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Article

Keywords: Depressive symptoms, Extremity fractures, Orthopedic trauma, PHQ-9, Physiotherapy, Ethiopia

Posted Date: November 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11020103/v1

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Additional Declarations: No competing interests reported.

Depressive Symptoms and Associated Factors among Patients with Extremity Fractures at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia: A Hospital-Based Cross-Sectional Study

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Abstract

Background: Depression-related symptoms can develop after extremity fractures and may interfere with recovery, rehabilitation, and quality of life. Evidence regarding these symptoms among fracture patients in Ethiopia is scarce. This study estimated the percentage of patients with depressive indications selected via the Patient Health Questionnaire-9 (PHQ-9) and examined associated factors among individuals with extremity fractures at the University of Gondar Comprehensive Specialized Hospital in northwestern Ethiopia.

Methods: A hospital-based cross-sectional investigation was undertaken among 210 adults with extremity fractures between April and May 2026. Participants were enrolled through convenience sampling, and information was obtained using a structured questionnaire administered by trained interviewer's expressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9), employing a threshold score of ≥10 as the operational cutoff. Data on socio-demographic characteristics, fracture-related clinical factors, pain, physical activity, general self-efficacy, and other relevant variables were collected. Both bivariate and multivariable binary logistic regression analyses were conducted. Variables meeting the $p<0.25$ criterion in the bivariate analysis were entered into the multivariable regression model. Statistical associations were expressed as presented using adjusted odds ratios (AORs) with 95% confidence intervals (CIs), with $p<0.05$ considered statistically significant.

Results: Of the 210 participants, 48 (22.9%; 95% CI: 17.4–29.2%) had PHQ-9 scores ≥10. After adjustment, males had greater odds of meeting the threshold than females (AOR=2.412, 95% CI: 1.054–5.518; p=0.037). Participants aged 35–49 years had greater odds than those aged ≥50 years (AOR=11.425, 95% CI: 1.418–92.051; p=0.022). Kinesiophobia was associated with lower odds of meeting the threshold (AOR=0.389, 95% CI: 0.178–0.852; p=0.018).

Conclusions: Almost one-quarter of patients with extremity fractures met the predefined PHQ-9 threshold for clinically significant depressive symptoms. Male sex and age 35–49 years were associated with higher odds, whereas kinesiophobia showed an unexpected inverse association. Incorporating psychological screening into orthopedic and rehabilitation services could aid in identifying patients likely to benefit from further assessment. Owing to the cross-sectional nature and reliance on a screening tool, these findings establish neither causal relationships nor formal diagnoses of major depressive disorder.

Keywords: *Depressive symptoms; Extremity fractures; Orthopedic trauma; PHQ-9; Physiotherapy; Ethiopia*

1. Introduction

Depressive symptoms represent a significant psychological condition that can adversely affect well-being, emotional expression, daily functioning, and overall quality of life. These symptoms frequently co-occur with physical health problems and are particularly pertinent following traumatic injury, as pain, functional limitations, and loss of independence can exacerbate psychological distress (1–4).

Extremity fractures are common consequences of trauma and can result in substantial pain, mobility limitations, and impaired physical functioning. Although orthopedic management primarily focuses on fracture stabilization, healing, and restoration of physical function, psychological difficulties may also affect recovery and rehabilitation (4–6). One systematic review and meta-analysis that have 27 studies involving 7,109 patients with acute orthopedic trauma reported a pooled depression prevalence of 32.6% (95% CI: 25.0–41.2%), highlighting a substantial psychological burden in this population (4).

Individual studies have similarly reported clinically important depressive symptoms among orthopedic trauma patients. Crichlow et al. found depression in approximately 45% of 161 orthopedic trauma patients and reported that greater depressive symptoms were associated with greater disability, while open fractures were related with higher likelihoods of depression (7). Nota et al. also found that depressive symptoms assessed one to two months after musculoskeletal trauma were associated with subsequent disability five to eight months later among patients with fractures and other musculoskeletal injuries (8).

