

Hip Fractures in Older Persons in Malta

an epidemiological study

**Julia Tua, Jessica Camilleri, Mark Spiteri, Lara Camilleri, Stephanie Dalli,
Mark-Anthony Vassallo, Paul Zammit, John Cordina**

Background

Hip fractures are a common cause of morbidity and mortality in older adults, and may sometimes be the result of the inability to cope with arising medical problems. The purpose of this study is dual; it is primarily a local epidemiological study of hip fractures in older persons in Malta. The secondary purpose of this study is to identify the number of patients who have had a significant hospital visit in the three months preceding the hip fracture.

Method

Data was collected over a period of 6 months from the national general hospital of Malta; Mater Dei Hospital. Patients included were 70 years and older, and sustained a proximal hip fracture.

Results

The incidence of hip fractures in Malta in persons aged 70 and over is 7.29 per 1000 persons per year in females and 4.66 per 1000 persons per year in males. The 1 year mortality rate was found to be 22%. In over one quarter of the cases, there was a significant hospital visit within the 3 months prior to the hip fracture incident, one fifth of whom had a falls related visit.

Conclusion

Hip fractures in older persons in Malta resulted in a high mortality rate and rate of admission to care homes. Incidence rate in Malta matched incidence rates in central Europe. While case prevention is still limited, we suggest an age and sex-matched control study to assess the significance of hospital visits occurring prior to hip fractures, in order to guide a direction for case prevention.

Dr Julia Tua, MD, MRCP

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Dr Jessica Camilleri, MD, MRCP

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

**Dr Mark Spiteri, MD, MRCP, Dip
Geriatric Med**

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Dr Lara Camilleri, MD, MRCP, MSc

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Dr Stephanie Dalli, MD, MRCP

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Dr Mark-Anthony Vassallo, MD, MA, FRCP

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Dr Paul Zammit, MD, PhD

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Dr John Cordina, MD, FRCP

Department of Geriatric Medicine,
St Vincent de Paul
Luqa, Malta

Proximal femoral fractures are associated with great morbidity and mortality in older adults. In fact, it is estimated that 25% of patients die within 1 year of a proximal femoral fracture, 76% will have impaired mobility, 50% will have a decline in their ability to perform activities of daily living (ADL) and 22% will require institutionalization within 1 year of having sustained the fracture.² There are various risk factors for proximal femoral fractures. In fact, an inability to cope with acute medical or surgical problems, can lead to falls and fractures.¹⁶

As a result, this study has two main objectives. The primary objective includes the collection of local epidemiological data on proximal femoral fractures in older persons in Malta, including the incidence of proximal femoral fractures, the average length of stay in the acute hospital, discharge destination, in-patient mortality rate, 6-month mortality rate and 1 year mortality rate. The secondary objective involves the identification of visits to the emergency department or significant hospital visits in the three months preceding the proximal femoral fracture which could potentially identify and possibly reduce the risk of falls and fractures.

MATERIALS AND METHODS

The patient population consisted of people aged 70 years and over who were admitted to hospital with a proximal femur fracture confirmed by bone imaging. Data was collected over a 6-month period from May 2019 until October 2019 and patients were followed up for 1 year post proximal femoral fracture. Cases were identified from two over-lapping sources to ensure a high pick-up rate: (i) the surgical PACS trauma list and (ii) the orthogeriatric team's census. The orthogeriatric team covers all proximal femoral fracture cases aged 70 years and over in the orthopaedic wards at Mater Dei Hospital, whether candidates for theatre or not. The surgical PACS trauma list includes all cases of operated proximal femoral fractures in Mater Dei Hospital as well as Gozo General Hospital.

Data was collected retrospectively via electronic case summaries, iSOFT clinical manager and CPAS. The following data was collected:

- The patient's demographics including gender and age
- The patient's residential location prior to hospitalization and after discharge,
- The proximal femoral fracture incident,

- Any emergency department visits or admissions to the acute hospital 3 months prior to the fracture,
- The nature of the hospital admission (i.e., medical pathology, surgical pathology, ophthalmic pathology or falls),
- Mortality status at 6 months and 1 year after the proximal femoral fracture incident.

