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Prevalence and association of depression in in-patient orthopaedic trauma patients: A single centre study in India

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ABSTRACT

Introduction: Depression is characterized by a persistent state of low mood and aversion to activity affecting a person's thoughts, behavior, feelings and sense of well-being. It has been reported in Orthopaedic trauma patients. Depression is likely to interfere in an individual's ability to sustain a long duration rehabilitation programme leading to poor function and delayed return to a productive lifestyle. The objective of this study was to identify the prevalence and identify factors associated with depression in indoor Orthopaedic trauma patients.

Methods: This prospective cohort study was conducted on 190 adult Orthopaedic trauma patients enrolled on a randomly selected day of a week subject to written informed consent. Patients with conditions that may preclude assessment of the mental status were excluded from the study. Age, sex, duration since injury, Injury Severity Score (ISS), type of surgery, marital status, insurance coverage, level of education, socioeconomic status, familial support, substance abuse. Hospital anxiety and depression scale (HADS) score and pain score (visual analogue scale) were recorded as soon as the patient was stabilized. Bivariate analyses and Logistic regression were used to identify factors associated with a HADS score of $\geq$8.

Results: Mean age was 33.8 years. One hundred fifty-one (79.47%) patients were males and thirty-nine patients were females (21.53%). A HADS score $\geq$8 was present in 42.63% enrolled cases. On logistic regression a higher pain score, nuclear family, and female sex were found to be significantly associated with HADS $\geq$8.

Conclusion: Depression is common in indoor Orthopaedic trauma patients. HADS may be used to screen patients for depression and refer patients to a psychiatrist for a definitive diagnosis and management.

1. Introduction

Depression is one of the most common mood disorders; characterized by a persistent state of low mood and aversion to activity that can affect a person's thoughts, behavior, feelings and sense of well-being.[1] In the year 1990, depressive disorders were the fourth leading cause of disability. By the year 2017, depressive disorders had become the third leading cause of disability.[2] Physical illness when combined with a depressive disorder can significantly increase the degree of disability.[3] In fact, depression is now an independent risk factor for worsened outcomes and delayed recovery from a number of physical conditions.[3–8]

High prevalence of depression among general trauma patients has been reported in high-income countries.[9,10] Additionally, a wide range of prevalence (33–87%) of depression has been reported among orthopaedic patients as well.[11–13] Orthopaedic trauma patients often have to undergo long periods of rehabilitation that require dedicated and sustained efforts at exercises and physiotherapy. Depression is likely to interfere in an individual's ability to sustain a long duration rehabilitation programme which in turn may lead to poor function and delayed return to a productive lifestyle.[29,30]

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Most of the published studies have focused on prevalence of depression in orthopaedic patients.[8,10,12,29] One study has reported factors found to be associated with depression in orthopaedic trauma patients.[13] The study reported female sex, poor social support, developing complications, amputation, and uncontrolled pain as factors predictive of depression taken as a Hospital Anxiety and Depression Scale (HADS) score of > 7.[13] However, the study was conducted on patients reporting to outpatient department (OPD) during follow up and therefore likely missed discharged in-patients who were lost to follow up due to constraints of distance, money, availability of required medical care close to their home and depressive symptoms.

There are multiple questionnaires used for screening inpatients for the detection of depression. The Hospital Anxiety and Depression Scale (HADS) and Beck's Depression Inventory (BDI) scores are widely accepted standard tools to screen for depression.[14,15] Both tools have been found to have excellent performance for hospitalized patients with little statistical difference between scales.[16] Hospital Anxiety and Depression Scale has been validated in the Indian population.[17] Anxiety and depression subscales of HADS have been reported to show good psychometric properties, high internal consistency, good convergent validity, no unexpected biases, a fit priori structure and high sensitivity to changes as a result of analgesic treatment.[18] A literature review of validity of HADS score reported an optimum balance between sensitivity and specificity when a positive case is defined as a score of 8 and above. The same study reported a mean Cronbach's alpha of 0.82 for the depression subscale of HADS, suggesting a high rate of internal consistency and reliability.[19] HADS performs well in assessing the symptom severity and case identification for anxiety as well as depression in somatic, psychiatric and primary care patients and in general population.[19]

Early detection of depression in in-patients is crucial as it gives orthopaedic providers a chance to take active measures while the patient is still in the hospital and enhances discharge planning with close follow up. Therefore, we planned to undertake a study designed to find the prevalence of depression and identify factors associated with it at a level 1 trauma centre of King George Medical University, Lucknow.

