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ORIGINAL ARTICLE

Factors Associated with Depression Among Patients with Femoral Fractures Treated at Muhimbili Orthopaedic Institute, Dar Es Salaam, Tanzania

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Introduction The occurrence of depression among patients with femoral fractures is overlooked and underestimated. Female sex, age, socioeconomic status, the severity of pain, and longer hospital stays are some of the factors that are associated with either developing or worsening of depression in patients with femoral fractures.

Objective To determine factors associated with depression among patients with femoral fractures treated at Muhimbili Orthopaedic Institute from July 2018 to June 2019.

Subjects and Methods This was a descriptive cross-sectional hospital-based study. Data collection was done using a structured questionnaire, which collected information about sociodemographics, pain severity prior to surgery, and depression using the nine items of the Patient Health Questionnaire. Fisher's exact test was used to determine the significance of variations and odds ratios strength of association.

Results One hundred and twenty-six patients who met the inclusion criteria were enrolled in this study. The mean duration from arrival to surgery was 10.4±14.3 days, with a pain severity (visual analog scale) score of 3.1±2.2 and Patient Health Questionnaire-9 of 2.5±4.4. The participants who developed depression were 16 (12.7%). Risk factors associated with depression were pain severity (p<0.001) and delayed time to surgery (p=0.003).

Conclusion The prevalence of clinically significant depression was 12.7%. This study has shown a strong association between pain and duration of stay before surgery in the development of depression in patients with femoral fractures.

Keywords Depression, Femoral fractures, Preoperative Hospital Stay, Visual analog scale.

INTRODUCTION

Depression is associated with musculoskeletal injuries in both males and females, notably with higher rates in females as compared to males [1]. A study done at Kilimanjaro Christian Medical Centre, a tertiary hospital in Tanzania, showed that femoral fractures are the most common presenting injury in the Orthopaedic Department [2].

The prevalence of depression among patients in trauma centers in Massachusetts and Boston is as high as 45% [3]. Disability and increased dependence on activities of daily living have also been observed in patients with orthopedic injuries of the limbs [4]. Depression is among the most significant causes of disability globally. Statistics show that more than 300 million people around the world have

had an episode of depression [5]. The WHO has ranked depression the fourth leading cause of disability [6].

According to the ICD-10 and the book Diagnostic and Statistical Manual of Mental Disorders (4th edition), depressive symptoms should be present most of the time for at least two consecutive weeks to make a diagnosis, hence distinguishing the syndrome for normal mood changes [7]. Most of the neurotransmitters responsible for brain functions such as mood, sleep, appetite, and cognition are located in the midbrain and brainstem nuclei and project in large areas of the entire brain [8].

A study done at Ohio State University showed that delay in wound healing was four times more likely in patients with depression as compared to patients with no depression [9].

Environmental factors, including childhood neglect, abuse, and severe poverty, can cause vulnerability to depression. A study in Kenya showed associations between alcohol use and depression in trauma patients [10]. A previous history of psychiatric disease, low socioeconomic status, and low access to employment opportunities are also associated with depression in orthopedic trauma patients [11].

This study aimed to assess the factors that are associated with depression among patients with femoral fractures treated at Muhimbili Orthopedic Institute (MOI).

SUBJECTS AND METHODS

A hospital-based descriptive cross-sectional study was done at Muhimbili Orthopaedic Institute. A convenient sampling technique was used to obtain study participants. Patients were included as they registered at the Emergency Department. The study population included patients with isolated femoral fractures who attended Muhimbili Orthopaedic Institute during the study period.

All patients with closed or open femoral fractures who were 18 years of age and above were included in the study. However, patients who had known depression or a history of any psychiatric disorder or substance use were not included in the study.

Sample size estimation using the formula computed a sample size of 126 participants, and this was achieved by a convenient sampling technique.