Pain and psychological responses to injury may further complicate recovery. Pain can interfere with sleep, mobility, physical activity, social participation, and rehabilitation, while depression may increase the perceived burden of pain and functional limitations (9,10). Psychological factors have also been associated with disability and pain intensity following orthopedic injury (11). Furthermore, depression has been linked to poorer adherence to medical treatment, with a meta-analysis reporting approximately threefold higher odds of treatment non-adherence among patients with depression (12). Kinesiophobia refers to an irrational, debilitating fear of physical movement or reinjure, may also hinder recovery through avoidance of movement and physical activity and has been correlated with disability, pain, , and quality of life (13).

Evidence from Ethiopia also indicates a substantial burden of depression among orthopedic and trauma populations. A review of studies conducted in Ethiopia reported considerable variation in

depression prevalence and identified multiple socio-demographic and psychosocial variables correlated with depressive symptoms (15). In the Amhara Region, a multicenter study of 443 adult postoperative orthopedic patients reported a depression prevalence of 61.8% and identified female sex, farming occupation, previous substance use, anxiety, poor social support, low body mass index, and open fractures as associated factors (16). More recently, a multicenter study of 621 trauma patients attending trauma outpatient clinics in Addis Ababa reported a depression prevalence of 35.4% assessed by the Patient (PHQ-9) Health Questionnaire-9 (17).

Despite these findings, evidence specifically addressing depression among patients with extremity fractures remains limited in Ethiopia. The previous postoperative orthopedic study included only surgically treated patients, whereas the Addis Ababa study examined a broader trauma population rather than focusing specifically on extremity fractures (16,17). Patients with extremity fractures may experience distinct patterns of pain, mobility restriction, functional impairment, treatment requirements, and rehabilitation needs. Determining the extent of depressive symptoms among these specific population is crucial for informing targeted rehabilitation car may provide clinically relevant evidence for orthopedic and rehabilitation services, particularly in Northwest Ethiopia.

The PHQ-9 is a validated nine-item tool aimed at assessing depressive symptom severity. Responses for each item range from zero to three, generating a composite score between zero and twenty seven, with elevated results denoting higher severity of depressive symptoms (18). According to an individual participant data meta-analysis, a score cutoff of ≥10 establishes a reliable balance between sensitivity and specificity when screening for major depression (19). In Ethiopia, Gelaye et al. demonstrate strong internal consistency and as well as test-retest reliability of the PHQ-9, with a cutoff of ≥10 demonstrating 86% sensitivity and 67% specificity for major depressive disorder (20). Accordingly, the present study used a PHQ-9 score of ≥10 as the operational threshold for clinically significant depressive symptoms rather than as confirmation of a clinical diagnosis, because no structured psychiatric diagnostic interview was conducted

Identifying depressive symptoms among patients with extremity fractures may facilitate timely psychological assessment, referral, counseling, and integration of mental health considerations into orthopedic and physiotherapy rehabilitation. Identifying associated factors may further help

clinicians recognize patients at greater psychological risk and provide targeted support during recovery. Consequently, we aimed to estimate the proportion of patients experiencing depressive symptoms and evaluate potential associated factors in an extremity fracture population treated at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia.

2. Materials and Methods

2.1 Study design and setting

A cross-sectional hospital design was employed among patients with extremity fractures at the University of Gondar Comprehensive Specialized Hospital (UoGCSH), Northwest Ethiopia. A cross-sectional design was selected to estimate the prevalence of depression and assess factors associated with depression among patients with extremity fractures during the study period. We structured and reported our findings following the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) recommendations for cross-sectional research (21).

The University of Gondar Comprehensive Specialized Hospital is a tertiary-level teaching hospital located in Gondar, Amhara Regional State, Northwest Ethiopia. The hospital provides specialized orthopedic and trauma services and serves patients referred from Gondar and surrounding areas. Patients with extremity fractures receive assessment and treatment through the orthopedic and trauma services and may subsequently receive physiotherapy and rehabilitation services.

2.2 Study period

While overall research activities spanned from January to June 2026, primary data collection was carried out during April and May 2026

2.3 Participants

The target population included individuals with extremity fractures who received care through the orthopedic and trauma departments of the University of Gondar Comprehensive Specialized Hospital while data collection was underway.

