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Original article

Prevalence of protein-energy malnutrition in hospital patients over 75 years of age admitted for hip fracture

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ABSTRACT

Introduction: One percent of falls in over-75 years old cause hip fracture (HF). Protein-energy malnutrition (PEM) is associated with falls and fracture. PEM screening and perioperative nutritional management are recommended by the European Society of Parenteral and Enteral Nutrition, yet data on nutritional status in elderly HF patients are sparse. The Mini Nutritional Assessment (MNA) score is presently the most effective screening tool for PEM in over-75 years old.
Objective: The principal objective of the present study was to determine the prevalence on MNA of PEM in patients aged over 75 years admitted for HF. Secondary objectives were to identify factors associated with PEM and its role as a factor of evolution.
Materials and methods: A prospective observational epidemiological study included 50 patients aged over 75 years admitted for HF in an 8-bed orthopedic surgery department with a geriatric follow-up unit. PEM was defined by MNA < 17/30. Assessment systematically comprised associated comorbidity (Cumulative Illness Rating Scale-Geriatric [CIRS-G]), cognitive status on the Mini Mental State Examination (MMSE), functional status on activities of daily life (ADL), and mean hospital stay (MHS). Scores were compared on quantitative tests (Student *t*) with the significance threshold set at $P < 0.05$.
Results: Mean age for the 50 patients was 86.1 years (range, 77–94 years). Prevalence of PEM was 28%; a further 58% of patients were at risk for PEM. PEM was associated with elevated CIRS-G ($P < 0.006$), greater numbers of severe comorbidities ($P = 0.006$), more severe cognitive disorder ($P = 0.005$) and functional dependence ($P = 0.002$), and 8 days' longer MHS ($P = 0.012$).
Discussion: The present study confirmed the high prevalence of PEM in HF patients aged over 75 years, supporting longer hospital stay. MNA is a diagnostic gold standard, not to be replaced by albuminemia or body-mass index in this perioperative clinical situation. Given the present economic stakes relating to geriatric trauma patients' hospital stay, it is essential to prevent, diagnose and treat PEM in elderly subjects.
Level of evidence: Level IV; prospective cohort study.

1. Introduction

Population forecasts for France suggest rapid increase in the number of over-75 years old, who may constitute 16% of the population as a whole by 2050 [1]. Fifty percent of over-80 year-olds living at home sustain at least one fall per year [2]. Ten percent of falls in over-75 years old lead to fracture or hospital admission [3]. Hip fracture (HF) is one of the most severe complications of falls in the elderly, exacerbating dependence [4]; postoperative morbidity and mortality are elevated, with 9% mortality in the first month and more than 30% within the first year [5,6]. Annual health costs occasioned by falls in the elderly are estimated at €1,034 m [7].

Protein-energy malnutrition (PEM) contributes to the occurrence of falls and fractures. Sarcopenia is a risk factor for falls, with an odds ratio of 4.4 (95% CI, 1.5–10.3) [2]. Nutritional status in elderly fracture patients deteriorates during hospital stay [8]: it is a dynamic entity. PEM is a factor of poor functional prognosis in hip surgery patients [9].

The Mini Nutritional Assessment (MNA) (Appendix 1) is a recent instrument for diagnosis and follow-up of PEM in elderly subjects [10]. PEM screening and perioperative nutritional treatment are recommended by scientific societies such as the European Society of Parenteral and Enteral Nutrition (ESPEN) [11], but there are as yet scant data on the nutritional status of elderly HF hospital patients in

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France. Early detection and management of PEM are nevertheless essential to reducing postoperative morbidity and mortality [5].

The principal objective of the present study was to assess PEM prevalence in over-75 years old HF hospital patients. The secondary objectives were to study factors associated with PEM and its role as a factor of evolution.

2. Material and methods

A single-center prospective observational study recruited patients aged over 75 years, admitted for HF to an 8-bed geriatric orthopedic unit within the University Hospital Orthopedic and Traumatologic Surgery Department of Grenoble (France). Data were collected between May and September 2012. The principal assessment criterion was MNA score < 17/30.

Inclusion criteria were: age ≥ 75 years, admission to the Grenoble geriatric orthopedic unit, and HF. Fractures sustained in road accidents were excluded. For logistic reasons, 143 of the 211 over-75 years old admitted to the Orthopedic Surgery Department were managed in classical units and 68 in the geriatric orthopedic unit; these two groups were comparable for age, activities of daily living (ADL), instrumental activities of daily living (IADL), mini mental state examination (MMSE) and MNA.

Study variables were: demographic (age in years, gender, place of residence, discharge destination, mean hospital stay [MHS] in days), orthopedic (history of fracture, HF type, associated fracture[s], type of surgery, interval between emergency admission and surgery), and anthropometric (weight in kg, body mass index [BMI] in kg/m^2, complete MNA).

