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Hospital malnutrition in gastro-entero-hepatology (GEH) patients and its relationship to clinical outcomes: a retrospective cohort study

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ABSTRACT

Background: Hospital malnutrition remains a significant global health burden, particularly among gastro-entero-hepatology patients. It adversely impacts clinical outcomes, prolongs hospital stays, and raises healthcare costs. Despite its relevance, recent data on malnutrition among Indonesia's gastro- entero-hepatology (GEH) patients are limited.

Objective: To determine the prevalence of malnutrition and its associated risk factors and clinical outcomes, inflammatory markers, and Prognostic Nutritional Index (PNI) in GEH patients at Wahidin Sudirohusodo General Hospital.

Methods: A retrospective cohort study was conducted among569 GEH inpatients aged 18–59 years with hospital stays exceeding 7 days. Nutritional risk was assessed using the Malnutrition Screening Tool (MST), while Neutrophil-Lymphocyte Ratio (NLR), Total Lymphocyte Count (TLC), and Prognostic Nutritional Index (PNI) were measured as inflammatory markers. Statistical analyses evaluated correlations between malnutrition risk, clinical outcomes, and laboratory values.

Results: Of the 569 patients, 7.4% were at high risk of malnutrition, 38.7% at moderate risk, and 54% at low risk. High-risk patients showed significantly elevated NLR ($p < 0.001$) and lower TLC ($p < 0.001$), reflecting an impaired immune response. These patients also had a lower PNI ($p < 0.001$) and more extended hospital stays ($p < 0.001$). No significant difference in mortality was found between different malnutrition risk groups.

Conclusion: Malnutrition is prevalent among GEH patients, particularly those with malignancies. Early nutritional screening and appropriate interventions are essential to improving clinical outcomes and reducinghospital stay durations. A multidisciplinary approach is necessary to optimize patient care.

KEYWORDS

Nutritional Status, Digestive Pathology, Clinical Malnutrition, Nutritional Intervention, Nutritional Support, Medical Prognosis.

INTRODUCTION

Hospital malnutrition is a significant global health burden, particularly among hospitalized patients. Malnutrition in hospitalized patients worsens prognosis, diminishes quality of life, and increases healthcare costs due to elevated mortality and morbidity rates, higher infection rates, prolonged hospital stays, reduced responses to medical treatment, and increased readmission rates.

[1]. The global prevalence of hospital malnutrition remains alarmingly high, ranging from 33% to 54%. In Indonesia, malnutrition data for hospitalized patients is limited, as not all hospitals conduct malnutrition risk screenings according to accreditation standards. The prevalence of hospital malnutrition in Indonesia ranges between 33% and 70%. In a 2010 study by Nurpudji et al. at Wahidin Sudirohusodo General Hospital, Makassar, mild-to-moderate malnutrition was 44%, while severe malnutrition affected 37% of inpatients. Moreover, two-thirds of patients with poor nutrition quality experience further deterioration during hospitalization if not

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promptly treated, while one-third of well- nourished patients may experience a decline in nutritional status[2].

Hospital malnutrition is caused by several factors, including inadequate intake and complex physiological and metabolic changes due to the disease process. The disease condition is often characterized by acute inflammatory responses that disrupt average nutrient utilization and promote catabolism or hypermetabolism. In some instances of disease-related malnutrition, nutritional support alone may be insufficient to prevent further nutritional decline, even when energy intake matches energy expenditure[3,4]. Therefore, it is recommended that a validated nutritional assessment be performed within the first 24 hours of admission and weekly thereafter during hospitalization, especially following changes in a patient's clinical condition. However, dietary assessments are sometimes overlooked due to competing clinical priorities, posing a significant challenge in reducing hospital-acquired malnutrition rates[4].

Although hospital malnutrition has been widely studied, research on the specific magnitude of malnutrition acquired during hospitalization and the institutional factors contributing to its worsening remains incomplete[5,6]. Malnutrition prevalence ranges between 6.1% and 69.7% among patients with GEH disorders. Disruption of digestive system function can impair nutrient digestion and absorption, leading to malnutrition. If not promptly addressed, malnutrition is expected to worsen the clinical outcomes of gastro-entero-hepatology patients[6]. Given the lack of recent data on malnutrition among gastro-entero-hepatology patients, particularly at Wahidin Sudirohusodo General Hospital, this study aims to fill that gap by investigating the prevalence and risk factors of hospital malnutrition in this patient population.

