CCI JOURNAL CRITICAL CARE INNOVATIONS

ORIGINAL ARTICLE

Crit. Care Innov. 2026; 9(1): 23-31

ISSN 2545-2533

Received: 02.02.2026
Accepted: 18.03.2026
First online: 19.03.2026
Published: 31.03.2026

Comorbid medical illnesses associated with proximal femur fractures in elderly population

Mohsin Bin Mushtaq [1] - A,B,C,I,K,L,M,N,O. ORCID www.orcid.org/0000-0002-4017-2451

Asma Rafi [2] - A,B,J,L,M,N,O. ORCID www.orcid.org/0000-0001-9867-3462

Muzaffar Maqbool [2] - A,B,C,E,F,G,H,I,K,L,M,N,O. ORCID www.orcid.org/0000-0003-4010-9900

Asif Sultan [3] - A,B,C,E,F,G,H,I,K,L,M,N,O. ORCID www.orcid.org/0000-0003-0587-4201

[1] *Paras Hospital Srinagar, Jammu & Kashmir,India.*
[2] *Department of Medicine, Government Medical College, Srinagar,Jammu & Kashmir, India.*
[3] *Department of Orthopedics, Government Medical College, Srinagar,Jammu & Kashmir, India.*

Address for correspondence:
Muzaffar Maqbool, MD. *Department of Medicine, Government Medical College, Srinagar,Jammu & Kashmir, 190010 India; e-mail: muzaffarmaqbool75@gmail.com; tel: +91 7006218644*

Author Contributions (CRediTTaxonomy):

Conceptualization - **A**
Data Curation - **B**
Formal Analysis - **C**
Funding Acquisition - **D**
Investigation - **E**
Methodology - **F**
Project Administration - **G**
Resources - **H**
Software - **I**
Supervision - **J**
Validation - **K**
Visualization - **L**
Writing (Draft Preparation) - **M**
Writing (Review & Editing) – **N**
Approved the final version - **O**

ABSTRACT

INTRODUCTION: Falls in the elderly are an important health problem, regardless of the cause. They are a significant cause of concern and contribute to both morbidity and mortality. The aim of this study was to understand the comorbidities, medication history, and other clinically important risk factors associated with such falls/fractures and their correlation with 30-day patient mortality.

MATERIALS AND METHODS: An 18-month study was conducted on 200 elderly patients, more than 60 years of age, admitted as proximal femur fractures in a medical school hospital. A proper history, detailed clinical examination, and relevant investigations were done to establish the diagnosis of fracture and a particular comorbid condition. The grading of comorbidity and its correlation with prevalence of proximal femur fractures and 30-day mortality was performed according to Charlson Comorbidity Index.

RESULTS: Of a total of 200 patients, 84 patients (42%) had a fractured neck of femur, 100 patients(50%) had a fracture intertrochanter and 16 patients(8%) had a fracture subtrochanter. Our study showed that 12.5% of the patients had no comorbidities, 31.25% had one comorbidity, 22.5% of the patients had two comorbidities, 20% of the patients had three comorbidities and 12.5% of the patients had more than or equal to 4 comorbidities. Hypertension, followed by diabetes, was the most prevalent comorbidity and hyponatremia was the most common electrolyte abnormality. 13.5% of the patients died in hospital within the first 30 days of fracture and these patients had a statistically significant and higher CCI compared to the survivors.

CONCLUSIONS: We concluded that a huge burden of comorbidities had a positive correlation with 30-day mortality. Hypertension followed by diabetes was the commonest comorbidity, patients who expired in-hospital within the first 30 days of fracture had a statistically significant and higher CCI compared to the survivors in the same period of time. It was also concluded that increased age had a statistically significant positive correlation with mortality.

KEY WORDS: Falls, proximal femur fractures, comorbidities, 30-day mortality, Charlson-comorbidity index.

