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The incidence and risk factors of phobic movement disorder after hip fracture internal fixation surgery

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Abstract

Objective This study aims to analyze the cumulative incidence and associated risk factors of phobic movement disorder (PMD) after hip fracture internal fixation surgery, with the goal of optimizing postoperative rehabilitation management and improving the quality of life in elderly patients.

Methods A total of 269 patients who underwent hip fracture internal fixation surgery at our hospital from June 2022 to June 2024 were retrospectively included. Clinical data, including age, sex, BMI, underlying diseases, psychological status, postoperative hip joint function, and self-efficacy, were collected. PMD was assessed using the Tampa Scale for Kinesiophobia (TSK), pain acceptance was evaluated using the Chronic Pain Acceptance Questionnaire (CPAQ-8), anxiety and depression status were assessed with the Hospital Anxiety and Depression Scale (HADS), hip joint function was measured using the Harris Hip Score, and self-efficacy was evaluated using the General Self-Efficacy Scale (GSE). Univariate analysis and multivariate binary logistic regression analysis were used to identify independent risk factors for PMD. The variance inflation factor (VIF) was calculated to assess multicollinearity.

Results The cumulative incidence of PMD was 34.9%. Univariate analysis revealed that BMI ≥ 30 kg/m^2, low pain acceptance, anxiety and depression, poor postoperative hip joint function, and low self-efficacy were significantly associated with PMD ($P < 0.001$). Multivariate logistic regression analysis further confirmed that BMI ≥ 30 kg/m^2 (OR = 4.07, 95% CI [2.39, 6.94]), low pain acceptance (OR = 4.67, 95% CI [2.69, 8.10]), anxiety and depression (OR = 4.14, 95% CI [2.44, 7.04]), poor postoperative hip joint function (OR = 10.61, 95% CI [5.67, 19.87]), and low self-efficacy (OR = 4.19, 95% CI [2.44, 7.18]) were independent risk factors for PMD. All VIF values were < 5, indicating no significant multicollinearity.

Conclusion PMD is common after hip fracture internal fixation surgery and is closely associated with high BMI, low pain acceptance, anxiety and depression, poor postoperative hip joint function, and low self-efficacy. The VIF analysis showed no significant multicollinearity, indicating stable results. Comprehensive interventions targeting high-risk factors may help reduce the incidence of PMD and improve postoperative recovery.

Keywords Hip fracture, Phobic movement disorder, Internal fixation, Risk factors, Elderly patients

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Introduction

The incidence of hip fractures among the elderly is increasing, and it is estimated that by 2050, the number of hip fracture cases in China among individuals aged 65 years and older will reach 1.3 million [1]. Hip fractures commonly occur in individuals over 50 years old and are primarily caused by osteoporosis and falls, leading to severe pain and restricted limb mobility [2].Conservative treatment has shown poor efficacy, with approximately 91.5% of patients developing complications and experiencing suboptimal functional recovery [3]. Most researchers [4–6] advocate for early surgical intervention to minimize the time between injury and surgery, as it can improve prognosis by reducing mortality, minimizing the risk of anemia [7], enhancing functional recovery, and shortening hospital stays. Consequently, surgical treatment is considered the preferred approach [8, 9] The primary surgical options for hip fractures include joint replacement and internal fixation, each with distinct advantages. Total hip arthroplasty (THA) is widely used for femoral neck fractures due to its high bone healing rate, low revision rate, and rapid recovery of mobility [10, 11]. Recent studies [12–14] have shown that, compared to internal fixation, THA significantly reduces complications and revision rates while improving postoperative hip function and quality of life. However, despite its advantages, THA carries risks, including dislocation, periprosthetic fractures, and revision surgery [15, 16]. Therefore, for non-displaced or minimally displaced femoral neck fractures and extracapsular hip fractures, internal fixation surgery is considered an effective treatment option as it preserves the patient's natural hip joint, avoiding the long-term complications of prosthetic use [17, 18]. Moreover, internal fixation has demonstrated favorable clinical outcomes [19] However, in clinical treatment, patients with hip fractures who undergo internal fixation surgery often develop Phobic Movement Disorder (PMD), which refers to a pathological fear of movement. Currently, the primary causes of PMD can be categorized into five factors. First, inadequate postoperative pain management can lead to a fear of movement, as patients worry that physical activity will exacerbate pain or cause new injuries [20]. Second, psychological factors such as anxiety and depression can intensify this fear [21]. Third, a lack of proper exercise guidance may leave patients uncertain about which movements are safe, thereby increasing their apprehension [22]. Additionally, postoperative muscle mass reduction [23] should not be overlooked. Finally, postoperative complications such as infections and internal fixation failure can also contribute to patients' fear of movement [24].Once PMD occurs, it negatively impacts patient prognosis and postoperative rehabilitation, leading to avoidance of necessary physical activity, which in turn hinders recovery outcomes [25].