RESULTS

Proximal Femoral Fracture Demographics

Over a period of 6 months, the total number of patients aged 70 years and over with a proximal femoral fracture, amounted to 195 with an average of 32.5 cases per month. The average age was 83 years, with an age range of 70 to 100; 70 being the minimum age of inclusion in the study. Thirty-four percent of the cases were males, while 66% of the case were females with a female: male ratio of 2:1. This ratio increased with age; the male cases peaked at age 70-74, and the female cases peaked at age 80-89. One hundred and forty-seven of the proximal femoral fracture incidents (75%) occurred in patients who were residing at their own home, while the remaining 25% of cases occurred in patients who were residing in institutions prior to the proximal

Table 1 Proximal Femur Fractures over the age of 70 years at Mater Dei Hospital over a period of 6 months

Age – years		
mean ± standard deviation	82.8 ± 6.95	
range	70 – 100	
Gender - number (%)		
Male	65 (34%)	
Female	130 (66%)	
Number of cases		
May 2019 until October 2019	195	
Average per month	32.5	
Patient location prior to fracture		
Own home	147 (75%)	
Care home	47 (24%)	
Rehabilitation Hospital	1 (1%)	
Patient location after fracture	6 months after fracture	1 year after fracture
Lost to follow up	6	6
Included in results	189	189
Own home	92 (49%)	86 (45%)
Care home	64 (34%)	62 (33%)
Death	33 (17%)	41 (22%)

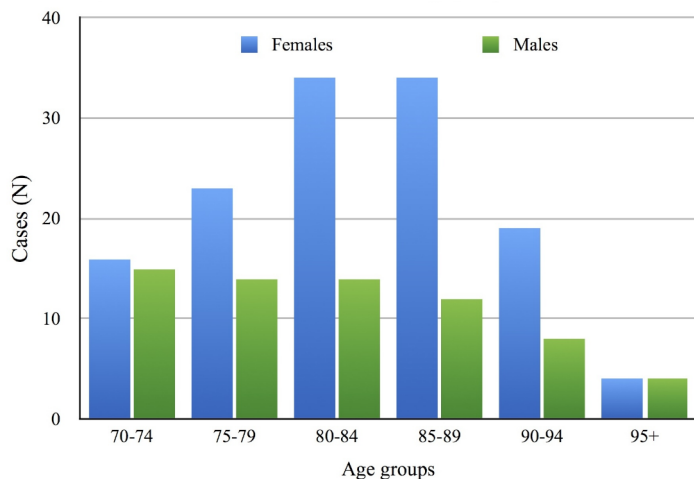


Figure 1 Female:Male ratio in different age groups

femoral fracture. Of the 195 cases, 6 cases were lost to follow up, as the patients were not local residents (shown in [Table 1](#), and [Figure 1](#)).

Estimated Incidence Rates

Data from the Maltese national statistics office from 2018 was used to establish the population size. The estimated incidence of proximal femoral fractures in Malta in persons aged 70 years and over was found to be 7.29 per 1000 persons per year in females and 4.66 per 1000 persons per year in males. In the age group 70 -79 years, the incidence was found to be 3.09 per 1000 persons per year. In females this was 3.43 per 1000 persons per year, and in males this was 2.71 per 1000 persons per year. The incidence rate rose dramatically with age, with a rate of 10.47 per 1000 persons per year in those aged 80 – 89 years, and 24.23 per 1000 persons per year in those aged 90 years and over, shown in [Table 2](#), [Supplementary File 1](#), and [Supplementary File 2](#).



