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Risk Factors and Comorbidities Associated with Fragility Hip Fracture among Fragility Hip Fracture Patients Admitted to Teaching Hospital Karapitiya

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Abstract

Background: Hip fracture, the most sinister clinical outcome of osteoporosis, is associated with disability, hospitalization, multi-morbidity and death. Many Asian countries lack an effective and coordinated system to detect high fracture risk patients early.

Objective: To identify risk factors and comorbidities associated with hip fracture (HF) among patients admitted to Teaching Hospital Karapitiya (THK).

Methods: Patients with incident fragility HF (n=180) admitted to THK and age and sex matched 348 subjects free of HF selected from the neighborhood of HF patients were included in this case-control study. Only new hip fractures resulted from falls of standing height or less were included. Hip fractures due to heavy injuries were excluded. Data were collected using an interviewer-administered questionnaire.

Results: The two groups were similar with regards to smoking, alcohol consumption and the usage of glucocorticoids. The prevalence of any type of previous fragility fracture (7.8% vs 3.4%) and family history of fragility fracture (8.9% vs 3.4%) were higher in the HF patients (p<0.05 and p<0.01). The 66.7% of HF patients had one or more comorbidities (83.9%, p<0.01). The HF patients had a greater prevalence of comorbidities such as peripheral vascular disease, cerebrovascular disease, peptic ulcer disease, liver diseases, neoplasm, hypertension, bronchial asthma, vision impairment and hearing impairment at the time of hospitalization (p<0.01).

Conclusions: This study revealed several risk factors of HF in the local population. Such information can be used in the development of a risk score to detect those with high fracture risk in the local population.

Keywords: Comorbidity, Hip fracture, Risk factors, Sri Lanka

Background

Hip fracture (HF) is associated with permanent disability, hospitalization, increased morbidity and death. It is the most sinister osteoporotic fracture seen among elderly people (1-5). The lifetime risk of HF is higher in women than in men and HF rate increases exponentially, beyond

50 years in both genders (1, 6-8). The lifetime risk of HF is much higher in white women and men compared to their black counterparts (1, 9).

The average length of hospital stay and overall bed use are higher with HFs when compared to pathological vertebral fractures. Mortality is higher during perioperative period and only a lesser number of older patients regain their pre-fracture mobility (10). The mortality rate of HF is increased with age (1, 7, 8). Also high proportion of patients need long term health care for their survival (3, 4, 11, 12).

The incidence of fragility hip fracture (FHF) is increasing, globally, due to the longer life expectancy of the population. The total number of HF worldwide was 1.7 million by 1990 (13, 14) and it could exceed 21 million in 2050 (14, 15). Identification of high fracture risk patients and offering timely measures to reduce fracture risk is the major strategy to tackle this problem (16) Identification of high-risk patients is partly based on clinical risk factors and these risk factors are likely to vary in different populations. Populations differ with regards to genetic composition, anthropometry, nutrition, social habits and physical activities and all these factors play a role in risk prediction (17).

Different methods are used to assess the risk of fracture. In general, they include clinical risk factors and measures of skeletal mass such as bone mineral density (BMD) and trabecular bone score (TBS). BMD is the main factor of bone fragility especially when HF is taken to consideration (18, 19). The calculation of fracture risk is based on BMD and clinical risk factors. However, to improve the accuracy of estimations, other risk factors such as risk of falling also need to be taken into account (20-24). More than 90% of HFs are due to falls (25-28) Therefore, factors that enhance the risk of falling and protective measures during a fall also need to be considered (6, 29).

The risk factors of fractures are many and include those associated with low BMD and falls such as low body mass index (BMI), past fragility fracture (FF), age at menarche, multiparity of women, early menopause, smoking, low vitamin D, use of glucocorticoids, excessive alcohol intake, caffeine intake, impaired physical activity, parental/family history of FFs, long-acting benzodiazepines, impaired vision, altered cognitive function and comorbidities (5, 21, 30-45).

Previous studies have estimated that in-hospital mortality for a patient with a HF is between 4% and 12% (46-52) whereas 1 year mortality is 12–37% (46-58). Studies have shown that comorbidity is a determinant of both in-hospital and at 1 year mortality following a HF. In that some of the previous studies consider the disease or diseases which is/are currently presented with the patients (46-48, 55, 57-61) and others consider the number of co-morbidities whether none, one and two or more, (46, 48) both types of studies found that those factors are independently associated with mortality.