The source population comprised all adult patients with extremity fractures receiving care at the hospital. The sample comprised eligible patients who were accessible during the data collection period and provided informed consent.

2.4 Eligibility criteria

Inclusion criteria

Participants were eligible if they

- Individuals aged ≥18years
- Had a clinically diagnosed extremity fracture
- Managed at the University of Gondar Comprehensive Specialized Hospital within the designated data collection window.
- Were able to communicate and provide the required information and
- Providing written informed agreement prior to enrollment.

Individuals were excluded based on the following

- Had severe cognitive or communication difficulties that prevented completion of the questionnaire;
- Were medically unstable and unable to participate in the interview; or
- Had another condition that prevented reliable completion of the study questionnaire.

2.5 Sample size determination

The estimated number of patients with extremity fractures attending the Orthopedic and Physiotherapy Departments during the two-month data collection period (April–May 2026) was approximately 200–260, based on departmental records. Given the relatively small and manageable study population, convenience sampling was employed. Eligible patients who were available within the designated data collection window. Patients who fulfilled the inclusion criteria and provided informed consent were sequentially enrolled until the required sample size was attained. Patients were not selected using a probability-based sampling method; recruitment was based on the availability and accessibility of eligible participants during the study period.

2.6 Sampling procedure

Convenience (availability) sampling was employed to recruit participants. Eligible patients presenting between April and May 2026 were approached; consecutive recruitment yielded 210 participants who met the inclusion criteria and consented to take part.

2.7 Data collection procedure

A structured, interviewer-administered instrument was used to gather data on sociodemographic parameters, clinical profiles, pain severity, physical activity engagement, depressive symptoms, and associated factors. The survey instrument was initially drafted in English, translated into Amharic, and subsequently back-translated into English to verify semantic and conceptual equivalence (20).

Trained data collectors approached eligible individuals who satisfied the inclusion criteria during the data collection window. Prior to survey administration, the study objectives were explained to each participant, and written informed consent was obtained. All completed instruments were audited daily to ensure data completeness and consistency

Data were collected by four BSc physiotherapists under the supervision of two MSc physiotherapists. Before deployment, data collectors received structured training covering the protocol, ethical standards, and survey administration. Interviews were conducted in hospital settings, with completed questionnaires cross-checked daily by supervisors to guarantee data quality and completeness.

2.8 Measurement of depression using the PHQ-9

epression was assessed using the 9-item Patient Health Questionnaire (PHQ-9), a standardized measurement tool reflecting the Diagnostic and Statistical Manual of Mental Disorders criteria for major depressive episode (18). Items assess the frequency of depressive symptoms over the prior fortnight, scored from 0 (not at all) to 3 (nearly every day). Total scores range from 0 to 27, with elevated scores signifying higher symptom burden (19).

The PHQ-9 has established psychometric properties, with good reliability and validity across clinical populations. In the original validation study, a score of ≥10 demonstrated for major depression when compared with an independent mental health professional interview(19).

The instrument has also been evaluated in an East African setting. Gelaye et al. reported good reliability and validity of the PHQ-9 among adults in Ethiopia, with a cutoff score of 10 demonstrating 86% sensitivity and 67% specificity for major depressive disorder(19).

For the present study, depression was operationally defined as a PHQ-9 total score of ≥10, based on the pre-specified cutoff used in the study protocol. Participants who scored ≥10 were classified as having depression (depressive symptoms), whereas those who scored <10 were classified as not having depression. This cutoff represents a screening threshold for clinically

significant depressive symptoms and does not constitute a confirmed clinical diagnosis of major depressive disorder, as no psychiatric diagnostic interview was conducted(18,20).

2.9 Measurement of pain

Pain severity was evaluated using a 0–10 Visual Analogue Scale (VAS), with higher scores denoting increased pain intensity. Pain was classified into mild (0–3), moderate (4–6), and severe (7–10) categories. Pain assessment is clinically essential given the known bidirectional relationship and high co-morbidity between post-traumatic pain and depressive symptoms following musculoskeletal trauma (10,11).