METHODS

Type of Study

This study is a retrospective cohort analysis conducted on patients diagnosed with GEH diseases hospitalized at Wahidin Sudirohusodo General Hospital, Makassar, between January 2022 and January 2024.

Subjects

The research subjects included all GEH inpatients at Wahidin Sudirohusodo General Hospital, Makassar, from January 2022 to January 2024, who met the inclusion criteria. The inclusion criteria for the study were as follows: patients diagnosed with GEH diseases as the primary diagnosis, confirmed by history, clinical examination, laboratory tests, and histopathology or endoscopy, regardless of consultation with the Clinical Nutrition Department. Eligible patients were aged between 18 and 59 years. Additionally, the availability of laboratory results, including a complete blood count (NLR, TLC) and serum albumin (PNI), was required, along with a hospital stay exceeding 7 days. The exclusion criteria included patients not meeting these conditions or those with GEH diseases in critical condition.GEH diseases under study encompassed conditions related to gastroenterology, such as chronic diarrhea, GERD, and hematemesis, as well as hepatology conditions like liver abscesses, biliary stones, and cirrhosis. Nutritional status and Hospital Malnutrition were assessed using the Malnutrition Screening Tool (MST), categorizing patients as low, moderate, or high risk[23]. Additional variables included the Prognostic Nutritional Index (PNI), calculated from serum albumin levels and total lymphocyte count (TLC), and the Neutrophil-Lymphocyte Ratio (NLR), determined by the ratio of absolute neutrophil count to absolute lymphocyte count. Other variables studied were total lymphocyte count (TLC), length of stay (LOS) in the hospital, mortality (death during hospitalization), complications arising during hospitalization, patient age, and the presence of comorbidities.

Ethical Clearance

This study was approved by the Ethics Committee of Wahidin Sudirohusodo General Hospital, and the hospital administration granted permission to access patient medical records. The research adhered to the ethical principles of confidentiality and patient anonymity.

Data Processing and Analysis

Descriptive statistics were used to present data in tables and graphs. Depending on data distribution, comparative analysis was performed using one-way ANOVA, T-tests, or Mann- Whitney tests. Correlation analysis was performed using Spearman's test. Significance levels were set at $p < 0.05$.

RESULTS

This study included 569 patients who met the inclusion and exclusion criteria. Data were collected and analyzed by comparing nutritional status with inflammatory markers (Neutrophil-Lymphocyte Ratio [NLR] and Total Lymphocyte Count [TLC]), Prognostic Nutritional Index (PNI), length of stay (LOS), and mortality.

Patient Characteristics

The average age of the participants was 47.0 ± 10.2 years. Most of the sample was male (62.9%, n=358), while 37.1% (n=211) were female. Most patients had completed formal education (94.7%, n=539), and 57.7% (n=328) were employed. Regarding marital status, 83.1% (n=473) were married, and 16.9% (n=96) were unmarried (Table 1).

The majority of patients had normal white blood cell (WBC) counts (51.8%, n=295) and platelets (58%, n=330). However, abnormal values were observed in hemoglobin (68.7%, n=391), neutrophil (50.6%, n=288), and lymphocyte counts (60.1%, n=342).

Table 1. Baseline Characteristics

Variables		Total (n = 569)
Age (yeay)		47.0 ± 10.2
Gender (n/percentage)	Male	358 (62.9%)
	Female	211 (37.1%)
Formal Education (n/percentage)	No	30 (5.3%)
	Yes	539 (94.7%)
Occupational Status (n/percentage)	Employed	328 (57.7%)
	Unemployed	241 (42.3%)
Marital Status (n/percentage)	Married	473 (83.1%)
	Unmarried	96 (16.9%)
White Blood Cell (WBC) (103/ul)		11.01±10.70
Hemoglobin (Hb) (gr/dl)		10.91±5.38
Platelet (PLT) (103/ul)		263.62±161.22
Neutrophil (%)		69.41±15.01
Lymposit (%)		18.57±10.50
Albumin (gr/dl)		3.06±1.47

Values are n (%) or means ± SD, unless otherwise stated.

Relationship Between Variables and MST

As shown in Table 2, Most patients (76.4%, n=435) had a hospital stay of fewer than two weeks, while 23.6% (n=134) stayed longer. The survival rate during hospitalization was 86.1% (n=490), with 13.9% (n=79) of patients dying during their stay.

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Malnutrition Screening Tool (MST) scores showed that 54% (n=307) of patients were at low risk of malnutrition, 38.7% (n=220) were at moderate risk, and 7.4% (n=42) were at high risk. Most patients (81.5%, n=464) did not receive medical nutrition therapy, while 18.5% (n=105) did.

