Risk Management and Healthcare Policy

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REVIEW

Factors Influencing Malnutrition in Patients with Heart Failure: A Scoping Review Based on the Biopsychosocial Model

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Background: Heart failure is characterized by high rates of hospitalization, substantial medical expenses and increased mortality, posing a serious threat to human health. Malnutrition is a common complication among patients with heart failure and is associated with increased risks of infection, rehospitalization and mortality, resulting in a considerable disease burden and financial strain on both patients and their families. Identifying patient-related influencing factors is the primary prerequisite for recognizing the risk of malnutrition.

Objective: This scoping review aims to systematically summarize the factors influencing malnutrition in patients with heart failure, based on evidence from both domestic and international studies.

Methods: Studies on malnutrition in heart failure were retrieved from PubMed, Web of Science, Cochrane Library, CINAHL, CNKI and Wanfang, from database inception to 25 May 2025. Two researchers independently screened titles and abstracts and extracted data according to predefined criteria. Findings were categorized and reported descriptively.

Results: A total of 30 studies were included. The reported prevalence of malnutrition in heart failure varied by assessment tool. Based on the biopsychosocial model, nine categories of influencing factors were identified: demographic characteristics, disease characteristics, clinical physiological indicators, pharmacological treatment, emotional status, cognitive function, behavior, support system and living environment.

Conclusion: This scoping review provides the first comprehensive summary of malnutrition-related factors in patients with heart failure through the biopsychosocial model. The findings indicate that malnutrition in patients with heart failure is affected by both subjective and objective factors and is closely associated with disease progression. A comprehensive understanding of the influencing factors of malnutrition contributes to the development of more precise nutritional risk assessment tools and lays the foundation for a continuous management pathway of screening, assessment, intervention, and monitoring to facilitate early risk identification.

Keywords: nutritional risk, psychosocial determinants, risk assessment, chronic disease management, evidence synthesis

Introduction

Heart failure (HF) represents a severe manifestation or the terminal stage of various cardiac diseases, posing a significant threat to human health.[1] In recent years, the prevalence of HF has continued to rise, driven by population ageing, an increasing incidence of other chronic conditions, and prolonged survival among patients with cardiac diseases.[2] Globally, more than 64 million individuals are affected by HF.[1] In China, the age-standardized prevalence of HF is 1.10% among adults aged 25 years and older, and 1.38% in those aged 35 years and above.[2] According to the American Heart Association, by 2030, the number of adults with HF is projected to exceed 8 million, with a prevalence of 8.5% in the 65–70-year age group.[1] Patients with HF often experience oedema and gastrointestinal congestion, necessitating dietary modifications and adherence to a restrictive diet to alleviate symptoms.[3] In addition, multiple pathophysiological

Received: 13 September 2025
Accepted: 7 December 2025
Published: 26 December 2025

mechanisms—including metabolic disturbances, inflammatory responses, malabsorption, impaired protein metabolism, increased energy expenditure, renal dysfunction and alterations in gut microbiota—contribute to anorexia, inadequate intake of protein and energy, weight loss, and deficiencies in micronutrients and vitamins, resulting in malnutrition.[4,5]

Malnutrition is one of the most common comorbidities in HF patients, with a reported prevalence ranging from approximately 20% to 80%, depending on the setting and assessment tools used.[6,7] Nutritional status is closely associated with clinical outcomes in HF. Malnutrition is an independent risk factor for unplanned 30-day readmission, with affected patients having more than a sixfold increased risk compared to those with normal nutritional status.[8] Furthermore, malnutrition is a predictor of all-cause mortality in HF,[9] with patients experiencing moderate malnutrition facing a six- to tenfold higher risk of death than those without malnutrition.[10] Persistent malnutrition leads to protein and muscle loss, increasing the likelihood of sarcopenia and frailty.[11] It contributes to higher rates of hospital readmission, mortality and complications such as infections, exacerbating cardiac dysfunction and perpetuating a vicious cycle of "malnutrition – inflammation – cachexia".[12] This cycle results in progressive weight loss and irreversible skeletal muscle depletion, which cannot be reversed through standard nutritional interventions.[12] As the underlying condition for severe clinical syndromes such as frailty and cachexia, malnutrition represents the most readily identifiable and modifiable stage, offering a clear therapeutic window that is critical for improving clinical outcomes.

