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Research Article

# Multidimensional Frailty Scale (MFS) As A Early Predictor Of Short Term Outcomes In Elderly Patients With Proximal Hip Fractures: A Prospective Study

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## ABSTRACT

**Background:** Proximal hip fractures represent a significant health concern among the elderly, with an annual global incidence of approximately 1.6 million, projected to rise to 6.3 million by 2050. These fractures are associated with high morbidity and mortality rates, necessitating an understanding of risk factors that influence outcomes.

**Objective:** This study aims to assess predictive risk factors for morbidity and mortality within 30 and 180 days post-fracture in older adults, utilizing the Multidimensional Frailty Score (MFS).

**Methods:** A prospective cohort study was conducted at JSS Hospital, Mysuru, enrolling 130 patients aged over 60 years with proximal hip fractures scheduled for surgical intervention. Data collection included demographics, comorbidities, and frailty assessments using the MFS, as well as functional evaluations via Barthel's Index and Functional Ambulation Classification (FAC). Follow-ups were conducted at one and six months post-discharge.

**Results:** The cohort consisted predominantly of females (73.10%) aged 60-70 years. Mortality within six months was 21%, aligning with literature estimates. Higher MFS scores correlated with longer hospital stays and increased mortality risk, with an odds ratio of 3.42 for each unit increase in MFS. Significant improvements in functional scores were observed over time, but 71.70% of patients scored 0 on FAC at discharge. Serum albumin levels and Charlson Comorbidity Index (CCI) were also identified as critical factors influencing outcomes.

**Conclusion:** The study underscores the importance of comprehensive frailty assessments, particularly using the MFS, in predicting adverse outcomes in elderly patients with proximal femur fractures. The findings advocate for interdisciplinary care models and the integration of frailty evaluations into clinical practice to enhance decision-making and patient care.

**Keywords:** Geriatric, Hip fracture, Multidimensional Frailty Score, ASA grade, Functional outcomes, Recovery trajectory, Mortality risk, Rehabilitation, MFS, Barthel's index

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## INTRODUCTION

Proximal hip fractures are a significant concern among the elderly, with an estimated global incidence of approximately 1.6 million fractures annually. This figure is projected to rise due to the aging population and

increasing rates of osteoporosis, with lifetime risks of experiencing a hip fracture estimated at 15-25% for women and 6-10% for men. By 2050, the number of hip fractures worldwide could reach 6.3 million annually, highlighting the growing prevalence of this injury as the

population ages, necessitating a thorough understanding of the risk factors influencing both immediate (30-day) and extended (180-day) outcomes for older adults with these fractures [1].

Hip fractures lead to severe consequences beyond the initial injury; 20-30% of patients may die within a year, while many survivors experience diminished functional abilities and quality of life, placing immense pressure on healthcare systems and families [2]. Effective management of these fractures requires balancing timely surgical intervention with careful evaluation of existing comorbidities, such as cardiovascular disease, diabetes, and cognitive impairments, which complicate recovery and increase perioperative risks [3].

Identifying predictive risk factors for morbidity and mortality is crucial for improving treatment outcomes [4]. The Multidimensional Frailty Scale (MFS) offers a holistic view of a patient's health status by incorporating various domains, including physical, psychological, and social factors. This multidimensional approach enhances the identification of frailty, which may be overlooked by unidimensional scores [5]. Research has demonstrated that the MFS is superior in predicting postoperative complications, length of hospital stay, and overall mortality compared to simpler frailty measures [6]. Its comprehensive nature aids in recognizing variations that single-domain assessments might miss. Additionally, the MFS has been linked to predicting not only mortality but also functional decline, re-hospitalization, and other morbidities, making it a versatile tool for clinicians managing geriatric patients [7].

In contrast, unidimensional scores often lack the comprehensive predictive validity that the MFS provides. For example, scores that focus solely on physical frailty may inadequately predict complications or mortality in patients with cognitive or emotional vulnerabilities. The MFS is capable of detecting subtle changes in a patient's condition over time, while other frailty scores may fail to capture gradual declines or improvements, limiting their effectiveness in monitoring progress or response to interventions [8]. Interdisciplinary care involving orthopaedic surgeons, anesthesiologists, geriatricians, and rehabilitation specialists is essential for optimizing outcomes [9].

This study aims to comprehensively assess risk factors predicting morbidity and mortality within 30 and 180 days post-fracture in older adults using the Multidimensional Frailty Score (MFS) [10]. By identifying these variables, the research seeks to enhance clinical decision-making, improve patient care, and contribute to developing targeted interventions and

evidence-based treatment protocols for hip fractures in this vulnerable population [11].