In recent years, research on psychological disorders following hip fractures has gradually increased, with progress made in areas such as cognitive-behavioral interventions, early postoperative rehabilitation training, and psychological education. Some studies suggest that the occurrence of PMD may be closely related to patients' preoperative psychological state, pain levels, and postoperative rehabilitation environment [26]. However, despite its significant clinical impact, research on PMD remains relatively limited. There is no consensus on the epidemiological characteristics of PMD in the existing literature. Some studies report an incidence rate ranging from 30 to 50%, though different surgical methods and patient characteristics may lead to substantial variability in findings [27] Moreover, current research on PMD risk factors mainly focuses on advanced age, female sex, postoperative pain, depression, and anxiety [28]. However, systematic analyses specific to patients undergoing internal fixation surgery are still lacking, and it remains unclear whether intraoperative and postoperative complications influence the occurrence of PMD. Existing studies suggest that psychological interventions (such as cognitive behavioral therapy), postoperative rehabilitation exercise programs, and psychological education may help reduce the risk of PMD [29, 30].However, research on the optimal timing of these interventions, their effectiveness, and individualized management strategies remains insufficient. Notably, most current studies focus on patients undergoing THA and hemiarthroplasty (HA), while research on PMD in patients receiving internal fixation surgery remains scarce. Therefore, based on a retrospective analysis of 269 patients with hip fractures who underwent internal fixation surgery at our hospital, this study aims to investigate the incidence and risk factors of PMD. The goal is to identify high-risk patients and provide a scientific basis for postoperative rehabilitation management, ultimately optimizing clinical intervention strategies and improving patient recovery outcomes.

Materials and methods

General information

We selected the clinical data of 269 patients with hip fractures who underwent internal fixation surgery in the Department of Trauma Orthopedics at our hospital from June 2022 to June 2024. Among them, 105 were male and 164 were female, with an age range of 40 to 89 years.

The inclusion criteria for this study were as follows:

(1) Patients diagnosed with hip fractures via X-ray examination (regardless of laterality), including femoral neck fractures, intertrochanteric femoral fractures, and subtrochanteric femoral fractures.
(2) Patients with clear surgical indications who underwent internal fixation surgery for the first

time at our hospital and were discharged after rehabilitation.
(3) Patients with complete and retrievable clinical data in the medical record system.

The exclusion criteria were as follows:

(1) Patients with fractures of the femoral shaft or distal femur (i.e., midshaft or lower femur fractures), bilateral hip fractures, or severe multiple injuries (fractures).
(2) Patients with a history of psychiatric disorders or recent onset of abnormal mental status.
(3) Patients with malignant tumors or pathological fractures.
(4) Patients who voluntarily left the hospital or were transferred to another hospital during treatment.

This study is a retrospective analysis and has been reviewed and approved by the Ethics Committee of Hezhou People's Hospital.

Research methods

By applying the inclusion and exclusion criteria, we initially identified 296 eligible patient records. However, 24 cases were excluded due to incomplete laboratory test data, and 3 cases with multiple fractures (complicated conditions) who underwent multiple surgeries but did not heal before discharge were also excluded. Ultimately, 269 qualified patient records were confirmed. The study included the occurrence of PMD and patient characteristics such as age, gender, underlying diseases (hypertension, diabetes), body mass index (BMI), ethnicity, marital status, place of residence, surgical duration, intraoperative blood loss, payment method, pain acceptance level, psychological status (anxiety and depression), postoperative hip function, and self-efficacy. In this study, PMD assessment was conducted at three months postoperatively, meaning all patients were evaluated for PMD during their three-month follow-up.

Evaluation criteria for study indicators

The TSK is commonly used to assess PMD, with a total score range of 17–68 points. Many studies define TSK > 37 as the threshold for high kinesiophobia. Patients in the high-score group (TSK > 37) typically exhibit more severe pain-avoidance behavior and functional limitations [31, 32].This threshold has been widely adopted in subsequent studies, distinguishing high and low kinesiophobia (PMD) using a cutoff score of 37. Therefore, in this study, a total score above 37 indicated the presence of PMD, while a score of 37 or below indicated the absence of PMD [33–35]。Pain acceptance level was assessed using the Chronic Pain Acceptance Questionnaire (CPAQ-8) [36],which consists of eight items, each scored from 0 to 6. The total score is positively correlated with the patient's pain acceptance level. A score below 38 indicates low pain acceptance, while a score of 38 or above indicates high pain acceptance. Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS) [37],which contains 14 items—7 for anxiety and 7 for depression. Each item is scored from 0 to 3, with the total score positively correlated with the severity of anxiety and depression. A score of 0 to 7 indicates no anxiety or depression, while a score of 8 to 21 indicates the presence of anxiety or depression. Hip function was assessed using the Harris Hip Score (HHS) [38],which includes four dimensions with a total score of 100. A score below 70 indicates poor hip function, while a score of 70 or above indicates good hip function. The General Self-Efficacy Scale (GSE) [39] has a score range of 10 to 40 points. A score below 20 indicates low self-efficacy, while a score above 30 indicates high self-efficacy. The GSE scale evaluates an individual's confidence level and ability to cope with various situations based on these score thresholds. BMI was calculated as weight (kg) ÷ height^2 (m^2). According to WHO standards, BMI is classified as follows: underweight (< 18.5), normal weight (18.5–24.9), overweight (25–29.9), and obese (≥ 30). In previous studies on joint replacement surgery, chronic pain management, and spinal disorders [40–42],BMI ≥ 30 has been widely used as a cutoff point for analyzing the risk of postoperative PMD. Therefore, this study also adopted BMI ≥ 30 as the cutoff point.

Statistical analysis

SPSS 25.0 statistical software was used for data analysis. Chi-square tests (χ^2 tests) were applied for comparisons between categorical variables, while independent sample t-tests were used for comparisons between continuous variables.For variables that were statistically significant in the univariate analysis, multivariate binary logistic regression analysis was performed to assess their independent impact on the occurrence of Phobic Movement Disorder (PMD), calculating the odds ratio (OR) and 95% confidence interval (CI).Model goodness-of-fit was evaluated using the Hosmer-Lemeshow test, and multicollinearity among variables was assessed using the variance inflation factor (VIF), where VIF < 5 indicated no significant collinearity issues.All statistical tests were two-tailed, with $P < 0.05$ considered statistically significant.