2. Methods

This prospective cohort study was conducted at the level 1 trauma centre of King George Medical University between August 2017 to July 2018. The study was approved by the departmental committee which reviewed all research proposals for ethical considerations. Regression analysis required 10 patients per variable with 19 variables of interest, resulting in a total sample size of 190. Adult orthopaedic trauma patients (18–60 years of age) admitted in the Department of Orthopaedics, on a randomly selected day of a week were enrolled in the study subject to written informed consent. Patients were enrolled from 8 a.m. of the randomly selected day to 8 a.m. of next day. Patients with conditions that may affect preclude assessment of the mental status were excluded from the study. These included conditions such as head injury (history of head injury or GCS < 15), chronic neurological illness (Alzhemier's disease, Dementia, Parkinsonism), history of psychiatric illness, ongoing treatment for any psychiatric disorder (defined as psychiatric medication and/or ongoing psychological intervention), chronic ongoing illness (including advanced cancer, HIV/AIDS, cardiomyopathy, motor neuron disease, chronic kidney disease, and chronic liver disease), and intellectual disability clinically diagnosed by a psychiatrist. Patients with a history, physical findings or investigations suggestive of chronic ongoing illness were evaluated by a physician for confirmation. In the KGMU trauma centre, patients with altered GCS are admitted in the department of Neurosurgery and subsequently transferred to the orthopaedics for any concomitant orthopaedic injuries. These patients were not enrolled in the study even if they had a normal GCS score when transferred to orthopaedics. Patients with obvious intoxication at the time of clinical presentation were offered enrollment when the effects of the intoxicant had wearied off.

In our study, a single author trained in the HADS questionnaire assisted the patients to complete the questionnaire. In our context, trauma patients are received in casualty where ATLS protocols are followed to stabilize the patient and WHO recommended protocol for providing analgesia is followed. Orthopaedic trauma patients with head injury are admitted in neurosurgery; other polytrauma patients are admitted in trauma surgery. Patients with pure orthopaedic injuries are admitted in orthopaedics. Patients were interviewed 24 h after injury to ensure the metabolism of any possible intoxicant was completed. Interviews were conducted only after patients reported physical comfort and consented to the study. Patients enrolled in the study were assessed for age, sex, duration since injury, Injury Severity Score (ISS), type of surgery if applicable (emergency/elective), marital status (single/married), presence of insurance (public as well as private)) coverage, level of education (illiterate/primary/intermediate/college), socioeconomic status (below poverty level card), familial support (nuclear family/joint family/No support), presence of substance abuse (smoking, alcohol, and cannabis use), Hospital Anxiety and Depression Scale Score and pain score (visual analogue scale). Use of cannabis more than at least once a day or more than 20 days in a month was recorded as substance abuse. More than 14 drinks a week was taken as the criteria for alcohol abuse. One drink was defined as 1.5 ounces of liquor (e.g. whisky, rum, or tequila) or 5 ounces of wine or 12 ounces of beer. Patients were categorised as per Table 1.

Microsoft EXCEL was used to record data. The data was kept on a password protected computer. Patient identifiers such as name and unique identity were not entered on the excel sheet. We chose lower range cut off for the definition of depression as 8 and above as it is reported to be associated with an optimum balance of sensitivity and specificity (approximately 80% each).[19] Bivariate analyses were done to identify factors that were associated with a HADS score $\geq$ 8 at > 0.05 level of significance. Factors with more >0.25 level of significance on bivariate analysis were used to build a logistic regression model to identify factors associated with a HADS score $\geq$8 at the time of admission.

3. Results

Two hundred and seven patients met the inclusion criteria. Eight patients were excluded on account of ongoing chronic disease and seven were excluded on account of concomitant head injury. Two patients did not agree to be enrolled in the study. One hundred ninety patients agreed to be enrolled in the study (91.7%). Baseline data of the enrolled patients is shown in Table 2.

