

## Nutritional Status in Patients with Non-Cystic Fibrosis Bronchiectasis

Leila Boussoffara\*, Soumaya Bouchareb, Nadia Keskes Boudawara, Imen Touil and Jalel Knani

*Pneumology Department, Tahar Sfar Hospital, Mahdia, Tunisia*

**\*Corresponding Author:** Leila Boussoffara, Pneumology Department, Tahar Sfar Hospital, Mahdia, Tunisia.

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### Abstract

**Introduction:** The association between nutritional depletion and chronic respiratory diseases has been recognised for years and mainly documented in chronic obstructive pulmonary disease. However little information is available regarding nutritional depletion in patients with non-cystic fibrosis bronchiectasis.

**Aims of the Study:** This study was carried out to determine the nutritional status in patients with bronchiectasis and the relationship between the extent of bronchiectasis on the C-T scan and the nutritional status of these patients.

**Methods:** In 45 patients with bronchiectasis, body mass index (BMI), serum albumin, C-reactive protein and spirometry were recorded.

**Results:** BMI was  $< 20 \text{ kg/m}^2$  in 17% of patients and serum albumin was  $< 35 \text{ g/l}$  in 15% of patients. C-reactive protein was  $> 6 \text{ mg/l}$  in 80% and were higher essentially in patients who had more than one pulmonary lobe affected by bronchiectasis. BMI was not correlated to the extent of bronchiectasis, but serum albumin was correlated with  $p = 0,02$ . Body mass index and serum albumin were not correlated with Post-bronchodilator FEV1 and long-term oxygen therapy.

**Conclusion:** Malnutrition is coming to be highly prevalent in patients with non-cystic fibrosis bronchiectasis. Assessing this nutritional depletion may be offers benefits beneficial to for patients with bronchiectasis.

**Keywords:** *Non Cystic Fibrosis Bronchiectasis; Nutrition; Severity; Complication; Pulmonary Function*

### Introduction

The non-cystic fibrosis (non-CF) bronchiectasis was first described in 1819 by Laennec [1] as irreversible thick-walled bronchi associated with changes in ciliated epithelium and chronic bacterial infection. The prevalence of bronchiectasis in developed countries has declined over the last three decades [2]. This development is largely due to the increased availability of antibiotics for the treatment of respiratory tract infections, a reduction in the incidence of tuberculosis and the widespread use of vaccination in childhood [3]. However, bronchiectasis remains an important factor of morbidity and mortality. In fact patients with non-CF bronchiectasis suffer from recurrent acute exacerbations which include airway infection and inflammation often resulting in hospitalization. Recurrent exacerbations and the severity of non-CF bronchiectasis can lead to progressive deterioration of lung function and evolution towards chronic respiratory failure. The other strongest factor that may affect the evolution of this disease is the nutritional status of these patients and mainly the nutritional impairment. The objective of this study was to determine the nutritional status in patients with non-CF bronchiectasis and to seek a possible correlation between the scannographic extension of the pathology and the nutritional status of these patients.

## Methods

### Subjects and selection criteria

This study was conducted in pneumology department at the Tahar Sfar Hospital of Mahdia. Forty-five patients recruited over a 4-month period. Patients were included in the study if they met the following criteria: (i) had a diagnosis of non-CF bronchiectasis based on clinical presentation and high-resolution computerized tomography (HRCT) findings (ii) patients in stable phase. Patients who had diagnosis of acute exacerbation, pregnant and lactating women, patients with a history of active tuberculosis or active allergic bronchopulmonary aspergillosis, and patients with other comorbidities were excluded from the study.

### Data collection

Clinical data including the demographic, symptoms, physical examination and treatment were recorded. A measurement of height and body weight and calculation of the body mass index ( $BMI = \text{weight}/\text{height}^2$ ) was performed for all patients. A biological assessment was performed at the time of inclusion and included results of C-reactive protein (CRP) and serum albumin level. Malnutrition was defined in this study by two indicators which are: (i)  $BMI < 20 \text{ Kg}/\text{m}^2$  and/or (ii) serum albumin  $< 35 \text{ g}/\text{l}$  [4].