## **MATERIALS AND METHODS**

This prospective cohort study was conducted at JSS Hospital, Department of Orthopaedics, Mysuru, targeting patients aged over 60 years who sustained proximal hip fractures with a calculated sample size of 152 and were scheduled for surgical intervention. Participants were enrolled from August 2022 through January 2024, with written informed consent obtained from all eligible patients.

The inclusion criteria for the study were individuals over 60 years of age who had sustained a low-energy proximal hip fracture and were scheduled for surgical intervention. Exclusion criteria included those with a previous hip fracture within the past two years, a diagnosed malignant tumor within the past two years, admission with polytrauma, or fractures managed conservatively.

Data were collected through a comprehensive questionnaire designed to assess various risk factors and patient demographics, utilizing tools such as the Multidimensional Frailty Score (MFS) at the time of admission, American Society of Anesthesiologists (ASA) grading, & Barthel's Index and Functional Ambulation Classification (FAC) before injury and at the time of discharge was noted. Information gathered included patient demographics, co-morbidities, and details of surgical procedures, documented from medical records and post-operative notes.

Patients were divided into two primary groups based on fracture type: Trochanteric Fracture and Neck of Femur Fracture. Surgical interventions were classified into subgroups, including Dynamic Hip Screw (DHS) and Intramedullary Nail for Trochanteric Fractures, and Hemiarthroplasty (both Cemented and Un-cemented) for Neck of Femur Fractures.

Follow-up assessments were conducted at two key intervals: 1 month and 6 months post-discharge. At each follow-up, the Functional Ambulation Classification (FAC) score was assessed, and mortality (if any) was noted. The primary endpoints of the study included mortality rates, Barthel's index and FAC scores at both follow-up points.

Statistical methods was employed at the end of the study (after one and a half years) to analyze the collected data, identify risk factors, and develop a predictive scoring system for outcomes related to proximal hip fractures in elderly patients.

**MULTI-DIMENSIONAL FRAILITY INDEX (MFS)**

SCORE			
Item	0	1	2
Sex	Female	Male	N/A
Charlson Co-morbidity index	0	1-2	>2
Albumin g/dl	>3.9	3.5-3.9	<3.5
Koval grade	1	2-6	7
Dementia	Normal	Mild cognitive impairment	Dementia
Risk of falling	Yes	No	N/A
MNA	Normal	Risk of malnutrition	Malnutrition
Mid arm circumference	>27	24.6-27	<24.6
<b>Total score</b>			

**Data Analysis:**

The collected data will be entered into Microsoft Excel followed by analysis using SPSS VERSION 22 (licensed to the institution). Demographical characters and risk factors will be represented using arithmetic means, standard deviation, and percentage calculations. Logistical regression analysis will be done to build a predictive model for the incidence of SSI. P value of less than 0.05 will be considered statistically significant.

**RESULT**

A total of 150 individuals with proximal femur fractures were assessed at JSS Hospital Mysuru, with 130 meeting the inclusion criteria. The cohort predominantly consisted of females (73.10%) and primarily aged 60-70 years. The demographic analysis revealed that 39.20% of patients were aged 60-70 years, 30.00% were aged 71-80 years, and 30.80% were above 80 years; additionally, ASA grading indicated that 11.50% were classified as Grade I, 44.60% as Grade II, and 43.80% as Grade III.

**Table: Demographic distribution**

		Frequency	Percentage
<b>Age Group</b>	60 to70 years	51	39.20%
	71 to 80 years	39	30.00%
	Above 80 years	40	30.80%
<b>SEX</b>	Female	95	73.10%
	Male	35	26.90%
<b>DIAGNOSIS</b>	InterTrochanteric Fracture	69	53.10%
	Neck of Femur Fracture	61	46.90%

**Table: Comparison of demographic parameters between IT and NOF fractures**

		DIAGNOSIS				$\chi^2$ value	df	P value
		IT Fracture		NOF Fracture				
		N	%	N	%			
<b>Age Group</b>	60-70 years	26	37.68%	25	40.98%	0.27	2	0.874
	71-80 years	22	31.88%	17	27.87%			
	Above 80 years	21	30.43%	19	31.15%			
<b>SEX</b>	Female	48	69.57%	47	77.05%	0.92	1	0.337
	Male	21	30.43%	14	22.95%			
<b>ASA GRADE</b>	III	30	43.48%	27	44.26%	0.35	2	0.838
	II	32	46.38%	26	42.62%			
	I	7	10%	8	13%			

\*Statistical significance set at 0.05; N: Number of samples;  $\chi^2$  value: Hi square value; df: Degrees of freedom

Fracture types included intertrochanteric (IT) fractures (53.10%) and neck of femur (NOF) fractures (46.90%). Surgical management varied: IT fractures were treated mainly with intramedullary nails (n=63), while NOF fractures often required hemiarthroplasty (n=56). Functional assessment using the Functional Ambulation Category (FAC) revealed a decline at discharge (71.70% scored 0) but gradual recovery by six months (42.20%

scored 3). The Barthel Index also showed significant improvement over time. Comparative analysis between IT and NOF fractures indicated significant differences in post-operative functional recovery and Barthel Index scores, particularly at discharge (p=0.033) and one month post-surgery (p=0.003).

