

Depression following fracture in adults: Comparative study between men and women at a tertiary care centre

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Abstract

Introduction: Fractures are usually associated with functional impairment and dependence; also bears psychological effect as the quality of life decreases. Many studies have shown the presence of depression associated with the fracture and hence the study was done to know the same in our institution. **Methods: Inclusion criteria:** Adults aged more than 35 years of both sexes who had sustained fractures of long bones, hip and vertebral fractures who were admitted as inpatients earlier, and requiring prolonged rehabilitation. **Exclusion criteria:** Severely medically ill patients. The mood state was evaluated in patients with fractures after taking consent with Beck's Depression inventory. Follow up of inpatient with fracture were done after their discharge. **Results:** This study shows that among patients with fractures, higher prevalence of moderate and severe depression is in females. Post-menopausal women are most severely affected. **Conclusion:** Postmenopausal females suffer more from depression associated with fractures than males.

Keywords: Hip fracture, Vertebral fractures, Long bone fractures, Depression.

Introduction

The report on Global Burden of Disease estimates the point prevalence of unipolar depressive episodes to be 1.9% for men and 3.2% for women, and the one-year prevalence has been estimated to be 5.8% for men and 9.5% for women[1] 15% of elderly individuals report clinically relevant symptoms of depression[2]. A meta-analysis of 13 studies on epidemiology of psychiatric disorders in Indian population reported prevalence of depression to be 7.9 to 8.9 per thousand population and the prevalence rates were nearly twice in the urban areas [3]. Prevalence of depression in older people after hip fracture ranged from 9% to 47% and largely exceed the 2% and 10% respectively reported for major and minor depressive disorder in the aged-matched not affected people [4].

The lifetime risk of hip fracture is about 14 percent for postmenopausal women and 6 percent for men [5]. Women with depression were also more likely to suffer

vertebral fractures than women without depression. Women with depression did not have an increased rate of wrist, humerus, or other fractures [6].

Etiopathogenesis of this association of depression in women and old age has been evaluated. High levels of Cortisol are often found in depressed individuals [7,8]. Higher cortisol levels in older adults have been associated with a reduction in grip strength over a six year period and standing and walking performance[9,10]. Also, the cortisol:DHEAS ratio is higher in older hip fracture patients than in healthy controls or younger comparable fracture patients[11,12]. Adrenocortical hormone balance may thus be a major determinant of frailty in older hip fracture patients, particularly in those with depression. Depression could lower bone mineral density through several direct pathways. For example, persistently elevated plasma cortisol levels have been associated with clinical depression [13]. Low bone mineral density is suggestive of osteoporosis which is a predisposing factor for fractures.

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Similar pathogenesis in the association between long bone fractures and depression can be anticipated. Correcting this ratio for example with DHEA supplementation could benefit this patient population. Also, older patients with depression have higher levels of the cytokine interleukin 6, indicating increased inflammatory activity, which may be linked to increased bone resorption (or depressed patients may be more sedentary, leading to increased resorption rates), thus increasing the risk for hip fracture [14]. Depressive symptoms and major depressive disorder in elderly persons after a stressful medical event like a hip fracture may be associated with 5-HTTLPR genotype. Subjects with an s allele (genotype s/l or s/s) had significantly higher Ham-D scores over 14 weeks of follow-up than those with the l/l genotype [15].

Most of the studies in this regard have been done in western population. A study in this regard comparing the two genders in the Indian population has not come

Results

70 subjects were included in the study after obtaining their consent. Out of 70 subjects, 40 were male and 30 were female.

Table 1: Gender distribution with severity of Depression

			Gender		Total
			Male	Female	
depression	Normal	Frequency	20	5	25
		%	50.0%	16.66%	35.7%
	Mild depression	Frequency	10	8	18
		%	25.0%	26.66%	25.7%
	Moderate depression	Frequency	8	12	20
		%	20.0%	40.0%	28.6%
	Severe depression	Frequency	2	5	7
		%	5.0%	16.66%	10%
Total	Frequency	40	30	70	
	%	100.0%	100.0%	100.0%	
Chi-square=10.085		Df=3	p-value=0.018		

Table 1 depicts the association of severity of depression and its gender distribution highlighting the higher prevalence of severe depression in female gender in the study population.

Table: 2: Comparing age and gender in patients with fracture associated with depression

	<65yrs	>65yrs
Male	14	06
Female	17	08

to the study group's attention. Given the impact of the gender differences in the functional recovery affecting the therapeutic and rehabilitative decision making from fractures, the need for this study to compare the incidence of depression in males and females suffering from fractures was evident to the study team.

Material and Methods

Inclusion criteria: Adults aged more than 35 years who had sustained fractures of long bones, hip and vertebral fractures who were admitted as inpatients earlier, and requiring prolonged rehabilitation.