According to all the predictions, Asian countries would have high proportion of the older people and HFs. Early identification is the key to reduce the impact of HF on healthcare system and to lessen the socio-economic burden. Many Asian countries lack an effective and coordinated system to detect high fracture risk patients early and refer them for appropriate treatment. HF risk factors are not well recognized in these countries and more studies are necessary to increase national awareness across countries in order to reduce the HF incidence. The aim of this study was to identify the risk factors and comorbidities associated with HF among patients admitted to a tertiary care facility in Southern Sri Lanka. Also the study was done to assess the impact of the comorbidities on the type of management and the outcome measures such as health related quality of life (HRQOL) and activities of daily living (ADL).

Methods

This case-control study was done in the Southern province of Sri Lanka and the study was approved by the Ethics Review Committee of the Faculty of Medicine, University of Ruhuna. The study was conducted at Teaching Hospital Karapitiya (THK) which is the only tertiary referral center in the Galle district. The principal investigator visited relevant wards (orthopedic,

surgical and acute medical) regularly and patients were recruited after obtaining informed written consent either from patients or their immediate family members.

One hundred and eighty patients with incident FHF admitted consecutively to THK in Galle were included in the study. Men and women who were 50 years and older and who were admitted with the diagnosis of new HF were recruited. Subjects with traumatic HFs which resulted from falling from heights and traffic accidents were excluded. Further those with pathological fracture (e.g., cancer) were also excluded from the study. Those readmitted due to the same fracture were also excluded. Patients were requested to bring two people of same sex and age (± 5years) from their neighborhood (with the radius of 500 meters) to be considered for controls. Those with HF or radiologically confirmed vertebral fracture were excluded. A detailed history was obtained and examination was performed to detect past HFs and the presence of comorbidities. Previous documents including diagnosis cards were used to gather information.

The participants (cases and controls) were interviewed using a pre-tested, interviewer administered questionnaire to assess socio-demographic characteristics, general health and other clinical data. The questionnaire was designed to assess the risk factors and comorbidities. HF patients were interviewed before discharge from the hospital and those who were controls were interviewed at times convenient to them.

A detailed history was obtained and a limited examination was performed in both groups. Previous documents including diagnosis cards were used to gather information. Also the laboratory reports in the case notes were perused to gather information. Fasting blood sugar (FBS) and lipid profile were done in all study subjects. Assays were done in the Department of Medicine, Faculty of Medicine, University of Ruhuna and each test was performed in triplicates to ensure the accuracy of test results.

Data analysis

Data were analyzed using the statistical package; SPSS software version 20.0. Results were presented as numbers (percentages) for categorical variables and mean (SD) and median (IQR) for numerical variables depending on the distribution. Mean values between the two groups were compared by the independent samples t-test. Both relative risk (RR) and odds ratio (OR) for the risk estimation were calculated. Different groups were compared by ANOVA (numerical) or Chi-square test and odd ratios were calculated to determine the association with risk factors.

Results

A group of 180 patients (149 women, 82.8%) and 348 control group (290 women, 83.3%) were included in the case-control study done in the Southern province of Sri Lanka. The patients and controls were in the age range of 50-93 and 50- 89 years, respectively. Mean (±SD) ages of patients and controls were 77.0 (±9.1) and 73.7 (±7.8) years, respectively. Almost 90% (n= 161) of FHFs occurred due to falling from standing height and all the others were spontaneous FHFs. The incidence of HF was 4.8 times higher in women (82.8%) than men (17.2%). Only 59.4% patients were managed surgically. Of the 73 patients who did not undergo surgery, 36 patients did not give consent for surgery because either patients or their family members were unwilling for surgery. Ninety four percent of patients were undergone surgery under the spinal or epidural anesthesia while others had general anesthesia. During the follow-up of 12 months post-fracture, 33 patients died (including in-hospital deaths). The common causes of death included pneumonia (n=13), ischemic heart disease (n=8), cardiac failure (n=5), pulmonary embolism (n=2), sepsis (n=3) and acute renal failure (n=2).

