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Hip fracture in Pará State, Brazil: officially recorded mortality and comorbidities in the elderly population. Retrospective cohort study

Fratura de quadril no estado do Pará, Brasil: mortalidade oficialmente registrada e comorbidades na população idosa. Estudo de coorte retrospectivo

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ABSTRACT

OBJECTIVE: To assess factors related to death among the elderly within one year after hip fracture surgery in Pará State, Brazil, Amazon Region. MATERIAL AND METHODS: A retrospective cohort study was performed using data collected from a referral center for orthopedic surgery and death records from the Pará State Health Department. We enrolled patients aged 60 years or older who were hospitalized for fractures in the proximal third of the femur between January 2015 and December 2016 (N = 542). Data were described using absolute and relative frequencies, means, medians, and respective standard deviations, minimum and maximum values. Clinical and sociodemographic factors associated with death up to one year after hip fracture surgery were investigated. We hypothesized that a delay in surgical intervention would correlate with an increased mortality risk. RESULTS: The death rate within one year was 12.2%. Together, the days between fracture and surgery did not have a statistically significant impact on one-year mortality (OR = 1.01; 95% CI: 1.00–1.03), nor did respiratory comorbidities (OR = 3.04; 95% CI: 0.92–10.06). Only age (OR = 1.053; 95% CI: 1.023–1.084) and male sex (OR = 2.11; 95% CI: 1.24–3.60) were statistically significant with higher mortality one year after surgery. CONCLUSION: Age and male sex were identified as factors associated with one-year mortality. Despite the challenges related to transportation and the limited availability of public health care in the Amazon Region, the delay in surgery did not emerge as a determinant of the mortality outcome.

Keywords: Hip Fractures; Aged; Mortality; Health Services for the Aged; Transportation of Patients.

RESUMO

OBJETIVO: Avaliar fatores relacionados à mortalidade entre idosos um ano após cirurgia de fratura de quadril no estado do Pará, Brasil. MATERIAIS E MÉTODOS: Estudo de coorte retrospectivo utilizando dados de um centro de referência em cirurgia ortopédica e registros de óbito da Secretaria de Estado da Saúde do Pará. Foram incluídos pacientes com 60 anos ou mais hospitalizados por fraturas no terço proximal do fêmur entre 2015 e 2016 (N = 542). Os dados foram descritos por frequências absolutas e relativas, médias, medianas, desvios padrão, valores mínimos e máximos. Fatores clínicos e sociodemográficos associados à morte até um ano após a cirurgia de fratura de quadril foram investigados. Hipotetizamos que o atraso na intervenção cirúrgica correlacionaria com um aumento no risco de mortalidade. RESULTADOS: A taxa de mortalidade em um ano foi de 12,2%. O intervalo de dias entre a fratura e a cirurgia não teve impacto estatisticamente significativo na mortalidade em um ano (OR = 1,01; IC 95%: 1,00–1,03), assim como as comorbidades respiratórias (OR = 3,04; IC 95%: 0,92–10,06). Apenas a idade (OR = 1,053; IC 95%: 1,023–1,084) e o sexo masculino (OR = 2,11; IC 95%: 1,24–3,60) foram estatisticamente significativos com maior mortalidade um ano após a cirurgia. CONCLUSÃO: Idade e sexo masculino foram identificados como fatores associados à mortalidade em um ano. Apesar dos desafios relacionados ao transporte e à limitada disponibilidade de cuidados de saúde públicos na Região Amazônica, o atraso na cirurgia não emergiu como determinante do desfecho de mortalidade.

Palavras-chave: Fraturas de Quadril; Idoso; Mortalidade; Serviços de Saúde para Idosos; Transporte de Pacientes.

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INTRODUCTION

Physiological changes inherent to aging predispose to fractures and their complications, which are related to unfavorable outcomes like death[1]. Worldwide, elderly mortality is high one year after hip fractures, with rates ranging from 22.8% to 29.5%[2,3]. In Brazil, accessing public hospitals poses challenges, and there are also delays in surgery for these cases[4]. These delays may heighten the risk of death during hospitalization and within one year, particularly in the Brazilian Public Health System (Sistema Único de Saúde – SUS) hospitals[5,6]. This can be particularly relevant in areas where transportation is difficult, such as the Amazon Region, where many roads are unpaved, ambulances are insufficient, and riverside populations remain isolated due to the lack of quick river transportation for these situations.

Despite the widely available evidence about mortality after hip fracture worldwide, the studies are usually based on areas of high urbanization[2,5,6]. In contrast, no data on death rates is available specifically in the Amazon Region. Therefore, formulating evidence-based public health policies becomes a challenge.