Results

Cumulative incidence of phobic movement disorder after hip fracture internal fixation surgery

Among the 269 patients with hip fractures included in this study, 94 cases developed PMD, resulting in a cumulative incidence rate of 34.9%.

Univariate analysis of factors associated with postoperative phobic movement disorder

In the univariate analysis of factors associated with Phobic Movement Disorder (PMD) after hip fracture internal fixation surgery, we found that age, gender, hypertension, diabetes, ethnicity, marital status, place of residence, surgical duration, preoperative movement VAS score, preoperative resting VAS score, surgical technique, intraoperative blood loss, and payment method were not significantly associated with the occurrence of PMD. Notably, higher BMI (≥ 30 kg/m²) was significantly associated with the occurrence of PMD ($P < 0.001$), suggesting that overweight patients are more prone to developing this complication. Additionally, low pain acceptance, anxiety and depression, poor postoperative hip function, and low self-efficacy were also significantly associated with a higher risk of developing PMD ($P < 0.001$).For detailed results, refer to Table 1.

Multivariate binary logistic regression analysis of postoperative phobic movement disorder

Based on the positive results from the univariate analysis, a binary logistic regression analysis was conducted, using the occurrence of Phobic Movement Disorder (PMD) after hip fracture internal fixation surgery as the dependent variable. The independent variables included BMI, pain acceptance level, anxiety and depression, postoperative hip function, and self-efficacy, with the following assignments: PMD occurrence: Present = 1, Absent = 0. BMI (categorized as a binary variable): ≥30 = 1 (reference category), < 30 = 0. Pain acceptance level: High acceptance = 0 (reference category), Low acceptance = 1. Anxiety and depression: No anxiety/depression = 0 (reference category), Presence of anxiety/depression = 1. Postoperative hip function: Good = 0 (reference category), Poor = 1. Self-efficacy: High = 0 (reference category), Low = 1.

Table 1 General and clinical characteristics of the included patients

Factor	Subcategory	without PMD Group (*N* = 175)	with PMD Group (*N* = 94)	χ^2/t	*P*
Age(years)	≥ 60y	105(60%)	50(53.19%)	0.899	0.343
	<60y	70(40%)	44(46.81%)		
Gender	Female	113(64.57%)	51(54.26%)	2.318	0.128
	Male	62(35.43%)	43(45.74%)		
Hypertension	Yes	127(72.57%)	75(79.79%)	1.338	0.247
	No	48(27.43%)	19(20.21%)		
Diabetes	Yes	96(54.86%)	45(47.87%)	0.933	0.334
	No	79(45.14%)	49(52.13%)		
BMI(kg/m^2)	≥ 30Kg/m^2	45(25.71%)	55(58.51%)	26.78	**<0.001**
	<30Kg/m^2	130(74.29%)	39(41.49%)		
Ethnicity	Han	158(90.29%)	83(88.3%)	0.090	0.764
	Minority	17(9.71%)	11(11.7%)		
Marital Status	Married	140(80.0%)	66(70.21%)	2.743	0.098
	Unmarried	35(20.0%)	28(29.79%)		
Residence	Urban	114(65.14%)	55(58.51%)	3.607	0.058
	Rural	61(34.86%)	49(52.13%)		
Surgical Time(M ± SD)		75.21 ± 25.96	78.49 ± 27.34	-0.955	0.341
Intraoperative Bleeding(M ± SD)		150.68 ± 50.17	155.24 ± 53.68	-0.679	0.498
Preoperative Movement VAS Score(M ± SD)		5.37 ± 0.89	5.34 ± 0.87	0.266	0.790
Preoperative Resting VAS Score(M ± SD)		3.60 ± 0.45	3.65 ± 0.50	-0.836	0.404
Surgical Technique	Intramedullary Fixation	98(56%)	64(68.1%)	3.727	0.053
	Extramedullary Fixation	77(44%)	30(31.9%)		
Payment Method	Insurance	158(90.29%)	86(91.49%)	0.011	0.917
	Self-pay	17(9.71%)	8(8.51%)		
Pain Tolerance	Low	65(37.14%)	69(73.4%)	30.73	**<0.001**
	High	110(62.86%)	25(26.6%)		
Anxiety/Depression	Yes	49(28.0%)	58(61.7%)	27.61	**<0.001**
	No	126(72.0%)	36(38.3%)		
Postoperative Hip Joint Function	Poor	19(10.86%)	53(56.38%)	62.36	**<0.001**
	Good	156(89.14%)	41(43.62%)		
Self-Efficacy	Low	63(36.0%)	66(70.21%)	27.33	**<0.001**
	High	112(64.0%)	28(29.79%)		

Notes: $N = 269$ (Without PMD Group ($N = 175$), With PMD Group ($N = 94$)). Categorical variables are expressed as n (%), and continuous variables are expressed as mean ± standard deviation (M ± SD). χ^2 = Chi-square test, t = Independent sample t-test. $P < 0.05$ is considered statistically significant

Table 2 Results of the multivariate binary logistic regression analysis

Variable	β	SE	Wals	df	*P*	OR	OR 95% CI
Constant	-1.48	0.22	44.72	1	0.000	0.23	-
BMI	1.405	0.272	26.76	1	0.000	4.07	[2.39, 6.94]
Pain Acceptance Ability	1.541	0.281	30.08	1	0.000	4.67	[2.69, 8.10]
Anxiety and Depression	1.421	0.271	27.54	1	0.000	4.14	[2.44, 7.04]
Postoperative Hip Joint Function	2.362	0.320	54.54	1	0.000	10.61	[5.67, 19.87]
Self-Efficacy	1.433	0.275	27.13	1	0.000	4.19	[2.44, 7.18]