Exclusion criteria: Severely medically ill patients. Their mood states were examined using Beck's Depression inventory [16] This was a prospective study done between April 2015 to July 2015 using continuous sampling method. Statistical analysis was done using the SPSS 21.0 version.

Table 2 shows the distribution of fractures across the age and gender among the depressed patients. 30% of the male gender sample and 32% of female gender sample are >65 yrs, showing the high prevalence of depression with associated fractures in the elderly female population.

Discussion

Depression has been shown to be more common in women who are suffering from fractures than those who are not. This is reported especially in older age group [17]. A Metaanalysis noted that depression was associated with a 17% - 52% increase in fracture risk. Also, it found an association between depression and increased risk of fracture and bone loss that may be mediated by antidepressants [18]. High depressive symptomatology remained predictive of hip fracture. A study gave evidence of a prospective association between depression and hip fracture [19]. In a five-year study of all fractures among [7,518] older women, depressed women had a rate of hip fracture 40 percent higher than women who were not depressed [20]. It was further found that higher number of diabetic macrovascular complications and hip fracture is significantly associated with a higher risk of depression onset in elderly diabetes [21]. Individuals with clinical evidence of apathy are at high risk for developing MDD [22]. High disability [23] poor physical function [24] falls [25,26] and low bone density [27] have been associated with depression. All these increase susceptibility to osteoporotic fractures [28]. Older individuals who are depressed may also be at increased risk for falls and fracture due to the effects of antidepressants or sedatives [29,30]. Patients with depression have poorer recoveries following fractures [31].

We found that women suffered from moderate (40%) and severe depression (16.66%) more than men (20% and 5% respectively). Men were found to have more of mild depression (25%) or had no mood symptoms (50%) at all. Also, we found that among the depressed patients 30% of the male and 32% of female are above 65 yrs, showing the higher prevalence of depression with associated fractures in the elderly population.

In agreement with our findings, it has been seen that men recovered from depressed mood better than women during the rehabilitation from hip fractures. Gender differences in functional recovery may affect therapeutic and rehabilitative decision making [32]. Some studies have shown that depressive symptoms can complicate the course of rehabilitation and affect functional recovery at discharge [33,34] but other

studies have shown no association of the psychological parameter with the recovery [35,36,37].

The life time risk of fracture in women is 40-50% and 13-22% in men [38]. A decline in quality of life has been shown following fracture regardless of its site producing substantial social and medical costs [39]. Another study showed that fracture is associated with poor psychological and physical health, resulting in physical dependence and hence lack of independence [40,41]. In a review it was shown that post injury depressive symptoms are common following hip fractures which are predictor of poor recovery in the old [40]. It appears that a two way relationship exists between depression and fracture. The pre-injury mood state and post fracture depression has an impact on the recovery from fracture in the elderly, while a failure to regain original pre-injury functional levels may be the cause of persistence of the depressed mood state [41].

There were many limitations in our study which can be addressed in later studies. Studying the individual fractures with the depressive symptoms was not done. This could throw more light on the differences between the effect of hip fractures and other long bone fractures on depression. Short duration of follow up, not accounting the family history of psychiatric illness or the past history of psychiatric illness were other limitations. As is already known, family history and past history are independent risk factors on the individual's potential to develop depressive symptoms. These can be confounding factors. Yet another limitation is the lower number of sample which makes it difficult for us to generalize the findings of the study. Also we have not taken into account other medical comorbidities that may co-exist with fractures and might have had confounding effect.

Although clear standards exist for the medical management of hip fracture, little attention has been given to depression and hip fracture [42]. Because of the close association of depression with lower bone mineral density, the advantages of including calcium supplementation in the management of depression should be considered.

Educating primary care physicians to recognize and treat or refer depressed older adults may help reduce the incidence of hip fracture. Apart from diagnosis and treating depression before and after fractures, psychiatrists can assist the patient in adapting to and coping with fractures and its sequelae. Supporting the patient in accepting temporary dependency and role changes of the patients and their families form a part of it. Empathetic listening, building a support network, Positive reinforcement and counselling, occupational therapy and devising coping strategies were found to improve depressed patients with hip fractures in a study [43].

For the depressed older adult confined indoors, the benefit of calcium plus vitamin D supplementation as well as treatment of depression can be evaluated. It is important to remember that all psychotropics may increase the risk of falls. Therefore, clinicians must continue to assess gait and stability while considering to titrate the dose of psychotropics, especially when patients are encouraged to increase physical activity.

Hormone replacement and calcium supplementation lower the risk of hip fracture among depressed older women. Two treatable baseline characteristics, postoperative pain and baseline anxiety were the strongest independent risk factors for Incident depression. Addressing these treatable symptoms could therefore be protective against fractures in this high risk group.