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

TOWARZYSTWO POMOCY DORAŹNEJ

INTRODUCTION

Falls are an important cause of death and disability worldwide [1]. Single and repeated falls are a special concern in the elderly. According to the latest European surveys, at least 20% people > 65 years suffer at least one fall per year [2] and up to 20% of falls result in significant injury in the elderly [3]. Proximal femur fractures pose serious health problems in the elderly [4]. Femur neck fractures also carry significant consequences, including morbidity [5] and mortality of approximately 13.5% at 6 months [6]. The origin of the fall is typically multifactorial including environmental, behavioural, and individual factors. Gait instability is a relatively consistent factor. Several drugs, especially psychotropic drugs, anti-hypertensives, anti-convulsants or multiple medications, have also been significantly associated with the risk of falls [7]. Hip fracture patients often suffer medical and surgical complications [8]. The latter, in turn double the cost of treatment for such patients and also adversely affect the outcome of such patients [9].

Proximal femur fractures are classified on the basis of their anatomical location:

1. **Fracture neck of Femur** - It occurs in the region between head of femur and intertrochanteric region;
2. **Intertrochanteric Fractures** - These occur in the area between the greater and lesser trochanters and may also involve these two structures. They account for 45% of all hip fractures;
3. **Subtrochanteric Fractures** - These occur between the lesser trochanter and the isthmus of the neck of the femur and constitute 10-30% of all hip fracture cases.

Considering the huge burden posed by proximal femur fractures on the health care system, both physically and financially, it thus becomes imperative to identify the various culprit comorbidities early enough so that they are managed well in time to avoid disastrous complications in an already dependent population group.

MATERIALS AND METHODS

A prospective hospital-based study was conducted on 200 patients above 60 years of age admitted with proximal femur fractures in associated hospitals of Government Medical College, Srinagar Kashmir from November 2017 to May 2019. Patients were enrolled after obtaining ethical clearance from Institutional Ethical Committee of Government Medical College Srinagar, Kashmir India vide Ref. No. 211/ETH/GMC/ICMR dated 19/10/2017 and written informed consent was obtained from the same from patients. The study was carried out according to the principles expressed in the Declaration of HelsinkiA thorough review of the history was done including a detailed demographic profile , medical records (diseases and drugs), detailed clinical examination and appropriate investigations to establish the diagnosis of a particular comorbid condition (Table 1). The classification of comorbid diseases and their correlation with prevalence of proximal femur fractures and mortality at 30 days was done according to Charlson Comorbidity Index. Patients were also divided into three groups, such as fracture neck of Femur, Inter-trochanteric and subtrochanteric fractures, and these groups were also compared for the presence of different co-morbid illnesses and individual mortality.

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

Table 1. Clinical and demographic profile of the study population.

Parameter	Number (n=200)	Percentage (0-100)
Age(Years)		
61-70	96	48
71-80	56	28
>80	48	24
Gender		
Male	88	44
Female	112	56
Residence		
Rural	128	64
Urban	72	36
Type of fracture		
Neck of the femur	84	42
Intertrochanteric	100	50
Subtrochanteric	16	8
Number of comorbidities		
None	25	12.5
1	65	32.5
2	45	22.5
3	40	20.0
≥4	25	12.5
MoCA Score		
<25	37	18.5
>25	163	81.5
Charlson Comorbidity Index (score)		
>3	122	61
<3	78	39

The socioeconomic status of patients was also assessed using the modified Kuppuswami scale. The MOCA scoring test for dementia was performed in all relevant patients. We also studied the short-term (30-day) mortality associated with individual comorbid conditions and proximal femur fractures.

STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS software. Continuous variables were summarised as mean and standard deviation. Categorical variables were summarised as frequency and percentage. The Chi-square test was used to test the independence between two categorical variables. The independent sample t-test was used to test the difference between two means. A p-value of <0.05 was considered statistically significant.