Figure 2 Approximate outcome at 6 months after a proximal hip fracture in older adults previously living at home prior to fracture

Mortality Rates

Mortality rate showed a plateaued curve, with a total of 11 deaths out of the 189 patients (5.8%) in the first 30 days from the proximal femoral fracture. This increased to 33 deaths (17%) at 6 months from the proximal femoral fracture and 41 (22%) deaths at 1 year from the proximal femoral fracture, shown in [Supplementary File 3](#).

Rate of Institutionalization

Of the 147 patients who were residing at home prior to the proximal femoral fracture, 6 were lost to follow up at 6 months. Of the remaining 141 cases, 26 (18%) were living in a care home within 6 months of the proximal femoral fracture ([Figure 2](#)).

Hospital Encounters Prior to Proximal Femoral Fracture

Table 2 Estimated incidence rates of proximal femoral fractures in older adults in the Maltese islands

	Males	Females	Total
Aged 70 - 79			
cases per 1000 person years	2.71	3.43	3.09
one year % incidence	0.27%	0.34%	0.31%
Aged 80 - 89			
cases per 1000 person years	7.39	12.45	10.47
one year % incidence	0.74%	1.25%	1.05%
Aged 90 and over			
cases per 1000 person years	27.30	22.89	24.23
one year % incidence	2.73%	2.29%	2.42%

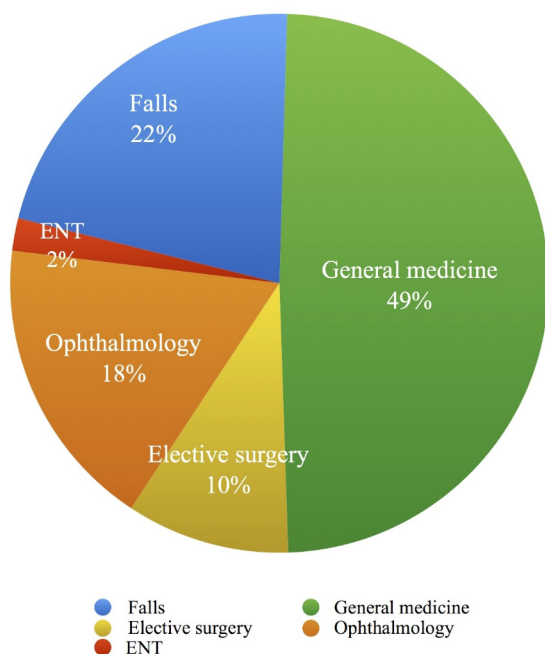


Figure 3 Admissions 90 days prior to proximal hip fracture sorted into categories

Just over one quarter of the cases, 27% (n=52), had contact with the hospital emergency department, or were discharged after a hospital admission, within the 90 days preceding the proximal femoral fracture. Of these, 15 (29%) were seen at the emergency department and sent home, 24 (46%) were discharged from under the care of a medical firm, 13 (25%) were discharged from under the care of a surgical firm. 21% of the visits were related to falls, 17% of the visits were related to ophthalmic problems including elective ophthalmic surgery, 10% of the visits were for elective surgery excluding ophthalmic surgery (Figure 3 and Supplementary File 4).

Duration In Acute Hospital

The average length of stay in the acute hospital was 20.1 days, ranging from 4 to 183 days. Patients who did not have a hospital encounter in the 3 months prior to a proximal femoral fracture had an average length of stay of 18.6 days. Patients who did have a hospital encounter in the 3 months prior to proximal femoral fracture had a longer average length of stay of 24.7 days.

DISCUSSION

Proximal Femoral Fracture Demographics

This study showed a clear trend of proximal femoral fractures by gender, with a female to male ratio of 2:1 for proximal femur fractures. The review conducted

by Rapp et al⁹, explored the epidemiology of proximal femoral fractures in Germany. They also concluded that age-standardized difference between women and men is about 2:1 in most countries of the world, with that in Germany being 1.72:1.

