, increase in daily caloric and protein intake. Additionally, the frequency of exacerbations decreased significantly ($p = 0.01$), suggesting that rehabilitation not only improved nutritional status but also reduced disease flare-ups.

Table 1: Demographic data

Variable	Pre-Rehabilitation (n=75)
Age (years)	62.3 ± 10.4
Gender (M/F)	40/35
Smoking Status	
- Current Smokers (%)	28 (37.3%)
- Former Smokers (%)	35 (46.7%)
- Never Smokers (%)	12 (16.0%)
Comorbidities	
- Hypertension (%)	32 (42.7%)
- Diabetes Mellitus (%)	15 (20.0%)

- Cardiovascular Disease (%)	22 (29.3%)
- Osteoporosis (%)	18 (24.0%)
Etiology of Bronchiectasis	
- Post-infectious (%)	40 (53.3%)
- Idiopathic (%)	18 (24.0%)
- Cystic Fibrosis (%)	7 (9.3%)
- Autoimmune Disease (%)	5 (6.7%)
- Other (%)	5 (6.7%)
Severity of Disease	
- Mild (FEV1 > 80% predicted)	18 (24.0%)
- Moderate (FEV1 50-80%)	38 (50.7%)
- Severe (FEV1 < 50%)	19 (25.3%)
Presence of Chronic Exacerbations	
- Yes (%)	52 (69.3%)
- No (%)	23 (30.7%)
Previous Pulmonary Rehabilitation	
- Yes (%)	12 (16.0%)
- No (%)	63 (84.0%)

Table 2: Clinical, and nutritional characteristics of the patients before and after pulmonary rehabilitation.

Variable	Pre-Rehabilitation (n=75)	Post-Rehabilitation (n=75)	P-Value
BMI (kg/m²)	22.4 ± 3.1	23.0 ± 3.3	0.03
Serum Albumin (g/L)	36.5 ± 4.2	38.2 ± 4.3	0.02
Handgrip Strength (kg)	26.5 ± 8.4	29.0 ± 7.9	0.04
Daily Caloric Intake (kcal)	1,800 ± 320	1,850 ± 330	0.12
Protein Intake (g/day)	72.3 ± 12.5	75.2 ± 13.0	0.09
Exacerbation Frequency (per year)	3.2 ± 1.3	2.4 ± 1.1	0.01

DISCUSSION

The findings of the study presented illustrate a significant enhancement in both nutritional and clinical outcomes for bronchiectasis patients undergoing pulmonary rehabilitation. Specifically, the data showing an increase in Body Mass Index (BMI) from 22.4 ± 3.1 kg/m² to 23.0 ± 3.3 kg/m² ($p = 0.03$) and serum albumin levels rising from 36.5 ± 4.2 g/L to 38.2 ± 4.3 g/L ($p = 0.02$) supports improvements in nutritional status, which are essential indicators of health in chronic disease management (Chalmers et al., 2019; , Zanini et al., 2015). Previous studies have documented the correlation between adequate nutritional status and improved clinical outcomes in bronchiectasis; nutrition influences immune responses and overall health, potentially mitigating the frequency and severity of exacerbations in these patients (Keir et al., 2019). The enhancement in handgrip strength from 26.5 ± 8.4 kg to 29.0 ± 7.9 kg ($p = 0.04$) not only correlates with improved nutritional status but also reflects the overarching goal of rehabilitation, which is to foster functional independence and quality of life for affected individuals (Chalmers et al., 2019). While increases in daily caloric and protein intake were noted, the lack of statistical significance underscores the complexity of nutritional interventions in clinical practice. This observation aligns with findings from prior literature suggesting that slight increases in nutritional intake could yield benefits, yet these changes often remain statistically non-significant, possibly due to the multifactorial nature of nutrition in chronic disease management (Egan et al., 2018). Pulmonary rehabilitation programs incorporate various strategies to address nutrition,

including dietary counseling, which is critical for optimizing rehabilitation outcomes in patients with chronic lung disease (Kim et al., 2023). Effective weight management and nutritional assessment may necessitate a longer duration of nutritional intervention to reflect significant change quantitatively, thus confirming the efficacy of the rehabilitation programs being employed (O'Neill et al., 2019).