2.10 Measurement of physical activity

Physical activity was measured via the International Physical Activity Questionnaire Short Form (IPAQ-SF). The instrument assesses weekly engagement in walking, moderate-intensity, and vigorous-intensity activities. Using the official IPAQ scoring protocol, total activity was quantified in MET-minutes/week and subsequently stratified into low, moderate, and high activity categories (22).

2.11 Measurement of general self-efficacy

Perceived self-efficacy was measured using the General Self-Efficacy Scale (GSES). This 10-item self-report questionnaire assesses general coping capabilities across stressful situations using a 4-point response scale (1 = not at all true to 4 = exactly true). Total scores range between 10 and 40, with elevated scores indicating higher general self-efficacy. Scores were categorized as low (10–19), moderate (20–29), or high (30–40) (23).

2.12 Other variables

Baseline sociodemographic parameters recorded included age, sex, residence, marital status, educational attainment, occupation, and pertinent socioeconomic indicators.

Clinical variables included characteristics of the fracture and treatment, including fracture location, fracture type, treatment status, and other relevant clinical characteristics collected from patient interviews and/or medical records.

Other potential explanatory variables included pain intensity, physical activity, and general self-efficacy. The selection of independent variables was guided by extensive literature review and clinical plausibility regarding potential determinants of depression in patients with extremity fractures (24).

2.13 Data quality assurance

Comprehensive data quality control measures were enforced. Instrument validity was preserved via forward translation into Amharic and back-translation into English (19). Furthermore, data collectors completed structured protocol training, and supervisors provided daily on-site supervision.

o refine the instrument, a pilot test was administered to 21 patients at the University of Gondar Comprehensive Specialized Hospital, leading to minor adjustments in item phrasing and order. Quality assurance during main data collection involved daily supervisor audits of completed forms to rectify discrepancies and missing values immediately.

2.14 Statistical analysis

Following completeness checks and coding, data were double-entered into EpiData version 4.6.0.6 and exported to SPSS version 25.0 for statistical processing. Categorical variables were expressed as frequencies and percentages, whereas continuous variables were presented using appropriate measures of central tendency and dispersion (mean/standard deviation or median/interquartile range).

Binary logistic regression analysis was used to identify factors associated with depression. In the bivariable analysis, variables with a p-value <0.25 were considered candidates for inclusion in the multivariable logistic regression model. The use of a less restrictive significance level during the initial screening stage is commonly recommended to avoid prematurely excluding potentially important explanatory variables (25).

The magnitude and direction of associations were determined using multivariable binary logistic regression analysis, with estimates presented as adjusted odds ratios (AOR) and 95% confidence intervals (CI). Statistical significance was defined as a p-value less than 0.05.

Collinearity diagnostics were performed using the Variance Inflation Factor (VIF), where a threshold of VIF < 10 indicated the absence of severe multicollinearity. The calibration and overall goodness-of-fit of the final multivariable model were verified via the Hosmer–Lemeshow test (26). Model diagnostics were also considered before interpreting the regression estimates.

2.15 Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki after securing ethical clearance from the Research and Ethical Review Committee of the School of Medicine, University of Gondar (Reference: SOM 838/2026). Formal support letters were issued to the hospital administration prior to field activities. Participation was entirely voluntary, and written informed consent was obtained from each respondent following a detailed explanation of the study objectives, benefits, and risks. Participants were assured that non-participation would not affect their routine clinical care. Confidentiality was safeguarded by assigning unique identification codes, removing personal identifiers from the dataset, and restricting data access exclusively to the study investigators.

3. Results

3.1 Participant flow

A convenience sampling technique was employed to enroll eligible, willing patients presenting with extremity fractures during the data collection period. All 210 enrolled participants fully completed the questionnaire, yielding a final analytical sample of n=210 with zero data loss.