Conclusion

It was found that females suffer more from depression associated with fractures than males in our study. The postmenopausal women were found to be more commonly affected with depression. The causative and influencing factors other than age and sex need to be further studied.

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References

1. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global Burden of Disease and Risk Factors. Washington: The World Bank; 2006.
2. Beekman AT, Deeg DJ, van Tilburg T, Smit JH, Hooijer C, van Tilburg W. Major and minor depression in later life: a study of prevalence and risk factors. *J Affect Disord.* 1995;36(1-2):65-75.
3. Reddy VM, Chandrashekar CR. Prevalence of mental and behavioural disorders in India : a meta-analysis. *Indian J Psychiatry.* 1998;40(2):149-57.
4. Voshaar RC, Banerjee S, Horan M, Baldwin R, Pendleton N, Proctor R, et al. Predictor of incident depression after hip fracture surgery. *Am J Geriatr Psychiatry.* 2007;15(9):807-14.
5. Lauritzen JB: Hip fractures: incidence, risk factors, energy absorption, and prevention. *Bone.* 1996;18(1):S65-S75.
6. Whooley MA, Kip KE, Cauley JA, Ensrud KE, Nevitt MC, Browner WS. Depression, Falls, and Risk of Fracture in Older Women. *Arch Intern Med.* 1999;159(5):484-90.
7. Deuschle M, Schweiger U, Weber B, Gotthardt U, Korner A, Schmider J, et al. Diurnal activity and pulsatility of the hypothalamus-pituitary-adrenal system in male depressed patients and healthy controls. *J Clin Endocrinol Metab.* 1997;82(1):234-38.
8. Lesch KP, Laux G, Schulte HM, Pfuller H, Beckmann H. Corticotropin and cortisol response to human CRH as a probe for HPA system integrity in major depressive disorder. *Psychiatry Res.* 1988;24(1):25-34.
9. Peeters GM, van Schoor NM, van Rossum EF, Visser M, Lips P. The relationship between cortisol, muscle mass and muscle strength in older persons and the role of genetic variations in the glucocorticoid receptor. *Clin Endocrinol.* 2008; 69(4):673-82.
10. Peeters GM, van Schoor NM, Visser M, Knol DL, Eekhoff EM, de Ronde W, et al. Relationship between cortisol and physical performance in older persons. *Clin Endocrinol.* 2007;67(3):398-406.
11. Dubin NH, Monahan LK, Yu-Yahiro JA, Michael RH, Zimmerman SI, Hawkes W, et al. Serum concentrations of steroids, parathyroid hormone, and calcitonin in postmenopausal women during the year following hip fracture: effect of location of fracture and