Patients with closed fractures would wait for definitive treatment in the ward, while those with open fractures would have their surgeries immediately as emergencies. The patients were assessed and reassessed using the Patient Health Questionnaire-9 (PHQ-9) during admission and 2 weeks of follow-up, respectively. Patients with an initial PHQ-9 score of five and above were not included in the study as they were already having symptoms of depression. The PHQ-9 classifies depression severity as none (score 0–4), mild (score 5–9), moderate (score 10–14), moderately severe (score 15–19), and severe (score 20–27). The PHQ-9 was done twice in the space of 2 weeks. The final PHQ-9 score (at 2 weeks) was used for data analysis.

Data collection was done by filling out structured questionnaires where patients were asked to fill in a translated English to Swahili self-administered questionnaire containing PHQ-9 and pain severity assessment by visual analog scale (VAS). The study duration was from July 2018 to June 2019 [12]. In this study, the cut-off score for moderate to severe depression used as validated for Tanzania was a score of 9 and above [13]. The VAS was used to assess and grade the severity of pain from the state of free of pain (none), which was scored 0, to very unbearable pain, which hinders any other activity or movement of the patients, which was scored as 10. Data was analyzed using SPSS, version 23. Fisher's exact test was used to determine the significance of variations and odds ratios strength of association between pain severity, preoperative stay duration before surgery, and sociodemographic and economic covariates in developing depression. The univariate analysis identifies independent variables (pain score and duration of stay before surgery) with p values less than 0.2 for multivariate analyses whereby a p value less than 0.05 suggested significant associations and was reported with odds ratios and 95% confidence interval termed as statistically significant. The Cronbach's alpha of the PHQ-9 depression measure was excellent at 0.9, suggesting internal consistency of the measured items.

Ethical issues about informed consent, confidentiality, and the right to withdraw from the study were respected by the researchers.

RESULTS

Demographic characteristics

A total of 126 patients were studied, which included 83 (65.9%) males and 43 (34.1%) females. Overall, it was found that 12.7% of patients with femoral fractures had depression. A higher percentage of females (23.26%) were affected with depression as compared to males (7.23%; p=0.021). The mean age was 42.7±19.7 ranging from 18 to 102 years old. In the age category 60 years and above, nine (36%) out of 25 were depressed as compared to those in age categories from 18 to 59 years, whereby only seven (6.9%) out of 101 (p=0.001) were depressed. The mean depression score by using the PHQ-9 was 2.5±4.4 with a range from 0 to 19. In this study, Cronbach's alpha was 0.9, which showed excellent internal consistency (Table 1).

Association of the duration of hospital stay before surgery and depression

The mean duration that the patients stayed in the ward before their discharge was 10.4±14.3 days, with a range of 1-57 days. There is an association between delayed surgeries and developing depression, as 13 (22.4%) out of 58 participants who developed depression were operated on after 48h of admission. However, three (4.4%) out of 68 participants who developed depression were operated within 48h of their injuries (p=0.003) (Table 2). Patients who operated more than 48h after admission were six times more likely to develop depression than those who operated within the recommended 48h (odds ratio 6.2; 95% confidence interval 1.686 to 23.236) (Figure 1).

The association of severity of pain and other clinical factors in developing depression.

The mean pain severity score was 3.1±2.2 with the lowest pain level scored as one and the highest pain level as six (range 0–10) on the pain VAS. Higher pain VAS scores (scores >4) were associated with the likelihood of developing depression as 16 (34.8%) patients out of 46 participants from the group with moderate to severe pain developed depression, and none in those reporting mild pain which had 80 participants developed depression (Fisher's exact test; p<0.001). The narrow 95% confidence interval of 1.242–1.894 showed good precision of the association between pain severity and developing depression.

Proximal femoral fractures constituted about 23% of all femoral fractures, as shown in (Table 2). There was insignificant variation in association with depression for proximal, midshaft, and distal femoral fracture locations in both bivariate and multivariate analyses.

Findings from multivariate analyses

Both age and sex were associated with developing depression; however, none were found to be statistically significant. The location of the fracture also did not show any significance in leading to depression. Socioeconomic status, the severity of pain, and preoperative duration of hospital stay were not analyzed due to less than 5 empty cells. The results of the multivariate analysis are summarized in (Tables 2 and 3).