Statistically significant relationships were observed between MST and several variables: NLR (p- value <0.001) and Spearman's correlation was positive (r=0.209), indicating a direct association; TLC (p-value <0.001), with a positive correlation (r=0.211); PNI (p- value <0.001 and a positive Spearman correlation (r=0.233) indicated a significant direct relationship; Length of stay (LOS) (p-value <0.001), with a positive correlation (r=0.179). No significant relationship was found between mortality and MST (p-value = 0.141, r = 0.062).

Table 2. Relationship Between Variables and MST

Variables			MST			Total	p-value
			Low Risk	Moderate Risk	High Risk		
NLR	Normal (≤3)	n	101	43	0	144	<0.001
		%	32.9%	19.5%	0.0%	25.3%	
	Abnormal (>3)	n	206	177	42	425	
		%	67.1%	80.5%	100.0%	74.7%	
TLC	Normal (≤1500)	n	126	55	4	185	<0.001
		%	41.0%	25.0%	9.5%	32.5%	
	Abnormal (>1500)	n	181	165	38	384	
		%	59.0%	75.0%	90.5%	67.5%	
PNI	Abnormal (>50)	n	246	167	6	419	<0.001
		%	80.1%	75.9%	14.3%	73.6%	
	Normal (≤50)	n	61	53	36	150	
		%	19.9%	24.1%	85.7%	26.4%	

*Chi-Square Test.

Table 2 continuation. Relationship Between Variables and MST

Variables			MST			Total	p-value
			Low Risk	Moderate Risk	High Risk		
Mortality	Alive	n	273	177	40	490	0.004
		%	88.9%	80.5%	95.2%	86.1%	
	Death	n	34	43	2	79	
		%	11.1%	19.5%	4.8%	13.9%	
Length of Hospitalization	<2 weeks	n	251	167	17	435	<0.001
		%	81.8%	75.9%	40.5%	76.4%	
	>2 weeks	n	56	53	25	134	
		%	18.2%	24.1%	59.5%	23.6%	
Medical utrition Therapy	Yes	n	0	63	42	105	<0.001
		%	0.0%	28.6%	100.0%	18.5%	
	No	n	307	157	0	464	
		%	100.0%	71.4%	0.0%	81.5%	
Total		n	307	220	42	569	
		%	100.0%	100.0%	100.0%	100.0%	

*Chi-Square Test.

DISCUSSION

According to the European Society for Parenteral and Enteral Nutrition (ESPEN), malnutrition is characterized by structural and functional changes in body composition. It is common in gastrointestinal diseases and carcinomas and is associated with prolonged hospital stays, increased infection rates, higher healthcare costs, and increased morbidity and mortality[7]. This study aligns with these findings, as most of the study subjects were at mild risk of malnutrition, according to the Malnutrition Screening Tool (MST). Previous research by Rizzi et al. showed that hospitalized patients are at higher risk of malnutrition than outpatients[4], and Cass and Charlton (2022) reported that 10% to 65% of patients experience nutritional decline during hospitalization[8].

Malnutrition and inflammation are closely linked in patients with gastrointestinal diseases, with inflammation affecting nutritional needs and intake. Inflammation triggers poor outcomes by inducing anorexia and altering metabolism, leading to increased energy expenditure and muscle catabolism[9]. In this study, most patients exhibited abnormal levels of inflammatory markers such as Neutrophil-Lymphocyte Ratio (NLR), Total Lymphocyte Count (TLC), albumin, and Prognostic Nutritional Index (PNI), which were significantly associated with MST. Patients with abnormal NLR, TLC, albumin, and PNI were categorized as being at mild nutritional risk based on MST. Inflammation due to acute or chronic illness leads to metabolic changes, affecting appetite, food intake, and gastrointestinal function at the cellular level, often through circulating cytokines like interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α)[10]. These cytokines contribute to low serum albumin levels, reflecting decreased synthesis and increased degradation during systemic inflammation[9].

NLR, an emerging marker of systemic inflammation, is a marker of inflammation and a significant prognostic predictor in various diseases. Kaya et al. demonstrated that NLR was significantly higher in malnourished or at-risk hospitalized patients than those with normal nutritional status[11]. This study also found a significant correlation between NLR and MST, which is consistent with prior research.

Albumin and TLC have long been recognized as predictors of postoperative complications. Rocha et al. found that when combined with nutritional assessments like subjective global

assessment (SGA), these parameters help identify patients at nutritional risk. Valero et al. also reported a positive association between serum albumin and lymphocyte counts and nutritional status, aligning with this study's findings[12].

