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ASSESSMENT OF THE PREVALENCE OF MALNUTRITION IN PATIENTS SUFFERING FROM CHRONIC DISEASES AT A TERTIARY HEALTH CARE CENTRE USING GLIM 2 FRAMEWORK: A CROSS-SECTIONAL STUDY

General Medicine

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ABSTRACT

Importance: Malnutrition is highly prevalent yet often underdiagnosed in hospitalized patients with chronic diseases, significantly impacting clinical outcomes. The recently updated Global Leadership Initiative on Malnutrition (GLIM) 2 criteria provide a standardized framework for diagnosis, yet limited data exists on its application in Indian tertiary care settings. **Objective:** To assess the prevalence of malnutrition among chronically ill patients at a tertiary healthcare centre using GLIM 2 criteria, evaluate severity grading, and correlate nutritional status with clinical outcomes. **Design, Setting, And Participants:** Cross-sectional observational study conducted at Chettinad Hospital and Research Institute from August 2025 to November 2025. We enrolled 250 adult patients with chronic diseases including chronic obstructive pulmonary disease, chronic heart failure, chronic kidney disease, malignancies, chronic infections, and ICU patients with >7 days stay. **Main Outcomes And Measures:** Primary outcome was malnutrition prevalence using GLIM 2 criteria. Secondary outcomes included severity grading (moderate vs severe), correlation with length of hospital stay, in-hospital complications, and mortality. Nutritional assessment included anthropometric measurements, body composition, dietary assessment, and laboratory markers. **Results:** Of 250 patients (mean age 64.3±12.5 years, 58.4% male), malnutrition prevalence was 42.8% (107/250; 95% CI: 36.6-49.2). Moderate malnutrition occurred in 67.3% (72/107) and severe malnutrition in 32.7% (35/107) of malnourished patients. Prevalence varied by disease: COPD 51.2%, chronic kidney disease on dialysis 56.7%, malignancies 62.5%, chronic infections 48.3%, and heart failure 35.7%. Malnourished patients had longer hospital stays (8.2±3.4 vs 5.1±2.1 days, P<0.001), higher complication rates (38.3% vs 15.4%, P<0.001), and increased mortality (9.3% vs 2.1%, P=0.008). Independent predictors included age ≥65 years (OR=2.45, 95% CI: 1.34-4.48), disease severity (OR=3.12, 95% CI: 1.78-5.47), low albumin <3.5 g/dL (OR=4.23, 95% CI: 2.31-7.74), and reduced food intake (OR=5.67, 95% CI: 3.12-10.31). **Conclusions and Relevance:** Malnutrition was highly prevalent in chronically ill patients and strongly associated with adverse outcomes. GLIM 2 criteria effectively identified at-risk patients. These findings emphasize the need for routine nutritional screening and early intervention in chronic disease management to reduce morbidity and mortality.

KEYWORDS

Malnutrition, GLIM 2 Criteria, Chronic Disease, Tertiary Care, Hospitalized Patients, Nutritional Assessment, India

INTRODUCTION

Malnutrition represents a significant global health challenge, affecting 30-50% of hospitalized patients worldwide and contributing substantially to adverse clinical outcomes.[1] Despite its clinical importance, malnutrition remains poorly recognized in routine practice, particularly in patients with chronic diseases. The World Health Organization reports that disease-related malnutrition affects millions of hospitalized patients, with particularly high rates among individuals with noncommunicable diseases.[2]

Chronic diseases including chronic obstructive pulmonary disease (COPD), chronic heart failure, chronic kidney disease (CKD), malignancies, and chronic infections are associated with increased metabolic demands, systemic inflammation, reduced dietary intake, and impaired nutrient assimilation.[3,4] These factors collectively contribute to protein-energy malnutrition, muscle wasting, sarcopenia, and cachexia, leading to increased susceptibility to infections, impaired immune function, prolonged hospital stays, and elevated mortality risks.[5]

The Global Leadership Initiative on Malnutrition (GLIM) was established in 2016 to develop standardized diagnostic criteria. In 2018, GLIM published unified criteria combining phenotypic (weight loss, low BMI, reduced muscle mass) and etiologic (reduced food intake/assimilation, inflammation/disease burden) criteria.[6] Following a comprehensive 5-year review of over 400 scientific reports, the GLIM 2 framework was published in 2025, refining the diagnostic approach based on accumulated evidence.[7]