Nevertheless, hip fractures are frequent in Amazon. According to the national public health system register, only 1,825 hip fractures were notified between January 2015 and December 2016 in Pará State[7]. Given the gap in the literature, this study aimed to investigate the factors associated with death up to one year after hip fracture surgery among the elderly admitted to an orthopedic referral hospital in Belém, the capital of Pará, northern Brazil. We hypothesize that associated comorbidities and the time interval between fracture and surgery occurrence influence the patients' survival in one year.

MATERIALS AND METHODS

STUDY DESIGN AND SETTING

This is a retrospective cohort study based on data from medical records. Data were collected from all consecutive patients admitted with hip fracture in Maradei Hospital, in the Belém City, Pará State, Brazil. The hospital is a metropolitan and regional referral center for orthopedic and trauma treatment in Pará. It serves SUS and private individuals through insurance policies, functioning as a teaching hospital for medical students from Federal University of Pará (UFPA).

All patients from SUS were referred to the hospital through Pará's health regulatory system. Those from private insurance were admitted directly from the hospital's emergency department.

ETHICS

The Research Ethics Committee of the Institute of Health Sciences at UFPA approved the study on November 27, 2018, under protocol CAAE 91758418.7.0000.0018. Informed consent was waived, as the study was based mainly on data from medical records; besides, anonymity was guaranteed to the patient and family in cases where a telephone call was accomplished.

PARTICIPANTS AND STUDY SIZE

The hospital admitted patients from the capital, Belém, and its metropolitan region, as well as from the northeast and southeast of the state and from Marajó Island (Figure 1), which were referred by the public health system. Across Pará State, patients from the Tapajós region were the only ones not referred to the hospital. All consecutive elderly patients who received surgical treatment for fractures in the proximal third of the femur (neck, intertrochanteric, and subtrochanteric), between January 1, 2015, and December 31, 2016, were included in the study. The initial date is the inception of the electronic medical records system in the hospital. Therefore, this study used a convenience sample of all consecutive patients for whom it was possible to retrieve data. All patients aged 60 years old or older were considered as elderly. Medical records without an exact surgery date and those treated conservatively were excluded from the study.

VARIABLES AND DATA SOURCES

Possible death in the first year after surgery was verified within a death certificates database provided by the Health Department of the State of Pará (Secretaria do Estado de Saúde do Pará – SESPA) for this study. The dates and causes of death were registered. The cause of death was recorded using an International Statistical Classification of Diseases and Related Health Problems Code (ICD10).

Additional information was also gathered from the medical records, including demographics (age at surgery, sex, and origin), general clinical characteristics (comorbidities, smoking status, date of admission, date of hospital discharge, and date of death if occurred), as well as clinical details related to the hip fracture (affected side of fracture and fracture site, type of surgery, date of fracture, and date of surgery).

The following comorbidities were registered: systemic arterial hypertension, diabetes mellitus, history of stroke, other heart diseases, Alzheimer's disease, and prostate cancer. The presence of pulmonary comorbidities was also verified, such as pulmonary fibrosis, chronic obstructive pulmonary disease (COPD), asthma, and hyper and hypothyroidism. Patients who used at least one smoked tobacco product at least once a week were considered current tobacco users. Patients who declared they did not smoke for at least one year were identified as former smokers.

The proportion of patients undergoing surgery within 48 h of the fracture was evaluated by analyzing the trauma and the surgery dates. This timeframe is considered optimal for minimizing postoperative risks of mortality[8,9]. Clinical and demographic variables associated with surgery delay (operations taking place after the window of 48 h from the trauma) were investigated.