Respiratory function was assessed by forced expiratory volume in one second (FEV<sub>1</sub>), Forced vital capacity (CVF) and the value of FEV<sub>1</sub>/FVC ratio. These spirometric values were expressed as percentages of values predicted for patient's age, sex, and height.

### Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) for windows, version 21.0. Data were summarized as mean  $\pm$  standard deviation. Data were compared using Student's t test. Numeration data were presented as frequency and compared using the  $\chi^2$  test. The associated relative risk was estimated as an odds ratio with a 95% confidence interval. The risk factors associated with malnutrition in non-CF bronchiectasis were analyzed by multiple logistic regressions using the forward stepwise method. A two-tailed  $p < 0.05$  was considered statistically significant.

## Results

### Demographic data, clinical features and nutritional status of the population

Forty-five patients were recruited. The mean age of the population was  $63.57 \pm 12.7$  years old with a sex ratio of 0.9 (22 males and 23 females). The most common symptoms were hemoptysis in 68.9% of cases ( $N = 31$ ), dyspnea in 62.2% ( $N = 28$ ) and a productive cough in 97.8% of cases ( $N = 44$ ).

On thoracic C-T scan the mean number of lobes affected by bronchiectasis was  $2 \pm 1$  lobes. More than half of the patients (71.1%,  $N = 32$ ), had more than one lobe affected by non-cystic fibrosis bronchiectasis. The mean value of FEV<sub>1</sub> compared to the predicted value was  $58.22 \pm 23.34\%$  with an average ratio FEV<sub>1</sub>/FVC value of  $80.20 \pm 16.97\%$ .

CRP was greater than 6 mg/l in 80% of cases and was essentially increased in patients with more than one lobe affected by non-cystic fibrosis bronchiectasis.

Concerning the parameters evaluating the nutritional status of these patients: mean BMI was  $24.7 \pm 4.6 \text{ Kg}/\text{m}^2$  and 17.8% of patients ( $N = 8$ ) had a  $BMI < 20 \text{ Kg}/\text{m}^2$ . The average value of albumin was  $42.29 \pm 6.21 \text{ g}/\text{l}$  and 15.6% of patients ( $N = 7$ ) had albumin less than 35 g/l.

### Correlation between nutritional status and the C-T scan results

Evaluation of nutritional status according to the number of lobes affected by non-CF bronchiectasis had resulted in significantly lower albumin levels in patients with more than one lobe affected by non-cystic fibrosis bronchiectasis ( $p = 0.02$ ). The BMI was comparable for both groups of patients regardless of the number of affected lobes (Table 1).

	One lobe	More than 1 lobe	P
Serum albumin (g/l)	44,53 ± 5,21	41,38 ± 6,43	0,099
Serum albumin			
< 35g/l	0	7	0,022
> 35g/l	13	25	
BMI (Kg/m <sup>2</sup> )	23,35 ± 4,74	25,24±4,55	0,233
BMI			
< 20 Kg/m <sup>2</sup>	4	4	
>20 Kg/m <sup>2</sup>	9	28	0,202

**Table 1:** Nutritional status according to non-CF bronchiectasis extension.

**Multiple regression analysis**

According to a stepwise regression analysis (Table 2), the risk factors associated with malnutrition included the C-T scan extension of bronchiectasis (the number of lobes affected), a positive CRP (greater than 6 mg/l) and chronic respiratory failure with home oxygen therapy (Table 2).

Factor	Adjusted OR (95% CI)	p value
Age	1,001	0,979
Sex	0,664	0,623
More than 1 lobe	1,264	0,511
FEV1	0,989	0,532
CRP > 6 mg/l	1,566	0,634
Long term oxygen	2,608	0,564

**Table 2:** Multivariate logistic regression analysis of clinical feature risk factors associated with malnutrition:

OR: Odds Ratio, CI: Confidence Interval

**Discussion**

The pathophysiology of malnutrition in non-cystic fibrosis bronchiectasis is multifactorial. On the one hand there is an increase in the energy expenditure which results from an increase in respiratory work [4]. Other by the diet is often altered by [4]:

- An increase in dyspnea during and after an effort
- The inflammatory syndrome responsible for anorexia
- The psychosocial context and the deterioration of the quality of life.