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

doi:10.32114/CCI.2026.9.1.23.31

RESULTS

Of a total of 200 patients enrolled in our study, 84 (42%) had a fractured neck of femur, 100 (50%) had an intertrochanteric fracture, and 16 (8%) had sub-trochanteric fracture. 32.5% of the patients had one comorbidity, 22.5% of the patients have two comorbidities, 20% had three comorbidities, 12.5% had more than or equal to four comorbidities, while 12.5% did not have any comorbidity (Table 2).

The average age of the patients was 72.4 years with a predominance of women (56%) as compared to males (44%). 63.5% patients suffered from hypertension and were in treatment (p-value 0.132). 29% patients were diabetic (p-value 0.028). 8% of the patients were hypothyroid (p-value 0.463). 15% of the patients had COPD (p-value 0.392). 9.5% of the patients suffered from dementia (p-value 0.098). 18.25% of the patients had a MOCA score<25 (p-value 0.251). 7% of the patients had CKD (p-value 0.462), 6% of the patients had CLD (p-value 0.366). 19% of the patients had hyponatremia (mild in 8.5%, moderate in 8%, and severe in 2.5%) (p-value 0.415). 3.5% of the patients had hyperkalemia (p-value 0.492). 8% of the patients had hypokalemia (p-value 0.120). 1.5% of the patients had seizure disorder (p-value 0.652). 15% of the patients had anemia (p-value 0.139). 35% of the patients had active cancer (p-value 0.708). 0.5% of the patients had concomitant DVT (p-value 0.003). 2.5% of the patients had chronic bronchitis (p-value 0.326). 2.5% of the patients had a history of old stroke (p-value 0.446). 2.5% of the patients had a history of coronary artery disease (p-value 0.772). 3% of the patients had AF (p-value 0.393). 1.5% of the patients had Parkinson’s disease (p-value 0.792).

Among antihypertensives, the majority (36.5%) of the patients were on ARB followed by 26.5% patients taking CCB. Among OHAs, 16.5% of the patients took sulfonylureas, 12.5% patients were on insulin therapy. 8% of the patients were on thyroxine replacement.3% patients were on Aspirin. 2.5% of the patients were on Levosulpride. 13% patients were on laxatives. 9% of the patients were on Proton Pump Inhibitors. 4.5% patients were on tricyclic antidepressants.3% of the patients were on benzodiazepenes. 4% of the patients were on SSRI, 2% of the patients were on SNRI, 1.5% of the patients were on antipsychotics and 1% patients were on anti-epileptics. In terms of ECG findings, the majority (n=19) patients had sinus tachycardia followed by 16 patients with sinus bradycardia. 9 patients had RBBB, 6 had LBBB, 6 had AF.

Five patients had VPC <3, 4 patients had bifascicular block while 2 patients had short SVT. 61% of patients admitted with proximal femur fractures had a Charlson Comorbidity Index>3 while 39% of patients had a Charlson Comorbidity Index<3. 30-day mortality of patients enroled in our study revealed who patients that expired during the 30 day period had a significantly higher mean CCI (4.8148) than those who survived at the end of this period (3.4971) (p-value<0.001) as shown in Table 3. Also, we found who 66.66% of patients that expired during this period were over 80 and above (p-value 0.02).

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

TOWARZYSTWO POMOCY DORAŹNEJ

Table 2. Common comorbidities in different types of proximal femur fractures.

Co-morbidity	Type of fracture			Total (%)
	Neck of Femur (n=84)	Intertrochanter (n=100)	Subtrochanter (n=16)	
Hypertension				
Present	49	70	08	127(63.5)
Absent	35	30	08	73 (36.5)
Diabetes Mellitus				
Present	27	31	0	58(29.0)
Absent	73	69	16	142(71.0)
COPD				
Present	10	19	02	31(15.5)
Absent	74	81	14	169(84.5)
Anemia				
Present	10	15	05	30(15.0)
Absent	74	85	11	170(85.0)
Dementia				
Present	12	07	0	19(9.5)
Absent	72	93	16	181(90.5)
Hyponatremia				
Present	21	17	0	38(19)
Absent	63	83	16	162(81)
CKD				
Present	04	08	02	14(7.0)
Absent	80	92	14	186(93.0)
CLD				
Present	07	05	0	12(6.0)
Absent	77	95	16	188(94.0)

Table 3. Charlson's comorbidity index and mortality.

