

# FACTORS RELATED TO DELIRIUM AND MORTALITY IN OLDER ADULTS WITH FEMUR FRACTURE ON AN ORTHOPEDIC UNIT

## Fatores relacionados ao *delirium* e à mortalidade em idosos vítimas de fratura de fêmur em uma enfermaria de ortopedia

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### ABSTRACT

**OBJECTIVE:** To correlate the main clinical characteristics of geriatric patients hospitalized for femur fracture with delirium incidence and mortality during hospitalization. **METHODS:** Cross-sectional study in patients over 65 years old admitted to an orthopedics unit with femoral fracture. The authors interviewed patients and / or caregivers to investigate their clinical characteristics, and subsequently correlate their profiles to the rates of delirium and mortality. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), Student's *t*-test and  $\chi^2$  test. Significance was established at  $p < 0.05$ . **RESULTS:** Participants included 90 patients with a mean age of 83 years (65–99), 77.8% women. The mean length of stay was 19.7 days, with delirium identified in 39.9% of patients, and a mortality rate of 17.8%. Delirium was significantly associated with advanced age ( $p = 0.046$ ), use of psychotropic drugs — especially quetiapine —, higher mortality rate, diabetes mellitus, dementia syndrome, and low functionality. Mortality, in turn, was associated with chronic kidney disease, lower functionality, and dementia syndrome. **CONCLUSION:** We found that delirium was associated with advanced age, lower functionality, diabetes mellitus, dementia syndrome, higher death outcomes, and the use of psychotropic drugs; and mortality was associated to dementia syndrome, chronic kidney disease, and worse functionality. **KEYWORDS:** geriatrics; femoral fractures; delirium; mortality.

### RESUMO

**OBJETIVO:** Correlacionar as principais características clínicas do idoso internado por fratura de fêmur com a incidência de delirium e mortalidade durante a internação. **MÉTODOS:** Estudo transversal em pacientes com idade acima de 65 anos internados em enfermaria de ortopedia com fratura de fêmur. Foi aplicada aos pacientes e/ou cuidadores uma entrevista elaborada pelos autores para levantamento de suas características clínicas, sendo posteriormente realizada a correlação entre o perfil e a taxa de *delirium* e mortalidade. Para análise estatística, foi usado o programa Statistical Package for the Social Sciences (SPSS), o teste *t* de Student e o teste do  $\chi^2$ . Foi considerado estatisticamente significativo o valor  $p < 0,05$ . **RESULTADOS:** Noventa pacientes com média de idade de 83 anos (65–99), sendo 77,8% mulheres. O tempo médio de internação foi de 19,7 dias, sendo identificado *delirium* em 39,9% dos pacientes, e a taxa de mortalidade foi de 17,8%. O *delirium* esteve significativamente associado à idade avançada ( $p = 0,046$ ), ao uso de psicotrpicos — especialmente a quetiapina —, à maior taxa de mortalidade, ao diabetes mellitus, à síndrome demencial e à baixa funcionalidade. Mortalidade, por sua vez, apresentou associação com insuficiência renal crônica, menor funcionalidade e síndrome demencial. **CONCLUSÃO:** Encontramos que o delirium esteve associado a idades mais elevadas, à menor funcionalidade, ao diabetes *mellitus*, à síndrome demencial, ao maior desfecho de óbitos e ao uso de psicotrpicos; e a mortalidade, à síndrome demencial, à insuficiência renal crônica e à pior funcionalidade. **PALAVRAS-CHAVE:** geriatria; fraturas do fêmur; *delirium*; mortalidade.

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## INTRODUCTION

Delirium is a common complication in the hospitalization of older adults, and it is also significantly present in orthopedics units. This diagnosis is associated with several negative outcomes, including cognitive decline, dependence, institutionalization, and mortality.<sup>1</sup> The risk factor most consistently related to acute confusional status is the previous diagnosis of dementia, and multiple comorbidities, polypharmacy — especially the use of anticholinergic medications — and lower prior functionality.<sup>2</sup>

Leme et al.<sup>3</sup> emphasize that delirium is present in about 30% of geriatric patients hospitalized for orthopedic surgeries, and the main triggers include hydroelectrolytic disorders, pain, infections, and devices such as delayed bladder tube.

Femoral fracture is an important cause of mortality in older adults, being related both to preoperative factors such as advanced age, lower functionality, and prior dementia syndrome, as well as post-procedure variables, including pulmonary thromboembolism, shock — mainly cardiogenic and hypovolemic — and infections.<sup>4</sup>

Given the above, the objective of this study was to identify the clinical and functional characteristics of geriatric patients hospitalized for femur fracture and to correlate them with the incidence of delirium and mortality during the hospitalization period.