Commonly used tools for assessing malnutrition in patients with HF include nutritional screening and nutritional assessment instruments. Screening tools comprise the Nutritional Risk Screening 2002 (NRS 2002)[13] and the Mini-Nutritional Assessment (MNA),[7] while assessment tools include objective indices such as the Controlling Nutritional Status (CONUT) score,[14] Prognostic Nutritional Index (PNI)[15] and Geriatric Nutritional Risk Index (GNRI).[6] These tools are practical in clinical settings and are generally brief and convenient to administer. However, they are generic in nature, differ in their focus, have limitations regarding their applicability across settings, and in some cases require professional training of healthcare personnel prior to use. There is no standardized tool specifically designed to assess malnutrition in patients with HF. Some scholars have proposed that early identification of potential risk or protective factors related to the nutritional status of HF patients may help improve clinical outcomes.[16] European researchers have suggested that nutrition and diet are influenced by a complex interplay of factors ranging from individual to environmental levels.[17] Several studies have shown that malnutrition in HF is not only associated with age, smoking and comorbidities, but is also influenced by psychological state, appetite and social support.[18–21] Although several systematic reviews and meta-analyses have examined the prevalence,[22] prognostic implications,[23] and the performance of various nutritional assessment tools in heart failure,[9] the comprehensive synthesis of contributing factors remains limited. One meta-analysis has summarized disease-related and sociodemographic determinants of malnutrition; however, it lacks a systematic integration of psychosocial aspects.[24]

The biopsychosocial model, proposed by George Engel in 1977,[25] serves both as a philosophy of clinical care and a practical framework for clinical practice. This model integrates biological, psychological and social-environmental factors, offering a comprehensive perspective for understanding health and disease. It emphasizes the interaction among these dimensions and enables healthcare professionals to identify and address a wide range of influencing factors more effectively, thereby facilitating holistic and person-centered care.[26] To enhance the systematicity, logical structure and comparability of the synthesis of influencing factors, this review adopts the biopsychosocial model as a framework for classification. This approach aims to reveal the multidimensional drivers of malnutrition in HF patients and to support healthcare professionals in the early and accurate identification of malnutrition, the strengthening of risk management, as well as the development of mechanistic research and targeted intervention strategies.

Materials and Methods

This study follows PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) to report factors influencing malnutrition in heart failure.[27] The methodology follows Arksey and O'Malley's[28] five-stage framework: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing and reporting results.

Identification of the Research Question

The research question was developed based on the PCC (Population, Concept, Context) framework.[29] Population: Adult patients diagnosed with HF; Concept: Malnutrition or risk of malnutrition; Context: Any healthcare setting, community, or home environment.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows: (1) studies involving adult patients with a confirmed diagnosis of HF; (2) studies reporting factors associated with malnutrition, including but not limited to physiological indicators, disease severity, comorbidities, psychological status and socioeconomic factors; and (3) publications in English or Chinese.

Exclusion criteria were: (1) studies not exclusively involving patients with heart failure; (2) studies reporting only nutritional assessment tools or prognostic outcomes; (3) reviews, expert opinions, conference abstracts, commentaries, or books; and (4) studies with inaccessible full texts, incomplete content or data, or duplicate publications.