Notes: BMI ≥ 30, low pain acceptance, presence of anxiety and depression, poor postoperative hip function, and low self-efficacy were all statistically significant factors associated with the occurrence of PMD. The OR values were calculated by exponentiating the regression coefficients (β), i.e., OR = e^β

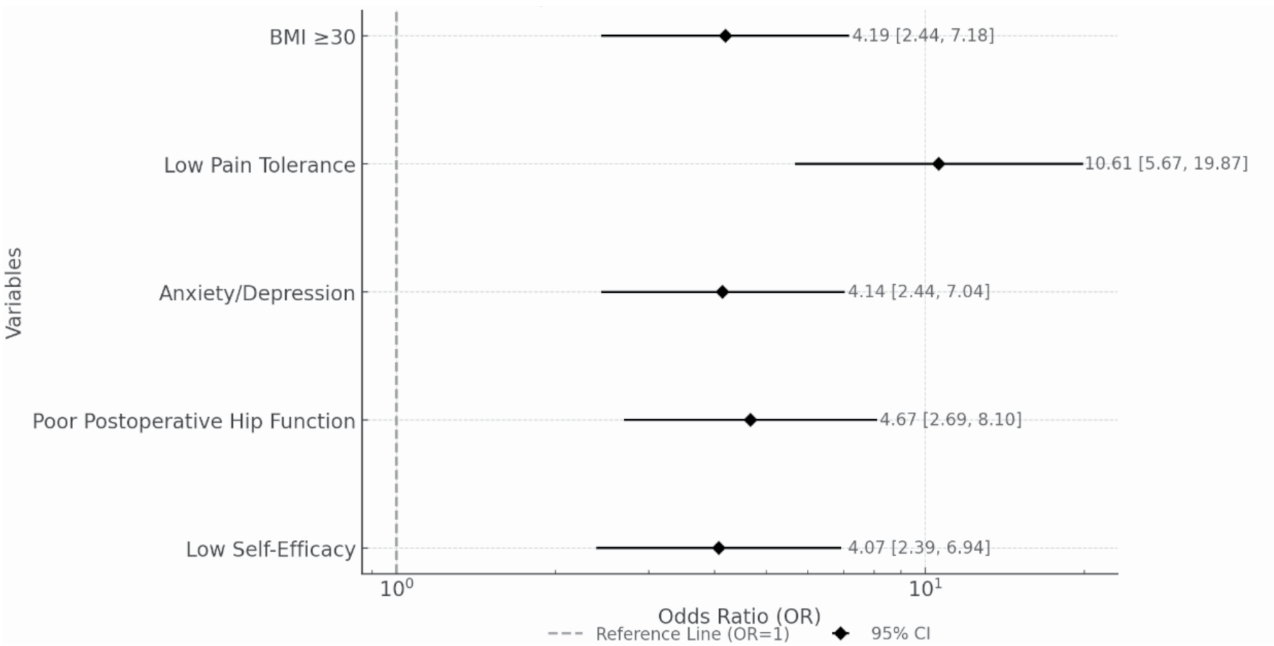

Fig. 1 The forest plot illustrates the odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) calculated from the multivariate binary logistic regression model for five variables. The diamond marker represents the point estimate of the OR, and the horizontal line represents the corresponding 95% confidence interval. The dotted line is positioned at OR = 1, indicating a null effect; confidence intervals crossing this line suggest that the association of the variable with PMD is not statistically significant

The results of the multivariate binary logistic regression analysis demonstrated that: Patients with BMI ≥ 30 had a significantly increased risk of developing PMD (OR = 4.07, $P = 0.000$).Patients with low pain acceptance levels had a significantly higher risk of PMD (OR = 4.67, $P = 0.000$).Patients with anxiety and depression had an increased risk of PMD (OR = 4.14, $P = 0.000$).Patients with poor postoperative hip function had the highest risk of PMD (OR = 10.61, $P = 0.000$).Patients with low self-efficacy were also at significantly higher risk (OR = 4.19, $P = 0.000$).For detailed results, refer to Table 2; Fig. 1.

Diagnostic evaluation of the multivariate binary logistic regression model

In this study, a model diagnostic analysis was conducted to assess the goodness-of-fit and stability of the regression model.First, the Hosmer-Lemeshow test results showed χ^2 = 51.16, df = 8, $P < 0.001$, indicating a significant deviation between the predicted and observed values. This suggests that the model may have poor fit and requires further optimization.Additionally, to detect potential multicollinearity issues, the VIF was calculated. The results showed that all variables had a VIF < 5 (ranging from 1.18 to 2.89), indicating no significant multicollinearity problems, and confirming that the independent variables were relatively independent.Overall, while the model does not exhibit multicollinearity issues, its overall goodness-of-fit needs optimization to improve predictive performance. The complete diagnostic results can be found in Table 3.