Few studies have focused on nutritional status in patients with non-cystic fibrosis bronchiectasis. Indeed, the majority of studies have focused on nutrition impairment in patients with chronic respiratory insufficiency and in particular chronic obstructive pulmonary disease (COPD). Malnutrition is a major problem that can be encountered in patients with non-cystic fibrosis bronchiectasis [5]. This nutritional status leads to an increase in the risk of infection by a reduction in the immune defenses, a reduction in the muscle mass causing loss of autonomy and can also leads to psycho-behavioral disorders such as anorexia [5].

Cano, *et al.* [6] Had included in a prospective study 446 patients with chronic respiratory failure including 33 patients with non-cystic fibrosis bronchiectasis. Malnutrition assessed by BMI and albuminemia was associated with poor prognosis in patients with bronchiectasis [6]. It was also demonstrated that chronic systemic inflammation attested by CRP was also associated with poor prognosis in patients with bronchiectasis [6]. In a study by Onen, *et al.* [7] it was found that nutritional status was a significant predictor of survival independently of mortality and that the critical level of BMI was 20 Kg/m<sup>2</sup> below which the mortality rate increased. In another study by Dupont [8], the decrease in BMI was not correlated with a poor prognosis; this was explained by an overestimation of BMI due to edema resulting from right Cardiac failure. In our study, the BMI was not correlated to the C-T scan extent of bronchiectasis and therefore to the severity of the disease.

A study published in 1992 [9] involved a population of 1775 patients with COPD. It was found that BMI was the most predictive factor of survival after age. Thus survival was better in overweight and worse in malnourished patients. An extension of this study to all the etiologies of respiratory insufficiency and comprising 26140 patients, including 1755 patients with bronchiectasis [10] confirmed that the influence of nutrition did not only affect patients with COPD but that it was an essential prognostic factor found in all etiologies, whether obstructive (chronic bronchitis, asthma, Emphysema, bronchiectasis) or restrictive (pulmonary sequelae, cyphoscoliosis, fibrosis) [10]. In another study [11], which included 744 patients with chronic respiratory failure, BMI, lean body mass, serum albumin and transthyretin concentrations, 6-minute walking perimeter, ventilatory function and blood gases had been evaluated. Lean body mass was the most sensitive nutritional parameter lowered in 53.6% of patients whereas a BMI less than 20 kg/m<sup>2</sup> was observed in 23.2% of them, albumin less than 35 g/l in 20.7% and transthyretinaemia less than 200 mg/l in 20% of patients. BMI and lean mass were correlated with ventilatory function and walking perimeter. The Reduction in lean body mass was present in 75% of patients with bronchiectasis and 40% in COPD. Albuminemia and transthyretinemia have no prognostic value as in other cachectising disorders [11]. Contrary to these results, a significant correlation between hypoalbuminemia and the scannographic extension of bronchiectasis was found in our study. The management of this malnutrition must take account of the causes of the reduction in nutritional intake [6,12]: continued smoking, poorly corrected hypoxemia, psycho-social context (isolation, depression) and/or a state infectious. Thus, a suitable rehabilitation program can be offered to patients with smoking cessation, health education and physical activity recovery combined with oral food supplements to provide an additional 500 Kcal [13]. The energy provided in the form of carbohydrates preferentially allows better digestibility and an optimal oxygen consumption ratio/product ATP [13].

### Conclusion

Malnutrition is frequent during non-cystic fibrosis bronchiectasis. It aggravates morbidity and mortality. Assessment of nutritional status and nutritional management should be integrated into the therapeutic strategy of each patient with non-cystic fibrosis bronchiectasis.

### Conflict of Interest

There's no conflict of interest.

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