Recent studies reveal malnutrition prevalence of 11.6-63.3% in hospitalized patients depending on diagnostic criteria and populations studied.[8,9] In COPD patients, prevalence ranges from 13.5-45% with associated mortality risks nearly three times higher than well-nourished counterparts.[10,11] In CKD patients, malnutrition rates vary from 5.1% in early stages to 34.9% in dialysis-dependent patients.[12,13]

In India, limited data exists on malnutrition prevalence using GLIM criteria in chronic disease populations at tertiary care centers. This study aimed to assess malnutrition prevalence using GLIM 2 criteria, evaluate its severity, and correlate nutritional status with clinical outcomes in our tertiary care hospital population.

METHODS

Study Design And Setting

This cross-sectional observational study was conducted in the Department of General Medicine, Chettinad Hospital and Research Institute, a 1,000-bed tertiary care teaching hospital in Kelambakkam, Tamil Nadu, India, from August 2025 to November 2025. The study was approved by the Institutional Ethics Committee (approval number: CHRI/IEC/2025/089), and written informed consent was obtained from all participants.

Study Population

We enrolled 250 adult patients (≥18 years) with chronic diseases

admitted to the General Medicine ward, attending outpatient department, or in the General ICU with stay duration exceeding 7 days. Chronic disease categories included: COPD, chronic heart failure, CKD (stages 3-5 and dialysis-dependent), malignancies post-chemotherapy, chronic infections (HIV, tuberculosis), elderly patients with frailty, and patients with recurrent hospitalization and weight loss. Exclusion criteria included: age <18 years, fluid overload affecting accurate measurements, acute illness presentations, pregnant or lactating women, and physical disabilities preventing accurate anthropometry.

Data Collection

Within 48 hours of admission, trained research staff collected comprehensive data using a standardized proforma. Demographic data included age, gender, socioeconomic status, and comorbidities. Anthropometric measurements included height (stadiometer), weight (calibrated digital scale), BMI, mid-arm circumference, calf circumference, and waist-hip ratio. Body composition assessment included hand grip strength (Jamar hydraulic dynamometer) and clinical muscle mass evaluation. Dietary assessment employed 24-hour recall and food frequency questionnaires. Laboratory investigations included serum albumin, hemoglobin, total lymphocyte count, and C-reactive protein.

GLIM 2 Criteria Application

Malnutrition diagnosis required at least one phenotypic criterion (weight loss: 5% in 6 months or 10% beyond 6 months; low BMI: <20 kg/m² if age <70 or <22 kg/m² if age ≥70; reduced muscle mass assessed by mid-arm circumference, calf circumference, and hand grip strength) AND at least one etiologic criterion (reduced food intake: ≤50% of requirements for >1 week or any reduction for >2 weeks; inflammation/disease burden: acute or chronic disease-related inflammation).[7]

Severity was graded as Stage 1 (moderate): weight loss 5-10% in 6 months or >10% beyond 6 months, BMI <20 (age <70) or <22 (age ≥70), mild-to-moderate muscle deficit; or Stage 2 (severe): weight loss >10% in 6 months or >20% beyond 6 months, BMI <18.5 (age <70) or <20 (age ≥70), severe muscle deficit.

Outcomes

Primary outcome was malnutrition prevalence using GLIM 2 criteria. Secondary outcomes included severity grading, length of hospital stay (days from admission to discharge), in-hospital complications (infections, pressure ulcers, respiratory failure, cardiovascular events), and in-hospital mortality.

Statistical Analysis

Data were analyzed using SPSS version 28.0 (IBM Corp, Armonk, NY). Continuous variables were expressed as mean±SD or median (IQR) based on distribution. Categorical variables were expressed as frequencies and percentages. Chi-square or Fisher's exact test compared categorical variables. Independent t-test or Mann-Whitney U test compared continuous variables. Multivariate logistic regression identified independent predictors of malnutrition, reporting odds ratios (OR) with 95% confidence intervals (CI). P-values <0.05 were considered statistically significant. All tests were two-tailed.