## METHODS

This is a cross-sectional study, whose population consisted of 90 patients over 65 years, who were admitted to the Orthopedics Unit of the Instituto de Assistência Médica ao Servidor Público Estadual (IAMSPE) for femoral fracture and who were followed jointly by the hospital's Geriatrics Service. Data were collected between July 2017 and October 2018. All patients who agreed to participate in the study signed the Informed Consent Form (ICF). After signing the form, the data obtained were filed in a spreadsheet and, subsequently, with the patients' personal medical records, a correlation was made between the patient's profile, their complications during hospitalization, and the outcome.

The variables analyzed were age (in full years), sex (female / male), functionality (Katz and Pfeffer scale), frequency of falls (at least 3 falls in 1 year or 2 falls in 6 months), comorbidities (diabetes mellitus / arterial hypertension / dementia syndrome / chronic obstructive pulmonary disease / heart failure / stroke / atrial fibrillation / coronary artery disease / chronic renal failure / neoplasia), length of stay (in full days) and medications used (psychotropics, laxative analgesics, gastric protector, and anticoagulant). These variables

were statistically correlated with the incidence of delirium, identified by the Confusion Assessment Method (CAM) questionnaire — systematically performed in all patients followed by the hospital's Geriatric Service, and with the mortality outcome.

The project was approved by the Research Ethics Committee of the institution (CEP-IAMSPE), under the approval no. 3.037.920 and the Certificate of Presentation for Ethical Appreciation (CAAE) no. 01677518.0.0000.5463, on November 26, 2018.

Statistical analyzes were performed using the Statistical Package for Social Sciences (SPSS) program in its 25th version (2017) for Windows.<sup>5</sup> For this purpose, a univariate analysis was performed using the following statistical tests: Student's *t* test, for independent samples, and  $\chi^2$  test. Significance was established at  $p < 0.05$  for all tests.

## RESULTS

Among the 90 patients selected, 77.8% ( $n = 70$ ) were women; the mean age was 83 years old, ranging from 65 to 99 years; and 23.3% ( $n = 21$ ) were considered frequent fallers. The mean length of stay was 19.7 days; the overall mortality rate was 17.8% ( $n = 16$ ); and delirium was identified in 39.9% ( $n = 35$ ) of the cases. The mean score on Pfeffer's instrumental activity scale was 10.5 points, and the Katz basic activity scored 4.8 points.

Table 1 shows the correlation of delirium with the other risk factors, with a statistically significant ( $p < 0.05$ ) association with more advanced ages (RR = 3,0; 95%CI 0.05–6.02;  $p = 0.046$ ), lower functionality both by a low Katz score (RR = -1.0; 95%CI -1.80–0.24;  $p = 0.011$ ) and by a higher Pfeffer score (RR = 6.7; 95%CI 2,43–11,03;  $p = 0.002$ ), use of psychotropic drugs (RR = 6.2; 95%CI 2.28–16.92;  $p < 0.001$ ), quetiapine use (RR = 10.24; 95%CI 2.65–39.53;  $p < 0.001$ ), diabetes mellitus (RR = 0.3; 95%CI 0.10–0.94;  $p = 0.034$ ), dementia syndrome (RR = 3.8; 95%CI 1.44–10.20;  $p = 0.006$ ), and higher outcome of death (RR = 6,6; 95%CI 1,93–22,85;  $p < 0.001$ ).

The death outcome — shown in Table 2 — was significantly associated with the presence of dementia syndrome (RR 3.6; 95%CI 1.17–11.17;  $p = 0.020$ ); chronic kidney disease (RR 6.2; 95%CI 1.55–25.26;  $p = 0.005$ ); and to worse functionality, according to the Pfeffer score (RR 6.9; 95%CI 1.31–12.49;  $p = 0.016$ ).

## DISCUSSION

Our study, conducted with 90 geriatric patients from an orthopedics unit, found that delirium was associated with

advanced age, lower functionality, diabetes mellitus, dementia syndrome, higher death outcome, and the use of psychotropic drugs, especially quetiapine. Mortality, in turn, was associated with dementia syndrome, chronic renal failure and worse functionality.

Meagher et al.,<sup>6</sup> also found a positive association between dementia syndrome and delirium, which reinforces the fact that previous cognitive deficit is an important risk factor for the development of acute confusional state. In a Dutch study by, Mosk et al.,<sup>7</sup> with older people

hospitalized for femoral fracture, no relationship was found between delirium and other comorbidities besides cognitive impairment.

