




# Evaluation of Nutritional Status and Correlation with Postoperative Complications in Elderly Patients Submitted to Surgical Treatment of Proximal Femoral Fractures\*

## *Avaliação do estado nutricional e correlação com complicações cirúrgicas em pacientes idosos submetidos a tratamento cirúrgico de fratura do fêmur proximal*

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Rev Bras Ortop 2021;56(1):104–108.

### Abstract

**Objective** This study aims to evaluate and correlate the nutritional status with potential complications during the immediate postoperative period of elderly patients surgically treated for proximal femoral fractures.

**Methods** A prospective, cross-sectional analytical study with a quantitative approach, targeting patients aged 60 years old or more who were admitted to a hospital in Amazonas, Brazil, for surgical treatment of proximal femoral fractures. Surgical complications during the immediate postoperative period and their relationship with the nutritional status of the patient were determined using the mini nutritional assessment (MNA); in addition, the lymphocyte numbers and serum albumin levels were determined and correlated with the length of hospital stay.

**Results** The sample consisted of 19 elderly patients, of both genders, with a mean age of 70.8 years. Most of the subjects (68.4%) were female. Malnutrition was diagnosed in 15.8% of the subjects using the body mass index (BMI) as, an anthropometric variable, and the MNA identified 31.6% of the subjects with malnutrition. Regarding total lymphocyte count, 100% of the sample showed a positive association with malnutrition in varying degrees; using serum albumin level as a parameter, malnutrition was identified in 89.4% of the subjects. Malnourished patients had the highest average

### Keywords

- ▶ postoperative complications
- ▶ malnutrition
- ▶ femoral fractures

\* Study developed at the Orthopedics and Traumatology Service, Hospital Universitário Getúlio Vargas (HUGV, Universidade Federal do Amazonas (UFAM), Manaus, AM, Brazil.

length of stay. Surgical complications as surgical site infections occurred in 10.5% of the patients at risk of malnutrition.

**Conclusion** This study revealed a higher rate of postoperative complications in elderly patients diagnosed with malnutrition.

## Resumo

**Objetivo** Avaliar e correlacionar o estado nutricional com possíveis complicações no pós-operatório imediato de pacientes submetidos a tratamento cirúrgico de fraturas de fêmur proximal.

**Métodos** Estudo transversal prospectivo analítico e de abordagem quantitativa, tendo como população-alvo pacientes com idade igual ou superior a 60 anos, internados em uma instituição hospitalar no Amazonas, submetidos a tratamento cirúrgico de fraturas de fêmur proximal. Foram avaliadas as complicações cirúrgicas no pós-operatório imediato e sua relação com o estado nutricional através da mini avaliação nutricional (MAN), assim como a mensuração da contagem de linfócitos e albumina e a sua correlação com o tempo de internação.

**Resultados** A amostra foi composta por 19 pacientes idosos, de ambos os sexos, com média de idade de 70,8 anos. A maioria dos pacientes (68,4%) eram do sexo feminino. Por meio da variável antropométrica índice de massa corporal (IMC), identificou-se a presença de desnutrição em 15,8% dos pacientes e, por meio da MAN, de 31,6%. Na avaliação do cálculo da contagem total de linfócitos, 100% da amostra apresentou associação positiva com desnutrição em graus variáveis e, fazendo-se uso da albumina sérica como parâmetro, a desnutrição foi identificada em 89,4%. Os pacientes desnutridos apresentaram a maior média de tempo de internação. As complicações cirúrgicas, como infecções do sítio cirúrgico, ocorreram em 10,5% dos pacientes em risco nutricional.

**Conclusão** Neste estudo, observou-se maior índice de complicações no pós-operatório em idosos diagnosticados com desnutrição.