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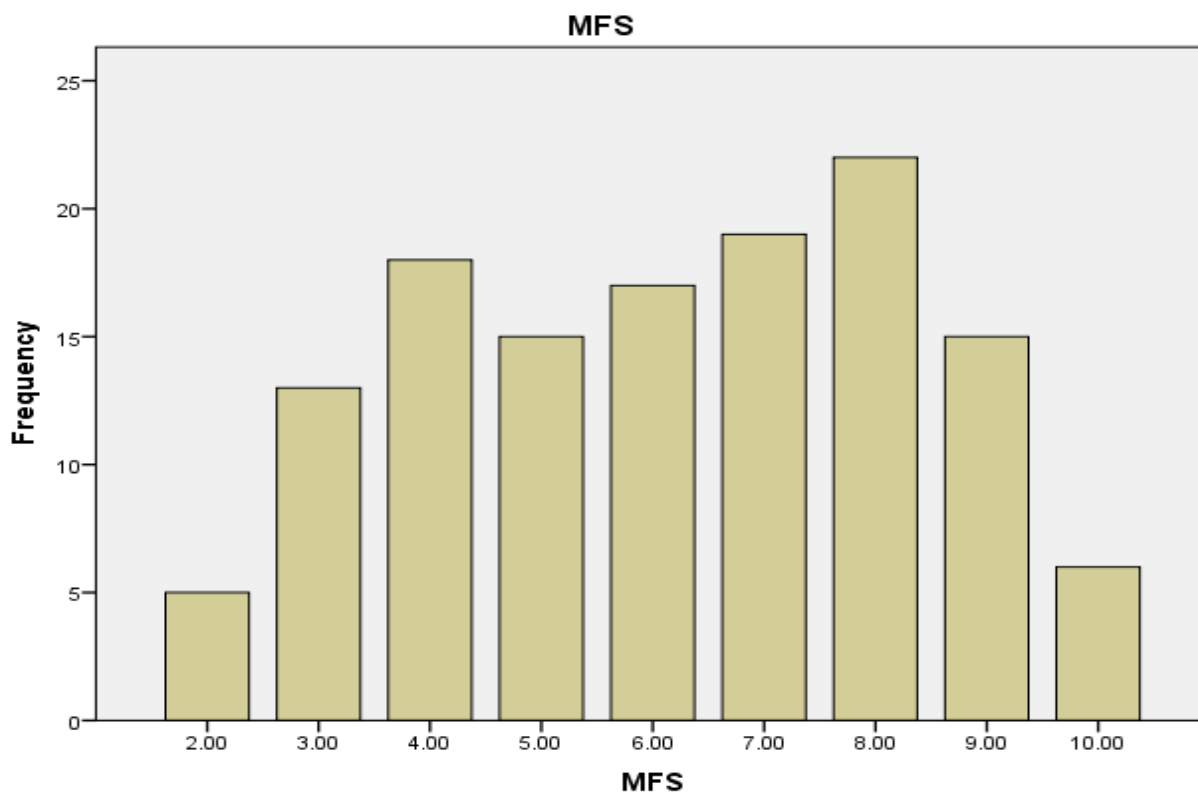
A significant correlation was found between the Multidimensional Frailty Score (MFS) and total hospital stay (r=0.29, p=0.001). Higher MFS values were

associated with increased mortality risk, with an odds ratio of 3.42 for each unit increase in MFS (p<0.001).

**Table: Correlation of MFS with Total Hospital stay and Post op Stay**

		TOTAL HOSPITAL STAY	POST-OP STAY
<b>MFS</b>	N	130	129
	Spearman Correlation Coefficient	0.29	0.18
	P value	<b>0.001*</b>	<b>0.043*</b>

\*Statistical significance set at 0.05; N: Number of samples



**Fig: MFS Score frequency**

**Classification table**

		Predicted			Correct
		Alive	Death		
Observed	Alive	96	6	94.12%	
	Death	13	15	53.57%	
Total				85.38%	

**Table: Association of MFS in predicting mortality (Logistic Regression)**

Total number of cases	Correct assignments	In percent
130	111	85.38%

Among the 130 patients, there were three cases of superficial surgical site infection and one case of implant dislocation (hemiarthroplasty) requiring surgical intervention.