PNI, developed initially to assess preoperative nutritional status and surgical risk in Japanese patients, has since been established as an independent prognostic indicator in a range of diseases[13]. This study found that most patients had abnormal PNI values, with a significant correlation between PNI and MST. These findings echo the work of Wu et al. (2023), who found low PNI to be associated with poor progression-free survival and overall survival in esophageal cancer patients.53 Similarly, Toya et al. (2021) and Xie et al. (2022) demonstrated that low PNI was linked to poor outcomes in elderly gastric cancer patients and those with decompensated liver cirrhosis, respectively[13,14].

Interestingly, this study found that most patients with malnutrition had less than two weeks of hospital stays, contrasting with research by Correia et al., which demonstrated an increase in malnutrition prevalence with more extended hospital stays.

[15]. Other studies, such as Beghetto et al., reported an increase in malnutrition rates from 40.2% at admission to 64.6% by the 14th day of hospitalization[16]. Malnourished patients typically have more extended hospital stays due to slower wound healing, higher complication rates, and increased mortality, which drive up healthcare costs.

[17]. Previous research has shown that 40% of patients are malnourished upon hospital admission and continue to experience nutritional decline during their stay[18].

In this study, there is a significant difference between patients who were given nutritional intervention and those who were not in terms of the risk of malnutrition and length of hospital stay. In line with a recent systematic review and meta-analysis by Gomes et al. (2022) of 27 clinical trials involving 6803 patients, nutritional support provided during hospitalization was associated with significantly lower rates of mortality and nonelective readmissions, as well as higher energy and protein intake and increased body weight[19].

Although malnutrition is associated with adverse outcomes, including immune depletion, impaired wound healing, muscle wasting, prolonged hospital stays, and higher mortality rates[20], this study found no significant association between mortality and MST. Most patients survived during hospitalization, which aligns with findings by Hormet et al. (2023), who reported no significant correlation between malnutrition and mortality using the Global Initiative on Malnutrition (GLIM) criteria[21]. This could be because most subjects in this study were classified as being at mild nutritional risk, excluding critically ill patients who might exhibit higher mortality rates.

Malnutrition is also linked to anemia and vitamin deficiencies. In this study, many patients had abnormal hemoglobin levels, indicative of iron deficiency, a common complication of malnutrition. Nutritional deficiencies have been associated with increased mortality in hospitalized and surgical patients[22], and malnutrition can further exacerbate mortality through mechanisms such as hypoglycemia and hypothermia. Malnutrition also increases the risk of infections due to impaired immune function, extending hospital stays and elevating healthcare costs.

In conclusion, malnutrition significantly affects outcomes in patients with gastroenterology-related diseases, a finding consistent with previous studies. Patel et al. (2023) found that malnourished patients with gastrointestinal diseases had higher risks of poor outcomes, including mortality, sepsis, deep vein thrombosis (DVT), and pulmonary embolism. Nutritional support should be considered when treating hospitalized patients who are malnourished or at nutritional risk since it is linked to improved nutritional and clinical outcomes[22].

This study had several limitations. First, as a retrospective cohort study, there is a risk of bias in the data. Second, the study was conducted in a single tertiary hospital, which may limit the generalizability of the findings to other settings. However, the large sample size and diverse patient population strengthen the external validity of the results. Finally, retrospective medical records may pose data quality issues, although standardized clinical measures and robust statistical analyses help mitigate these concerns.

CONCLUSION

This study revealed that 7.4% of GEH patients at Wahidin Sudirohusodo General Hospital were at high risk of malnutrition, 38.7% were at moderate risk, and 54% were at low risk. High malnutrition risk was more commonly observed in patients with malignancies compared to non- malignant cases. Additionally, GEH patients at high risk of malnutrition exhibited elevated lymphocyte ratio (NLR) and reduced Total Lymphocyte

Count (TLC), indicating that malnutrition impacts immune response. These patients also had lower Prognostic Nutritional Index (PNI), suggesting a poorer prognosis, and experienced more extended hospital stays. While no significant difference in mortality was found between patients at high, moderate, and low malnutrition risk, malnutrition remains a critical factor influencing clinical outcomes and quality of life.

These findings underscore the importance of early malnutrition screening and the implementation of appropriate nutritional interventions to improve nutritional status and clinical outcomes in GEH patients. A multidisciplinary approach is essential to ensure optimal patient care and management.

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