Literature Search Strategy

A systematic search was conducted in PubMed, Web of Science, Cochrane Library, CINAHL, CNKI and Wanfang databases, covering the period from database inception to 25 May 2025. Both subject headings and free-text terms were used in the search strategy. The search terms included combinations of the following: "Heart Failure OR Chronic Heart Failure OR CHF OR Cardiac Failure OR Congestive Heart Failure OR Heart Decompensation OR Myocardial Failure", "Malnutrition OR Nutrition Disorders OR Nutritional Status OR Malnourishment OR Undernutrition OR Nutritional Deficiency OR Nutritional Risk", and "Risk Factors OR Influence Factors OR Associated Factors OR Correlates OR Predictors OR Determinants". The detailed search strategy is presented in Appendix Table A.1.

Data Extraction and Analysis

All search results were imported into EndNote. Two researchers (LMD and CH) independently screened the titles and abstracts according to the inclusion and exclusion criteria to perform the initial screening, followed by a full-text review for secondary screening. The results were cross-checked by the two researchers (LMD and CH), and any discrepancies were resolved through discussion with a third researcher (XXY). A standardized data extraction form was developed to collect information including author, year of publication, country, study design, age, sample size, assessment tools, prevalence, malnutrition/malnutrition risk and influencing factors. The extracted data were then categorized and analyzed descriptively by the researchers according to the biopsychosocial model to generate the final results.

Results

Results of Literature Search

A total of 4,501 records were identified through the database search. After removing 735 duplicates, 3,730 records were excluded based on title and abstract screening. The remaining 36 full-text articles were assessed for eligibility. Among these, one full text was unavailable, two were conference abstracts, one was an editorial, and two did not meet the inclusion criteria regarding study population. Ultimately, 30 studies were included in the review. The study selection process and results are illustrated in Figure 1.

Characteristics of Included Studies

A total of 30 studies involving 23,116 patients with HF were included. The publications ranged from 2015 to 2025 and originated from various countries, including Spain,[14,18] Ethiopia,[7,30] China,[6,13,15,19,20,31–42] Japan,[43–47] Italy,[48] Iran,[21] the United Kingdom[49] and Poland.[50] Of these, 28 were observational studies and 2 were observational studies with single-arm pre–post interventions. 13 studies employed nutritional screening tools, including the MNA-FL (Mini-Nutritional Assessment–Full Form), NRS 2002, MNA-SF (Mini-Nutritional Assessment–Short Form), MNA-HF (Mini-Nutrition Assessment Special for Heart Failure) and MNA. 17 studies used nutritional assessment tools to diagnose malnutrition, such as CONUT, albumin combined with triceps skinfold thickness, PNI, albumin alone, the