## Palavras-chave

- complicações pós-operatórias
- desnutrição
- fraturas do fêmur

## Introduction

Nutritional status is a critical health concern in elderly subjects. Aging is related to physiological, metabolic, and functional capacity changes that impact caloric requirements. Among elderly subjects, the most important of these conditions is malnutrition, which is associated with increased mortality and susceptibility to infections and reduced quality of life. Malnutrition is often misdiagnosed because it frequently accompanies other aging-related organic changes.<sup>1</sup>

Malnutrition increases the risk of developing a variety of conditions, including anemia, pressure sores, bone fractures, frailty, cognitive impairment, dehydration, orthostatic hypotension, and immune dysfunction.<sup>2</sup> The main indicators of malnutrition in elderly subjects include an involuntary weight loss of 5% in 1 month, 7.5% in 3 months and/or 10% in 6 months; low weight for height, that is, less than 20% of ideal body weight; a body mass index (BMI) lower than 22 kg/m<sup>2</sup>; a serum albumin level below 3.5 mg/dL; a serum total cholesterol level below 160 mg/dL; a functional status change from independent to dependent; an inadequate food intake; an arm muscle circumference below the 10<sup>th</sup> percentile; and a tricipital skinfold below the 10<sup>th</sup> percentile or greater than the 95<sup>th</sup> percentile.<sup>3</sup>

Most authors believe that anthropometric measurements and laboratory tests are good parameters to assess the nutritional status of elderly subjects.<sup>4</sup> Although anthropometry is a simple method, it is good at predicting future diseases, functional disability, and mortality.<sup>5</sup> Hemoglobin levels, hematocrit and total lymphocyte counts usually reflect the nutritional status; in addition, lymphocyte counts are associated with immunosenescence.<sup>4</sup>

The mini nutritional assessment (MNA), a validated score to classify the nutritional status of elderly subjects,<sup>1</sup> is considered an easy-to-use, simple, fast, and reliable tool. It allows the identification of malnutrition risk even before the onset of clinical changes.<sup>6</sup> This score adopts the following reference parameters: a total score lower than 17 points indicates malnutrition; a score ranging from 17 to 23.5 points indicates risk of malnutrition; and a total score above 23.5 points indicates good nourishment.<sup>1</sup> The MNA uses the sum of two scores; one refers to changes in food intake, weight, mobility, psychological status, clinical status and BMI, while the other refers to the global assessment.<sup>1</sup>

Proximal femoral fracture is a common and important cause of mortality and functional loss in elderly subjects.<sup>2</sup> Its incidence increases with age due to the higher number of falls and increased osteoporosis prevalence.<sup>7</sup> Proximal femoral

fractures can be intracapsular or extracapsular. Intracapsular fractures include femoral neck and head injuries, whereas extracapsular fractures include transtrochanteric injuries. Both result from low energy trauma.<sup>8</sup> Protein-calorie malnutrition is an important determinant of the clinical outcome of elderly subjects with hip fracture, but the effectiveness of nutritional support programs in routine clinical practice is controversial.<sup>9</sup> Nevertheless, elderly patients with hip fractures rarely receive nutritional assessments and adequate interventions.<sup>10</sup>

## Methods

This is a prospective, analytical cross-sectional study with a quantitative approach approved by the Ethics and Research Committee under CAAE number 68313817.5.0000.5020. The population consisted of elderly patients with proximal femoral fractures who were admitted to the orthopedic clinic for surgical treatment. The sample size was calculated based on the estimated average number of patients submitted to surgery in the last 3 years using the formula for finite populations (prevalence, 0.5; margin of error, 5%; confidence coefficient, 95%). The patients were selected according to the following inclusion criteria: informed consent form signature; elderly subjects over 60 years old; and diagnosis of proximal femoral fracture with surgical indication up to 5 days after trauma and up to 48 hours after hospitalization. Patients with neurological conditions and those from native populations were excluded. Patients were evaluated using the MNA score and biochemical tests. Postoperative complications were recorded on a specific form.