Estimated Incidence Rates

Proximal femoral fracture incidence rates show a wide geographical variation. The estimated incidence rate from this study in Malta are similar to the incidence rates in central Europe; the Netherlands, Germany and Austria as noted in the review by Dhanwall et al.⁶ Rey-Rodriguez et al¹⁰ also showed a similar proximal femoral fracture incidence rate in Southern Spain of 2.28 per 1000 persons per year, where the incidence was higher in women (3.13 per 1000 women per year compared to 1.25 per 1000 men per year).

Mortality Rates

An incremental rise in mortality was noted from in-patient up to 1 year after a proximal femoral fracture. In fact, there was a mortality of 5.8% at 30 days and 22% at 1 year. This coincides with results from the study carried out in Malta by Zammit et al¹⁵, which showed a 30-day mortality of 5.9% and a mortality of 23.9% at 1 year.

Rate of Institutionalization

In their review Rapp et al⁹, showed that in high income countries, 10–20% of proximal femoral fracture patients will end up in a long-term facility following a proximal femoral fracture. This coincides with our results where 18% of the patients were living in a care home at 6 months from the proximal femoral fracture. This result also highlights how a proximal femoral fracture is often a major life event, having both a medical and social impact.

Hospital Encounters prior to Proximal Femoral Fracture

Part of our study identified how many patients had a significant hospital contact prior to sustaining a proximal femoral fracture. This was done with an aim to identify any potential risk factors which could have been identified and possibly managed.

A large proportion of the proximal femoral fracture cases did have a hospital encounter in the 90 days prior to their proximal femoral fracture. Among these, the commonest mechanism of injury was secondary to a fall. In fact, 90% of proximal femoral fractures result from falls but only 1% of falls result in proximal femoral fractures² Moreover, osteoporosis is an independent risk factor for both

Table 3 Risk factors for proximal femoral fractures

Risk factors for osteoporosis ⁷	Fall Characteristics
<ul style="list-style-type: none"> • Increasing Age • Family history • Certain medical conditions including endocrine disorders, menopause, renal and liver impairment and gastrointestinal conditions leading to malabsorption and malnutrition. • Smoking • Medications including antiepileptics, anticoagulants, chemotherapy, gonadotrophic-releasing hormone agonists/antagonists. • Low BMI • High alcohol consumption • Reduced mobility and physical inactivity • Low dietary intake of calcium and vitamin D • Personal history of fragility fracture <p>Risk factors for falls¹</p> <ul style="list-style-type: none"> • Female gender • Advancing age • Multimorbidity • Conditions leading to gait and balance disturbances • Conditions leading to dizziness/syncope • Acute disease process • Polypharmacy especially sedatives, antihypertensives and neuroleptics. • Visual Impairment • Impaired mobility • Sensory impairment including tactile-proprioceptive and vestibular impairment • Environmental hazards including inappropriate footwear • Risk taking behaviour • Cognitive impairment, especially delirium • Psychosocial problems including anxiety, depression and fear of falling. • History of recurrent falls 	<p>Mechanism of fall¹</p> <ul style="list-style-type: none"> • Higher risk of proximal femoral fracture if unable to break the fall, example in loss of consciousness or syncope. <p>Factors involved in falls descent: (Berry SD and Miller RR, 2008)</p> <ul style="list-style-type: none"> • A greater height of descent results in a greater force of impact to the ground. • The direction of fall: Proximal femoral fractures are more common when people land on their side. <p>Factors involved with fall impact:³</p> <ul style="list-style-type: none"> • The amount of subcutaneous fat and soft tissue: A greater BMI or fall on the buttocks is associated with reduced proximal femoral fracture risk. • The surface of impact: Harder or uneven surfaces like stairs are associated with greater risk when compared to softer surfaces like carpeted or matted floors.

falls and fractures.⁵ Table 3 gives a list of the risk factors for proximal femoral fractures, falls and osteoporosis.