The two groups were similar with regards to smoking, alcohol consumption and the usage of glucocorticoids. The prevalence of any type of previous FF and family history of FF were higher in the HF patients (Table 1). These elderly FHF patients had a high prevalence of

comorbidity with 66.7% having one or more of the comorbidities listed in Table 2. Apart from ischemic heart disease, diabetes mellitus and hyperlipidaemia, HF patients had a greater prevalence of other comorbidities at the time of hospitalization (Table 2). In-hospital mortality and mortality within one year after discharge were 2.8% and 15.6%, respectively. Both types of mortalities were significantly increased with the presence of one (In hospital mortality= 20%, mortality within one year after discharge =32.1%) or more comorbidities (In hospital mortality= 80%, mortality within one year after discharge =53.6%) in the FHF patients ($p<0.01$). The two groups were similar in mental status, but control group had better HRQOL and ADL than hip fracture patients (Table 3).

Table 1: Risk factors of FHF patients and controls

Characteristic	Patients (n=180) N (%)	Control group (n=348) N (%)
History of fragility fracture	14 (7.8)*	12 (3.4)
Family history of fragility fracture	16 (8.9)**	12 (3.4)
Smoking	14 (7.8)	22 (6.3)
Alcohol consumption	19 (10.6)	30 (8.6)
Use of Glucocorticoids	51 (28.3)	73 (21.0)

N- Number; * Significant at the $p<0.05$ level; ** Significant at the $p<0.01$ level

Table 2: Comorbidities of FHF patients and controls

Characteristic	Patients (n=180) N (%)	Control group (n=348) N (%)
Comorbid Conditions		
IHD	8 (4.4)	62 (17.8)**
PVD	52 (28.9)**	3 (0.9)
CVD	11 (6.1)**	6 (1.7)
Dementia	12 (6.7)	17 (4.9)
COPD	20 (11.1)	28 (8.0)
Rheumatic diseases	6 (3.3)	21 (6.0)
Peptic ulcer disease	18 (10.0)**	11 (3.2)
Liver disease	10 (5.6)**	3 (0.9)
Diabetes Mellitus	36 (20.0)	163 (46.8)**
Renal diseases	4 (2.2)	6 (1.7)
Neoplasm (Benign or malignant)	4 (2.2)**	0 (0.0)
Hypertension	69 (38.3)**	49 (14.1)
Hyperlipidemia	13 (7.2)	81 (23.3)**
Bronchial Asthma	25 (13.9)*	27 (7.8)
Vision impairment	30 (16.7)*	36 (10.3)
Hearing Impairment	15 (8.3)**	10 (2.9)
Number of comorbid conditions		
0	60 (33.3)**	56 (16.1)
1	64 (35.6)	258 (74.1)**
2+	56 (31.1)**	34 (9.8)

N- Number
* Significant at the $p<0.05$ level ** Significant at the $p<0.01$ level
IHD- Ischemic heart disease, PVD- Peripheral vascular disease, CVD-Cerebrovascular diseases, COPD-Chronic obstructive pulmonary disease

Table 3: Trends of SF 36, BI and MMSE among FHF patients and controls

		Patients (n=180) Mean (SD)	Control group (n=348) Mean (SD)
SF 36		(n=175)	(n=348)
	SF36 Physical	9.2 (3.8)	58.0 (18.8)**
	SF 36 Psychological	12.8 (3.3)	70.5 (15.8)**
BI		(n=180)	(n=348)
		96.8 (5.1)	98.0 (4.5)**
MMSE		(n=180)	(n=348)
		25.6 (5.5)	25.3 (3.8)

** Significant at the $p<0.01$ level

Discussion

This study revealed several factors that are associated with HF in older people. Patients with a past history or family history of FF were at increased risk of HF. Peripheral vascular disease (PVD), cerebrovascular diseases (CVD), peptic ulcer disease, liver disease, neoplasm, hypertension, bronchial asthma, vision impairment and hearing impairment were predisposed to HF.

The history of FF has been identified as a risk factor of subsequent fracture in many studies and the high risk persists even after adjusting for BMD (28, 42, 62-67) Studies have shown that the risk of subsequent fracture is increased with the history of a previous fracture (36, 38, 62, 64, 65, 68-70).

The finding that a family or maternal history of FF increases the risk of HF agrees with the observations made in previous studies. A family history of HF is connected with increased risk of HF in both men and women (42, 65). Apart from fracture, family history of osteoporosis is also associated with increased risk of HF (5, 71). A woman with maternal history of HF, is at two times greater risk of HF when compared with a woman without such maternal history (36). Current or previous smoking is considered a risk factor for future fracture including FHF (38, 72-75). Also the risk of HF is increased in parallel with the age of the smoker (73) Smoking increases risk of fracture in both men and women (42, 44, 73, 76-78) while the lifetime fracture risk is higher in male smokers (79, 80). The cessation of smoking tends to decrease the high fracture risk associated with smoking (75, 79).

