Archives of Osteoporosis (2019) 14:97
https://doi.org/10.1007/s11657-019-0649-3

ORIGINAL ARTICLE

Mortality and physical dependence following fragility hip fracture: data from a regional hip fracture registry in Sri Lanka

Sarath Lekamwasam[1] · Saumyarika Sabapathippillai[2]

Received: 20 May 2019 / Accepted: 26 August 2019

Abstract

Summary This study based on 306 hip fracture patients admitted to a tertiary care center in Sri Lanka showed higher inpatient (6.1% vs 2.8%) and post-discharge (26% vs 20% at 24 months) mortality among men compared with women. Furthermore, 58% had impaired activities of daily living at 12 months.

Introduction Data related to the outcome of patients admitted following fragility hip fracture are not found in Sri Lanka. We assessed the mortality and physical dependence of hip fracture survivors in our region.

Methods All patients admitted with new hip fracture to Teaching Hospital, Karapitiya, Galle, Sri Lanka, during June 2014 to Feb 2015 were followed up for 24 months. Readmissions and old fractures were excluded and patients were followed up during the hospital stay and subsequently for 24 months.

Results The registry included 309 patients (women = 211) and mean (SD) age of men and women were 75.1 (11.3) and 76.8 (8.9) years, respectively. Majority ($n = 285$, 92%) had been physically independent and were able to walk indoors unaided prior to fracture. Based on the 10-item Barthel Index, only 37.6% were physically independent (score of 100) at 3 months after discharge. This number increased to 40% at 6 months but 58% had impaired activities of daily living at 12 months, post-fracture. Mortality rates, both inpatient hospital (6.1% vs 2.8%) and post-discharge from hospital (26% vs 20% at 24 months) were higher in men compared with women. Most deaths (66.6% in men and 73.1% in women) occurred within the first 12 months. When compared with age- and sex-matched national mortality rates, at 24 months, the relative risks of death in men and women were 3.4 and 3.7, respectively.

Conclusions There is an increased risk of death following hip fracture and the risk was higher in the first 12 months compared with the next 12 months. Men had higher crude mortality compared with women and 58% patients had limitations in daily activities at 12 months, post-fracture.

Keywords Hip fracture · Fracture registry · Mortality · Sri Lanka

Introduction

Hip fracture, the most sinister complication of osteoporosis, is associated with increased risk of mortality, morbidity, institutionalization, dependency, and loss of productivity [1]. Unadjusted mortality at 12 months following hip fracture ranges from 8.4 to 36% and remains higher when compared with non-hip fracture and community controls [2]. Furthermore, mortality is higher among men compared with women and becomes less pronounced with advancing age [2, 3].

Apart from mortality, hip fracture survivors have a higher morbidity. Comorbidities such as urosepsis, pressure ulcers, pulmonary complications, venous thrombo-embolism, and delirium are seen especially during the initial period [4, 5] and long-term comorbidity is an independent risk factor of increased mortality seen in these patients [6, 7]. Furthermore, hip fracture survivors have increased risk of impaired physical and mental functions [8]. Studies have shown that nearly 50% of hip fracture survivors have impairment of at least one component of activities of daily living (ADL) at 12 months, post-fracture [1, 9, 10].

Excess mortality following low trauma hip fracture is universal. Many systematic reviews and meta-analyses illustrate

✉ Sarath Lekamwasam
slekamwasam@gmail.com

[1] Population Health Research Center, Department of Medicine, Faculty of Medicine, Galle, Sri Lanka

[2] Teaching Hospital, Karapitiya, Galle, Sri Lanka

Published online: 06 September 2019

high mortality and factors that are associated with mortality among post-hip fracture patients [2, 3, 11]. Data related to post-hip fracture mortality, morbidity, and physical dependence among Asians, especially in the South region, are sparse. Chow SK et al. observed 14.9% gross mortality 1 year after hip fracture among Chinese patients and among them male gender and advancing age were associated with higher mortality [12]. In Korea, crude mortality after hip fracture showed an upward trend between 2005 and 2008, parallel to a similar trend in crude hip fracture incidence [13].

The scarcity of studies in the South Asian region could partly be due to the less priority given for osteoporosis and fragility fractures in these countries which are still dominated by communicable diseases. The lack of data prevents health authorities recognizing hip fracture as a disease which needs coordinated care delivered through a multidisciplinary team. Furthermore, lack of data hinders the development of the community services such as physical therapy, transport of patients with mobility restrictions, and home care, especially required for these patients. Therefore, it is pertinent for a country to have own mortality and morbidity data related to hip fracture in order to plan proper medical and social services for hip fracture victims in the country.