This study showed that most emergency visits or hospital admission at 90 days preinjury, were due to medical problems (48%) followed by falls (21%). This is expected since multiple medical pathologies are risk factors for both osteoporosis and falls as shown in Table 3, thereby increasing the risk of sustaining a

proximal femoral fracture after a fall. Moreover, certain medical pathologies might lead to a more dangerous mechanism of injury. For instance, those people who fall secondary to a syncopal episode or loss of consciousness would be unable to break the fall and therefore result in a higher impact on the ground.¹ Moreover, certain medical problems may lead to sensory impairment which is also a risk factor for falls. In fact, a portion of patients had a hospital visit related to ophthalmic (17%) and ENT (1.9%)

SUMMARY BOX

- Proximal femoral fractures are associated with high morbidity and mortality in older adults¹¹ and increase the risk of institutionalization.¹²
- Falls with resultant proximal femoral fractures, may arise from the inability to cope with acute medical problems.¹⁶
- The incidence of proximal femoral fractures worldwide is known to be greater with increasing age⁸ and more common in women compared to men¹¹
- The incidence of proximal femoral fractures in Malta in those aged over 70 years old was found to be 7.29 per 1000 persons per year in females and 4.66 per 1000 persons per year in males in this study.
- The local trend of proximal femoral fractures in Malta matched the worldwide trend of increased incidence with older age and female gender.
- In this study, 18% of patients with proximal femoral fractures living at home were admitted to a care home within 6 months of the event.
- Over one quarter of patients aged 70 and over who sustained a proximal femoral fracture had a significant hospital visit within the 90 days preceding the event.

pathology at 90 days before injury. However, not all people who have risk factors will necessarily sustain a fall or fracture, but any acute event may lead to an increased risk especially in frailer elderly people with an already reduced baseline physiological reserve.³

LIMITATIONS

A main study limitation includes a degree of selection bias. For instance, patients with a proximal femoral fracture were identified from online databases which include in-patients only and the orthogeriatric service at Mater Dei hospital which includes patients who are receiving care at two specific orthopedic wards only. As a result, those patients who received care in a private hospital or died before reaching the

orthogeriatric services might have been missed thereby underestimating the incidence rate. In addition, those patients who sustained a proximal femoral fracture in Gozo were more likely to be misrepresented since cases were obtained from the Gozo online databases only so those proximal femoral fractures who were treated conservatively and not admitted to hospital may have also been missed.

Moreover, Bugeja et al.⁵ showed a seasonal variation in proximal femoral fracture incidence in Malta, with summer months having the lowest number of proximal femoral fractures and mortality. The incidence and mortality of proximal femoral fractures in this study, was recorded from data that was collected over 6 months from May till October 2019. The seasonal variation may therefore have affected the results presented.

Six out of 195 patients were lost to follow up being foreign nationals visiting Malta who returned to their country of origin as soon as it was fit for them to travel post proximal femoral fracture surgery. As a result, these were lost to follow-up so data on their longer postoperative outcomes could not be included. These represent 3% of the study population.

CONCLUSION

This study highlights the profound medical and social impact of proximal femoral fractures in the elderly in Malta, having a high mortality rate and a high rate of admission to care homes. Incidence rate in Malta matched incidence rates in central Europe⁷ Moreover, multiple risk factors for proximal femoral fractures have been identified in the literature. These risk factors can be used for screening strategies for primary and/or secondary fracture prevention. This study showed that the majority of patients sustained a proximal femoral fracture following a fall. As a result, we recommend that those patients who present with a fall should have an in-patient comprehensive geriatric assessment including a falls risk and fracture risk assessment. In addition, many elderly patients made use of emergency services, ophthalmic services, and elective surgery within 3 months prior to a proximal

16. Zapatero A, Barba R, Canora J, Losa JE, Plaza S, San Roman J, Marco J. (2013), 'Proximal femoral fracture in hospitalized medical patients' *BMC Musculoskeletal Disord*; 14:15.

femoral fracture. As a result, we would suggest that elderly patients admitted with acute medical problems, have sensory impairment or undergo elective surgeries, should be screened for falls and fracture risk and be referred to falls prevention clinics.