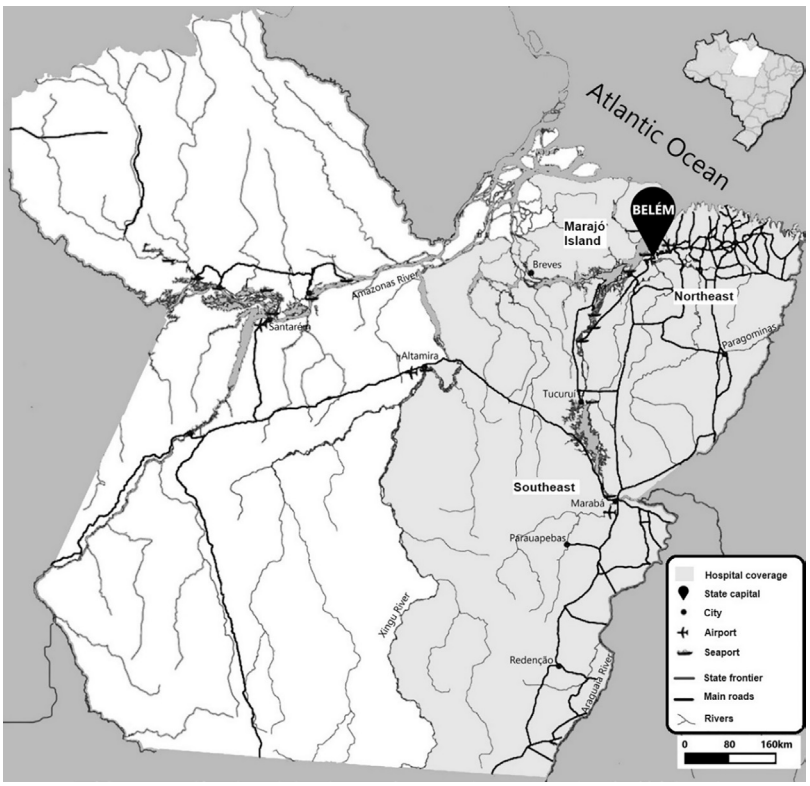

Photo: Maria Clara Pinheiro da Silva.

Figure 1 – Map of Pará State showing, in light gray, the area of origin of patients admitted to Maradei Hospital

SOURCES OF BIAS

To mitigate the risk of clerical errors in death certificates, we attempted to confirm the cause and date of death by making telephone contact with the families of the deceased. All data collected for this study were recorded by one researcher and independently double-checked by another.

STATISTICAL ANALYSIS

The binary variables in all patients were described using absolute and relative frequencies. Quantitative characteristics used summary measures (mean, standard deviation, median, minimum, and maximum)[10]. According to each binary variable, mortality within one year was characterized in absolute and relative frequencies, and the association was verified using chi-square tests or exact tests (Fisher test or likelihood ratio test)[10]. Quantitative variables were described according to one-year mortality and were compared using the Student's t-test or Mann-Whitney test[10]. In addition, the unadjusted odds ratios (OR) of each variable of interest with one-year mortality, along with the respective 95% confidence intervals, were estimated in bivariate logistic regression[11].

A multiple logistic regression model was performed[11], with variables that presented a descriptive level of less than 0.20 ($P < 0.20$) in the bivariate analyses entering the multiple model, keeping all the variables selected in the model, the "full model", to jointly assess the characteristics that influenced one-year mortality. To avoid multicollinearity, the variable "days between fracture and surgery" was selected instead of the variables "days between fracture and hospitalization" and "days between hospitalization and surgery" since the chosen variable encompasses the other two times.

Microsoft Excel 2003 and IBM-SPSS for Windows v20.0 software were used to tabulate and analyze the data. A significance level of 5% was considered.

RESULTS

Over the two-year study period, the hospital admitted 814 elderly patients for hip fracture treatment, encompassing femoral neck, intertrochanteric, and subtrochanteric regions of the hip. Forty-eight patients for whom the fracture date was unavailable were excluded, along with 224 who were treated conservatively. The remaining 542 cases were evaluated for this study.

Most patients were female (64.9%) and 80 years old or older (55.7%), with the mean age as 80 years (standard deviation – SD of 9.5 years; minimum of 60, maximum of 112 years). When admitted to the hospital, 236 patients (43.5%) were under treatment for hypertension, 110 (20.3%) for diabetes, and 30 (5.5%) suffered from other cardiovascular diseases. At the moment of fracture, 81 (14.9%) were smokers (Table 1).

The most common type of fracture was intertrochanteric (63.1%). Most patients were treated with cephalomedullary nails (48.0%) or bipolar hip hemiarthroplasty (27.3%). As shown in table 2, most patients lived outside the capital (59.0%), where the hospital is located (59%), and the mean time between the fracture and hospital admission was 8.7 days (SD 10.7), with 12.4 mean days between fracture and surgery (SD 12.3). The time between fracture and surgery was below 48 h for 20 (3.7%) patients.

Table 1 – Epidemiological characteristics of all evaluated patients who treated hip fracture at Maradei Hospital, Pará State, Brazil, 2015–2016

Variables	Patients	
	N	%
Age (years old)		
60 to 69	88	16.2
70 to 79	152	28.0
80 to 89	227	41.9
≥ 90	75	13.8
Sex		
Female	352	64.9
Male	190	35.1
Laterality		
Right	253	46.7
Left	289	53.3
Controlled systemic arterial hypertension		
No	306	56.5
Yes	236	43.5
Controlled diabetes mellitus		
No	432	79.7
Yes	110	20.3
Other cardiovascular disease		
No	512	94.5
Yes	30	5.5
Smoker		
No	461	85.1
Yes	81	14.9
Stroke history		
No	520	95.9
Yes	22	4.1
Alzheimer's disease		
No	515	95.0
Yes	27	5.0
Pulmonary comorbidity		
No	527	97.2
Yes	15	2.8
Prostate cancer history		
No	539	99.4
Yes	3	0.6
Current hyperthyroidism		
No	541	99.8
Yes	1	0.2
Current hypothyroidism		
No	539	99.4
Yes	3	0.6

Table 2 – Orthopedic procedure to treat hip fracture of all evaluated patients at Maradei Hospital, Pará State, Brazil, 2015–2016