## Results

Twenty patients were selected per the inclusion criteria and evaluated from July 2017 to July 2018. A questionnaire was applied for data collection and laboratory tests assessment. The subjects were cataloged and characterized according to age, gender, nutritional status, and surgical complications. One patient was excluded from the study due to loss to follow-up.

The final sample consisted of 19 elderly subjects, from both genders, with a mean age of 70.8 years old (minimum, 62; maximum, 84 years) with a standard deviation value of 7.12; in addition, 68.4% of the patients were female (n = 13) and 31.6% were male (n = 6).

The anthropometric variable BMI led to a malnutrition diagnosis in 15.8% (n = 3) of the subjects (►Table 1).

The MNA questionnaire revealed malnutrition in 31.6% (n = 6) of the subjects and a risk of malnutrition in 42.1% (n = 8) of them (►Table 2).

All subjects presented abnormal variations in total lymphocyte counts. Using serum albumin level as a parameter, malnutrition was identified in 89.4% of the patients (►Table 3).

The relative risk of complications was considered higher for albumin levels (9.39), MNA scores (3.56), and BMI (3.48), compared to the other variables analyzed (►Figure 1).

**Table 1** Nutritional status classification according to the body mass index

	n	%
Underweight	3	15.8
Eutrophic	11	57.9
Overweight/obesity	5	26.3
Total	19	100

In elderly subjects (Lipschitz continuity); n = 19.

**Table 2** Nutritional status classification according to the mini nutritional assessment score

	n	%
Normal nutrition	5	26.3
Malnutrition risk	8	42.1
Malnourishment	6	31.6
Total	19	100

In elderly subjects; n = 19.

**Table 3** Nutritional status classification according to biochemical parameters: total lymphocyte count and serum albumin levels

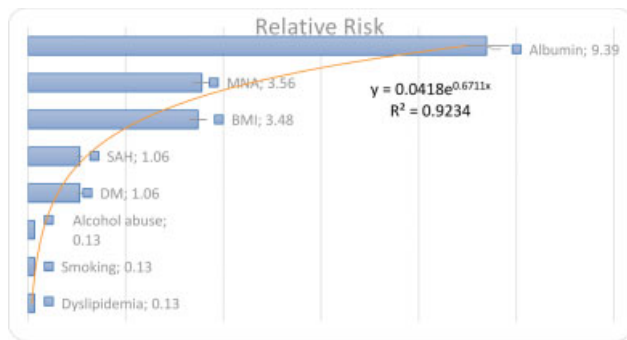
	TLC		Albumin	
	n	%	n	%
Severe malnutrition	–	–	–	–
Moderate malnutrition	10	52.6	7	36.8
Mild malnutrition	9	47.4	10	52.6
Normal nutrition			2	10.5
Total	19	100	19	100

Abbreviation: TLC, total lymphocyte count.

TLC (cells/mm<sup>3</sup>): severe depletion, < 800; moderate depletion, 800 to 1,199; mild depletion, 1,200 to 2,000; normal values, > 2,000; Albumin levels (g/dL): normal values, > 3.5; mild depletion, 3.0 to 3.5; moderate depletion, 2.4 to 2.9; severe depletion, < 2.4.

The average hospitalization period of the study population was 9.1 days, with a minimum of 5 days and a maximum of 23 days; the highest average hospitalization time was 13 days, in malnourished patients according to the MNA score (►Table 4).

Postoperative complications included surgical site infections in 10.5% (n = 2) of the patients; these subjects were in malnutrition risk according to the MNA score and had moderate malnutrition according to total lymphocyte counts and serum albumin levels. Bruises were detected in 26.2% (n = 5) of the patients; of these, 5.2% (n = 1) were classified as well-nourished; 10.5% (n = 2) as in malnutrition risk, and 10.5% (n = 2) as malnourished, according to the MNA score. Sacral ulcers were observed in 5.2% (n = 1) of the patients classified as well-nourished and in 5.2% of those under malnutrition risk according to the MNA score. No suture dehiscence or necrosis were observed (►Table 5).