3.2 Socio-demographic characteristics

The final analytical sample comprised 210 patients. Most participants were male (72.9%)**,** aged 18–34 years (54.3%)**,** and married (57.1%)**.** Most participants had no formal education (40.0%), were NGO employees (64.3%)**,** and lived in rural areas (57.6%)**.** Regarding monthly income, 44.3% reported an income of less than 1,500 ETB. Based on BMI, 44.3% of participants had a normal BMI, 28.6% were underweight, and 27.1% were overweight or above for more see **table 1** below

Table 1:- Socio-demographic characteristics of patients with extremity fractures at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2026 (n = 210).

Variable		Frequency	Percentage
Gender	Male	153	72.9
	Female	57	27.1
Religion	Catholic	1	0.5
	Muslim	15	7.1
	Orthodox	193	91.9
	Protestant	1	0.5
Age	18-34 years	114	54.3
	35-49 years	75	35.7
	≥50 years	21	10
Marital status	Married	120	57.1
	Divorced	9	4.3
	Single	81	38.6
Educational level	No formal education	84	40.0
	Primary School	72	34.3
	Secondary School	33	15.7
	Higher Education (Diploma and above)	21	10.0
Occupational	Government employee	21	10

level	NGO employee	135	64.3
	Unemployed	54	25.7
Residence	Urban	89	42.4
	Rural	121	57.6
Monthly income (ETB)	< 1500	93	44.3
	1500–3500	60	28.6
	≥ 3501	57	27.1
BMI	Normal	93	44.3
	Under weight	60	28.6
	Overweight and above	57	27.1

3.3 Clinical and Injury-Related Characteristics of Study Participants

Regarding clinical and injury-related characteristics, most participants had lower-limb fractures (68.6%) and open fractures (74.3%). Bullet/gunshot injury was the predominant mechanism of injury (64.3%), followed by road traffic accidents (15.7%) and falls from height (14.3%). Pain was reported by 57.1% of participants, and most underwent surgical management (88.6%) (Table 2).

Table 2:- Clinical and injury-related characteristics of patients with extremity fractures at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2026 (n = 210).

Variable		Frequency	Percentage
Fracture Location	Upper Limb	66	31.4
	Lower limb	144	68.6
Fracture Type	Open	156	74.3
	Closed	54	25.7
Mechanism of Injury	Bullet/Gunshot Injury	135	64.3
	Road Traffic Accident	33	15.7
	Fall from height	30	14.3
	Others	12	5.7
Pain	Yes	120	57.1
	No	90	42.9
Treatment Modality	Surgical (ORIF/External Fixation)	186	88.6
	Conservative (Cast/Splint/Traction)	24	11.4
Previous fracture history	Yes	8	3.8
	No	202	96.2
Pain intensity (VAS)	Mild (0–3)	9	7.5
	Moderate (4–6)	81	67.5
	Severe (7–10)	30	25

3.4 Psychosocial and Behavioral Characteristics of Study Participants

Evaluation of psychosocial and behavioral profiles revealed varying levels of self-efficacy and physical activity. General self-efficacy was categorized as low, moderate, or high based on study definitions, and physical activity was grouped into low, moderate, and high tiers using the IPAQ-SF protocol. The categorical distribution of these characteristics is summarized in (Table 3).

Table 3:- Psychosocial and behavioral characteristics of patients with extremity fractures at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2026 (n = 210)

Variable		Frequency	Percentage
General self-efficacy	Low (10–19)	24	11.4
	Moderate (20–29)	60	28.6
	High (30–40)	126	60
Physical activity level (IPAQ-SF)	Low	134	63.8
	Moderate	59	28.1
	High	17	8.1

3.5 Prevalence and severity of depression

Among the 210 patients with extremity fractures, 48 had depression (PHQ-9 score ≥10), giving an overall prevalence of 22.9% (95% CI: 17.4–29.2%). Bivariable cross-tabulations revealed notable variations in depression prevalence across several participant parameters. Specifically, differences were observed by sex, marital status, educational attainment, residential area, pain severity, general self-efficacy, and kinesiophobia levels (Table 4).