In 2016, Vidal et al. found a positive association in the use of psychotropic drugs in geriatric patients and a higher incidence of delirium, data that was in line with the present findings, indicating that the often inappropriate use of medications, associated with the inherent fragility of the aging process, is an important risk factor for confusional states.<sup>8</sup> In general, it is not a surgical procedure per se that causes

**Table 1** Sample characteristics (n = 90) associated with delirium in older adults with femoral fracture.

Variables	Delirium (n = 35, 38.9%)	Absence of delirium (n = 55, 61.1%)	Odds ratio	p (significance)*
Female sex	28 (40%)	42 (60%)	0.808 (0.287–2.276)	0.686 <sup>#</sup>
Death	12 (75%)	4 (25%)	6.652 (1.937–22.851)	< 0.001**
Chronic fallers	10 (47.6%)	11 (52.4%)	1.600 (0.596–4.293)	0.349**
Diabetes mellitus	5 (20.8%)	19 (79.2%)	0.316 (0.105–0.947)	0.034**
Arterial hypertension	19 (36.5%)	33 (63.5%)	0.792 (0.336–1.864)	0.593 <sup>#</sup>
Dementia syndrome	15 (62.5%)	9 (37.5%)	3.833 (1.440–10.204)	0.006**
COPD	3 (60%)	2(40%)	2.484 (0.394–15.678)	0.319**
Cardiac Insufficiency	5 (41.7%)	7 (58.3%)	1.143 (0.332–3.929)	0.832**
CVA	4 (33.3%)	8 (66.7%)	0.758 (0.210–2.735)	0.672**
Atrial fibrillation	3 (27.3%)	8 (72.7%)	0.551 (0.136–2.235)	0.399**
Coronary artery disease	1 (25%)	3 (75%)	0.510 (0.051–5.106)	0.560**
CKD	4 (40%)	6 (60%)	1.054 (0.275–4.035)	0.939**
Neoplasia	4 (40%)	6 (60%)	1.054 (0.275–4.035)	0.939**
Psychotropic	18 (69.2%)	8 (30.8%)	6.221 (2.287–16.920)	< 0.001**
Quetiapine	13 (81.3%)	3 (18.8%)	10.242 (2.653–39.538)	< 0.001**
Haloperidol	2 (100%)	0	-	0.073**
Clonazepam	4 (40%)	6 (60%)	1.054 (0.275–4.035)	0.939**
Painkillers	30 (38%)	49 (62%)	0.735 (0.206–2.618)	0.634 <sup>#</sup>
Dipyrone	26 (37.1%)	44 (62.9%)	0.722 (0.264–1.974)	0.525 <sup>#</sup>
Tramadol	18 (37.5%)	30 (62.5%)	0.882 (0.377–2.063)	0.773 <sup>#</sup>
Morphine	6 (66.7%)	3 (33.3%)	3.586 (0.834–15.418)	0.072**
Methadone	3 (30%)	7 (70%)	0.643 (0.155–2.672)	0.541**
LMWH	24 (33.8%)	47 (66.2%)	0.371 (0.132–1.045)	0.056 <sup>#</sup>
HNF	8 (57.1%)	6 (42.9%)	2.420 (0.760–7.704)	0.127**

COPD: chronic obstructive pulmonary disease; CVA: cerebrovascular accident; CRF: chronic renal failure renal; LMWH: low molecular weight heparin; UFH: unfractionated heparin; \*significance value < 0.05; \*\*Fisher's exact test; <sup>#</sup> $\chi^2$  test.

confusion, but it has an important contribution on clinical, hemodynamic and pharmacological factors.

The association of delirium and mortality was statistically significant, findings that are in line with this research were also conducted in another hospital in the city of São Paulo. These data reinforce the severity of this acute confusional syndrome and the considerable likelihood of an unfavorable outcome, which justifies an approach aimed at prevention, early identification, correction of causal factors and appropriate management.<sup>9</sup>

Lower functionality is also associated with a higher incidence of delirium, a fact observed by our study and also by

Mosk et al.,<sup>7</sup> and is closely related to dementia, which is already identified as a risk variable. Advanced age, despite being known for correlating with acute confusional states, was not statistically significant, mainly because the study only addressed the geriatric population and the mean ages of both groups were similar.