	Mortality	No. (%)	Mean(S.D)	P-value
Charlson comorbidity Index	Expired	27(13.5)	4.8148(1.96189)	<0.0001
	Alive	173(86.5)	3.4971(1.60531)	

DISCUSSION

Due to the relevance of falls and fractures in the elderly, our study aimed to analyse comorbidities and medication use in this subset of our population admitted with proximal femur fractures. The average age of our patients was 72.4 years with a preponderance of women (56%) over males (44%).

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

12.5% had no comorbidity, 32.5% had one comorbidity, 22.5% had two comorbidities, 20% had three comorbidities and 12.5% of the patients had 4 or more comorbidities. This is in agreement with the study done by Stephanie Victoria Camargo Leao Edelmuth et al. in 2018 [10] when they observed that 11.9% had no comorbidity, 37.3% had one comorbidity, 17.9% had two comorbidities 22.3% had three comorbidities, and 10.9% of patients had more than or equal to four comorbidities.

In our study, hypertension was present in 63.5 % of the patients, again in concordance with the same study by Stephanie [10] who found that the main comorbidity in the study population was systemic arterial hypertension with a prevalence of 61.1%. The high percentage of hypertensive patients in our study can be understood as a consequence of high prevalence of this condition in our population observed with increasing age. A study conducted at the State University of Campinas [11] estimated that 50.4% of patients between 60-69 years of age suffered from hypertension, and 54.4% of patients aged 70-79 years had hypertension. The latter has been considered again as a risk factor for the occurrence of falls and fractures in the elderly. 36.5% of the patients were on ARBs, 26.5% were on CCB, 11.5% were on diuretics, 10.5% were on beta blockers and 4% were on ACE inhibitors. A case series from Ontario reported that elderly patients on antihypertensive treatment had 43% increase in risk of hip fractures within the first 45 days of the start of treatment, especially those on beta-blockers and ACE inhibitors [12].

The second most prevalent disease in our population was diabetes (29% of patients). Stephanie Camargo also observed *Type 2 Diabetes* of 28.3% in their study population [10]. Ioannis Papaioannou et al. in a systematic review concluded that there is an increased prevalence of all kinds of fragility fractures, especially low energy hip fractures in elderly patients with *Type 2 DM* compared to non-diabetic patients [13]. It has also been observed that in patients>65years, average HbA1c>9%, there is an increased chance of fractures up to 31% [14]. Possible reasons for this could be complications of diabetes, eg polyneuropathy / retinal dysfunction, vestibular dysfunction, cognitive dysfunction and hypoglycemia episodes associated with insulin use [15]. Among our patients, 12.5% were on biguanides, 16.5% on sulfonylureas, 4% on DPP4 inhibitors, 1.5% patients on GLP-1 analogues, and 7.5% patients on Insulin. Dementia was present in 9.5% of the patients, while depression was present in 5.5% of our patients. 3% of the patients had Parkinson’s disease, 1.5% had seizure disorder. 18.5% of the patients had a MOCA score<25 (akin to dementia), but this also had a confounding factor of hospital delirium after falls / fractures. A study by Breiffini Leavy et al. [16] observed a 3-fold increase in hip fractures associated with mental and behavioural disorders. Dementia and hip fractures share predisposing risk fractures, e.g., advanced age, gait impairment, and increased risk of falls [17]. Stephenie Camargo [10] observed depression in 11.9% of patients. A study by the British Geriatric Society (Age and Ageing) concluded that depression, delirium, and dementia are common in older people with hip fractures [18]. A structured review by Mohammad Auais et al. highlighted that psychological conditions are common in hip fracture patients and influence their recovery and outcome [19]. In turn, fractures, fear of falling again, and loss of post-fall independence may favour the onset of depression in the elderly.

