

# Frequency of pneumonitis among malnourished autopsied adults

## Frequência de pneumonite em adultos subnutridos autopsiados

Millena Prata Jammal<sup>1</sup>, Selma Freire de Carvalho da Cunha<sup>2</sup>,  
Vicente de Paula Antunes Teixeira<sup>3</sup> and Daniel Ferreira da Cunha<sup>1</sup>

### ABSTRACT

The objective of this study was to investigate whether malnourished autopsied adults would present higher frequency of pneumonitis than non-malnourished ones would. All of the autopsied adults (n = 175; age ≥ 18 years) with complete records, including weight and height data, were included. Pneumonitis was observed more frequently in malnourished individuals (59.1%) than in non-malnourished individuals (41.3%). This study showed that the percentage of pneumonitis among autopsied adults was high, in addition to an increased risk of pneumonitis among these individuals.

**Key-words:** Protein-energy malnutrition. Pneumonitis. Autopsy. Adults.

### RESUMO

O objetivo deste estudo foi verificar se adultos subnutridos autopsiados teriam maior frequência de pneumonite que adultos não-subnutridos. Todos os adultos autopsiados (n = 175; idade ≥ 18 anos) com dados completos, incluindo peso e estatura, foram incluídos. Pneumonite foi observada com maior frequência em subnutridos (59,1%) do que em não-subnutridos (41,3%). Este estudo mostrou uma alta porcentagem de pneumonite entre os adultos autopsiados, além do aumento do risco de pneumonite entre estes.

**Palavras-chaves:** Subnutrição protéico-energética. Pneumonite. Autópsia. Adultos.

Apart from infectious diarrhea, acute lower respiratory infections are the main cause of mortality among malnourished children<sup>9</sup>. In adults, pneumonitis is associated with significant morbidity and mortality, and has been considered to be a terminal event among sick, elderly or frail patients<sup>2</sup>. The risk factors for pneumonitis among hospitalized adults include supine positioning, enteral feeding, mechanical ventilation, impaired airway reflexes<sup>2</sup>, prolonged hospital stay and coexisting illnesses such as COPD, malignancy and renal failure<sup>8</sup>.

In addition to supplying information to patients' families and data on therapy appropriateness, autopsy also serves to provide data on both new and old diseases, including pneumonitis and malnutrition. A study on 234 autopsied elderly patients at a chronic care facility found that pneumonitis was the most common cause of mortality, accounting for the deaths of 33% of all of the patients<sup>4</sup>.

Protein-energy malnutrition (PEM) is found in 41% of the autopsied adults who die at our teaching hospital<sup>3</sup>. Because the end of life of patients with acute or chronic debilitating terminal

diseases is associated with decreased mobility, impaired mental status and other conditions predisposing towards pneumonitis, our objective in this study was to investigate whether malnourished autopsied adults would present higher frequency of malnutrition than non-malnourished ones would.

This retrospective study took place at the 300-bed clinical teaching hospital of the Federal University of the Triângulo Mineiro, Uberaba, Brazil, after official approval from the institutional review board (Ethics Committee). All adults aged ≥ 18 years with complete autopsy records, including data on gender, color, weight and height (n = 175), were initially eligible for the study. Most of the cases came from the intensive care unit and the clinical and surgical wards. Because of possible abnormal water retention that could affect body weight and body mass index, thirty-nine individuals (22.3%) with signs of congestive heart failure (cardiomegaly associated with generalized edema, ascites, pleural effusion and hepatomegaly), chronic liver diseases (jaundice plus viral or alcoholic hepatitis or cirrhosis) or nephrotic syndrome due to glomerular disease, were excluded. Pneumonitis cases were defined as the presence of either 1) lobar pneumonia, recognized as areas of fibrinosuppurative consolidation in the lungs at any of the stages (congestion or red or gray hepatization); or 2) bronchopneumonia, characterized by patchy acute neutrophil-rich suppurative lung inflammation. The nutritional status was assessed by means of the body mass index (BMI), based on the body weight and height registered at the autopsy (BMI = wt (kg)/ht<sup>2</sup> (m<sup>2</sup>)). The malnourished group consisted of individuals with BMI < 18.5kg/m<sup>2</sup>; and the non-malnourished group consisted of individuals with BMI ≥ 18.5kg/m<sup>2</sup><sup>6</sup>. Continuous variables with

1. Nutrition Division, Department of Internal Medicine, Clinics Hospital, Triângulo Mineiro Federal University, Uberaba, MG, Brazil. 2. Department of Clinical Medicine, University of São Paulo, Ribeirão Preto, SP, Brazil. 3. Pathology, Biological Sciences Department, Triângulo Mineiro Federal University, Uberaba, MG, Brazil. Financial Support: Partial FAPEMIG and FUNEPU.