- age. *J Gerontol A Biol Sci Med Sci.* 1999;54(9):M467–73.
12. Butcher SK, Killampalli V, Chahal H, Kaya Alpar E, Lord JM. Effect of age on susceptibility to post-traumatic infection in the elderly. *Biochem Soc Trans.* 2003;31(2):449–51.
13. Michelson D, Stratakis C, Hill L. Bone mineral density in women with depression. *N Engl J Med.* 1996;335:1176–81.
14. Schweiger U, Deuschle M, Korner A. Low lumbar bone mineral density in patients with major depression. *Am J Psychiatr.* 1994;151:1691–95.
15. Lenze EJ, Munin MC, Ferrell RE, Pollock BG, Skidmore E, Lotrich F, et al. Association of the Serotonin Transporter Gene-Linked Polymorphic Region (5-HTTLPR) Genotype With Depression in Elderly Persons After Hip Fracture. *Am J Geriatr Psychiatry.* 2005;13(5):428–32.
16. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry.* 1961;4:561-71.
17. Williams LJ, Berk M, Henry MJ, Stuart AL, Brennan SL, Jacka FN, et al. Depression following fracture in women: a study of age-matched cohort. *BMJ Open.* 2014;4:e004226.
18. Wu Q, Liu J, Gallegos-Orozco JF, Hentz JG. Depression, fracture risk, and bone loss: A meta analysis of cohort studies. *Osteoporosis international.* 2010;21:1627-35.
19. Michael E. Mussolino. Depression and Hip Fracture Risk: The NHANES I Epidemiologic Follow-Up Study. *Public Health Rep.* 2005;120:71-75.
20. Forsen L, Haakon EM, Sogaard AJ, Naess S, Schei B, Edna TH. Mental distress and risk of hip fracture: do broken hearts lead to broken bones? *J Epidemiol Community Health.* 1999;53(6):343–7.
21. Pan HH, Li CY, Chen PC, Lee MD, Liang CY, Hou WH, et al. Contributions of diabetic macrovascular complications and hip fracture to depression onset in elderly patients with diabetes: An 8-year population-based follow-up study. *J Psychosom Res.* 2012;73(3):180-4.
22. Lenze EJ, Munin MC, Skidmore ER, Dew MA, Rogers JC, Whyte EM, et al. Onset of Depression in Elderly Persons After Hip Fracture: Implications for Prevention and Early Intervention of Late-Life Depression. *J Am Geriatr Soc.* 2007;55(1): 81–6.
23. Broadhead WE, Blazer DG, George LK, Tse CK. Depression, disability days, and days lost from work in a prospective epidemiologic survey. *JAMA.* 1990;264(19):2524-8.
24. Hays RD, Wells KB, Sherbourne CD, Rogers W, Spritzer K. Functioning and wellbeing outcomes of patients with depression compared with chronic general medical illnesses. *Arch Gen Psychiatry.* 1995;52(1):11-9.
25. Mossey JM. Social and psychologic factors related to falls among the elderly. *Clin Geriatr Med.* 1985;1(3):541-53.
26. Cwikel J, Fried AV, Galinsky D. Falls and psychosocial factors among community dwelling elderly persons: a review and integration of findings from Israel. *Public Health Rev.* 1989-1990;17(1):39-50.
27. Halbreich U, Rojansky N, Palter S, Hreshchysyn M, Kreeger J, Bakhai Y, et al. Decreased bone mineral density in medicated psychiatric patients. *Psychosom Med.* 1995;57(5):485-91.
28. Cummings SR, Black DM, Nevitt MC, Browner W, Cauley J, Ensrud K, et al. Bone density at various sites for prediction of hip fractures: the Study of Osteoporotic Fractures Research Group. *Lancet.* 1993; 341(8837):72-5.
29. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med.* 1988; 319(26):1701-7.
30. Liu B, Anderson G, Mittmann N, Axcell T, To T, Schear N. Use of selective serotonin reuptake inhibitors or tricyclic antidepressants and risk of hip fractures in elderly people. *Lancet.* 1998; 351(9112):1303-7.
31. Mutran EJ, Reitzes DC, Mossey J, Fernandez ME. Social support, depression, and recovery of walking ability following hip fracture surgery. *J Gerontol B Psychol Sci Soc Sci.* 1995;50(6):S354-61.

32. Arinzon Z, Shabat S, Peisakh A, Gepstein R, Berner YN. Gender differences influence the outcome of Geriatric rehabilitation following hip fracture. *Arch Gerontol Geriatr.* 2010;50:86-91.
33. Cullum S, Metcalfe C, Todd C, Brayne C. Does depression predict adverse outcomes for older medical inpatients? A prospective cohort study of individuals screened for a trial. *Age and Ageing.* 2008;37:690-5.
34. Lenze EJ, Munim MC, Dew MA, Rogers JC, Seligman K, Mulsant BH, et al. Adverse effects of Depression and cognitive impairment on rehabilitation participation and recovery from hip fracture. *Int J Geriatr Psychiatry.* 2004;19(5):472-8.
35. HersHKovitz A, Kalandariov Z, Hermush V, Weiss R, Brill S. Factors affecting short term rehabilitation outcomes of disabled elderly patients with proximal hip fracture. *Arch Phys Med Rehabil.* 2007;88:916-921.
36. Liberman D, Friger M, Liberman D. Inpatient rehabilitation outcome after hip fracture surgery in elderly patients; A prospective cohort study of 946 patients. *Arch Phys Med Rehabil.* 2006;87(2):167-171.
37. Lenze EJ, Skidmore ER, Dew MA, Butters MA, Rogers JC, Beagley A, et al. Does depression, apathy, or cognitive impairment reduce the benefit of inpatient rehabilitation facilities for elderly hip fracture patients? *Gen Hosp Psychiatry.* 2007;29:141-6.
38. Dennison E, Mohamed MA, Cooper C. Epidemiology of osteoporosis. *Rheum Dis Clin North Am.* 2006;32:617-29.
39. Pasco JA, Sanders KM, Hoekstra FM, Henry MJ, Nicholson GC, Kotowicz MA. The Human cost of fracture. *Osteoporosis Int.* 2005;16:2046-52.
40. Magaziner J, Simonsick EM, Kashner TM, Hebel JR, Kenzora JE. Predictors of functional recovery one year following hospital discharge for hip fracture: a prospective study. *J Gerontol.* 1990;45(3):M101-7.
41. Mossey JM, Knott K, Craik R. The effects of persistent depressive symptoms on hip fracture recovery. *J Gerontol.* 1990;45(5):M163-8.
42. Morrison R: The medical consultant's role in caring for patients with hip fracture. *Ann Intern Med.* 1998;128:1010-20.
43. Duignan D, Woodward Y, Daniel E, Burns A. An intervention to manage depression after hip fracture. *Nursing Times.* 2007;103(28):32-33.

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