Discussion

Incidence and clinical impact of phobic movement disorder

Phobic Movement Disorder is a common postoperative psychological disorder in which patients experience

Table 3 Diagnostic evaluation of the multivariate logistic regression model

Variable	OR	OR 95% CI	VIF	H-L Test (p)
BMI	4.07	[2.39, 6.94]	1.18	2.44×10^{-8}
Pain Acceptance Ability	4.67	[2.69, 8.10]	2.32	-
Anxiety and Depression	4.14	[2.44, 7.04]	2.89	-
Postoperative Hip Joint Function	10.61	[5.67, 19.87]	1.75	-
Self-Efficacy	4.19	[2.44, 7.18]	2.54	-

Notes: VIF is used to detect multicollinearity. A VIF < 5 indicates no significant collinearity issues.H-L Test (Hosmer-Lemeshow goodness-of-fit test) is used to evaluate model fit

excessive fear of movement or physical activity, leading them to avoid bodily movement. This is a frequently observed psychological complication after surgery [43]. PMD can have a significant negative impact on postoperative recovery, including postoperative pain and functional impairment [44], poor rehabilitation outcomes [45],and psychological distress. In summary, PMD significantly affects pain perception, functional recovery, and mental health. Early identification and intervention for PMD are essential for improving postoperative rehabilitation outcomes. In this retrospective study, among the 269 hip fracture patients, 94 cases developed PMD, resulting in a cumulative incidence of 34.9%. Bower's study reported that the incidence of PMD after hip fracture was 60.5% at four weeks postoperatively and 47.0% at 12 weeks [46], which is consistent with our findings. Furthermore, studies have indicated that PMD is significantly associated with functional recovery following hip fractures. Another study involving 100 elderly hip fracture patients found that the incidence of PMD was 62% within four weeks postoperatively and 59% within eight weeks, further supporting the high prevalence of PMD in hip fracture patients [47].

Association between high BMI and PMD

Previous clinical research has shown that high BMI is associated with an increased risk of PMD after internal fixation surgery [48].High BMI is not only linked to metabolic syndrome, which exacerbates inflammatory responses and leads to poor postoperative recovery, thereby increasing the incidence of PMD [49],but it is also associated with a higher likelihood of complications, such as wound infections and thrombosis, which further heighten the risk of PMD [50].Moreover, it negatively impacts physical function and psychological well-being [44].Bryant's study [51] explored the impact of BMI on postoperative outcomes following femoral fracture fixation. He reviewed 333 adult patients who underwent femoral fracture fixation surgery at a Level I trauma center in North Carolina between 2010 and 2016. The study found that obese patients had longer hospital stays, prolonged ICU stays, and higher complication rates. A higher BMI was associated with a delayed time to first mobilization, leading to poor clinical outcomes. Similarly, Bello et al. [52] investigated the relationship between high BMI and PMD in hip fracture patients. The study included 109 patients who underwent hip fracture surgery at two tertiary medical institutions in Accra. The results showed that 72.50% of patients had PMD (TSK score ≥ 37). High BMI was significantly correlated with PMD occurrence and was negatively associated with postoperative lower limb functional recovery (r = -0.345, P < 0.001). These findings strongly support the conclusion of this study that BMI is a significant risk factor for PMD, aligning with our results. Therefore, controlling BMI and promoting early mobilization are crucial for reducing the incidence of PMD after surgery.

Psychological factors and PMD

Postoperative PMD can be alleviated through various psychological interventions, particularly those targeting anxiety, depression, and self-efficacy [53]. Studies have shown that anxiety can heighten pain perception, leading to an increased fear of movement [54]. One study [55] found a significant association between preoperative psychological health (including anxiety) and postoperative pain and functional recovery, increasing the risk of PMD. Malik [56] emphasized the importance of identifying high-risk patients and implementing targeted interventions to reduce postoperative complications. Additionally, postoperative anxiety is significantly associated with pain and functional impairment [44]. Patients with high anxiety levels experience greater postoperative pain intensity and interference, leading to a higher incidence of PMD. Depressive symptoms negatively affect postoperative recovery, increase pain perception, and reduce mobility [45]. This combination of anxiety and depression exacerbates pain perception, limits movement, and decreases rehabilitation participation, significantly increasing the risk of PMD after internal fixation surgery. Ultimately, this loss of confidence further reinforces the fear of movement, prolonging recovery. Previous research has indicated that low self-efficacy is associated with greater functional impairment and a higher incidence of PMD in postoperative recovery [57].

Poor postoperative hip function and PMD

The results of this study indicate that patients with poor postoperative hip function were 10.61 times more likely to develop PMD than those with good hip function, demonstrating a significant increase in risk.A study by Belova et al. [58] reported similar findings, with an even higher risk, showing that poor postoperative function significantly increased the likelihood of PMD. The underlying causes of this association can be analyzed from three perspectives: Physiological Mechanisms: Poor postoperative hip function is often associated with inflammation, muscle weakness, and joint stiffness.These physiological issues not only lead to pain and discomfort but also enhance pain sensitivity through neural feedback mechanisms, making patients more prone to pain perception [58] • Negative Cognition and Emotional Responses: Patients with poor hip function may develop negative cognitive and emotional reactions, such as helplessness and hopelessness.These negative emotions influence pain perception, increasing pain sensitivity and further exacerbating PMD [55].The Pain-Fear-Avoidance Cycle: When patients experience postoperative pain, they may interpret it as a severe threat, triggering fear responses. This fear leads to avoidance of movement, reducing activity levels and further impairing functional recovery. Ultimately, this pain-fear-avoidance cycle becomes self-reinforcing, delaying recovery and worsening PMD [59, 60].