The MNA is a diagnostic instrument classifying patients in three nutritional groups according to final score (out of 30 points) (Appendix 1): < 17/30 defines PEM, 17–23.5 risk of PEM and > 23.5 absence of PEM. Vitamin D (nmol/L), albuminemia (g/L) and CRP (mg/L) were assayed from postoperative day 6. Geriatric variables were: mini mental state examination (MMSE) [12] on 30 points, assessed at discharge, activities of daily living (ADL) [13] on 6 points assessed at D -15 and at discharge, in-hospital functional deterioration (difference between D -15 and discharge ADL), and comorbidity on the Cumulative Illness Rating Score-Geriatric (CIRS-G) [14] on 60 points. Complications and mortality were assessed up to discharge from the orthopedic department: anemia, confusion, cardiorespiratory pathology (heart failure, acute coronary syndrome, arrhythmia), venous thromboembolism, bed-sores, digestive pathology (digestive hemorrhage, fecaloma), uro-nephrologic pathology (acute renal insufficiency, acute urinary retention), and infection (surgical site infection, pneumonia, cholecystitis, oral mycosis).

Data were entered in a Microsoft Excel spreadsheet. Statistical analysis used SPSS 15.0 software. PEM prevalence was calculated on the basis of MNA < 17/30. Given the low prevalence of patients free of PEM, two groups were distinguished: PEM versus non-PEM (free of or at risk of PEM). Quantitative variables were expressed as mean and standard deviation and qualitative variables as number. Analysis was univariate, due to small numbers: *t*-test or non-parametric tests when intergroup variances were not equal, and Chi^2 for qualitative variables. The significance threshold was set at $P < 0.05$.

3. Results

Fifty of the 68 patients managed in the geriatric orthopedic unit had HF, and composed the study sample (Table 1). Table 2 details fractures and treatments. On MNA, the prevalence of PEM was 28% and risk of PEM (median MNA 20/30) 58%, with a minority free of PEM (14%). Mean MNA score was 18.6/30 (range, 9–27; median, 19.3).

Table 1
Population characteristics.

Demographic data	
Patient age (years)	86.1 ± 4.4
Gender	
Female	35 (70%)
Male	15 (30%)
Residence	
Home	37 (74%)
Hostel	4 (8%)
Nursing home	9 (18%)
MHS (days)	15.8 ± 11.0
Discharge (n = 48)	
Rehabilitation	40 (80%)
Home	9 (18%)
Cardiac intensive care	1 (2%)
Geriatric data	
CIRS-G	19.7 ± 5.6
Total number of comorbidities	9 ± 2.1
Number of severe and very severe comorbidities	3.8 ± 1.7
MMSE	17.7 ± 7.3
ADL at D -15	4.6 ± 1.5
ADL at discharge	2.6 ± 1.3
Functional deterioration in ADL	2.1 ± 1.2
Orthopedic data	
Type of fracture	
Cervical fracture	20 (40%)
Trochanteric	17 (34%)
Periprosthetic	6 (12%)
Trochanteric-diaphyseal	4 (8%)
On nail	2 (4%)
Basicervical	1 (2%)
Associated fractures	
Upper limb	8 (16%)
Face	4 (8%)
Rib	1 (2%)
Time to surgery (n = 47) (hours)	67.1 ± 57.6
Type of surgery (n = 47)	
THR	13 (26%)
PHR	12 (24%)
Nail	20 (40%)
Plate	2 (4%)
History of fracture	
Hip	15 (30%)
Other	11 (22%)
Total	26 (52%)
Nutritional data	
MNA	18.6 ± 5
BMI (kg/m^2)	22.6 ± 4.3
Albuminemia (n = 49) (g/L)	26.7 ± 3.6
CRP (n = 48) (mg/L)	81.4 ± 71.3
Vitamin D (n = 48) (nmol/L)	45.8 ± 27.9

MHS: mean hospital stay; CIRS-G: Cumulative illness rating scale-Geriatric; MMSE: mini mental state examination; ADL: activities of daily living; THR: total hip replacement; PHR: partial hip replacement; MNA: Mini nutritional assessment; BMI: Body mass index; CRP: C-reactive protein; THR: total hip replacement, PHR: partial hip replacement.

CIRS-G was significantly higher in PEM ($P < 0.006$), as was severe and very severe comorbidity ($P = 0.006$). The non-PEM group showed higher MMSE scores ($P = 0.005$). Functional status was poorer in PEM ($P = 0.002$) (Table 3).

Table 2
Types of fracture and treatment.

	Prosthesis	Nail	Plate	Abstention
Cervical (n = 20)	20	–	–	–
Trochanteric (n = 17)	–	16	–	1
Periprosthetic (n = 6)	3	–	1	2
Trochanteric-diaphyseal (n = 4)	1	3	–	–
On nail (n = 2)	–	1	1	–
Basicervical (n = 1)	1	–	–	–
Total	25	20	2	3