In Sri Lanka, majority of hip fracture patients are discharged to family care and managed in the community which has no proper community rehabilitation services. Mobility restrictions prevent them seeking proper after-care and most patients have no access to physical rehabilitation. If sufficient epidemiological data related to post-hip fracture patients can be generated, it is easier to convince health authorities and social services to provide community programs to fill this care gap. In this study, we intended to assess the mortality and the level of dependency of patients who were admitted with incident hip fracture in a selected region in Sri Lanka.

Methods

All consecutive patients with incident hip fracture admitted from June 2014 to Feb 2015 to Teaching Hospital, Karapitiya were included in a Patient Registry and followed up for 2 years after discharge. Old fractures (those occurred before 1st of June 2014) and readmissions (repeat admissions of those included) were excluded after matching case records. The principal investigator (SS) visited all patients twice a week while they were in the hospital and follow-up data were collected during their clinic visits or by contacting them. The principal investigator maintained a close relationship with family members while patient was in the ward and this was continued for 2 years with regular telephone conversations and they were given free access to the research team during this period.

Teaching hospital, Karapitiya, the only tertiary care center in the Southern province of Sri Lanka, primarily caters to nearly one million population in the Galle district. In addition, it provides specialized services to needy patients from the rest of the Southern province. We used the data collection sheet used by the Malaysian hip fracture registry after necessary modifications [14]. Modifications to the questionnaire were done after a focused group discussion with three experts to ensure content validity and suitability to the local settings. All patients were treated by the orthopedic team in the hospital led by two specialist orthopedic surgeons and the research team did not get involve in patient care at any stage.

Data were collected during the hospital stay, at the time of discharge, and during follow-up. Physical independence and walking ability, indoor and outdoor, prior to fracture were recorded. Follow-up data were collected at 3 months, 6 months, 12 months, and 24 months post-fracture either at clinic visits or by contacting the patient, a family member, or a close relative who were informed about the process of data collection while patient was in the ward. Physical ADL were assessed using the Sinhala version of the Barthal Index (BI) [15] at 3, 6, and 12 month post-fracture and patients were categorized independent (100), slightly dependent (91–99), moderately dependent (61–90), severely dependent (21–60), and totally dependent (0–20) based on the total score [16]. Survival data were collected at 12 and 24 months. The Ethics Review Committee of the Faculty of Medicine, University of Ruhuna gave ethical approval for the study.

Statistical analysis

Descriptive data are given as number (%), mean (SD), or median (IQR). In calculating the physical disability (Barthel Index), only the patients who survived at 12 months were considered. The expected number of deaths was calculated based on the latest gender-specific national mortality rates of people above 50 years; 4.0% in men and 2.9% in women (http://www.statistics.gov.lk). Relative risks of death at different time points were calculated using the observed and estimated deaths (observed death rate/estimated death rate) and 95% confidence intervals were calculated with a free online statistical package.

Results

After the exclusion of readmissions and old fractures, there were 309 patients (211 women) admitted with incident hip fracture during the study period. Mean (SD) age of men and women were 75.1 (11.3) and 76.8 (8.9) years, respectively ($P = 0.17$). All women were post-menopausal and mean (SD) age at menopause was 53.6 (11.9) years. All fractures, except two which occurred without noticeable trauma or fall,

occurred following minor falls while walking either indoor or in the garden. In 180 patients, fracture was confined to the intertrochanteric region while 99 had intracapsular and another 30 subtrochanteric fracture. One hundred and sixty-eight patients underwent surgery and the median (IQR) gap between admission and surgery was 11 (7–21) days. We obtained mortality data from all patients but some patients failed to provide information on ADL. Patients who failed to provide this information were not different from others with regard to the age, sex, fracture type, and ADL at the time of discharge.

Twelve patients (6 males) died while in the hospital resulting total inpatient hospital death rate of 3.9% (death rate in men 6.1% and in women 2.8%). The causes of inpatient death included chest infections (5), acute coronary events (2), hepatic failure (2), sepsis (2), and renal failure (1). A higher mortality was observed among men (24/92, 26%) than women (41/205, 20%) at 24 months post-fracture. Most of these deaths (66.6% in men and 73.1% in women) occurred within the first 12 months. Table 1 shows the mortality rates during the follow-up according to gender. Most of the deaths were not directly related to fracture or surgery. The common causes of death included chest infections ($n = 18$), sepsis due to infected wounds or urine infections ($n = 16$), acute coronary events ($n = 15$), and malignancies ($n = 3$).