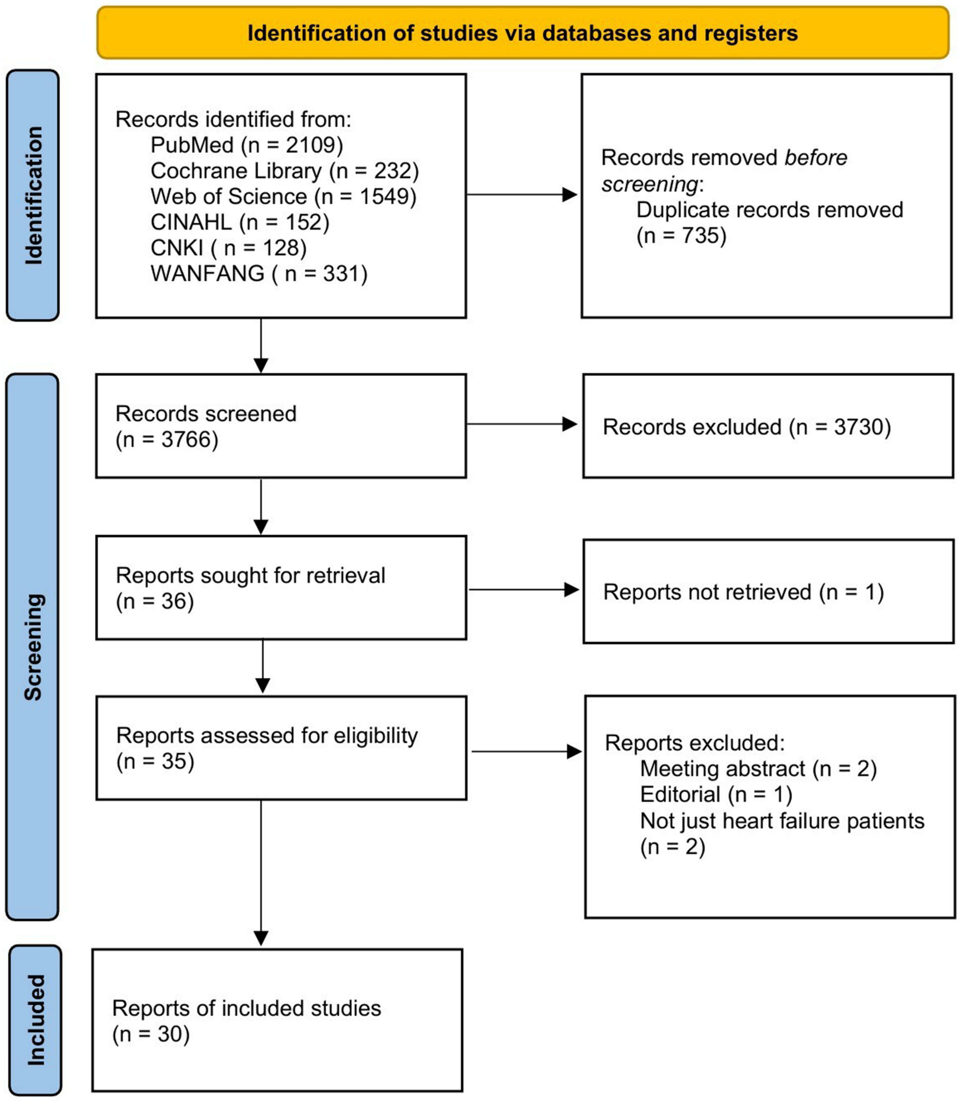

Figure 1 PRISMA flow diagram of the study selection process.

AND-ASPEN (Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition) criteria, GNRI and O-PNI (Onodera's Prognostic Nutritional Index). 119 studies focused on malnutrition, while 10 studies examined the risk of malnutrition. The reported prevalence ranged from 15.0% to 86.9%. In one study, the focus could not be clearly determined,[38] and in another, the prevalence could not be calculated.[49] The characteristics of the included studies are summarized in Table 1.

Factors Influencing Malnutrition in HF Patients

Within the biopsychosocial model, biological factors refer to genetics, physical health status and pathophysiological changes; psychological factors encompass emotions, cognition, behavior and overall psychological state; while social factors relate to social support, economic status, cultural background and living environment. Based on the included studies, the researchers conducted repeated readings and data extraction, ultimately identifying nine categories across the three domains: demographic characteristics, disease characteristics, clinical physiological indicators, pharmacological treatment, emotional status, cognitive function, behavior, support system and living environment. The specific classification and frequency of malnutrition-related factors in patients with heart failure are presented in Table 2.

Table 1 Characteristics of the Included Studies (n=30)