**Address to:** Dr. Daniel Ferreira da Cunha. Nutrition Division, Department of Internal Medicine/HC/UFTM. Av. Getúlio Guaritá 130, 38025-440 Uberaba, MG, Brazil.

Tel: 55 34 3318-5335, Fax 55 34 3318-5335.

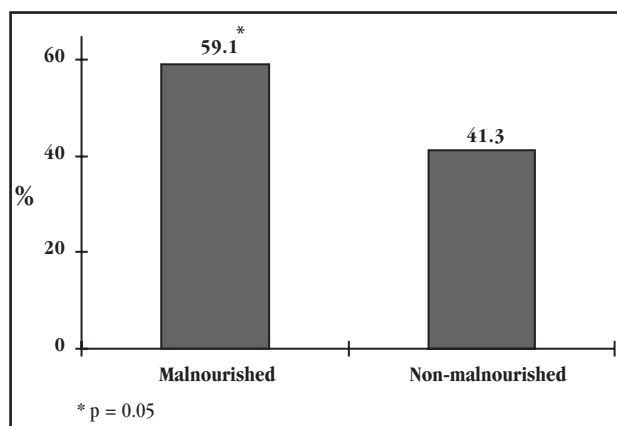
e-mail: dfnutro@gmail.com

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normal distribution were expressed as mean  $\pm$  standard deviation; in such cases, the comparison between groups was performed by using the "t" test. The Mann-Whitney test was used for variables with non-normal distribution, which were expressed as median and range. The Fisher exact test was used to compare frequency distributions between groups. A p value  $< 0.05$  was considered statistically significant.

A total of 136 cases without edema or clear-cut signs of water retention were studied; forty-four (32.3%) were classified as malnourished. There were no statistical differences between malnourished and non-malnourished individuals, respectively, in relation to age ( $58.2 \pm 20.9$  vs.  $52.3 \pm 18.4$  years), or male gender predominance (72.7 vs 64.1%). As expected, the malnourished group had lower body weight (median [range]: 43.2 [28-57] vs 59.7 [36-103] kg) and BMI (16.89 [12.41-18.47] vs 22.05 [18.51-36.36] kg/m<sup>2</sup>). The malnourished and non-malnourished groups respectively, had similar percentages of diagnoses of severe infections (63.6 vs 61.9%), stroke (27.3 vs 20.6%), malignant neoplasms (20.4 vs 25.0%) and liver steatosis (29.5 vs 34.8%). Pneumonitis was observed in 64 cases (47% of all cases), with higher (59.1%) frequency among malnourished than among non-malnourished individuals (41.3%). The odds ratio for the presence of pneumonitis among malnourished cases was 2.05 (95% confidence interval, 0.93-4.55) (**Figure 1**).



**FIGURE 1**

Frequency (%) of pneumonitis among malnourished and non-malnourished adults autopsied at the clinical teaching hospital of the Federal University of the Triângulo Mineiro, Uberaba, MG, Brazil.

The present study found that the percentage of pneumonitis among autopsied adults was high. Furthermore, the malnourished individuals presented greater risk of pneumonitis. Although somewhat expected, these findings had not previously been described among adults, and they cannot be ascribed to differences in gender or socioeconomic status, to associated diagnoses or to other autopsy findings. In addition, even though age is considered to be the old man's friend<sup>1</sup>, it did not appear to have influenced the frequency of terminal pneumonitis in the present study.

Nutritional status is an important measurement of an individual's underlying health and anticipated response to critical illness. Malnutrition causes deleterious changes to the structure

and function of respiratory muscles, including a reduction in diaphragm mass and strength<sup>7</sup>. Since malnourished children and adults tend to have diminished physiological reserves, impaired lung function and reduced immunocompetence<sup>9</sup>, malnutrition itself is the probable cause of this increased frequency of pneumonitis<sup>7</sup>.

The limitations of this study include the lack of laboratory data for better characterization of malnutrition. According to anthropometry criteria, most of our cases presented marasmus, which is a fairly well adapted form of malnutrition that is clinically recognized by the lack of edema and normal serum albumin levels<sup>5</sup>. Furthermore, we cannot rule out possible subclinical body water retention associated with severe infection in many of our cases. However, it is possible that the inclusion and exclusion criteria used in this study would homogeneously distribute cases with or without edema into both the malnourished and the non-malnourished groups, thereby validating our conclusions.

Pneumonitis is a common finding among autopsied adults. In the same way as among malnourished children, adults with protein-energy malnutrition are at increased risk of developing pneumonitis. Routine nutritional assessment of hospitalized adults may help to identify malnourished patients who are at increased risk of pneumonitis. In addition to improving the quality of life of terminally ill patients, adequate early nutritional therapy may also improve the nutritional status, and perhaps also the immediate outcome, for terminally ill patients.

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