Limitations of the study

This study provides valuable insights into the incidence and associated factors of PMD after hip fracture surgery. These findings highlight the need to pay special attention to high-risk factors in postoperative management of hip fractures and to implement appropriate interventions to reduce the occurrence of PMD.However, several limitations exist. First, this is a retrospective study, and the data were obtained from hospital medical records, which may be subject to missing information or bias. Additionally, the study design itself cannot establish causal relationships. In the future, we plan to conduct multicenter or prospective cohort studies to further validate our findings and reduce the risk of bias. Second, the sample size is relatively small and limited to a single medical center, which may affect the accuracy and generalizability of the results. However, under the current conditions, we included all eligible cases from our hospital, resulting in a total of 269 cases. We acknowledge the limited sample size, but this also reflects the patient composition and regional characteristics of Hezhou, Guangxi. Furthermore, there may be some selection bias, as the proportion of obese patients seeking medical attention during the study period might have been higher. Moving forward, we plan to collaborate with multiple hospitals to conduct joint studies, expand the sample size, and improve external validity. Additionally, the risk factors considered in this study were not comprehensive, as variables such as socioeconomic status, personal lifestyle habits, and postoperative rehabilitation plans were not included [61],all of which may influence the occurrence of PMD. This is another limitation, as the original database contained fragmented economic and rehabilitation-related data, making comprehensive quantitative analysis difficult. Therefore, in future prospective studies, we will focus on collecting complete data for inclusion in the analysis.

Conclusion

The results of this study indicate that the incidence of PMD after hip fracture internal fixation surgery is 34.9%. Multivariate binary logistic regression analysis showed that BMI ≥ 30 kg/m² (OR = 4.07), low pain acceptance (OR = 4.67), anxiety and depression (OR = 4.14), poor postoperative hip function (OR = 10.61), and low self-efficacy (OR = 4.19) were all independent risk factors for PMD ($P < 0.001$). Special attention should be given to high-risk patients, and efforts should be made to optimize postoperative pain management, psychological interventions, and functional rehabilitation to reduce the incidence of PMD and improve postoperative recovery.

Author contributions

Liming Xu is currently responsible for the design, writing, and revision of the article, as well as the subsequent publication fees. Wenjie Chen is responsible for collecting case data, data analysis, creating charts, and proofreading the article. Both authors contributed equally to this study.

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Data availability

The data in this study were obtained from patients in the Orthopedics Department of our hospital who underwent internal fixation surgery for hip fractures. The data collection and processing methods ensured the reliability and authenticity of the data.

Declarations

Ethics approval and consent to participate

Both authors confirm that they fully adhere to ethical standards, and this study has been approved by the Ethics Committee of Hezhou People's Hospital.

Competing interests

We, the two authors, confirm that there are no conflicts of interest related to this manuscript.

Informed consent

This paper is a retrospective analysis study. Informed consent was not applicable, and ethical support has been obtained. No harm to patient interests or privacy has occurred, and the data are authentic and reliable.

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References

1. Gong XF, Li XP, Zhang LX et al. Current status and distribution of hip fractures among older adults in China[J].Osteoporos Int.2021.329.1785-1793.
2. Alexiou KI, Roushias A, Varitimidis SE et al. Quality of life and psychological consequences in elderly patients after a hip fracture: a review[J].Clin Interv Aging.2018.13.143-150.
3. Liu J, Wen L, Ji Q et al. Causes and therapeutic effects of Conservative treatment for hip fracture in the elderly[J].2018.37.1343-1347.
4. Maffulli N, Aicale.Proximal R. Femoral fractures in the elderly: A few things to know, and some to Forget[J].Medicina (Kaunas).2022.5810.