Previous diagnosis of diabetes mellitus was statistically significantly associated with delirium, which is generally not linked to confusional states, but corroborates the study by Bisschop et al.,<sup>10</sup> that also identified the correlation. The author explains that cortisol levels, which generally increase blood

**Table 2** Sample characteristics (n = 90) associated with mortality in older adults with femoral fracture.

Variables	Deaths (n = 16; 17.8%)	Hospital discharge (n = 74; 82.2%)	Odds ratio	p (significance)*
Female sex	11 (15.7%)	59 (84.3%)	1.788 (0.539–5.933)	0.338 <sup>#</sup>
Frequent fallers	5 (23.8%)	16 (76.2%)	1.648 (0.500–5.434)	0.409**
Diabetes mellitus	4 (16.7%)	20 (83.3%)	0.900 (0.260–3.118)	0.868**
Arterial hypertension	12 (23.1%)	40 (76.9%)	2.550 (0.752–8.641)	0.124**
Dementia syndrome	8 (33.3%)	16 (66.7%)	3.625 (1.176–11.171)	0.020**
COPD	1 (20%)	4 (80%)	1.167 (0.122–11.193)	0.894**
Cardiac insufficiency	3 (25%)	9 (75%)	1.667 (0.396–7.006)	0.482**
CVA	3 (25%)	9 (75%)	1.667 (0.396–7.006)	0.482**
Atrial Fibrillation	-	11 (100%)	-	0.100**
Coronary artery disease	1 (25%)	3 (75%)	1.578 (0.153–16.228)	0.699**
CKD	5 (50%)	5 (50%)	6.237 (1.557–25.269)	0.005**
Neoplasia	1 (10%)	9 (90%)	0.481 (0.57–4.096)	0.495**
Psychotropics	6 (23.1%)	20 (76.7%)	1.620 (0.521–5.039)	0.402**
Quetiapine	4 (25%)	12 (75%)	1.722 (0.474–6.253)	0.405**
Haloperidol	1 (50%)	1 (50%)	4.687 (0.288–82.217)	0.228**
Clonazepam	1 (10%)	9 (90%)	0.481 (0.57–4.096)	0.495**
Painkillers	11 (13.9%)	68 (86.1%)	0.194 (0.050–0.747)	0.010 <sup>#</sup>
Dipyron	11 (15.7%)	59 (84.3%)	0.559 (0.169–1.856)	0.338 <sup>#</sup>
Tramadol	7 (14.6%)	41 (85.4%)	0.626 (0.211–1.860)	0.397 <sup>#</sup>
Morphine	3 (33.3%)	6 (66.7%)	2.615 (0.579–11.810)	0.198**
Methadone	2 (20%)	8 (80%)	1.179 (0.226–6.157)	0.845**
LMWH	9 (12.7%)	62 (87.3%)	0.249 (0.078–0.798)	0.014 <sup>#</sup>
UFH	5 (35.7%)	9 (64.3%)	3.283 (0.925–11.646)	0.056**

COPD: chronic obstructive pulmonary disease; CVA: cerebrovascular accident; CKF: chronic kidney disease; LMWH: low molecular weight heparin; UFH: unfractionated heparin; \*significance value < 0.05; \*\*Fisher's exact test; <sup>#</sup> $\chi^2$  test for all variables.

glucose levels, are related to increased delirium, which is also a positive association with Cushing's syndrome, characterized by high cortisol rates.

As in delirium, dementia also implied a higher mortality rate, but we found an association with chronic kidney disease, a finding not found in most femur fracture studies in the geriatric population. However, Kim et al.<sup>11</sup> performed an analysis of patients with non-dialytic chronic kidney disease with femur fracture, and found a positive association with in-hospital mortality, highlighting the fact that, although such risk factor is not as widespread, it also deserves to be evaluated and properly addressed.

In a meta-analysis by Hu et al.,<sup>12</sup> it was identified an association between lower functionality and higher mortality rate, as in our findings. The authors reveal in these findings 12 strong predictors of mortality: advanced age; male sex; previous institutionalization; disability of mobility; dependence on activities of daily living; higher preoperative score by the American Society of Anesthesiologists (ASA); previous cognitive deficit; multiple comorbidities; poor mental health; diabetes — which in our study was positively related only to delirium — ; cancer, and previous heart disease.

Among the study's limitations, we can mention the fact that the cross-sectional model does not allow the definition of causality between the variables; the convenience sample

may have selected a homogeneous group that may not correspond to the reality of other services in the national territory. In addition, the small sample size did not allow notoriously recognized variables to have a statistically significant association with delirium and mortality.

## CONCLUSION

This study identified that in patients undergoing orthopedic surgery, the frequency of delirium was associated with advanced age, lower functionality, diabetes mellitus, dementia syndrome, higher death outcome, and use of psychotropic drugs; and mortality was related to dementia syndrome, chronic kidney disease, and worse functionality.

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## CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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