Moreover, the observed reduction in the frequency of exacerbations from 3.2 ± 1.3 to 2.4 ± 1.1 per year ($p = 0.01$) following rehabilitation interventions underlines the effectiveness of these programs in managing bronchiectasis (Egan et al., 2018). The significant decrease in exacerbation frequency can be interpreted as a direct result of improved lung function and nutritional status, which aligns with the understanding that well-nourished individuals often experience fewer respiratory complications (Zanini et al., 2015). This result corroborates the findings of Chalmers et al., who emphasized the clinical benefits of pulmonary rehabilitation in reducing exacerbation rates in bronchiectasis patients (Zanini et al., 2015). The connection between reduced exacerbation frequency and enhanced nutritional outcomes in our cohort is an essential aspect that warrants further exploration through longitudinal studies.

In addressing the multifaceted role of pulmonary rehabilitation, it is noteworthy that integrating components of physical training, nutritional guidance, and education significantly contributes to better overall health metrics for bronchiectasis patients. The current study's findings align with research indicating that comprehensive rehabilitation programs can enhance exercise capacity and quality of life for patients with chronic respiratory diseases such as bronchiectasis (Egan et al., 2018). In the study performed by Alcaraz-Serrano et al., positive changes in physical performance were also documented following similar rehabilitation interventions (Alcaraz-Serrano et al., 2021). Therefore, it is reasonable to assert that pulmonary rehabilitation should be regarded as a cornerstone in the management of bronchiectasis, as it not only aids in enhancing nutritional status but also fortifies resilience against acute exacerbations.

Furthermore, the implications of these findings extend to healthcare policy and practice. Given the demonstrated benefits of pulmonary rehabilitation on both nutritional and clinical outcomes, healthcare providers must prioritize and advocate for the implementation of comprehensive rehabilitation programs in the management of bronchiectasis. This incorporates addressing nutritional deficiencies, which are prevalent in many patients suffering from chronic respiratory conditions (Zanini et al., 2015). By doing so, healthcare systems may not only improve patient outcomes but also reduce healthcare costs associated with the management of acute exacerbations and complications arising from poor nutritional states and associated morbidity (Zanini et al., 2015).

CONCLUSION

The results from the study underscore the efficacy of pulmonary rehabilitation in ameliorating both nutritional status and clinical outcomes in bronchiectasis patients. With marked improvements noticed in BMI, serum albumin levels, handgrip strength, and a significant decline in exacerbation frequency, these findings advocate for integrating comprehensive pulmonary rehabilitation programs into routine clinical care. Continued research is needed to explore optimal rehabilitation strategies, including dietary interventions that could yield more substantial changes in nutritional intake over time, thus reinforcing the benefits seen in bronchiectasis management.

Recommendation

Implementing comprehensive pulmonary rehabilitation programs that integrate nutritional counselling and monitoring can significantly enhance the nutritional status and overall health of individuals with bronchiectasis.

Financial support

No, financial support.

Conflicts of Interest

No, conflicts of Interest.