In the current study no significant association was found between fracture risk and smoking and this could be due to several reasons. It could simply be due to chance and it is also possible that the small sample size in the current study would have limited the power of the study to reveal such association. This observation, however, is consistent with several studies which failed to find an association between smoking and fracture risk (35, 36, 66, 81-83).

In previous studies alcohol consumption was found to be associated with an increased risk of HF (35, 38, 84-86). Excessive alcohol intake is associated with an increased risk of HF in white men and women and as well as in Asians (5, 35, 38, 42, 72, 85, 87-89). The risk between alcohol consumption and fracture is dose-dependent in which higher exposure increases the risk (38, 62, 63). In contrast some researchers found occasional alcohol consumption and moderate alcohol consumption to be associated with a low risk of HF (38). Also they had higher BMD (90, 91). The finding of the current study related to alcohol are consistent with the findings of previous studies (36, 92).

The impact of smoking and alcohol consumption on risk of HF varies geographically (75). Compared to the Western countries, the prevalence of smoking among women in Asia is relatively low (38). Similarly, prevalence of alcohol consumption is lower among women in

Asian countries (38). Therefore, smoking and alcohol consumption are associated with relatively small effects on HF risk in Asian women (38).

In contrast to other investigators, the use of glucocorticoids was not associated with HF risk in the current study. Since the use of glucocorticoid in the community was low, the establishment of an association between glucocorticoid use and fracture was not possible. The low prevalence of glucocorticoid use is the most likely reason for the lack of association seen between these two variables in this study. The use of glucocorticoids has been recognized as an important risk factor of osteoporosis and fractures (42, 62, 65, 93). The oral glucocorticoid therapy leads to reduction in BMD and a rapid increase in the risk of fracture after the initiation of therapy (93, 94). It has a dose-dependent effect on increased risk of HF (93, 94). The previous or current use of glucocorticoids is associated with increased risk of any fracture at all ages compared with those with no history of glucocorticoids use and the highest level of risk among all FFs is observed for HFs (65, 95, 96).

Several clinical risk factors including comorbidities were identified as risk factors for FHFs in this analysis. This study confirmed that a history of fragility or osteoporotic fracture, a family or maternal history of FF, PVD, CVD, peptic ulcer disease, liver disease, neoplasm, hypertension, bronchial asthma, vision impairment and hearing impairment were risk factors increased an individual patient's risk of FHF. The finding of the current study also agrees with previous studies (36, 42, 45, 97, 98).

In contrast to other investigators (35, 36, 42, 98, 99), this study failed to find an association between common comorbidities such as ischemic heart disease, dementia, chronic obstructive pulmonary disease, rheumatic diseases, diabetes mellitus and renal diseases and the risk of HF.

The primary determinants of mortality following HF are comorbidities present at the time of fracture (97) and the findings of this study related to in-hospital and 1 year mortality are comparable with the large body of evidence emerging from previous studies (46-61). For in-hospital mortality, the rate of 2.8% is very much comparable with ranged from 4% to 12% (46-52); for 1 year mortality, the study value of 15.6%, is also consistent with previous results that have ranged from 12% to 37% (46, 48-58). The finding that the type and number of comorbidities at the baseline is associated with post-fracture mortality, both in-hospital and at 1 year are consistent with the findings of previous studies.

Limitations

There are several limitations in the present study. This study was limited to a single geographical area of Sri Lanka and the relatively small sample size did not have adequate power to reveal weaker associations. Further information on several other factors associated with HF, including BMD, BMI, hormone replacement therapy, vitamin D deficiency, intake of milk and calcium and environmental risk factors were not assessed.

Conclusions

It can be concluded that history of fragility or osteoporotic fracture and family or maternal history of FF increase the risk of HF in older people living in the community. Also, the comorbidities such as PVD, CVD, peptic ulcer disease, liver diseases, neoplasm, hypertension, bronchial asthma, vision impairment and hearing impairment are significantly associated with FHF patients. Also it was found that the type and number of baseline comorbidities are determinants of mortality in the HF patients, both in-hospital and at 1 year.

Recommendations

It can be recommended that more studies of similar nature in large sample to identify independent predictors of HF risk that contribute to a substantial proportion of HFs among elderly people.

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