Twenty-six patients (13.68%) had a HADS score of >11; 56 (29.47%) patients had a HADS score between 8 and 10; and 108 (56,84%) patients had a score of more < 8. One hundred fifty-one (79.47%) were males and thirty-nine patients were females

Table 1
Categorization of patients using Hospital Anxiety and Depression Scale.

HADS	Categorization
0–7	Normal
8–10	Borderline abnormal
11–21	Depression

Table 2
Showing the baseline data of the enrolled patients.

Descriptor		
Median Age		30 years
Median Duration since injury		24 Hrs
Males		151 (79.47%)
ISS		6.8
Mean pain score at admission (VAS)		9.3
HADS - Ad ≥8		81 (42.63%)
Education	Illiterate	3 (1.5%)
	High school	24 (12.63%)
	Higher secondary	95 (50%)
	Graduate or higher	68 (35.79%)
Family support	None	6 (3.16%)
	Nuclear Family	74 (38.95%)
	Joint Family	110 (57.89%)
Insurance	None	179 (94.21%)
	Yes	11 (5.79%)
Marital status	Married	113 (64.76%)
	Single	67 (35.26%)
Surgery	Elective	23 (12.10%)
	Emergency	129 (67.89%)
	None	38 (20.00%)
BPL Card		6 (3.16%)
Smokers		98 (51.58%)
Cannabis abuse		54 (28.42%)
Alcohol abuse		67 (35.26%)

(21.53%), corresponding to the burden of orthopaedic trauma commonly seen in our setting.[20]

Results of bivariable analysis are shown in Tables 3–5. A younger age, higher ISS, type of family support, female sex, and being single were found to be significantly associated (***p*** value < 0.05) with a HADS score of ≥8.

Stepwise logistic regression was used (using variables with significance level < 0.25 on bivariate analysis) to identify significant predictors of HADS ≥ 8. A higher pain score, a younger age, being single, nuclear family, and female sex were found to be significantly associated with HADS ≥8. Table 6.

4. Discussion

In our study the frequency of depressive symptoms (HADS ≥ 8) was 42.63%. Studies have reported a prevalence rate of depressive symptoms in the range of 33%–45% in orthopaedic trauma patients.[11,13,21,22,29] A prognostic level II study conducted on orthopaedic trauma patients reported 45% of the enrolled patients having a BDI (Beck's depression inventory) score indicating moderate, moderate to severe or severe depression.[29] In the Lower Extremity Assessment Project (LEAP) population (patients with severe lower-extremity injuries) the incidence of moderate-to-severe depression was 41.8% and the incidence of severe depression was 15.3%.[22] Levels reported by us as well as other studies are much higher than levels of depressive symptoms reported in general population which range from 3.2% to 19.8% depending upon the instrument used to measure the presence of depressive symptoms as well as the study population.[23–30] In India, a metanalysis of 13 studies on epidemiology of psychiatric disorders including 33,572 subjects from the community reported the prevalence of depression to be 7.9 to 8.9 per thousand population, with prevalence in urban areas two times that in rural areas.[31] We did not classify our patients as rural or urban and therefore we are unable to comment on the association that may or may not exist in the injured orthopaedic patients. This is a limitation of our study.

On logistic regression we found female sex, a younger age, higher pain score, and living in a nuclear family to be associated with a HADS score ≥8. A study that used multivariable analysis to identify factors associated with depression in orthopaedic trauma patients has reported female sex, poor social support, complications, amputation and pain to be associated with depression.[13] However, the study enrolled patients reporting for follow up and is therefore likely to have missed patients who did not report for follow up. A study investigated the correlation of Beck's Depression Inventory score with injury specific factors namely the AO fracture classification, Abbreviated Injury Scale, Injury Severity Score, and Gustilo and Anderson grade of open fractures. They reported that only open fractures had an impact on presence of depression.[30] We did not find any association between Injury Severity Score and HADS score. However, we did not investigate the effect of Gustilo Anderson grade or amputation on HADS score.