Variables	Patients	
	N	%
Fracture site		
Femoral neck	172	31.7
Subtrochanteric	28	5.2
Intertrochanteric	342	63.1
Type of surgery		
Cephalomedullary nail	260	48.0
Bipolar hip hemiarthroplasty	148	27.3
Total hip arthroplasty	19	3.5
Dynamic hip screw plate	90	16.6
External fixator	2	0.4
Cannulated screws	4	0.7
Dynamic condylar screw plate	18	3.3
Girdlestone	1	0.2
City		
Belém (capital)	222	41.0
Countryside	320	59.0
Death in one year		
No	476	87.8
Yes	66	12.2
Days between fracture and hospital admission		
Mean and standard deviation	8.7 ± 10.7	
Median (minimum; maximum)	6 (– ; 108)	
Days in hospital		
Mean and standard deviation	5.8 ± 3.3	
Median (minimum; maximum)	5 (1; 43)	
Days between hospital admission and surgery		
Mean and standard deviation	3.7 ± 6.4	
Median (minimum; maximum)	3 (– ; 127)	
Days between fracture and surgery		
Mean and standard deviation	12.4 ± 12.3	
Median (minimum; maximum)	10 (1; 135)	
Time between fracture and surgery > 48 h		
No	20	3.7
Yes	522	96.3

Conventional sign used: – Numerical data equal to zero not resulting from rounding.

Table 3 – Cause of death in all assessed patients, according to the ICD-10 code, registered in SESPA's database, 2015–2017

Death cause / ICD-10 code	Days between surgery and death
Pulmonary events	
I26 - Pulmonary embolism	324
J96.0 - Acute respiratory failure	245
J96.0 - Acute respiratory failure	71
J96.0 - Acute respiratory failure	138
J96.0 - Acute respiratory failure	66
J96.0 - Acute respiratory failure	156
J96.0 - Acute respiratory failure	125
J96.0 - Acute respiratory failure	36
J96.0 - Acute respiratory failure	14
J96.0 - Acute respiratory failure	6
J96.0 - Acute respiratory failure	132
J96.0 - Acute respiratory failure	129
J96.0 - Acute respiratory failure	30
J96.0 - Acute respiratory failure	53
J96.0 - Acute respiratory failure	1
R09.2 - Respiratory arrest	18
R09.2 - Respiratory arrest	23
R09.2 - Respiratory arrest	13
R09.2 - Respiratory arrest	312
R09.2 - Respiratory arrest	73
R09.2 - Respiratory arrest	41
R09.2 - Respiratory arrest	266
R09.2 - Respiratory arrest	187
R09.2 - Respiratory arrest	2
Cardiovascular events	
I63.9 - Cerebral infarction, unspecified	72
I63.9 - Cerebral infarction, unspecified	142
I63.9 - Cerebral infarction, unspecified	143
I63.9 - Cerebral infarction, unspecified	175
I60.9 - Nontraumatic subarachnoid hemorrhage, unspecified	4
Cardiac events	
I48 - Atrial fibrillation and flutter	14
I21 - Acute myocardial infarction	9
I46 - Cardiac arrest	12
I46 - Cardiac arrest	262
I46 - Cardiac arrest	101
I46.9 - Cardiac arrest, cause unspecified	254
I46.9 - Cardiac arrest, cause unspecified	318
Shock	
R57.0 - Cardiogenic shock	141
R57.0 - Cardiogenic shock	76
R57.0 - Cardiogenic shock	23
R57.8 - Other shock	110
R57.8 - Other shock	122
R57.8 - Other shock	357
R57.9 - Shock, unspecified	133
Unspecified septicemia	
A41.9 - Sepsis, unspecified organism	286
A41.9 - Sepsis, unspecified organism	258
A41.9 - Sepsis, unspecified organism	85
A41.9 - Sepsis, unspecified organism	64
A41.9 - Sepsis, unspecified organism	134
A41.9 - Sepsis, unspecified organism	343
A41.9 - Sepsis, unspecified organism	55
A41.9 - Sepsis, unspecified organism	7
A41.9 - Sepsis, unspecified organism	159
Uterine cancer	
C55 - Malignant neoplasm of uterus, part unspecified	268
Femoral fracture	
S72 - Fracture of femur	20
Dementia	
F03 - Unspecified dementia	48
Not defined	
R99 - Ill-defined and unknown cause of mortality	265
R99 - Ill-defined and unknown cause of mortality	158
R99 - Ill-defined and unknown cause of mortality	117
R99 - Ill-defined and unknown cause of mortality	89
R99 - Ill-defined and unknown cause of mortality	192
R99 - Ill-defined and unknown cause of mortality	4
Death without assistance	
R98 - Unattended death	41
R98 - Unattended death	309
R98 - Unattended death	17
R98 - Unattended death	32
R98 - Unattended death	324