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

Furthermore, a previous diagnosis of depression is associated with rehabilitation difficulties, high risk of infections, and decreased overall survival in femur fracture patients [20]. We found hyponatremia in 19% of our patients. Aida Fernanda et al. [21] found hyponatremia in 20.3% of the patients in their study. Gianfranco Cervelin et al. in 2014 [22] investigated the prevalence of hyponatremia in patients with intracapsular femoral neck fractures and found sodium levels in entire/elderly population much lesser than in controls (p-value significant). We found that 15% of our patients had anemia. Breiffini Leavy et al. [16] found that blood diseases caused 3 times increase in risk of hip fractures, with an attributable risk of 10%. Previously, a lower risk estimate for B12 deficiency in hip fractures has also been studied [23]. Deficiency anemias are common in hip fractures [24]. It is common in institutionalised elderly people and is associated with decreased physical performance and falls [25]. 2.5% of our patients had a history of stroke and 1.5% of patients had a history of coronary artery disease.

Ulf Sennersy et al. obtained similar results in 2009 [26] who concluded that a diagnosis of cardiovascular disease was significantly associated with the risk of subsequent hip fracture. The ECG findings in our study were sinus tachycardia in 9.5% of the patients, sinus bradycardia in 8%, AF in 3%, LBBB in 3%, RBBB in 4.5%, BFB in 2% and VPCs in 2.5% of the patients. Holter showed short runs of SVT in 1% of patients. These findings were compatible with a study by Jansen et al in 2014 [27]. We found an overall mortality of 13.5% in the first 30 days of fracture. It was also found that patients with a higher burden of comorbidities, as measured by the Charlson's comorbidity index, had a higher mortality than those with fewer comorbidities, which was statistically significant.

We also observed a positive correlation between increased age and higher mortality, which was also statistically significant. Reyes C et al. [28] in 2014 also found an independent association of these major comorbidities with an increased risk of hip fractures in the elderly population, where he found an increase of 50% with CCI> or equal to 3. We found that our study population was polymorbid and on polypharmacy. Sartoretti C et al. in 1997 [29] concluded that multimorbidity in an old patient is a major intrinsic factor causing an increased incidence of falls and associated femur fractures. The postoperative mortality rate in our patients was 11% and the mean hospitalisation period was 30 days.

CONCLUSIONS

We concluded that a huge burden of comorbidities had a positive correlation with 30-day mortality. Hypertension was the most common comorbidity, followed by diabetes. 13.5% of the patients died in hospital within the first 30 days of fracture and these patients had a statistically significant and higher CCI compared to the survivors in the same time period. It was also concluded that increased age had a statistically significant positive correlation with mortality.

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

SUPPLEMENTARY INFORMATION

Funding: *No fund was received related to this study.*
Institutional Review Statement: *The study was conducted according to the guidelines of the Declaration of Helsinki.*
Informed Consent Statement: *Informed consent was obtained from all subjects involved in the study.*
Data Availability Statement: *The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.*
Conflicts of Interest: *The authors declare no conflicts of interest.*

REFERENCES

[1] James SL, Lucchesi LR, Bisignano C, Castle CD, Dingels ZV, Fox JT, et al.. The global burden of falls: global, regional and national estimates of morbidity and mortality from the Global Burden of Disease Study 2017. Inj Prev. 2020; 26(Suppl 1): i3–i11.
doi: https://doi.org/10.1136/injuryprev-2019-043286

[2] Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. N Engl J Med. 1988; 319(26): 1701–1707.
doi: https://doi.org/10.1056/NEJM198812293192604

[3] Tinetti ME, Liu WL, Ginter SF. Mechanical restraint use and fall-related injuries among residents of skilled nursing facilities. Ann Intern Med. 1992; 116(5): 369–374.
doi: https://doi.org/10.1056/NEJM198812293192604