Table 4:- Prevalence of depression according to socio-demographic, clinical, and psychosocial characteristics among patients with extremity fractures

Characteristic		Total (n)	Depression, n (%)
Sex	Male	153	41 (26.8)
	Female	57	7 (12.3)
Age	18–34	114	18 (15.8)
	35–49	75	29 (38.7)
	≥ 50	21	1 (4.8)
Marital status	Married	120	28 (23.3)
	Divorced	9	3 (33.3)
	Single	81	17 (21.0)
Educational level	No formal education	84	19 (22.6)
	Primary school	72	19 (26.4)
	Secondary school	33	8 (24.2)
	Higher education (Diploma and above)	21	2 (9.5)
Pain category	Mild (0–3)	9	3 (33.3)
	Moderate (4–6)	81	12 (14.8)
	Severe (7–10)	30	6 (20.0)
Residence	Rural	121	26 (21.5)
	Urban	89	22 (24.7)
General self-efficacy	Low	24	3 (12.5)
	Moderate	60	14 (23.3)
	High	126	31 (24.6)
Kinesiophobia	No kinesiophobia	54	18 (33.3)
	Kinesiophobia	156	30 (19.2)

3.6 Factors associated with depression

To evaluate factors associated with depression following extremity fractures, bivariable and multivariable binary logistic regression models were fitted. Variables demonstrating a candidate threshold of $p < 0.25$ in bivariable screening—including sex, age, and kinesiophobia—were retained for multivariable adjustment. Factors such as place of residence ($p = 0.446$), income category ($p = 0.300$), and general self-efficacy ($p = 0.268$) did not meet the inclusion criterion and were omitted. Controlled estimates were reported as adjusted odds ratios (AOR) with 95% confidence intervals (CI), setting the statistical significance threshold at $p < 0.05$.

3.7 Factors Associated with Depression: Bivariable and Multivariable Logistic Regression Analyses

In the bivariable logistic regression analysis, male participants had significantly greater likelihood of depression than female participants (COR=2.615, 95% CI: 1.098–6.230, p=0.030). Participants aged 35–49 years also had significantly higher odds of depression compared with those aged ≥50 years (COR=12.609, 95% CI: 1.605–99.073, p=0.016). In contrast, participants with kinesiophobia had lower odds of depression than those without kinesiophobia (COR=0.476, 95% CI: 0.238–0.951, p=0.036).

Upon adjusting for baseline confounders the variables included in the multivariable model, male participants remained significantly more likely to have depression than female participants (AOR=2.412, 95% CI: 1.054–5.518, p=0.037). Participants aged 35–49 years had significantly higher odds of depression compared with those aged ≥50 years (AOR=11.425, 95% CI: 1.418–92.051, p=0.022), while the association for participants aged 18–34 years was not statistically significant (AOR=3.810, 95% CI: 0.462–31.420, p=0.215).

Kinesiophobia stayed significantly related with depression in the adjusted model. Participants with kinesiophobia had lower odds of depression compared with those without kinesiophobia (AOR=0.389, 95% CI: 0.178–0.852, p=0.018).

Overall, the multivariable analysis identified male sex, age 35–49 years, and kinesiophobia as statistically significant factors associated with depression among patients with extremity fractures for more see **table 5** below

Table 5:- Predictors of Depression Following Extremity Fractures: Bivariable and Multivariable Analysis

Variable		Total (N)	Depression, n (%)	COR (95% CI)	P-value	AOR (95% CI)	P-value
Gender	Female *(Ref)*	57	7 (12.3)	1.00	1.00	1.00	1.00
	Male	153	41 (26.8)	2.615 (1.098–6.230)	**0.030**	2.412 (1.054–5.518)	**0.037**
Age (years)	≥ 50 *(Ref)*	21	1 (4.8)	1.00	1.00	1.00	1.00
	18–34	114	18 (15.8)	3.750 (0.473–29.734)	0.211	3.810 (0.462–31.420)	0.215
	35–49	75	29 (38.7)	12.609 (1.605–99.073)	**0.016**	11.425 (1.418–92.051)	**0.022**
Kinesio phobia	No *(Ref)*	54	18 (33.3)	1.00	1.00	1.00	1.00
	Yes	156	30 (19.2)	0.476 (0.238–0.951)	**0.036**	0.389 (0.178–0.852)	**0.018**

Discussion

This study evaluated the magnitude and independent determinants of depression among patients presenting with extremity fractures at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. Among the 210 participants, 48 (22.9%; 95% CI: 17.4–29.2%) met the operational definition of depression based on a PHQ-9 score of ≥10. Male sex and age 35–49 years remained independent predictors of elevated depression risks, whereas kinesiophobia was inversely associated with depression. These findings indicate that depressive symptoms represent an important psychological concern among patients with extremity fractures and should be considered alongside physical and purposeful outcomes.