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Table 4 – A description of one-year mortality based on each evaluated characteristic and the results of the unadjusted analysis for patients undergoing surgical treatment for hip fractures at Maradei Hospital, Pará State, Brazil, 2015–2016

Variables	Death in one year				95% CI			P-value
	No		Yes		Odds ratio	Inferior	Superior	
	N = 476	%	N = 66	%				
Age (interval)								
Mean and standard deviation	79.5 ± 9.4		83.7 ± 9.5		1.049	1.019	1.078	0.001*
Age (years old)								
60 to 69	81	92.0	7	8.0	1			
70 to 79	138	90.8	14	9.2	1.17	0.46	3.03	0.105
80 to 89	196	86.3	31	13.7	1.83	0.77	4.33	
≥ 90	61	81.3	14	18.7	2.66	1.01	6.98	
Sex								
Female	318	90.3	34	9.7	1			0.015
Male	158	83.2	32	16.8	1.89	1.13	3.18	
Laterality								
Right	225	88.9	28	11.1	1			0.460
Left	251	86.9	38	13.1	1.22	0.72	2.05	
Controlled systemic arterial hypertension								
No	266	86.9	40	13.1	1			0.468
Yes	210	89.0	26	11.0	0.82	0.49	1.39	
Controlled diabetes mellitus								
No	381	88.2	51	11.8	1			0.600
Yes	95	86.4	15	13.6	1.18	0.64	2.19	
Stroke history								
No	456	87.7	64	12.3	1			> 0.999†
Yes	20	90.9	2	9.1	0.71	0.16	3.12	
Other cardiovascular disease								
No	451	88.1	61	11.9	1			0.395†
Yes	25	83.3	5	16.7	1.48	0.55	4.01	

(continue)

Table 4 – A description of one-year mortality based on each evaluated characteristic and the results of the unadjusted analysis for patients undergoing surgical treatment for hip fractures at Maradei Hospital, 2015–2016

Variables	Death in one year				95% CI			P-value
	No		Yes		Odds ratio	Inferior	Superior	
	N = 476	%	N = 66	%				
Alzheimer's disease								
No	451	87.6	64	12.4	1			0.761†
Yes	25	92.6	2	7.4	0.56	0.13	2.44	
Pulmonary comorbidity								
No	465	88.2	62	11.8	1			0.097†
Yes	11	73.3	4	26.7	2.73	0.84	8.83	
Smoker								
No	405	87.9	56	12.1	1			0.960
Yes	71	87.7	10	12.3	1.02	0.5	2.09	
Fracture site								
Femoral neck	151	87.8	21	12.2	1			
Subtrochanteric	24	85.7	4	14.3	1.2	0.38	3.8	0.940‡
Intertrochanteric	301	88.0	41	12.0	0.98	0.56	1.72	
Type of surgery								
Cephalomedullary nail	225	86.5	35	13.5	1			
Bipolar hip hemiarthroplasty	129	87.2	19	12.8	0.95	0.52	1.72	
Total hip arthroplasty	18	94.7	1	5.3	0.36	0.05	2.76	
Dynamic hip screw plate	81	90.0	9	10.0	0.71	0.33	1.55	0.807‡
External fixator	2	100.0	–	–	ND			
Cannulated screws	4	100.0	–	–	ND			
Dynamic condylar screw plate	16	88.9	2	11.1	0.80	0.18	3.65	
Girdlestone	1	100.0	–	–	ND			

(end)

Table 4 – A description of one-year mortality based on each evaluated characteristic and the results of the unadjusted analysis for patients undergoing surgical treatment for hip fractures at Maradei Hospital, 2015–2016

Variables	Death in one year				95% CI			P-value
	No		Yes		Odds ratio	Inferior	Superior	
	N = 476	%	N = 66	%				
Days between fracture and hospital admission					1.01	0.99	1.03	
Mean and standard deviation	8.4 ± 10.5		10.4 ± 12.3					0.008§
Median (minimum; maximum)	5 (– ; 108)		7 (– ; 92)					
Days in hospital								
Mean and standard deviation	5.7 ± 3.3		6.3 ± 3.3		1.05	0.98	1.11	0.078§
Median (minimum; maximum)	5 (1; 43)		6 (3; 23)					
Days between hospital admission and surgery								
Mean and standard deviation	3.7 ± 6.7		4 ± 2.7		1.01	0,97	1.04	0.033§
Median (minimum; maximum)	3 (– ; 127)		3.5 (1; 14)					
Days between fracture and surgery								
Mean and standard deviation	12.1 ± 12.3		14.4 ± 12.6		1.01	1.00	1.03	0.002§
Median (minimum; maximum)	9 (1; 135)		12 (1; 95)					
Time between fracture and surgery > 48 h								
No	18	90.0	2	10.0	1			> 0.999†
Yes	458	87.7	64	12.3	1.26	0.29	5.55	
City								
Belém (capital)	193	86.9	29	13.1	1			0.599
Countryside	283	88.4	37	11.6	0.87	0.52	1.46	

Conventional sign used: – Numerical data equal to zero not resulting from rounding; CI: Confidence interval; p-values from Chi-square test except: * Student t-test; † Fisher's exact test; ‡ Likelihood ratio test; § Mann-Whitney test; ND: Unable to estimate.