**Fig. 1** Relative risk of the major comorbidities related to surgical complications in the analyzed population. Abbreviations: MNA, mini nutritional assessment; BMI, body mass index; SAH, systemic arterial hypertension; DM, diabetes mellitus.

**Table 4** Comparison between nutritional status according to the mini nutritional assessment classification and the average length of stay in days

MNA classification	n	%	Average length of stay (days)
Normal nutrition	5	26.3	5.8
Malnutrition risk	8	42.1	9
Malnourishment	6	31.6	13
Total	19	100	9.1

Abbreviation: MNA, mini nutritional assessment.

## Discussion

The current data indicate that the prevalence of malnutrition in elderly subjects living in households ranges from 1 to 15%; in elderly people admitted to hospitals, these figures range from 35 to 65%. Compared to other countries, the risk of death secondary to malnutrition in Brazilian elderly subjects is 71% higher than in the USA and 32.13% higher than in Costa Rica.<sup>8</sup>

The present study revealed that adding malnutrition rates to the risk of malnutrition resulted in a prevalence rate of 73.7% ( $p$ -value of 0.00036 and an increased relative risk of 3.56, with minimum and maximum values of 1.55 and 8.06,

respectively). All subjects presented abnormal total lymphocyte counts, and 89.4% of them had abnormal serum albumin levels.<sup>6</sup>

At a randomized controlled trial to determine whether nutritional supplementation reduces fracture-related complication rates in a selected group of healthy patients with hip fractures, the risk of complications was greater in the control group (70%) compared to the experimental group (15%). The authors concluded that balanced nutritional supplements result in lower complications and mortality rates 120 days after surgery.<sup>9</sup>

Another study revealed a greater risk of death in patients with hypoalbuminemia (albumin level < 3.5g/dL) during hospitalization, and higher mortality rates 1 year after fracture in subjects with lymphopenia (total lymphocyte count < 1,500 cells/ $\mu$ L).<sup>7</sup> Other authors reported that preoperative serum albumin levels are a strong predictor of complications in the first 30 postoperative days and that this parameter is associated with greater morbidity and mortality, longer hospitalization, and a higher number of readmissions.<sup>8</sup>

Our study showed that changes in albumin levels, malnutrition risk, and BMI scores were statistically representative, due to the high  $p$ -value and the increased relative risk.

For Nourissat et al.,<sup>11</sup> malnourished patients are more likely to present complications compared to their well-nourished counterparts. Such complications include wound healing issues, fistula formation, infection, increased hospital stay, decreased survival time, and reduced quality of life.

Cruz and Marimoto<sup>12</sup> stated that an adequate nutritional monitoring ensures surgical success, and reduces complication, morbidity, and mortality rates, as well as the length of hospital stay and surgical site infections.

Malnourished patients had a longer average hospital stay (13 days) and a higher number of complications during the postoperative period.

## Conclusion

In the present study, elderly people, either malnourished or at risk of malnutrition, and proximal femoral fracture presented a higher rate of surgical site infection and longer length of hospital stay when compared to eutrophic patients. The parameters used in the current study (MNA score,

**Table 5** Correlation between nutritional status according to the mini nutritional assessment classification and postoperative complications

MNA Classification	n	Complications	% per classification	% from total
Normal nutrition	5	Hematomas (n = 1)	20	5.2
Malnutrition risk	8	Surgical site infections (n = 2) Hematomas (n = 2) Sacral ulcers (n = 1)	62.5	26.2
Malnourishment	6	Hematomas (n = 2) Sacral ulcers (n = 1)	50	15.8
Total	19			47.2

Abbreviation: MNA, mini nutritional assessment.

albumin levels, and total lymphocyte count) are good for nutritional status assessment.

#### Conflict of Interests

The authors declare no conflict of interests.

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