Clinically significant depression affected nearly a quarter of participants (22.9%), highlighting the recognized vulnerability to psychological distress following extremity fractures. In a study of orthopedic trauma patients, Crichlow et al. reported that the nearly 45% of participants exhibited clinically relevant depressive symptoms demonstrating a substantial burden of depressive symptoms in this population (7). Similarly, a prospective cohort study of orthopedic trauma patients found that 22 patients had moderate-to-major depression at the time of injury, while 36 had mild depression, highlighting the presence of depressive symptoms during the acute stage of orthopedic trauma (27). Differences between these estimates and the prevalence observed in the present study may be related to differences in patient characteristics, injury severity, timing of assessment, clinical setting, and depression measurement.

Using the PHQ-9 with a cutoff score of ≥10 provides high diagnostic accuracy (88% sensitivity and 88% specificity for major depression compared with structured clinical assessments) (18). Importantly, the PHQ-9 has also been evaluated among adults within the Ethiopian context, where it has shown strong psychometric properties for major depression screening and diagnostic evaluation (20). Therefore, the 22.9% prevalence observed in this study represents patients who met the study's predefined PHQ-9 threshold and should not be interpreted as the prevalence of clinically diagnosed major depressive disorder.

The prevalence observed in the present study was lower than that reported in some studies involving patients with orthopedic and musculoskeletal conditions in Ethiopia. Such differences may reflect variation in the characteristics of the study populations, clinical settings, injury types, sampling approaches, and measurement instruments. The present study specifically included patients with extremity fractures, whereas studies involving broader musculoskeletal populations

may include patients with chronic pain and longstanding disability. These clinical differences are important because the psychological response to an acute traumatic fracture may differ from that associated with chronic musculoskeletal disorders.

Pain may be one factor contributing to psychological distress following musculoskeletal injury. Findings spanning 47 low- and middle-income countries demonstrated a consistent link between depression and severe pain, corresponding to a nearly fourfold increased risk (pooled OR = 3.93) for the association between severe pain and depression (28). In the current study, 57.1% of participants reported pain; however, pain category was not independently associated with depression in the final multivariable model. These results indicate that the interplay between pain and depressive symptoms following extremity fractures is not direct, but rather modulated by injury severity, functional status, psychological coping mechanisms, and contextual social determinants.

Male sex was independently associated with depression in this study. Male participants had approximately 2.4 times greater likelihood of depression than their female counterparts (AOR=2.412, 95% CI: 1.054–5.518). This result varies from the wider epidemiological literature in which women commonly have a higher prevalence of depression. However, sex differences may vary according to the characteristics of specific clinical populations. In the present study, the sample was predominantly male and bullet/gunshot injury was the most common mechanism of injury. These characteristics may distinguish the current population from general community populations and may partly explain the observed association. Due to the cross-sectional design, causal inferences regarding sex-specific mechanisms cannot be established.

Age was another factor independently associated with depression. Participants aged 35–49 years had substantially higher odds of depression than those aged ≥50 years (AOR=11.425, 95% CI: 1.418–92.051). The prevalence of depression was 38.7% among participants aged 35–49 years, compared with 15.8% among those aged 18–34 years and 4.8% among those aged ≥50 years. This finding suggests that middle-aged patients may represent an important group for psychological assessment following extremity fractures. One possible explanation is that injury-related disability during middle adulthood may interfere with employment, income generation, family responsibilities, and social participation. However, these mechanisms were not directly measured in the present study and should therefore be regarded as possible explanations rather than established causal pathways.