Death registers were examined among the 542 patients who underwent surgery, and it was identified that 66 (12.2%) of them had died within one year of the procedure. For two patients, the death date was unknown (although certified). The most common causes of death were pulmonary (36.4%) and cardiac or cardiovascular events (18.2%). However, six patients did not have a cause of death described, and the other five were registered as "deaths without assistance". The only case of cancer, specifically uterine cancer, was a pre-existing condition prior to the hip surgery. In the only case where "death due to hip fracture" was registered, the patient had been indicated for a second surgery, but the procedure had been delayed due to difficulties in transportation to the hospital, as described in the medical record (Table 3).

In the univariate analysis, the variables identified as related to death in one year were age, sex, days between fracture and hospital admission, days between hospital admission and surgery, and days between fracture and surgery (Table 4). However, in the multivariate logistic regression (Table 5), the days between fracture and surgery (OR = 3.04; P = 0.169) are not significantly related to mortality in one year. Despite being the most common causes of death, respiratory comorbidities (OR = 3.04; P = 0.070) were not related to death in one year after hip surgery either. For every one year added to age, the risk of death increased 5.5%. Men with hip fractures had a 111% higher chance of dying one year after hip surgery than women.

DISCUSSION

This study identified a mortality rate of 12.2% in one year after hip surgery, with age and sex as the main variables associated with death. While the time between fracture and surgery was associated with mortality in isolated analysis, it lost statistical significance in multivariate analysis, a similar pattern with respiratory comorbidities. This result implies we could not substantiate the hypothesis that a prolonged interval between fracture and surgery impacts mortality. Nevertheless, the study highlights that elderly patients with hip fractures are succumbing to respiratory and cardiovascular diseases. We speculate that adequate primary care could have been prevented some of these deaths. Perhaps preventive measures to control high blood pressure, diabetes, and preventable infectious diseases are still finding barriers to reaching the communities that live alongside the rivers in the Amazon.

The death rate in this study is similar to the 12% rate found in a study in Taiwan, where the intertrochanteric fracture was more prevalent[12]. However, other studies have even higher rates, of 19% or 26%[13,14].

The epidemiological profile of the patients analyzed here is not different from other national studies, which also show, for example, that the female sex is the most prevalent in hip fractures[15,16]. When analyzing one-year mortality, male gender is the most prevalent, consistent with findings in other studies[6,17,18]. Age affected the death rate: for each year added to age, there was a 5.5% higher chance of mortality in this study, a similar number to what was found in another evaluation in the South of Brazil, which registered an 8% increase per year in the risk[19].

The hospital where this study was conducted is a referral center for hip surgery for the public system. It receives patients from SUS across the state that are not equipped or staffed to treat them surgically. Nearly 60% of our patients were non-residents in the capital, Belém, and required transportation by river and roads to reach the hospital for treatment. These trips took, on average, 8.4 days (from fracture to hospitalization). Inter-city transportation for hip surgery is common in Brazil[20]. Only 20 patients in this study underwent surgery within 48 h of the trauma. Cases not treated within this time window may entail a worse prognosis and higher healthcare costs associated with sequelae[20,21]; although, in fact, it has not affected the death rate in other studies[22,23]. We could not find any significant difference between these 20 and the remaining patients who had to wait more time.

Some authors argue that a delay exceeding 48 h may permit the stabilization of comorbidities that could otherwise impact surgical outcomes[22]. However, one must consider that the conditions of the hospitals where patients wait for surgery can be far from ideal, especially in the Amazon Region. The delay in surgery can affect prognosis and is associated with a higher risk of nosocomial pneumonia and reoperations due to other infections[24,25]. The higher hospital infection risk, especially among the elderly, speaks in favor of trying to operate in 48 h[8,9].

Hip fractures mainly affect the elderly. Moreover, this population tends to present chronic comorbidities. It is natural that the death rates one year after hip fracture surgical treatment be related to diseases such as anemia, dementia, myocardial infarction, and chronic

Table 5 – Result of the multiple model to explain mortality in one year according to the evaluated characteristics of the patients undergoing hip fracture surgical treatment at Maradei Hospital, 2015–2016

Variable	OR	95% CI		P-value
		Inferior	Superior	
Age (years old)	1.053	1.023	1.084	< 0.001
Sex (male)	2.11	1.24	3.60	0.006
Pulmonary comorbidity	3.04	0.92	10.06	0.07
Days between fracture and surgery	1.01	1.00	1.03	0.161

CI: Confidence interval; OR: Odds ratio.

obstructive pulmonary disease[5,22]. The elderly with hip fractures tend to suffer from hypertension and diabetes, too[16]. However, no specific association between these chronic diseases and mortality after one year was found in this study sample.