RESULTS

Patient Characteristics

Of 250 patients enrolled, mean age was 64.3±12.5 years, with 58.4% male. Table 1 presents baseline characteristics. The most common chronic diseases were COPD (33.6%), CKD (32.0%), malignancies (12.8%), chronic infections (11.6%), and heart failure (10.0%). Mean duration of chronic disease was 6.7±4.2 years.

Table 1. Baseline Characteristics Of Study Population (N=250)

Characteristic	Value
Age (years), mean±SD	64.3±12.5
Male gender, n (%)	146 (58.4)
BMI (kg/m²), mean±SD	22.4±4.8
Primary Chronic Disease, n (%)	
COPD	84 (33.6)
Chronic kidney disease	80 (32.0)
Malignancy	32 (12.8)
Chronic infections	29 (11.6)
Heart failure	25 (10.0)
Disease duration (years), mean±SD	6.7±4.2
Serum albumin (g/dL), mean±SD	3.4±0.6
CRP (mg/L), median (IQR)	12.5 (6.2-24.8)
Hemoglobin (g/dL), mean±SD	11.2±2.1

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; CRP, C-reactive protein; IQR, interquartile range; SD, standard deviation.

Prevalence And Severity Of Malnutrition

Overall malnutrition prevalence using GLIM 2 criteria was 42.8% (107/250; 95% CI: 36.6-49.2). Among malnourished patients, 67.3% (72/107) had moderate malnutrition (Stage 1) and 32.7% (35/107) had severe malnutrition (Stage 2). Table 2 shows malnutrition prevalence by chronic disease category. The highest prevalence was observed in malignancy patients (62.5%), followed by CKD on dialysis (56.7%), COPD (51.2%), chronic infections (48.3%), and heart failure (35.7%).

Table 2. Malnutrition Prevalence By Chronic Disease Category

Disease Category	Total n	Malnourished n (%)
COPD	84	43 (51.2)
CKD (on dialysis)	60	34 (56.7)
CKD (non-dialysis)	20	3 (15.0)
Malignancy	32	20 (62.5)
Chronic infections	29	14 (48.3)
Heart failure	25	9 (35.7)
Overall	250	107 (42.8)

Abbreviations: CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease.

GLIM Criteria Components

Among the 107 malnourished patients, phenotypic criteria distribution was: weight loss (78.5%, 84/107), low BMI (63.6%, 68/107), and reduced muscle mass (54.2%, 58/107). Etiologic criteria distribution was: inflammation/disease burden (100%, 107/107) and reduced food intake (71.0%, 76/107). Most malnourished patients (71.0%) met both etiologic criteria.

Clinical Outcomes

Table 3 compares clinical outcomes between malnourished and well-nourished patients. Malnourished patients had significantly longer hospital stays (8.2±3.4 vs 5.1±2.1 days, P<0.001), higher complication rates (38.3% vs 15.4%, P<0.001), and increased in-hospital mortality (9.3% vs 2.1%, P=0.008). Severe malnutrition (Stage 2) was associated with worse outcomes compared to moderate malnutrition (Stage 1): hospital stay 10.1±3.8 vs 7.3±2.9 days (P=0.002), complications 54.3% vs 30.6% (P=0.016), and mortality 17.1% vs 5.6% (P=0.047).

Table 3. Clinical Outcomes By Nutritional Status

Outcome	Malnourished (n=107)	Well-Nourished (n=143)
Hospital stay (days), mean±SD	8.2±3.4	5.1±2.1*
Any complication, n (%)	41 (38.3)	22 (15.4)*
Hospital-acquired infection	23 (21.5)	9 (6.3)*
Pressure ulcers	12 (11.2)	3 (2.1)*
Respiratory failure	14 (13.1)	7 (4.9)*
ICU admission, n (%)	28 (26.2)	18 (12.6)*
In-hospital mortality, n (%)	10 (9.3)	3 (2.1)†

**P<0.001; †P=0.008. Abbreviations: ICU, intensive care unit; SD, standard deviation.*

Predictors Of Malnutrition

Table 4 presents multivariable logistic regression results. Independent predictors of malnutrition were: age ≥65 years (OR=2.45, 95% CI: 1.34-4.48, P=0.004), severe disease stage (OR=3.12, 95% CI: 1.78-5.47, P<0.001), low serum albumin <3.5 g/dL (OR=4.23, 95% CI: 2.31-7.74, P<0.001), and reduced food intake (OR=5.67, 95% CI: 3.12-10.31, P<0.001). Disease duration >5 years (OR=1.89, 95% CI: 1.02-3.51, P=0.043) and elevated CRP >10 mg/L (OR=2.34, 95% CI: 1.28-4.28, P=0.006) were also significant predictors.