Study	Country	Study Design	Age Mean±SD/Range	Sample	Tools	Prevalence	Focus of STUDY	Factors
Zhao et al, 2023[6]	China	Observational study	65~97	260 ≥ 65 CHF patients	GNRI CONUT	68.1% 86.9%	Malnutrition risk	GNRI: age↑, body mass index↓, hemoglobin↓ CONUT: sex, coronary heart disease, hemoglobin↓
Ahmed et al, 2022[7]	Ethiopia	Cross-sectional study	64.6±9.2	262 ≥50 HF patients	MNA-FL	28.6%	Malnutrition	NYHA classification↑, disease duration↑, comorbidities, loop diuretic use, rural residence
Chen et al, 2025[13]	China	Observational study	68~78	375 elderly HF patients	NRS 2002	49%	Malnutrition risk	Coronary heart disease, age↑, prealbumin (protective factor), urea↑, neutrophil-to-lymphocyte ratio↑
Agra Bermejo et al, 2017[14]	Spain	Retrospective observational study	69.8±11.0	145 de novo or decompensated CHF patients	CONUT	66.9%	Malnutrition	ProBNP↑, hemoglobin↓, sex
Chen & Liu, 2025[15]	China	Observational study	NA	102 CHF patients	PNI	55.88%	Malnutrition	Age↑, NYHA classification↑, anemia, NT-proBNP↓, total protein↓
González-Sosa et al, 2024*[18]	Spain	Retrospective observational study	88.4±2.98	413 ≥85 HF patients	MNA-SF	27.6%	Malnutrition risk	Dementia, hip fracture, Barthel Index, Pfeiffer test, frailty index, Charlson comorbidity index, urea, total protein, NT-proBNP
Jin et al, 2022[19]	China	Observational study with single-arm pre-post intervention	75.29±3.27 (Malnutrition group) 70.98±4.38 (Control group)	180 ≥60 HF patients	MNA-SF	46.1%	Malnutrition	Disease duration↑, C-reactive protein↑, BNP↑, NYHA classification↑, age↑, smoking history
Mo et al, 2025[20]	China	Observational study	69.23±16.49 (Malnutritional group) 66.99±15.34 (Control group)	459 CHF patients	GNRI	69.9%	Malnutrition	GAD-7, blood urea nitrogen↑, body mass↓, albumin↓
Sharifi et al, 2024[21]	Iran	Cross-sectional study	64.2±11.2	319 HF patients	MNA-SF	65.5%	Malnutrition risk	Social support↓, body mass index↓, NYHA classification↑, disease duration↑, albumin↓
Amare et al, 2015[30]	Ethiopia	Cross-sectional study	48.3±15.9	284 HF patients	Albumin and triceps skin fold thickness	77.8%	Malnutrition	Hemoglobin↓

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https://doi.org/10.2147/RMHP.S567410

Table 1 (Continued).

Study	Country	Study Design	Age Mean±SD/Range	Sample	Tools	Prevalence	Focus of STUDY	Factors
Chien et al, 2019[31]	China	Retrospective observational study	77.2±12.6	1120 acute HF patients	Albumin	56%	Malnutrition	Lean body size, white cell count↑, C-reactive protein↑, hemoglobin↓, lack of ACEI/ARB use
Dai et al, 2024[32]	China	Observational study	NA	338 ≥60 HF patients	Albumin	21.6%	Malnutrition	Age↑, length of hospital stay↑, NT-proBNP↑, glomerular filtration rate↓, fasting blood glucose↑
Fu & Xiang, 2021[33]	China	Observational study with single-arm pre-post intervention	74.95±2.34 (Malnutritional group) 75.03±2.52 (Control group)	200 ≥70 HF patients	MNA-SF NRS 2002	49.5%	Malnutrition risk	C-reactive protein↑, NYHA classification↑, NT-proBNP↑, left ventricular ejection fraction↑ (protective factor)
Hao et al, 2022[34]	China	Observational study	NA	320 CHF patients	PNI	32.5%	Malnutrition	Age↑, oedema, anemia, blood urea nitrogen↑, total protein↓
Hui & Zhang, 2021[35]	China	Observational study	NA	109 CHF patients	Albumin	36.7%	Malnutrition	Age↑, smoking, total protein↓, C-reactive protein↑, oedema
Li et al, 2020[36]	China	Observational study	78.9±11.2	221 ≥60 CHF patients	NRS 2002	45.2%	Malnutrition risk	Age↑, ejection fraction↓, BNP↑, NYHA classification↑, number of medications↑, number of comorbidities↑, frailty, quality of life↓, digoxin (protective factor)
Liu et al, 2023[37]	China	Cross-sectional study	62.09±13.65	433 HF patients	AND-ASPEN criteria	15.2%	Malnutrition	Total protein↓, hemoglobin↓, triglycerides↓, blood glucose↑
Lu, 2022[38]	China	Observational study	NA	128 CHF patients	MNA-SF	47.7%	NA	Age↑, smoking, oedema, C-reactive protein↑
Yao et al, 2022[39]	China	Observational study	NA	112 CHF patients	MNA-SF	48.2%	Malnutrition risk	Age↑, smoking, NYHA classification↑, C-reactive protein↑
Zeng et al, 2024[40]	China	Observational study	NA	2135 CHF patients	MNA-HF	67.3%	Malnutrition risk	Age↑, body mass index↓, living arrangement, NYHA classification↑, oedema, Barthel Index↓, Eating Attitudes Test↑, left ventricular posterior wall thickness↑, hemoglobin↓, albumin↓, C-reactive protein↑