Most of the patients ($n = 285$, 92%) were able to walk indoors unaided prior to fracture while 24 used walking aids. Three months after discharge from the hospital, 3.6% were totally dependent (BI 0–20) while 37.6% were totally independent (BI 100) with regard to their physical ADL. The ADL improved gradually but only 42% were totally independent at the end of 12 months post-fracture (Table 2).

Discussion

We observed mortality rates exceeding national mortality rates among both men and women following hip fracture. Mortality rates, both inpatient hospital (6.1% vs 2.8%) and post-discharge from hospital (26% vs 20% at 24 months) were higher in men compared with women. Furthermore, most of the deaths observed during the 2-year period occurred during the first 12 months.

Our results are concordant with previous studies showing increased mortality among hip fracture survivors. The crude 12-month mortality rates of 18.6% observed by Zabaleta et al. [7] and 18.8% and 17.8% in 2005and 2008, respectively, observed by Yoon et al. [13] are similar to our results. Abrahamsen et al., however, observed that 12-month mortality following hip fracture varies from 8.6 to 34% [2] with higher mortality rates among certain subgroups [17, 18].

Variation of mortality following hip fracture between studies could occur due to multitude of reasons. Many factors have emerged as associations or predictors of mortality in hip fracture patients and these factors can vary between countries and even regions in the same country. Higher mortality following hip fracture is not restricted to old age and in a nationwide survey in Taiwan, Leu et al. showed a higher mortality among hip fracture survivors aged 20–40 years [19]. Higher mortality (36.2% at 6 months) has been observed among nursing home residents [20] and patients older than 85 years [11]. Apart from age, many factors have been shown to be associated with increased mortality in hip fracture patients. These include comorbidity [7, 20], ASA score [21], atrial fibrillation [17], abnormal ECG, and pre-fracture mobility [11]. Furthermore, Daugaard et al. found that surgical delay increased in-hospital mortality of hip fracture patients (OR 1.3 per 24-h delay) [21].Surgical delay is a common occurrence in countries with restricted orthopedic facilities and coordinated care programs such as fracture liaison services.

A gender difference in mortality following hip fracture has been observed in many studies. In general, men have a higher mortality compared with women, confirmed by many studies [11, 22, 23]. Similarly, we too found a higher crude death rate among men compared with women (26% vs 20% at

Table 1 Mortality rates according to gender up to 2 years since discharge

	Observed number (%)	Number expected*	Relative risk (95% CI)	*P* value
Deaths among men first 12 months after discharge ($n = 92$)	16 (17.3)	04	4 (1.4–11.5)	0.010
Deaths among men between 12–24 months ($n = 76$)	08 (10.5)	03	2.7 (0.7–9.6)	0.135
Deaths among men in first 2 years ($n = 92$)	24 (26)	07	3.4 (1.6–7.6)	0.002
Deaths among women first 12 months after discharge ($n = 205$)	30 (14.6)	06	5 (2.1–11.8)	0.0002
Deaths among women between 12–24 months ($n = 175$)	11 (6.2)	05	2.2 (0.78–6.2)	0. 135
Deaths among women in first 2 years ($n = 205$)	41 (20)	11	3.7 (1.9–7.0)	0.0001

*Number of deaths expected based on gender- and age-specific national mortality data

Table 2 Distribution of physical ADL assessed by Barthal Index during follow-up

Time	Barthal Index 0–20	Barthal Index 21–60	Barthal Index 61–90	Barthal Index 91–99	Barthal Index 100
At 3 months	3.6%	18%	19%	21.5%	37.6%
At 6 months	3.6%	10%	26.5%	20%	40%
At 12 months	1.7%	9.6%	26.5%	20.3%	42%

Only the data of those survived at 12 months ($n = 167$) were analyzed

24 months). Compared with men, women, however, showed a higher relative risk of death, possibly due to lower mortality rate in women in the population.