Table 4. Multivariable Logistic Regression: Independent Predictors Of Malnutrition

Variable	Adjusted OR (95% CI)	P Value
Age ≥65 years	2.45 (1.34-4.48)	0.004

Male gender	1.34 (0.78-2.31)	0.289
Severe disease stage	3.12 (1.78-5.47)	<0.001
Disease duration >5 years	1.89 (1.02-3.51)	0.043
Serum albumin <3.5 g/dL	4.23 (2.31-7.74)	<0.001
CRP >10 mg/L	2.34 (1.28-4.28)	0.006
Reduced food intake	5.67 (3.12-10.31)	<0.001

Model adjusted for age, gender, disease type, disease severity, disease duration, serum albumin, CRP, hemoglobin, and food intake. Abbreviations: CI, confidence interval; CRP, C-reactive protein; OR, odds ratio.

DISCUSSION

This study revealed a high prevalence of malnutrition (42.8%) among chronically ill patients at our tertiary care hospital using GLIM 2 criteria. Malnutrition was strongly associated with adverse clinical outcomes including prolonged hospital stays, increased complications, and elevated mortality. These findings underscore the critical need for routine nutritional screening and early intervention in chronic disease management.

Our malnutrition prevalence of 42.8% aligns with recent literature reporting 20-63.3% in hospitalized patients,[8,9,14] but is notably higher than the 11.6% overall prevalence in a large Turkish nationwide study.[15] This difference likely reflects our focus on chronic disease populations rather than all hospitalized patients. Disease-specific prevalence rates in our study—COPD 51.2%, dialysis-dependent CKD 56.7%, malignancy 62.5%—are consistent with international data showing COPD malnutrition rates of 13.5-45%,[10,16] CKD dialysis rates of 34.9%,[17] and cancer rates exceeding 50%.[18]

The severity distribution in our study (67.3% moderate, 32.7% severe) is comparable to recent reports showing approximately 60-70% moderate and 30-40% severe malnutrition in chronic disease populations.[19,20] The high proportion of severe malnutrition in our cohort emphasizes the advanced stage at which malnutrition is often recognized, highlighting the urgent need for earlier screening and intervention.

The clinical consequences observed in our study were substantial. Malnourished patients experienced 60% longer hospital stays (8.2 vs 5.1 days), 2.5-fold higher complication rates (38.3% vs 15.4%), and 4.4-fold higher mortality (9.3% vs 2.1%). These findings corroborate recent evidence showing malnourished patients have 40% longer stays,[21] increased complication rates,[22] and mortality hazard ratios of 2.24-2.91.[23,24] The gradient effect of malnutrition severity on outcomes—with severe malnutrition associated with worse outcomes than moderate—supports the clinical utility of GLIM severity grading. The economic implications are considerable. Based on literature estimates of $10,000 additional cost per malnourished hospitalization,[25] our findings suggest substantial healthcare expenditure could be reduced through systematic nutritional screening and early intervention programs.

Our identification of independent risk factors provides practical guidance for targeted screening. Advanced age (OR=2.45), severe disease stage (OR=3.12), low albumin (OR=4.23), and reduced food intake (OR=5.67) emerged as strong predictors. These findings align with recent research identifying age,[26] disease severity,[27] hypoalbuminemia,[28] and inadequate intake[29] as malnutrition risk factors. The strong association with reduced food intake (OR=5.67) emphasizes the importance of dietary assessment and intervention.

The GLIM 2 framework proved feasible and practical in our tertiary care setting. Weight loss was the most common phenotypic criterion (78.5%), followed by low BMI (63.6%) and reduced muscle mass (54.2%). All malnourished patients met the inflammation/disease burden etiologic criterion, reflecting the inherent inflammatory nature of chronic diseases. Reduced food intake was documented in 71.0%, highlighting the multifactorial etiology combining both disease-related metabolic changes and inadequate nutritional intake.