We have reported female sex to be significantly positively associated with HADS ≥8 at the time of admission. Other studies in literature have also reported female sex to be associated with depression.[12,13] There is a higher prevalence of depression in females compared to males in general population as well.[32–35] In our study 21/39 (53.84%) female patients had a HADS score ≥ 8, which is very high compared to a life time prevalence of depressive disorder of 5.7% in females and 4.8% in males in general population reported by the National Mental Health survey of India.[32] A higher female: male prevalence ratios of depression in developed countries and globally may reflect the fact the difference may be primarily due to biological rather than due to race, culture, diet, education and numerous other potentially confounding social and economic factors.[35]

We have found a significant positive association between pain and HADS ≥ 8 score. Positive association has been reported in literature on orthopaedic trauma patients.[13,14] Another study has reported pain to be a significant predictor of final disability

Table 4
Association of level of education and family support with HADS ≥ 8.

	HADS-Ad<8 No. (%)	HADS-Ad ≥8 No.(%)	*p* Value
Education			
Illiterate	3 (2.5)	0 (0.0)	.303
Primary	16 (13.6)	8 (11.1)	
Inter	54 (45.8)	41 (56.9)	
Graduate	45 (38.1)	23 (31.9)	
Total	***118 (100)***	***72 (100)***	
Family support			
No Support	4 (3.4)	2 (2.8)	<.001
Nuclear Family	32 (27.1)	42 (58.3)	
Joint Family	82 (69.5)	28 (38.9)	
Total	***118 (100)***	***72(100)***	

Table 3
Association of age, ISS and pain with HADS ≥ 8.

Quantitative Variable	HADS < 8			HADS ≥ 8			*p* Value
	N	Mean ± SD	Median	N	Mean ± SD	Median	
Age	118	35.86 ± 12.58	39	72	30.51 ± 11.17	28	.003
ISS	118	6.37 ± 8.51	4	72	7.56 ± 2.63	9	.002
Pain	118	9.01 ± 1.54	10	72	9.86 ± 0.51	10	<.001

Table 5
Association between binary variables and HADS ≥ 8.

Exposed parameter	HADS < 8 N (%)	HADS ≥ 8 N (%)	OR (95% CI)	*p* value
Female sex (N = 39)	18 (15.3)	21 (29.2)	2.29 (1.12–4.67)	.021
Single (N = 67)	34 (28.8)	33 (45.8)	2.09 (1.13–3.85)	.017
No Insurance coverage (N = 179)	111 (94.1)	68 (94.4)	1.07 (0.26–3.31)	.914
No BPL card (N = 184)	113 (95.8)	71 (98.6)	3.14 (0.36–27.45)	.276
Smoking (N = 92)	59 (50.0)	33 (45.8)	0.85 (0.47–1.52)	.557
Alcohol (N = 67)	38 (32.2)	29 (40.3)	1.42 (0.77–2.61)	.258
Cannabis (N = 54)	32 (27.1)	22 (30.6)	1.18 (0.62, 2.25)	.610

measurement in orthopaedic trauma patients.[36] We are unable to comment on the association of pain with final disability as it was not within the purview of our study.

Lack of social support has been reported to predict depression.[13] Another study has reported social support from friends and family as having an inverse correlation with depression.[37] In our study, being single (unmarried) was found to be associated with HADS-≥ 8 on bivariable analysis but not on logistic regression. In the Indian context, being unmarried does not mean unsupported as unmarried males or females generally live with their family members; This may explain the lack of significance on logistic regression. We have found living in a nuclear family to be significantly positively associated with HADS ≥8 at admission. Joint families are likely to provide more resources in terms of financial and emotional support than nuclear families which may help the victim cope up with depression. This may also explain the association between nuclear family and depression.

We have found a younger age to be significantly positively associated with HADS ≥8 score. There is a known relationship between age and depression in general population globally.[38] Depression is known to be at its lowest level at 45 years of age and higher at ages below.[37] In our study, we also found the mean age in the HADS ≥8 group was lower than the mean age in the HADS <8 group at the time of admission.