No noticeable secular change in mortality has been observed despite reduction of hip fracture incidence in some countries. Bliuc et al. found no secular change in post-hip fracture outcome over the 2 decades (1989–2004 and 2000–2014) despite the decline in the general-population mortality and initial fracture incidence [24]. In Hong Kong, despite reduction of hip fracture rates between 2001 and 2009, no significant change of mortality was observed [25]. Despite advances in health care facilities, mortality following hip fracture has remained unchanged and more studies are needed to address the reasons for persistently high mortality in these patients.

Apart from high mortality, hip fracture survivors have a high dependency for daily activities. Although nearly 85% of our patients were fully independent before fracture, only 38% were totally independent at 3 months after discharge. The ADL showed a gradual but slow improvement during the next 12 months. At 6 months, 40% were independent and this proportion increased to 42% at 12 months. Some degree of restriction of ADL at 12 months was seen in 58% of patients. The major improvement of ADL seen at 12 months occurred within the first 6 months and the recovery of ADL beyond 6 months was only marginal.

Studies have consistently demonstrated that a substantial proportion of hip fracture survivors have limited physical ADL. Dyer et al. analyzing 38 studies found that hip fracture survivors, compared with controls, experience significantly worse mobility, functional independence, health in general, and quality of life [1]. Furthermore, similar to our results, they found that bulk of recovery of ADL occurs within 6 months of post-fracture. The proportion of patients who regained pre-fracture mobility in our study is concordant with 40–60% they observed in their analysis [1]. Rapid recovery of ADL within the first 6 months following hip fracture has been reported in other studies too [26].

This study has limitations and strengths worth recording. All patients were followed up by the principal investigator (SS) by maintaining a close contact with patients and family members. Some information, especially about the ADL, were recorded over the phone and it is a reliable method of colleting this type of information [27]. We, however, were unable to record all comorbidities that occurred during the follow-up since no electronic databases are used to maintain health records in Sri Lanka. We were unable to apply the age-specific national mortality rates in calculating the excess mortality among fracture survivors since the number of subjects in different age categories were insufficient. Hence, we applied the mortality rates applicable to mean age of the study sample and this is a serious limitation. More studies are required to ascertain the accuracy of our findings. Until then these values should be applied with caution.

Our data, however, will help health authorities, social services, and community care services in planning their work and allocation of resources. We encourage more studies involving wider geographical areas and longer follow-up periods to confirm our observations and find more information.

Author's Contributions S Sabapathipilli: Designing of the study, data collection, and preparation of the manuscript.

S Lekamwasam: Designing of the study, supervision of data collection, data analysis, and preparation of the manuscript.

Compliance with ethical standards The Ethics Review Committee of the Faculty of Medicine, University of Ruhuna gave ethical approval for the study.

Conflict of interest None.

References

1. Dyer SM, Crotty M, Fairhall N, Magaziner J, Beaupre LA, Cameron ID, Sherrington C (2016) Fragility Fracture Network Rehabilitation Research Special Interest G: A critical review of the long-term disability outcomes following hip fracture. BMC Geriatr 16:158
2. Abrahamsen B, van Staa T, Ariely R, Olson M, Cooper C (2009) Excess mortality following hip fracture: a systematic epidemiological review. Osteoporos Int 20:1633–1650
3. Hu F, Jiang C, Shen J, Tang P, Wang Y (2012) Preoperative predictors for mortality following hip fracture surgery: a systematic review and meta-analysis. Injury 43:676–685
4. Ma RS, Gu GS, Huang X, Zhu D, Zhang Y, Li M, Yao HY (2011) Postoperative mortality and morbidity in octogenarians and nonagenarians with hip fracture: an analysis of perioperative risk factors. Chin J Traumatol 14:323–328
5. Kim SD, Park SJ, Lee DH, Jee DL (2013) Risk factors of morbidity and mortality following hip fracture surgery. Korean J Anesthesiol 64:505–510