This study underscores the importance of frailty assessment in predicting outcomes and managing care for patients with proximal femur fractures.

## **DISCUSSION**

In this study MFS score of 5 or higher were more likely to experience complications and had poorer functional outcomes and were associated with longer hospital stays and higher mortality risks, with a 3.42 times increased risk of mortality for each unit increase in MFS score.

In our study Serum albumin level showed a clear correlation between low levels and a higher risk of death. There were 28 recorded deaths, with one occurring in the high serum albumin group, two in the normal range, and 25 in the low serum albumin category. This result was consistent with previous research showing that low serum albumin is a strong indicator of poor outcomes in the elderly. This signifies that low serum albumin levels are associated with malnutrition, which leads to frailty and negative health consequences, such as decreased functional ability and prolonged recovery periods. Approximately 82.14% of deaths occurred among people with a CCI greater than 2, indicating that most patient had higher comorbidity scores. This result supported previous research that linked higher CCI scores to worse health outcomes and higher rates of death among senior citizens. Thus identification of predictive risk factors, particularly through the use of the Multidimensional Frailty Scale (MFS), emerges as a critical element in improving clinical decision-making and patient care [5].

Our study found a significant correlation between MFS values and total hospital stay ( $r=0.29$ ,  $p=0.001$ ), reinforcing the scale's predictive validity [8].

Surgical management varied among the types of fractures, with intertrochanteric fractures predominantly treated with intramedullary nails and neck of femur fractures often requiring hemiarthroplasty. The differences in post-operative recovery between these groups, particularly in Barthel Index scores at discharge and one month post-surgery, underscore the need for tailored rehabilitation strategies [10]. The decline in functional ability at discharge, with 71.70% of patients scoring 0 on the Functional Ambulation Category (FAC), points to the immediate challenges faced by this population. However, the observed gradual recovery by six months (42.20% scoring 3) suggests that with appropriate rehabilitation, significant improvements can be achieved [11].

The interdisciplinary care model involving orthopedic surgeons, anesthesiologists, geriatricians, and rehabilitation specialists is essential for optimizing outcomes in this complex patient population [12]. Such collaborative approaches ensure that both surgical and nonsurgical aspects of care are addressed, ultimately leading to better recovery and quality of life for patients.

## **LIMITATION**

The study has several limitations that should be considered when interpreting the findings. First, being conducted at a single center may limit the generalizability of the results to other hospitals or populations. Additionally, insufficient sample size to detect statistically significant differences, potentially affecting the reliability of the outcomes. While validated tools like the Multidimensional Frailty Score were used

to assess comorbidities, unmeasured factors could still influence results. Variability in surgical techniques and the focus on mortality and morbidity may overlook other important aspects, such as psychological well-being and pain management. Finally, the short follow-up period of six months may not adequately capture long-term recovery and outcomes, making it difficult to draw comprehensive conclusions about the overall impact of the interventions studied.

## **CONCLUSION**

This study highlights the critical role of comprehensive frailty assessments, particularly using the Multidimensional Frailty Scale (MFS), in predicting outcomes for patients with proximal femur fractures. With 21% of the patients experiencing mortality within six months, these findings correlate with existing literature that suggests a high risk of post-fracture mortality among older adults.

The MFS scores demonstrated strong predictive validity for complications, longer hospital stays, and increased mortality risk, particularly with scores of 5 or higher. The association between low serum albumin levels and adverse outcomes further emphasizes the importance of nutritional assessment in managing these patients. Proximal hip fractures represent a major health issue in the aging population due to rise in osteoporosis. The Multidimensional Frailty Scale (MFS) offers a holistic view of a patient's health status by incorporating various domains, including physical, psychological, and social factors. This multidimensional approach enhances the identification of frailty, which may be overlooked by unidimensional scores. In our study there were 28 deaths among 130 individuals within 6 months accounting for 21% of deaths as evidenced by the finding that 20-30% of patients may die within one-year post-fracture. This underscores the necessity for healthcare providers to be vigilant in assessing not just the fracture itself, but the broader implications for functional abilities and quality of life.

Overall, the necessity for an interdisciplinary care model is evident, as it can enhance patient outcomes by addressing the multifaceted needs of this complex population. This study advocates for integrating frailty assessments and comprehensive preoperative evaluations into clinical practice to improve decision-making and patient care for those suffering from proximal femur fractures.

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