https://doi.org/10.2147/RMHP.S567410

Zhou et al, 2020[41]	China	Observational study	72.15±10.28 (Malnutritional risk group) 72.64±10.43 (Malnutritional group) 71.65±10.27 (Control group)	156 elderly HF patients	MNA	53.8%	Malnutrition risk	Age↑, NYHA classification↑, quality of life↓, self-management behavior↓, social support↓, caregiver adherence↓
Zhu & Ma, 2022[42]	China	Observational study with single-arm pre-post intervention	66~72	110 ≥65 HF patients	PNI	58.2%	Malnutrition	NYHA classification↑, left ventricular ejection fraction↓
Matsuo et al, 2019[43]	Japan	Cross-sectional study	77.3±12.6	105 HF patients	MNA-SF	56.2%	Malnutrition risk	Barthel Index
Nakagomi et al, 2016[44]	Japan	Prospective observational study	66.0±11.3	114 CHF patients	CONUT	54.4%	Malnutrition	Tumor necrosis factor-α↑, C-reactive protein↑, estimated glomerular filtration rate↓, carotid intima-media thickness, hemoglobin↓
Otaki et al, 2022[45]	Japan	Observational study	72±13	1061 HF patients	CONUT	40%	Malnutrition	Age↑, NYHA classification↑, renal tubular damage, BNP↑, high-sensitivity C-reactive protein↑, diuretics use
Watanabe et al, 2022[46]	Japan	Retrospective observational study	NA	420 HF patients	CONUT	Approximately 70%	Malnutrition	C-reactive protein, BNP, right atrium pressure
Yasuhara et al, 2020[47]	Japan	Observational study	71±15	50 CHF patients	O-PNI CONUT GNRI	25% 21% 40%	Malnutrition	BNP↑
Pagnesi et al, 2024[48]	Italy	Retrospective observational study	73.8±11.8	510 HF patients	GNRI	35.1%	Malnutrition	Body mass index↓, BNP↑, NT-proBNP↑

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Table 1 (Continued).

Study	Country	Study Design	Age Mean±SD/Range	Sample	Tools	Prevalence	Focus of STUDY	Factors
Solano et al, 2025*[49]	UK	Observational study	NA	12462 HF patients with preserved ejection fraction and reduced ejection fraction	PNI	NA	Malnutrition	Age, comorbidities, frailty, NYHA classification, KCCQ, NT-proBNP, estimated glomerular filtration rate, serum urea nitrogen, total protein, triglyceride, hemoglobin, white blood cell count, neutrophil-lymphocyte ratio, loop diuretic
Swiatoniowska-Lonc et al, 2025*[50]	Poland	Retrospective observational study	74.7±14.3	213 HF patients	NRS 2002	15%	Malnutrition risk	Age, body height, body mass, length of hospital stay, hemoglobin