6. de Luise C, Brimacombe M, Pedersen L, Sorensen HT (2008) Comorbidity and mortality following hip fracture: a population-based cohort study. Aging Clin Exp Res 20:412–418
7. Gonzalez-Zabaleta J, Pita-Fernandez S, Seoane-Pillado T, Lopez-Calvino B, Gonzalez-Zabaleta JL (2016) Comorbidity as a predictor of mortality and mobility after hip fracture. Geriatr Gerontol Int 16:561–569
8. Ramirez-Perez E, Clark P, Carlos F, Camacho A, Franco-Marina F (2014) Health-related quality of life after surgery for hip fracture: a multicentric study in Mexican population. Medwave 14:e5972
9. Sakamoto K, Nakamura T, Hagino H, Endo N, Mori S, Muto Y, Harada A, Nakano T, Yamamoto S, Kushida K, Tomita K, Yoshimura M, Yamamoto H (2006) Report on the Japanese Orthopaedic Association's 3-year project observing hip fractures at fixed-point hospitals. J Orthop Sci 11:127–134
10. Theander E, Jarnlo GB, Ornstein E, Karlsson M (2004) Activities of daily living decrease similarly in hospital-treated patients with a hip fracture or a vertebral fracture: a one-year prospective study in 151 patients. Scand J Public Health 32:356–360
11. Smith T, Pelpola K, Ball M, Ong A, Myint PK (2014) Pre-operative indicators for mortality following hip fracture surgery: a systematic review and meta-analysis. Age Ageing 43:464–471
12. Chow SK, Qin JH, Wong RM, Yuen WF, Ngai WK, Tang N, Lam CY, Lau TW, Lee KB, Siu KM et al (2018) One-year mortality in displaced intracapsular hip fractures and associated risk: a report of Chinese-based fragility fracture registry. J Orthop Surg Res 13:235
13. Yoon HK, Park C, Jang S, Jang S, Lee YK, Ha YC (2011) Incidence and mortality following hip fracture in Korea. J Korean Med Sci 26: 1087–1092
14. Muhammad Anwar Hau A (2008) National Orthopedic Registry in Malaysia–National Orthopedic Hip Fracture Database (NOHFD). Med J Malaysia 63 Suppl C:74
15. Lekamwasam S, Karunatilake K, Kankanamge SK, Lekamwasam V (2011) Physical dependency of elderly and physically disabled; measurement concordance between 10-item Barthel index and 5-item shorter version. Ceylon Med J 56:114–118
16. Katz PP (2003) Measures ofssss adult general functional status. Arthritis & Rheumatism (Arthritis Care & Research) 49:S15–S27
17. Adunsky A, Arad M, Koren-Morag N, Fleissig Y, Mizrahi EH (2012) Increased 1-year mortality rates among elderly hip fracture patients with atrial fibrillation. Aging Clin Exp Res 24:233–238
18. Adunsky A, Arad M, Koren-Morag N, Fleissig Y, Mizrahi EH (2012) Atrial fibrillation is not associated with rehabilitation outcomes of elderly hip fracture patients. Geriatr Gerontol Int 12:688–694
19. Leu TH, Chang WC, Lin JC, Lo C, Liang WM, Chang YJ, Shih DP, Wu CC, Cheng CF, Wei SJ (2016) Incidence and excess mortality of hip fracture in young adults: a nationwide population-based cohort study. BMC Musculoskelet Disord 17:326
20. Neuman MD, Silber JH, Magaziner JS, Passarella MA, Mehta S, Werner RM (2014) Survival and functional outcomes after hip fracture among nursing home residents. JAMA Intern Med 174:1273–1280
21. Daugaard CL, Jorgensen HL, Riis T, Lauritzen JB, Duus BR, van der Mark S (2012) Is mortality after hip fracture associated with surgical delay or admission during weekends and public holidays? A retrospective study of 38,020 patients. Acta Orthop 83:609–613
22. Endo Y, Aharonoff GB, Zuckerman JD, Egol KA, Koval KJ (2005) Gender differences in patients with hip fracture: a greater risk of morbidity and mortality in men. J Orthop Trauma 19:29–35
23. Wehren LE, Hawkes WG, Orwig DL, Hebel JR, Zimmerman SI, Magaziner J (2003) Gender differences in mortality after hip fracture: the role of infection. J Bone Miner Res 18:2231–2237
24. Bliuc D, Tran T, Alarkawi D, Nguyen TV, Eisman JA, Center JR (2016) Secular changes in postfracture outcomes over 2 decades in Australia: a time-trend comparison of excess postfracture mortality in two birth controls over two decades. J Clin Endocrinol Metab 101:2475–2483
25. Chau PH, Wong M, Lee A, Ling M, Woo J (2013) Trends in hip fracture incidence and mortality in Chinese population from Hong Kong 2001-09. Age Ageing 42:229–233
26. Bertram M, Norman R, Kemp L, Vos T (2011) Review of the long-term disability associated with hip fractures. Inj Prev 17:365–370
27. Korner-Bitensky N, Wood-Dauphinee S (1995) Barthel Index information elicited over the telephone. Is it reliable? Am J Phys Med Rehabil 74:9–18