[4] Lizaur UA, Serna BR, Lopez-Prats FA, Gil-Guillen V. Early rehospitalization after hip fracture in elderly patients: risk factors and prognosis. Arch Orthop Trauma Surg. 2015; 135(12): 1663–1667.
doi: https://doi.org/10.1007/s00402-015-2328-1

[5] Carriero FP, Christmas C. In the clinic. Hip fracture. Ann Intern Med. 2011; 155(11): ITC6-1–ITC6-15.
doi: https://doi.org/10.7326/0003-4819-155-11-201112060-01006

[6] Hannan EL, Magaziner J, Wang JJ, Eastwood EA, Silberzweig SB, Gilbert M, et al. Mortality and locomotion 6 months after hospitalization for hip fracture: risk factors and risk-adjusted hospital outcomes. JAMA 2001; 285(21): 2736–2742.
doi: https://doi.org/10.1001/jama.285.21.2736

[7] Hanlon JT, Zhao X, Naples JG, Aspinall SL, Perera S, Nace DA, et al.. Central nervous system medication burden and serious falls in older nursing home residents. J Am Geriatr Soc. 2017; 65(6): 1183–1189.
doi: https://doi.org/10.1111/jgs.14759

[8] Carpintero P, Caeiro JR, Carpintero R, Morales A, Silva S, Mesa M. Complications of hip fractures: a review. World J Orthop. 2014; 5: 402–411.
doi: https://doi.org/10.5312/wjo.v5.i4.402

[9] Edwards C, Counsell A, Boulton C, Moran CG. Early infection after hip fracture surgery: risk factors, costs and outcome. J Bone Joint Surg Br. 2008; 90(6): 770–777.
doi: https://doi.org/10.1302/0301-620X.90B6.20194

[10] 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; 53(5): 543–551.
doi: https://doi.org/10.1016/j.rboe.2018.07.014

[11] Zaitune MPA, Barros MBA, Galvão Cesar CL, Carandina L, Goldbaum M. Hipertensão arterial em idosos: prevalência, fatores associados e práticas de controle no município de Campinas, São Paulo, Brasil. Cad Saude Publica. 2006; 22(2): 285–294.
doi: https://doi.org/10.1590/S0102-311X2006000200006

[12] Butt DA, Mamdani M, Austin PC, Tu K, Gomes T, Glazier RH. The risk of hip fracture after initiating antihypertensive drugs in the elderly. Arch Intern Med. 2012; 172(22): 1739–1744.
doi: https://doi.org/10.1001/2013.jamainternmed.469

[13] Papaioannou I, Pantazidou G, Kokkalis Z, Georgopoulos N, Jelastopulu E. Systematic Review: Are the elderly with diabetes mellitus type 2 prone to fragility fractures? Cureus. 2021; 13(4): e14514.
doi: https://doi.org/10.7759/cureus.14514

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/

[14] Li C, Liu C, Lin WY, Meng NH, Chen CC, Yang SY, et al.. Glycated hemoglobin level and risk of hip fracture in older people with type 2 diabetes: a competing risk analysis of Taiwan diabetes cohort study. J Bone Miner Res. 2015; 30(7): 1338–1346.
doi: https://doi.org/10.1002/jbmr.2462

[15] Fan Y, Wei F, Lang Y, Liu Y. Diabetes mellitus and risk of hip fractures: a meta-analysis. Osteoporos Int. 2016; 27(1): 219-228.
doi: https://doi.org/10.1007/s00198-015-3279-7

[16] Leavy B, Michaelsson K, Christinaberg A, Melhus H, Byberg L. The impact of disease and drugs on hip fracture risk. Calcif Tissue Int. 2017; 100(1): 1–12.
doi: https://doi.org/10.1007/s00223-016-0194-7