Table 1: Distribution of age and sex by the presence of depression in orthopedic patients at Muhimbili Orthopaedic Institute in Dar es Salaam, Tanzania

		Depression [*n* (%)]				95% confidence interval	
Variables		**Yes**	**No**	***p* value**	**Odds ratio**	**Lower**	**Upper**
Age	18 to ≤59	7 (6.9)	94 (93.1)	0.001	7.55	2.462	23.173
	60 and above	9 (36)	16 (64)				
Sex				0.021	3.88	1.306	11.580
	Male	6 (7.2)	77 (92.8)				
	Female	10 (23.3)	33 (76.7)				

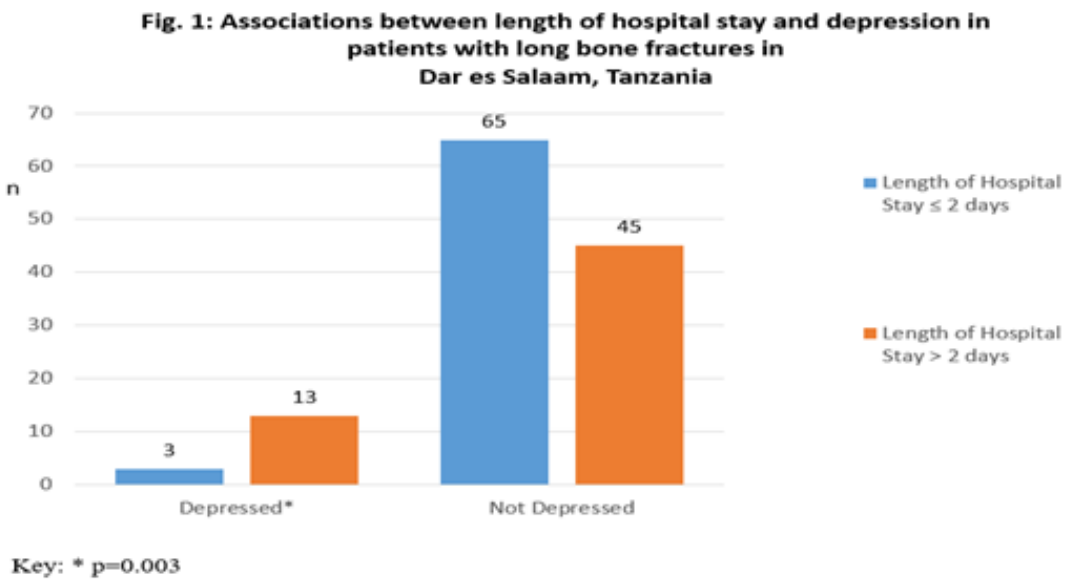

Figure 1: Associations between the length of hospital stay and depression in patients with femoral fractures in Dar es Salaam, Tanzania.

Table 2: Distribution of pain severity, fracture location, and preoperative, hospital stay by the presence of depression in orthopaedic patients in Dar es Salaam, Tanzania

Characteristic	Total (*N*)	Depression present [*n* (%)]	Univariate OR (95% confidence interval); *p* value	Multivariate a OR (95% confidence interval); *p* value
Age				
18 to ≤59	101	7 (6.9)	1.00	1.00
60 and above	25	9 (36.0)	7.55 (2.462–23.173); 0.001	3.9 (0.516–30.371); 0.186
Sex				
Male	83	6 (7.2)	1.00	1.00
Female	43	10 (23.3)	3.88 (1.306–11.580); 0.021	4.0 (0.743–21.880); 0.106
Fracture location				
Proximal	48	11 (22.9)	2.8 (0.567–14.059); 0.205	6.2 (0.524–72.772); 0.63
Midshaft	57	3 (5.3)	0.5 (0.082–3.404); 0.502	1.8 (0.165–19.557); 0.148
Distal	21	2 (9.5)	1.00	1.00
Preoperative duration of hospital stay (days)				
Two or less	68	3 (4.4)	1.00	1.00
More than two	58	13 (22.4)	6.25 (1.686–23.236); 0.003	5.3 (0.719–39.685); 0.1
Pain severity (range 1–10)				
Mild	80	0	1.00	1.00
Moderate to severe	46	16 (34.8)	1.53 (1.242–1.894); <0.001	*

OR, odds ratio; *Indeterminate due to low sample size.