The most frequently recorded causes of death among the patients within one year were pulmonary and cardiovascular events. The confidence in these data, sourced from death rate certificates within the Pará State system, might be appropriately questioned. However, the limitations in information quality and the absence of specific details on pulmonary diseases or cardiac events causing death hinder more in-depth analyses[26,27,28].

Another limitation of the present study is the small sample. It is known that there is underreporting of deaths in Pará State because families in riverside communities fail to notify the death of relatives due to social and economic restraints. It is estimated that 7% of deaths in Pará are not notified[29,30], and although we tried to mitigate this by making telephone calls to the families, we could not identify further deaths. Also, there is the possibility that some patients have died even before receiving adequate treatment, and so were not included in this research. Notwithstanding, the sample highly represents what happens in the Pará region and allows future comparisons.

CONCLUSION

Considering the local realities, ensuring that patients have access to surgical treatment for hip surgery 48 h after the trauma can be challenging. Although a significant association between this delay and mortality was not found, we conclude that reducing this time is justified by preventing complications that can impact patients' lives and healthcare systems. More extensive and in-depth investigations into the causes of death among patients operated for hip fractures are necessary to facilitate better planning of healthcare and logistics, particularly in the context of transporting patients in the Amazon.

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CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest involved in this research.

AUTHORS' CONTRIBUTION

Each author contributed individually and significantly to the development of this article.

Silva ABF: conceptualization, data curation, formal analysis, investigation, methodology, and manuscript writing.

Silva MCP: data curation, formal analysis, visualization, manuscript writing, reviewing, and editing.

Lima Gustavo K: conceptualization, investigation, and methodology.

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REFERENCES

1 Bilik O, Damar HT, Karayurt O. Fall behaviors and risk factors among elderly patients with hip fractures. Acta Paul Enferm. 2017 Jul-Aug;30(4):420-27.

2 Pollmann CT, Røtterud JH, Gjertsen JE, Dahl FA, Lenvik O, Årøen A. Fast track hip fracture care and mortality - an observational study of 2230 patients. BMC Musculoskelet Disord. 2019 May;20(1):248.

3 Lin JCF, Liang WM. Mortality, readmission, and reoperation after hip fracture in nonagenarians. BMC Musculoskelet Disord. 2017 Apr;18(1):144.

4 Edelmuth SVCL, Sorio GN, Sprovieri FAA, Gali JC, Peron SF. Comorbidities, clinical intercurrences, and factors associated with mortality in elderly patients admitted for a hip fracture. Rev Bras Ortop. 2018 Sep-Oct;53(5):543-51.

5 Guerra MTE, Viana RD, Feil L, Feron ET, Maboni J, Vargas ASG. One-year mortality of elderly patients with hip fracture surgically treated at a hospital in Southern Brazil. Rev Bras Ortop. 2017 Jan-Feb;52(1):17-23.

6 Correa JGL, Andrade-Silva FB, Fortes Filho S, Kojima KE, Silva JS, Leme LEG. Evaluation of predictive factors of in hospital mortality in patients with proximal femoral fracture. Acta Ortop Bras. 2020 Jan-Feb;28(1):40-3.

7 Ministério da Saúde (BR). Departamento de Informática do Sistema Único de Saúde. Morbidade hospitalar do SUS – por local de internação – Pará [Internet]. Brasília: DATASUS; 2016 [citado 2021 nov 11]. Disponível em: http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sih/cnv/nipa.def.

8 American College of Surgeons. Best practices in the management of orthopaedic trauma [Internet]. Chicago: ACS, Committee on Trauma; 2015 [cited 2021 Nov 15]. Available from: https://doh.wa.gov/sites/default/files/legacy/Documents/2900//MgmtOrthopaedicTrauma.pdf.

9 Lisk R, Yeong K. Reducing mortality from hip fractures: a systematic quality improvement programme. BMJ Qual Improv Rep. 2014 Sep;3(1):u205006.w2103.

10 Kirkwood BR, Sterne JAC. Essential medical statistics. 2nd ed. Malden (Mass): Blackwell Science, 2003. 502 p.

11 Hosmer DW, Hosmer DW, Lemeshow S. Applied logistic regression. 2nd ed. New York: Wiley; 2000. 320 p.

12 Lin WP, Wen CJ, Jiang CC, Hou SM, Chen CY, Lin J. Risk factors for hip fracture sites and mortality in older adults. J Trauma Acute Care Surg. 2011 Jul;71(1):191-7.