5. Farrow L, Ablett AD, Sargeant HW et al. Does early surgery improve outcomes for periprosthetic fractures of the hip and knee? A systematic review and meta-analysis[J].Arch orthop trauma Surg.2021.1418.1393-1400.
6. Ahmad U, Khan MN, Khan GN et al. Influence of timing of surgery on surgical outcomes of Elderly Hip Fractures[J].2023.
7. Quaranta M, Miranda L, Oliva F et al. Haemoglobin and transfusions in elderly patients with hip fractures: the effect of a dedicated orthogeriatrician[J].J orthop Surg res.2021.161.387.
8. Slim K, Joris J. and L Delaunay.Enhanced recovery programmes can also reduce postoperative mortality[J].Langenbecks arch Surg.2021.4067.2567-2568.
9. Marsillo E, Pintore A, Asparago G et al. Cephalomedullary nailing for reverse oblique intertrochanteric fractures 31A3 (AO/OTA)[J].Orthop rev (Pavia).2022.146.38560.
10. Farey JE, Cuthbert AR, Adie S et al. Revision risk after unipolar or bipolar hemiarthroplasty for femoral neck fractures: an instrumental variable analysis of 62,875 procedures from the Australian orthopaedic association National joint replacement Registry[J].J bone joint Surg Am.2021.1033.195-204.
11. Saxer F, Studer P, Jakob M et al. Minimally invasive anterior muscle-sparing versus a transgluteal approach for hemiarthroplasty in femoral neck fractures-a prospective randomised controlled trial including 190 elderly patients[J].BMC geriatr.2018.181.222.
12. Tu TY, Chen CY, Lin PC et al. Comparison of primary total hip arthroplasty with limited open reduction and internal fixation vs open reduction and internal fixation for geriatric acetabular fractures: a systematic review and meta-analysis[J].EFORT open Rev.2023.87.532-547.
13. Liang C, Chen B, Hu Z et al. Dual-mobility cup total hip arthroplasty improves the quality of life compared to internal fixation in femoral neck fractures patients with severe neuromuscular disease in the lower extremity after stroke: a retrospective study[J].Front Surg.2023.10.1120273.
14. Favreau H, Ehlinger M, Adam P et al. Total hip arthroplasty with exclusive use of dual-mobility cup after failure of internal fixation in trochanteric fracture[J]. Orthop traumatol Surg Res.2020.1064.645-649.
15. Upfill-Brown A, Shi B, Maturana C et al. Higher rates of readmission after acute total hip arthroplasty versus open reduction internal fixation for elderly acetabular fractures, a National study from 2010 to 2019[J].J orthop Trauma.2023.377.334-340.
16. Einhorn S, Höch A, Osterhoff G et al. Comparison of percutaneous screw fixation to open reduction and internal fixation in acetabular fractures: A matched pair study regarding the Short-Term rate of conversion to total hip arthroplasty and functional Outcomes[J].J Clin Med.2023.123.
17. Overmann AL, Richards JT, O'Hara NN et al. Outcomes of elderly patients with nondisplaced or minimally displaced femoral neck fractures treated with internal fixation: A systematic review and meta-analysis[J]. Injury.2019.5012.2158-2166.
18. Vidakovic H, Kieser D, Hooper G et al. Valgus-impacted subcapital neck of femur fractures: a systematic review, meta-analysis with cost analysis of fixation in-situ versus nonoperative management[J].Hip Int.2024.342.260–9.
19. Gargano G, Poeta N, Oliva F et al. Zimmer natural nail and ELOS nails in Pertrochanteric fractures[J].J orthop Surg res.2021.161.509.
20. Goto K, Kataoka H, Honda A et al. Factors affecting persistent postoperative pain in patients with hip Fractures[J].Pain Res Manag.2020.2020.8814290.
21. Labaste F, Delort F, Ferré F et al. Postoperative delirium is a risk factor of institutionalization after hip fracture: an observational cohort study[J].Front med (Lausanne).2023.10.1165734.
22. Yamamoto N, Sakura S, Noda T et al. Comparison of the postoperative analgesic efficacies of intravenous acetaminophen and fascia Iliaca compartment block in hip fracture surgery: A randomised controlled trial[J]. Injury.2019.5010.1689-1693.
23. Chen YP, Kuo YJ, Hung SW et al. Loss of skeletal muscle mass can be predicted by sarcopenia and reflects poor functional recovery at one year after surgery for geriatric hip fractures[J].Injury.2021.5211.3446-3452.
24. Beecham G, Cusack R, Vencken S et al. Hypotension during hip fracture surgery and postoperative morbidity[J]. Ir J Med Sci 2020 18931087–96.
25. Brown OS, Hu L, Demetriou C et al. The effects of kinesiophobia on outcome following total knee replacement: a systematic review[J].Arch orthop trauma Surg.2020.14012.2057-2070.
26. Mesaroli G, Vader K, Rosenbloom BN et al. Sensibility and measurement properties of the Tampa scale of kinesiophobia to measure fear of movement in children and adults in surgical settings[J].Disabil Rehabil.2023.4514.2390–7.
27. Wang W, Wang D-X. The incidence and risk factors of postoperative delirium in elderly patients in critical condition after non-cardiac surgery[J].2011.
28. Wu X, Sun W, Tan.Incidence M. and Risk factors for postoperative delirium in patients undergoing spine surgery: A systematic review and Meta-Analysis[J]. BioMed Research International.2019.2019.
29. Zhang Y, Tian W, Xu D et al. Application of bundles of intervention for treatment of postoperative delirium in patients with esophageal cancer[J].Cancer research and Clinic.2018.30.613-616.
30. Wang Y, Liao Y, Gao L et al. [Localization Establishment of an Interdisciplinary Intervention Model to Prevent Post-Operative Delirium in Older Patients Based on 'Hospital Elder Life Program'][J].Hu li za zhi The journal of nursing.2017.64 3.33–42.
31. Neblett R, Hartzell M, Mayer T et al. Establishing clinically meaningful severity levels for the Tampa scale for kinesiophobia (TSK-13)[J].European Journal of Pain.2016.20.
32. Mesaroli G, Vader K, Rosenbloom B et al. Sensibility and measurement properties of the Tampa scale of kinesiophobia to measure fear of movement in children and adults in surgical settings[J].Disability and Rehabilitation.2022.45.2390–2397.
33. Wasiuk-Zowada D, Knapik A, Szefler-Derela J et al. Kinesiophobia in stroke patients, Multiple Sclerosis and Parkinson's Disesase[J].Diagnostics.2021.11.
34. Huang H-L, Nagao M, Arita H et al. Reproducibility, responsiveness and validation of the Tampa scale for kinesiophobia in patients with ACL injuries[J]. Health and quality of Life Outcomes.2019.17.
35. Gregg C, McIntosh G, Hall H et al. The relationship between the Tampa scale of kinesiophobia and low back pain rehabilitation outcomes[J]. Spine Journal: Official J North Am Spine Soc.2015.15 12.2466–71.
36. Wicksell RK, Olsson GL. and L Melin.The chronic pain acceptance questionnaire (CPAQ)-further validation including a confirmatory factor analysis and a comparison with the Tampa scale of Kinesiophobia[J]. Eur J Pain.2009.137.760–768.
37. Bjelland I, Dahl AA, Haug TT et al. The validity of the hospital anxiety and depression scale. An updated literature review[J]. J Psychosom Res 2002 52269–77.
38. Nilsdotter A. and A Bremander.Measures of hip function and symptoms: Harris Hip Score (HHS), Hip Disability and Osteoarthritis Outcome Score (HOOS), Oxford Hip Score (OHS), Lequesne Index of Severity for Osteoarthritis of the Hip (LISOH), and American Academy of Orthopedic Surgeons (AAOS) Hip and Knee Questionnaire[J].Arthritis Care Res (Hoboken).2011.63 Suppl 11.S200-207.
39. FitzGerald J, Wells YD. and J M Ellis.Psychosocial modification of general self-efficacy in older adults: A restricted review[J]. Australas J Ageing 2022 413e210–26.
40. Doury-Panchout F, Metivier JC. and B Fouquet.Kinesiophobia negatively influences recovery of joint function following total knee arthroplasty[J]. Eur J Phys Rehabil Med 2015 512155–61.
41. Altunel Kılınç E, Kırmızıer G. and N Oruçoğlu.The impact of disease activity and obesity on kinesiophobia in ankylosing spondylitis kinesiophobia and ankylosing spondylitis[J].ODÜ Tıp Dergisi.2023.102.54-64.
42. Ercan S, Küçük F, Örsçelik A et al. Musculoskeletal pain, kinesiophobia, and quality of life in obese patients[J].The European Research Journal.2023.94.665-673.
43. U G, Longo M, Marino G, Rizzello et al. Preoperative and postoperative kinesiophobia influences postoperative outcome measures following anterior cruciate ligament reconstruction: A prospective Study[J].J Clin Med.2023.1214.
44. Archer KR, Seebach CL, Mathis SL et al. Early postoperative fear of movement predicts pain, disability, and physical health six months after spinal surgery for degenerative conditions[J].Spine J.2014.145.759-767.
45. Archer KR, Wegener ST, Seebach C et al. The effect of fear of movement beliefs on pain and disability after surgery for lumbar and cervical degenerative conditions[J].Spine (Phila Pa 1976).2011.3619.1554-1562.
46. Bower ES, Wetherell JL, Petkus AJ et al. Fear of falling after hip fracture: prevalence, course, and relationship with One-Year functional Recovery[J].Am J Geriatr Psychiatry.2016.2412.1228-1236.
47. Visschedijk J, van Balen R, Hertogh C et al. Fear of falling in patients with hip fractures: prevalence and related psychological factors[J].J am med dir Assoc.2013.143.218-220.
48. Morri M, Venturini E, Franchini N et al. Is kinesiophobia a predictor of early functional performance after total hip replacement? A prospective prognostic cohort study[J].BMC Musculoskelet Disord.2020.211.724.
49. Zusmanovich M, Kester BS. and R schwarzkopf.postoperative complications of total joint arthroplasty in obese patients stratified by BMI[J].J arthroplasty.2018.333.856-864.