Table 3: Distribution of sensitivity analysis to explore interactions between pain and location of fracture by the presence of depression in patients with femur fractures in Dar es Salaam, Tanzania

		Depression [*n* (%)]			
Pain and fracture location characteristics		No depression	Depression	Exact significance (2-sided)*	Total *N*
Pain score	Location of fracture				
Mild pain	Proximal	28 (100.0)	–	–	28
	Midshaft	41 (100.0)	–		41
	Distal	11 (100.0)	–		11
	Total	80 (100.0)			80
Moderate to severe pain	Proximal	9 (45.0)	11 (55.0)	0.052**	20
	Midshaft	13 (81.3)	3 (18.8)		16
	Distal	8 (80.0)	2 (20.0)		10
	Total	30 (65.2)	16 (34.8)		46
Total	Proximal	37 (77.1)	11 (22.9)	0.025**	48
	Midshaft	54 (94.7)	3 (5.3)		57
	Distal	19 (90.5)	2 (9.5)		21
	Total	110 (87.3)	16 (12.7)		126

*Fisher's Exact Test; **Not significant for trend.

DISCUSSION

Sociodemographic characteristics

This study showed that the elderly population was four times more likely to develop depression than the younger ones. Females with femur fractures were also seen to have higher odds of being depressed (odds ratio 3.9). The findings in this study are similar to studies by William and Albert, which showed that elderly females were two to three times more likely to develop depression postfracture [1,13]. The female sex was more affected by depression than males, and this may be due to social or cultural differences as the males are more focused on decision-making, are more exposed to stressful life, and have a ruminative way of coping with those stresses. Hormonal changes from puberty to menopause could also be the reason for more depression in females. The possible risks for developing depression in the elderly include cognitive decline, physical limitations on activities of daily living, chronic pain, work retirement,

and loneliness, just to mention a few [14]. In this study, both sex and age did not have a confounding effect on the development of depression due to a P value of more than 0.05 and a very wide 95% confidence interval. Most depressed participants had proximal femur fractures, as in other studies. The fear of falling again and depression are associated with proximal femur fractures [13]. On the other hand, a few males and younger participants also developed depression. The fear of losing jobs, business decline, hence becoming economically unstable, and the dilemma of family matters, including spouse relationships, are some of the factors associated with depression development in young male patients [15].

The association between length of hospital stay and depression

Patients were grouped according to how long they stayed before the operation. In this category, two groups were created for patients – those who stayed less than 48h and those who stayed for more than that. Only three (4.4%) patients with femur fractures out of 68 in the group who were fixed within 48h developed depression, as compared to 13 (22.4%) in the group whose surgery was after 48h (p=0.003). Hosaka and colleagues, in their study, showed that 21.5% of the 65 inpatients with physical diseases met the criteria for major depression, and long hospital stay was associated with depression [16]. Castelli and colleagues also showed the relationship between depression and length of hospital stay [17]. The standard operating procedures for the treatment of long fractures, according to the literature, show that these fractures should be fixed within 48h if the patient has no other comorbidities conditions [18,19]. The findings above are similar to findings in this study whereby those patients who stayed for a longer duration before the operation developed depression more as compared to the group with fewer days less than 48h before the operation. Factors that contributed to prolonged stay before surgery included lack of implants and the presence of comorbid conditions.

CONCLUSION

The prevalence of clinically significant depression was 12.7% among patients with femoral fractures. This study has shown a strong association between pain and duration of stay before definitive treatment in the development of depression in patients with femoral fractures treated at Muhimbili Orthopedic Institute.

RECOMMENDATION

Adequate pain management and timely definitive treatment of patients with femoral fractures are advocated to reduce the possibility of developing depression. The treatment should also cover physical, mental, and social well-being as a holistic approach advocated by WHO.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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