REFERENCES

1. Aizen E, Dranker N, Swartman R and Michalak R. (2003), 'Risk Factors and Characteristics of Falls Resulting in Proximal femoral Fracture in the Elderly' *IMAJ*; 5:333-336. Available from <https://pubmed.ncbi.nlm.nih.gov/12811949/>.
2. Ambrose AF, Gee P and Hausdorff JM. (2013), 'Risk factors for falls among older adults: A review of the literature' *Maturitas*; 75:51-61.
3. Berry SD, & Miller RR. (2008), 'Falls: epidemiology, pathophysiology, and relationsproximal femoral to fracture' *Current osteoporosis reports*; 6:(4)149–154.
4. Bugeja M, Aquilina S, Farrugia C, Esposito I(2018), 'Demographic Study of Proximal femoral Fractures in the Maltese Islands' *Geriatr Orthop Surg Rehabil.*; 23;9.
5. Burke-Doe A, Hudson A, Werth HR. (2008), 'Knowledge of Osteoporosis Risk Factors and Prevalence of Risk Factors for Osteoporosis, Falls and Fracture in Functionally Independent Older Adults', *Journal of Geriatric Physical Therapy*; 31:(1)11-17.
6. Dhanwal DK, Dennison EM, Harvey NC, Cooper C. (2011), 'Epidemiology of proximal femoral fracture: Worldwide geographic variation' *Indian J Orthop.*; 45:(1)15-22.
7. Kenkre JS & Bassett JHD. (2018), 'The bone remodeling cycle' *Ann Clin Biochem.*; 55:(3)308-327.
8. Pillai A, Eranki V, Shenoy R, Hadidi M(2011), 'Age related incidence and early outcomes of proximal femoral fractures: a prospective cohort study of 1177 patients' *J Orthop Surg Res.*; 6:5.
9. Rapp K, Büchele G, Dreinhöfer K, Bücking B, Becker C, Benzinger P. (2019), 'Epidemiology of proximal femoral fractures: Systematic literature review of German data and an overview of the international literature' *Z Gerontol Geriatr.*; 52:(1)10-16.
10. Rey-Rodriguez MM, Vazquez-Gamez MA, Giner M, Garrachón-Vallo F, Fernández-López L, Colmenero MA, Montoya-García MJ. (2020), 'Incidence, morbidity and mortality of proximal femoral fractures over a period of 20 years in a health area of Southern Spain' *BMJ Open.*; 10:(9) e037101.
11. Sterling RS. (2011), 'Gender and race/ethnicity differences in proximal femoral fracture incidence, morbidity, mortality, and function' *Clin Orthop Relat Res.*; 469:(7)1913-1918.
12. Uriz-Otano F, Pla-Vidal J, Tiberio-López G, Malafarina V. (2016), 'Factors associated to institutionalization and mortality over three years, in elderly people with a proximal femoral fracture-An observational study' *Maturitas.*; 89: 9-15.
13. World Health Organization(2018), 'Falls' [online]. Accessed on 27th April 2020. Available from: <https://www.who.int/news-room/fact-sheets/detail/falls>
14. Yoo J, Lee JS, Kim S, Kim BS, Choi H, Song DY, Kim WB, Won CW. (2019), 'Length of hospital stay after proximal femoral fracture surgery and 1-year mortality' *Osteoporos Int.*; 30:(1)145-153.
15. Zammit P, Ferry P, Cordina J, Vassallo M, Dalli S, Vella A, Bugeja V, Muscat J, Zammit K. (2016), 'Orthogeriatrics in Malta: a 3-year experience' *Malta Medical Journal.*; 28:(1) 38-40. Available from <https://www.um.edu.mt/library/oar/handle/123456789/9710>.