[17] Merriman NA, Putt ME, Metz DC, Yang YX. Hip fracture risk in patients with a diagnosis of pernicious anemia. Gastroenterology. 2010; 138(4): 1330–1337.
doi: https://doi.org/10.1053/j.gastro.2009.12.007

[18] Holmes JD, House AO. Psychiatric illness in hip fracture. Age Ageing. 2000; 29(6): 537–546.
doi: https://doi.org/10.1093/ageing/29.6.537

[19] Auais M, Sousa TAC, Feng C, Gill S, French SD. Understanding the relationship between psychological factors and important health outcomes in older adults with hip fracture: a structured scoping review. Arch Gerontol Geriatr. 2022; 101: 104666.
doi: https://doi.org/10.1016/j.archger.2022.104666

[20] Phillips AC, Upton J, Duggal NA, Carroll D, Lord JM. Depression following hip fracture is associated with increased physical frailty in older adults: the role of cortisol to dehydroepiandrosterone sulphate ratio. BMC Geriatr. 2013; 13: 60.
doi: https://doi.org/10.1186/1471-2318-13-60

[21] Rocha AFB, Sá MVBO, Elihimas Junior UF. Hyponatremia in elderly patients with fragility fractures of the proximal femur: a cross-sectional study. J Bras Nefrol. 2019; 41(4): 518–525.
doi: https://doi.org/10.1590/2175-8239-JBN-2019-0019

[22] Cervellin G, Mitaritonno M, Pedrazzoni M, Picanza A, Lippi G. Prevalence of hyponatremia in femur neck fractures: a one-year survey in an urban emergency department. Adv Orthop. 2014; 2014: 397059.
doi: https://doi.org/10.1155/2014/397059

[23] Swart KM, van Schoor NM, Lips P. Vitamin B12, folic acid and bone. Curr Osteoporos Rep. 2013; 11(3): 213–218.
doi: https://doi.org/10.1007/s11914-013-0155-2

[24] Nikkel LE, Fox EJ, Black KP, Davis C, Andersen L, Hollenbeak CS. Impact of comorbidities on hospitalization costs following hip fracture. J Bone Joint Surg Am. 2012; 94(1): 9–17.
doi: https://doi.org/10.2106/JBJS.J.01077

[25] Chen Z, Thomson CA, Aikin M, Nicholas JS, Van Wyck D, Lewis CE, et al.. The relationship between incidence of fractures and anemia in older multiethnic women. J Am Geriatr Soc. 2010; 58(12): 2337–2344.
doi: https://doi.org/10.1111/j.1532-5415.2010.03183.x

[26] Sennerby U, Melhus H, Gedeborg R, Byberg L, Garmo H, Ahlbom A, et al. Cardiovascular diseases and risk of hip fracture. JAMA. 2009; 302(15): 1666-1673.
doi: https://doi.org/10.1001/jama.2009.1463

[27] Arden NK, Crozier S, Smith H, Anderson F, Edwards C, Raphael H, et al. Knee pain, knee osteoarthritis, and the risk of fracture. Arthritis Rheum. 2006; 55(4): 610–615.
doi: https://doi.org/10.1002/art.22088

[28] Reyes C, Estrada P, Nogués X, Orozco P, Cooper C, Díez-Pérez A, et al.. The impact of common comorbidities (as measured using the Charlson Index) on hip fracture risk in elderly men: a population-based cohort study. Osteoporos Int. 2014; 25(6): 1751–1758.
doi: https://doi.org/10.1007/s00198-014-2682-9

[29] Sartoretti C, Sartoretti-Schefer S, Rückert R, Buchmann P. Comorbid conditions in old patients with femur fractures. J Trauma. 1997; 43(4): 570–577.
doi: https://doi.org/10.1097/00005373-199710000-00002

© 2026 The Authors. This article is an Open Access article distributed under the terms and conditions of the CC BY-NC license. https://creativecommons.org/licenses/by-nc/4.0/