13 Daraphongsataporn N, Saloa S, Sriruanthong K, Philawuth N, Waiwattana K, Chonyuen P, et al. One-year mortality rate after fragility hip fractures and associated risk in Nan, Thailand. Osteoporos Sarcopenia. 2020 Jun;6(2):65-70.

14 Mattisson L, Bojan A, Enocson A. Epidemiology, treatment and mortality of trochanteric and subtrochanteric hip fractures: data from the Swedish fracture register. BMC Musculoskelet Disord. 2018 Oct;19(1):369.

15 Farias FID, Terra NL, Guerra MTE. Evaluation of the effectiveness of a care program for elderly patients with hip fractures: a network strategy. Rev Bras Geriatr Gerontol. 2017 Sep-Oct;20(5):702-12.

16 Silva ERR, Marinho DF. Perfil epidemiológico de idosos com fratura proximal de fêmur atendidos no Hospital Regional do Baixo Amazonas, Santarém, PA, Brasil. Rev Kairos-Gerontologia. 2018;21(3):217-37.

17 Guzon-Illescas O, Perez Fernandez E, Crespí Villarias N, Donate FJQ, Peña M, Alonso-Blas C, et al. Mortality after osteoporotic hip fracture: incidence, trends, and associated factors. J Orthop Surg Res. 2019 Jul;14(1):203.

18 Chow SKH, Qin JH, Wong RMY, Yuen WF, Ngai WK, Tang N, et al. One-year mortality in displaced intracapsular hip fractures and associated risk: a report of Chinese-based fragility fracture registry. J Orthop Surg Res. 2018 Sep;13(1):235.

19 Ribeiro TA, Premaor MO, Larangeira JA, Brito LG, Luft M, Guterres LW, et al. Predictors of hip fracture mortality at a general hospital in South Brazil: an unacceptable surgical delay. Clinics. 2014 Apr;69(4):253-8.

20 Bortolon PC, Andrade CLT, Andrade CAF. O perfil das internações do SUS para fratura osteoporótica de fêmur em idosos no Brasil: uma descrição do triênio 2006-2008. Cad Saude Publica. 2011 abr;27(4):733-42.

21 Chiou BL, Chen YF, Chen HY, Chen CY, Yeh SCJ, Shi HY. Effect of referral systems on costs and outcomes after hip fracture surgery in Taiwan. Int J Qual Health Care. 2020 Dec;32(10):649-57.

22 Espinosa KA, Gélvez AG, Torres LP, García MF, Peña OR. Pre-operative factors associated with increased mortality in elderly patients with a hip fracture: A cohort study in a developing country. Injury. 2018 Jun;49(6):1162-8.

23 Franco LG, Kindermann AL, Tramujas L, Kock KS. Fatores associados à mortalidade em idosos hospitalizados por fraturas de fêmur. Rev Bras Ortop. 2016 set-out;51(5):509-14.

24 Öztürk B, Johnsen SP, Röck ND, Pedersen L, Pedersen AB. Impact of comorbidity on the association between surgery delay and mortality in hip fracture patients: a Danish nationwide cohort study. Injury. 2019 Feb;50(2):424-31.

25 Glassou EN, Kjørholt KKE, Hansen TB, Pedersen AB. Delay in surgery, risk of hospital-treated infections and the prognostic impact of comorbidity in hip fracture patients. A Danish nationwide cohort study, 2005-2016. Clin Epidemiol. 2019 May;11:383-95.

26 Passos VMA, Champs APS, Teixeira R, Lima-Costa MFF, Kirkwood R, Veras R, et al. The burden of disease among Brazilian older adults and the challenge for health policies: results of the Global Burden of Disease Study 2017. Popul Health Metr. 2020 Sep;18(Suppl 1):14.

27 GBD 2016 Brazil Collaborators. Burden of disease in Brazil, 1990–2016: a systematic subnational analysis for the Global Burden of Disease Study 2016. Lancet. 2018 Sep;392(10149):760-75.

28 Paula FL, Cunha GM, Leite IC, Pinheiro RS, Valente JG. Elderly readmission and death after discharge from treatment of hip fracture, occurred in public hospitals from 2008 to 2010, Rio de Janeiro. Rev Bras Epidemiol. 2015 Apr-Jun;18(2):439-53.

29 Oliveira ATR, organizador. Sistemas de estatísticas vitais no Brasil: avanços, perspectivas e desafios [Internet]. Rio de Janeiro: IBGE; 2018 [citado 2021 nov 11]. Disponível em: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101575.pdf.

30 Pourabbas B, Emami MJ, Vosoughi AR, Mahdaviazad H, Kargarshouroki Z. Mortality and function after surgically-treated hip fracture in adults younger than age 60. Acta Ortop Bras. 2017 Jul-Aug;25(4):129-31.

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