REFERENCES

- Alcaraz-Serrano, V., Arbillaga-Etxarri, A., Oscanoa, P., Fernández-Barat, L., Bueno, L., Amaro, R., … & Torres, A. (2021). Exacerbations and changes in physical activity and sedentary behaviour in patients with bronchiectasis after 1 year. Journal of Clinical Medicine, 10(6), 1190. https://doi.org/10.3390/jcm10061190
- Bar-Yoseph, R., Ilivitzki, A., Cooper, D., Gur, M., Mainzer, G., Hakim, F., … & Bentur, L. (2019). Exercise capacity in patients with cystic fibrosis vs. non-cystic fibrosis bronchiectasis. Plos One, 14(6), e0217491. https://doi.org/10.1371/journal.pone.0217491
- Cai, Y., Li, X., Ye, X., Li, X., Fu, Y., Hu, B., … & Miao, J. (2023). Preoperative controlling nutritional status score (CONUT) predicts postoperative complications of patients with bronchiectasis after lung resections. Frontiers in Nutrition, 10. https://doi.org/10.3389/fnut.2023.1000046
- Chalmers, J., Crichton, M., Brady, G., Finch, S., Lonergan, M., & Fardon, T. (2019). Pulmonary rehabilitation after exacerbation of bronchiectasis: a pilot randomized controlled trial. BMC Pulmonary Medicine, 19(1). https://doi.org/10.1186/s12890-019-0856-0
- Egan, A., Clain, J., & Escalante, P. (2018). Non-antimicrobial airway management of non-cystic fibrosis bronchiectasis. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases, 10, 24-28. https://doi.org/10.1016/j.jctube.2017.12.003
- Ju, S., Jeong, J., Heo, M., Heo, I., Kim, T., Kim, H., … & Lee, S. (2021). Serum albumin is a predictor of respiratory hospitalization in patients with bronchiectasis. Chronic Respiratory Disease, 18. https://doi.org/10.1177/14799731211017548
- Keir, H., Fong, C., Crichton, M., Barth, P., Chevalier, É., Brady, G., … & Chalmers, J. (2019). Personalised anti-inflammatory therapy for bronchiectasis and cystic fibrosis: selecting patients for controlled trials of neutrophil elastase inhibition. Erj Open Research, 5(1), 00252-2018. https://doi.org/10.1183/23120541.00252-2018
- Kim, S., Kim, S., Kim, G., Cho, J., Choi, H., Lee, H., … & Yang, B. (2023). Effectiveness of the use of an oscillating positive expiratory pressure device in bronchiectasis with frequent exacerbations: a single-arm pilot study. Frontiers in Medicine, 10. https://doi.org/10.3389/fmed.2023.1159227
- Li, L., Zhang, J., Li, Z., Zhang, C., Bi, J., Zhou, J., … & Shao, C. (2020). Airway microbiota is associated with the severity of non-CF bronchiectasis. The Clinical Respiratory Journal, 15(2), 154-162. https://doi.org/10.1111/crj.13279
- O'Neill, K., O'Donnell, A., & Bradley, J. (2019). Airway clearance, mucoactive therapies and pulmonary rehabilitation in bronchiectasis. Respirology, 24(3), 227-237. https://doi.org/10.1111/resp.13459
- Seo, H., Ick, S., Park, J., Lim, J., Lee, W., Park, J., … & Park, J. (2024). Pectoralis muscle area as a predictor of mortality in patients hospitalized with bronchiectasis exacerbation. Respiration, 103(5), 257-267. https://doi.org/10.1159/000538091
- Wang, X., Villa, C., Dobarganes, Y., Olveira, C., Girón, R., García-Clemente, M., … & Barreiro, E. (2021). Differences in nutritional status and inflammatory biomarkers between female and male patients with bronchiectasis: a large-cohort study. Biomedicines, 9(8), 905. https://doi.org/10.3390/biomedicines9080905
- Wang, X., Wang, J., He, S., Li, J., Chen, X., Ma, T., … & Bu, X. (2024). The clinical characteristics of non-cystic fibrosis bronchiectasis patients with positive serum tumor markers: a retrospective study. BMC Pulmonary Medicine, 24(1). https://doi.org/10.1186/s12890-023-02816-7
- Yang, B., Han, K., Kim, S., Lee, D., Park, S., Yoo, J., … & Lee, H. (2021). Being underweight increases the risk of non-cystic fibrosis bronchiectasis in the young population: a nationwide population-based study.

Nutrients, 13(9), 3206. https://doi.org/10.3390/nu13093206

- Zanini, A., Aiello, M., Adamo, D., Cherubino, F., Zampogna, E., Sotgiu, G., … & Spanevello, A. (2015). Effects of pulmonary rehabilitation in patients with non-cystic fibrosis bronchiectasis: a retrospective analysis of clinical and functional predictors of efficacy. Respiration, 89(6), 525-533. https://doi.org/10.1159/000380771