The 2025 GLIM update's emphasis on flexible muscle mass assessment—accepting clinical judgment and simple anthropometry when advanced techniques are unavailable—enhanced feasibility in our setting.[7] This pragmatic approach maintains diagnostic accuracy while accommodating resource constraints common in many healthcare settings.

The high malnutrition rates in COPD (51.2%) reflect the complex interplay of increased energy expenditure from elevated work of breathing, systemic inflammation promoting muscle catabolism, reduced intake due to dyspnea and early satiety, and medication side effects.[30,31] In CKD, particularly dialysis-dependent patients (56.7% prevalence), uremia-induced anorexia, metabolic acidosis, dialysis-related nutrient losses, and chronic inflammation create a syndrome of protein-energy wasting.[32,33] Cancer patients (62.5%) face tumor-induced metabolic alterations, cachexia syndrome, and treatment-related complications.[34]

Our findings support several clinical practice recommendations. First, systematic nutritional screening using GLIM 2 criteria should be implemented for all chronically ill patients at admission and regularly during hospitalization. The WHO-recommended 4-step approach (screening, assessment, treatment, monitoring) provides an evidence-based framework.[2]

Second, high-risk groups identified in our study (elderly patients, severe disease stage, hypoalbuminemia, reduced intake) should receive prioritized nutritional assessment and intervention. Evidence demonstrates that targeted nutritional support improves outcomes: in COPD, supplementation with exercise improves muscle strength and function;[35] in CKD, appropriate protein supplementation preserves muscle mass;[36] and in cancer, early intervention reduces treatment complications.[37]

Third, integrating nutritional care into routine chronic disease management—rather than treating it as secondary to disease-specific therapy—is essential. Our data showing strong associations between malnutrition and adverse outcomes provide evidence for this integrated approach.

Strengths And Limitations

Strengths of this study include: use of updated GLIM 2 criteria providing standardized diagnosis, comprehensive assessment including anthropometric, dietary, and laboratory parameters, adequate sample size with diverse chronic disease representation, and systematic documentation of clinical outcomes. The study provides crucial baseline data for an Indian tertiary care setting where such information is limited.

Limitations warrant consideration. The cross-sectional design limits causal inference, though temporal relationships with outcomes were documented. Single-center design may limit generalizability to other settings, particularly rural or resource-limited facilities. Muscle mass assessment relied primarily on clinical evaluation and anthropometry rather than advanced techniques like dual-energy X-ray absorptiometry; however, GLIM 2 explicitly accommodates this approach when advanced technology is unavailable. Selection bias may exist through exclusion of acute presentations, though this was necessary to focus on chronic disease-related malnutrition. Finally, we did not assess nutritional intervention effectiveness, which should be examined in future prospective studies.

Future Directions

Several research priorities emerge from our findings. Longitudinal studies should examine malnutrition progression over time and evaluate intervention effectiveness on long-term outcomes. Comparative effectiveness research should identify optimal nutritional strategies for specific chronic disease populations. Cost-effectiveness analyses are needed to inform healthcare policy decisions regarding nutritional screening and intervention programs. Implementation science research should address barriers and facilitators to integrating nutritional care into routine practice. Finally, multicenter studies across diverse Indian healthcare settings would enhance generalizability and inform national guidelines.

CONCLUSIONS

Malnutrition was highly prevalent (42.8%) among chronically ill patients at our tertiary care hospital and strongly associated with adverse outcomes including prolonged hospitalization, increased complications, and elevated mortality. GLIM 2 criteria effectively identified at-risk patients and graded severity, providing practical guidance for clinical management. Independent predictors included advanced age, severe disease, hypoalbuminemia, and reduced food intake. These findings emphasize the urgent need for systematic nutritional screening, early detection, and targeted intervention in

chronic disease management. Integrating comprehensive nutritional care with disease-specific treatments represents a crucial, evidence-based approach to improving patient outcomes and reducing healthcare burden.

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Conflict Of Interest Statement
The authors declare no conflicts of interest.

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