A positive association between use of cannabis and depression has been reported in literature.[39] However, this study found no association between use of cannabis and HADS ≥8 at admission. Cessation of heavy or prolonged cannabis use leads to irritability, nervousness/anxiety, difficulty in sleeping, loss of appetite or weight, depressed mood and one of the following physical symptoms namely abdominal pain, tremors, sweating, fever, chills, or headache.[40] Regular use of cannabis leads to desensitization and down regulation of human cortical and sub-cortical CB_1 cannabinoid receptors. This effect starts reversing within the first 2 days of discontinuing cannabis and the receptors return to normal functioning after ~4 weeks of abstinence.[41] A robust correlation has been reported between CB1 receptor availability and cannabis withdrawal symptoms after 2 days of cannabis abstinence which in turn resolved in the next 28 days of abstinence.[42] Since we interviewed the patients 24 h after admission, the effect of cannabis abstinence had not set in. Therefore, we are unable to report on the effect of cannabis abstinence on depressive symptoms after cessation.

We did not find any association of alcohol abuse with HADS ≥8 score at admission which is in keeping with findings of a large longitudinal study that investigated the association between alcohol consumption and depression and anxiety.[43] However, four large community based epidemiological studies (N = 422 000) in Europe and the USA demonstrated a 2–3 times increase in the lifetime prevalence of anxiety and depression in those with DSM–III (Diagnostic and Statistical Manual of Mental Disorders) or DSM–III–R alcohol abuse or dependence.[44] This study was unable to conclude any definitive association. More robust longitudinal studies are required to investigate the role of alcohol in depression in orthopaedic trauma patients.

We did not find any association between depression and the economic status (BPL card) of the patient. This may be because in our setup all treatment including orthopaedic implants are provided free to below poverty line card holders as well as poor patients who do not have a BPL card provided the treating surgeon certifies that the patient is poor and unable to bear the cost of implant. This study reports very low levels of insurance coverage. Policy changes have recently changed as the government of India has now instituted a universal insurance for the poor.

A serious limitation of our study is that depression screening scores typically use questions related to the physical status of the patient. Impaired activities of daily living, chronic pain and use of narcotics may act as confounders. Logistic regression analysis to identify predictors of HADS ≥8 score was used to attempt to overcome these confounders. Another limitation of our study is our inability to collect data on the preinjury levels of depression in our patients, limiting our ability to state if there was a significant change due to the injury. Certain particularly at-risk groups for depression were excluded from this study including those with history of psychiatric illness limiting our ability to comment upon the role of injury and its subsequent management in course of disease. A shortcoming of our study is that we did not investigate the role that open fractures may play on HADS score.

Presence of depressive symptoms (abnormal HADS) is not the same as presence of clinical depression. Therefore, a positive screening result should be followed by a diagnostic evaluation based on a diagnostic interview or through a questionnaire, which covers not only various symptoms, but actually the diagnostic criteria according to the DSM. Whether the patient should be labeled as suffering from clinical depression should depend on the results of the diagnostic evaluation by a psychiatrist.

In conclusion, a significantly high percentage of in-patient orthopaedic trauma patients in our setting have depressive symptoms. Female sex, elevated pain, being single, living in nuclear family, and a younger age are associated with a HADS score ≥8.

Table 6
Logistic Regression Analysis showing the relationship of Significant Depression Predictors with HAD ≥8.

	Variable	B	*p*-value	Exp(B)/OR
Age		-.053	.001	.949
Injury Severity Score		.123	.095	1.130
Pain Score at time of admission		.930	<.001	2.535
Gender	Female	1.041	.024	2.831
Marital Status	Single	.150	.776	1.161
Family Support	Overall		.004	
	No support	.168	.860	1.183
	Nuclear Family	1.222	.001	3.394
Constant		−9.224	<.001	.000

Another notable finding included the common use of cannabis among this population of orthopaedic patients. While this is a single center study, the conclusions are consistent with the published research to date. Based on the findings of this study, we recommend that in-patient orthopaedic trauma patients be screened for depression and those with an abnormal score on screening should be referred to a psychiatrist for a diagnostic evaluation and treatment.

Declaration of competing interest

The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

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