50. Busato A, Röder C, Herren S et al. Influence of high BMI on functional outcome after total hip arthroplasty[J].Obes Surg.2008.185.595-600.
51. Bryant MK, Parrish M, Roy S et al. Inferior clinical outcomes after femur fracture in the obese are potentially preventable[J].Injury.2019.5011.2049-2054.
52. Bello A, Kanebi L, Iyor F et al. A survey of kinesiophobia as a correlate of lower limb function in patients with lower extremity fractures during inpatient post-operative rehabilitation[J].Health sciences investigations Journal.2020.1.128-134.
53. Woods MP, and G J G Asmundson. Evaluating the efficacy of graded in vivo exposure for the treatment of fear in patients with chronic back pain: a randomized controlled clinical trial[J].Pain.2008.1363.271-280.
54. Kalem M, Kocaoğlu H, Duman B et al. Prospective associations between fear of falling, anxiety, depression, and pain and functional outcomes following surgery for intertrochanteric hip Fracture[J].Geriatr orthop Surg Rehabil.2023.14.21514593231193234.
55. Jochimsen KN, Noehren B, Mattacola CG et al. Preoperative psychosocial factors and Short-term pain and functional recovery after hip arthroscopy for femoroacetabular impingement Syndrome[J].J athl Train.2021.5610.1064-1071.
56. Malik AT, Quatman CE, Phieffer LS et al. Incidence, risk factors and clinical impact of postoperative delirium following open reduction and internal fixation (ORIF) for hip fractures: an analysis of 7859 patients from the ACS-NSQIP hip fracture procedure targeted database[J].Eur J orthop Surg Traumatol.2019.292.435-446.
57. Fu Y, Zhu LJ, Li DC et al. Evidence-based intervention on postoperative fear, compliance, and self-efficacy in elderly patients with hip fracture[J].World J clin Cases.2022.1010.3069-3077.
58. Belova AN, Shabanova MA, Sushin VO et al. [Kinesiophobia in patients requiring hip and knee endoprosthetics: severity and provoking factors][J].Vopr kurortol Fizioter lech Fiz Kult.2022.996.34-41.
59. Wane M, Naqvi WM, Vaidya L et al. Kinesiophobia in a patient with postoperative midshaft fracture: A case report of its impact on rehabilitation in a 16-Year-Old Girl[J].Cureus.2020.1211.e11333.
60. Padovan AM, Kuvačić G, Gulotta F et al. A new integrative approach to increase quality of life by reducing pain and fear of movement in patients undergoing total hip arthroplasty: the IARA model[J].Psychol Health Med.2018.2310.1223-1230.
61. Belova A, Shabanova M, Sushin V et al. [Kinesiophobia in patients requiring hip and knee endoprosthetics: severity and provoking factors][J].Voprosy kurortologii, fizioterapii, i Lechebnoi fizicheskoi kultury.2022.99 6.34–41.

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