The large adjusted odds ratio for the 35–49-year age group should also be interpreted cautiously because the reference group contained relatively few participants. The corresponding confidence interval was wide, indicating limited precision of the estimate. Larger studies with more balanced age-group distributions are needed to confirm the observed association between age and depression.

An unexpected finding in the present study was the inverse association between kinesiophobia and depression. Participants with kinesiophobia had lower odds of depression than those without kinesiophobia (AOR=0.389, 95% CI: 0.178–0.852). This finding differs from previous evidence suggesting that kinesiophobia is related to psychological distress and poorer outcomes among people with musculoskeletal disorders. A systematic review involving more than 10,000 participants found that kinesiophobia was associated with pain, disability, and poorer quality of life among people with chronic musculoskeletal pain (13). The fear-avoidance model similarly proposes that fear related to pain or movement may contribute to avoidance behavior, reduced activity, disability, and psychological distress (29).

Conversely, a multicenter Ethiopian study among patients with musculoskeletal disorders reported a considerably stronger link between depression and kinesiophobia (AOR = 8.21, 95% CI: 3.47–19.46) (14). Discrepancies between these findings and our observed inverse association likely stem from differences in patient cohorts, specific injury types, recovery trajectories, measurement timing, or contextual variables. The Ethiopian multicenter study included patients with a broad range of musculoskeletal disorders, whereas the present study focused specifically on patients with extremity fractures.

Consequently, this inverse relationship should not be construed as a protective effect. Assessment at a single time point prevents inferring causality, and wide confidence intervals stemming from a small reference subgroup indicate estimate instability. Prospective cohorts are required to clarify temporal dynamics during fracture recovery

Psychological factors may be particularly relevant to functional recovery after orthopedic trauma. Research in orthopedic trauma has demonstrated that depression and other psychological conditions may be associated with poorer patient-reported outcomes and disability (7,30). These findings support the biopsychosocial approach to orthopedic and rehabilitation care, in which psychological and social factors are considered together with physical injury and functional impairment.

The findings of this study have implications for clinical practice. Psychological assessment should be considered alongside routine assessment of fracture healing, pain, mobility, strength, and functional recovery. Screening with a brief validated instrument such as the PHQ-9 may facilitate identification of patients with clinically important depressive symptoms (18,20). Particular attention may be warranted among middle-aged patients and male patients in this clinical setting. However, a positive PHQ-9 screening result should not be regarded as a definitive psychiatric diagnosis and should be followed by appropriate clinical assessment and referral when indicated.

Strengths and limitations

Several methodological strengths characterize this study, including its focus on examined depressive symptoms among patients with extremity fractures, a population in which psychological outcomes may receive less attention than physical recovery. Depression was measured via the PHQ-9 with a predefined cutoff, and the instrument has established validity internationally and in Ethiopia (18,20). The study also considered a range of socio-demographic, clinical, and psychosocial characteristics and used multivariable logistic regression to account for potential confounding.

This study has a few methodological limitations. The cross-sectional design limits causal and temporal interpretations of the observed associations. Convenience sampling from a single hospital may limit generalizability. The PHQ-9 is a screening tool and does not confirm major depressive disorder. Wide confidence intervals for some estimates indicate limited precision. Finally, factors such as psychiatric history, social support, time since injury, and functional disability were not fully assessed.

Conclusion

In this hospital-based study, 22.9% of patients with extremity fractures had depressive symptoms meeting the predefined PHQ-9 threshold. Male sex and age 35–49 years demonstrated independent associations with higher depression risk, although kinesiophobia showed an unexpected inverse association, highlighting the potential value of importance of incorporating psychological screening into comprehensive fracture and rehabilitation careCaution is warranted due to our cross-sectional design and non-probability sampling. Future longitudinal, multicenter research should delineate temporal relationships among clinical features, psychological distress, and physical recovery.

Acknowledgments

The authors would like to thank the University of Gondar Comprehensive Specialized Hospital for facilitating to conduct of this study. We also sincerely thank the study participants for their time and willingness to participate. We are grateful to the data collectors and supervisors for their valuable contributions during the data collection process.

Funding: The authors received no specific funding for this work

Competing interests: The authors have declared that no competing interests exist

Data availability: The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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