Notes: ↑ indicates a higher level or increased value of the variable; ↓ indicates a lower level or decreased value; *Univariate analysis only; extracted factors were limited to those overlapping with findings from other studies.
Abbreviations: GNRI, Geriatric Nutritional Risk Index; CONUT, Controlling Nutritional Status; MNA-FL, Mini-Nutritional Assessment–Full Form; NYHA, New York Heart Association; NRS 2002, Nutritional Risk Screening 2002; pro-BNP, Pro–B-type Natriuretic Peptide; PNI, Prognostic Nutritional Index; NT-proBNP, N-terminal pro–B-type Natriuretic Peptide; MNA-SF, Mini-Nutritional Assessment–Short Form; BNP, Brain Natriuretic Peptide; GAD-7, Generalized Anxiety Disorder-7 scale; ACEI, Angiotensin-Converting Enzyme Inhibitor; ARB, Angiotensin Receptor Blocker; AND-ASPEN, Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition; MNA-HF, Mini-Nutrition Assessment Special for Heart Failure; O-PNI, Onodera's Prognostic Nutritional Index; KCCQ, Kansas City Cardiomyopathy Questionnaire; CHF, Congestive Heart Failure; HF, Heart Failure; MNA, Mini-Nutritional Assessment; NA, Not Available.

https://doi.org/10.2147/RMHP.S567410

Table 2 Analysis of Influencing Factors Based on the Biopsychosocial Model

Biopsychosocial Model	Categories	Details	Frequencies
Biological factors	Demographic characteristics	Age	15
		Sex	2
		Body mass/body mass index	7
		Length of hospital stay	2
		Smoking	4
		Number of medications	1
	Disease characteristics	NYHA classification	12
		Disease duration	3
		Comorbidities	7
		Frailty	3
		Oedema	4
		Ejection fraction	3
		Right atrium pressure	1
		Left ventricular posterior wall thickness	1
	Clinical physiological indicators	BNP biomarkers	12
		Hemoglobin/Anemia	11
		Total protein	6
		Albumin	3
		Prealbumin	1
		Neutrophil-to-lymphocyte ratio	2
		White cell count	2
		C-reactive protein	10
		Tumor necrosis factor-α	1
		Blood glucose	2
		Triglycerides	2
		Urea	5
		eGFR/GFR	3
		Renal tubular damage	1
		Carotid intima-media thickness	1
	Pharmacological treatment	Diuretic use	3
		Lack of ACEI/ARB use	1
		Digoxin	1

(*Continued*)

https://doi.org/10.2147/RMHP.S567410

Table 2 (Continued).

Biopsychosocial Model	Categories	Details	Frequencies
Psychological factors	Emotional status	Anxiety	1
	Cognitive function	Dementia	1
		Cognition	1
	Behavior	Barthel Index	3
		Quality of life	3
		Eating attitudes	1
		Self-management behavior	1
Social factors	Support system	Social support	2
		Caregiver adherence	1
	Living environment	Rural residence	1
		Living arrangement	1

Abbreviations: NYHA, New York Heart Association; BNP, Brain Natriuretic Peptide; eGFR, estimated glomerular filtration rate; ACEI, Angiotensin-Converting Enzyme Inhibitor; ARB, Angiotensin Receptor Blocker.

Biological Factors

Demographic Characteristics

Demographic characteristics include age, sex, body composition, length of hospital stay, smoking and number of medications. Fifteen studies[6,13,15,19,32,34–36,38–41,45,49,50] reported that older age was associated with a higher risk of malnutrition in patients with HF, possibly due to age-related declines in health status, functional capacity and gastrointestinal absorption. Two studies[6,14] indicated that male patients were at greater risk of malnutrition than females, suggesting an inherent, non-modifiable factor. Seven studies[6,20,21,31,40,48,50] identified body composition as a contributing factor, although terminologies varied across studies, including lean body size, body mass, body height and body mass index. Prolonged hospital stay was associated with increased risk in two studies,[32,50] likely reflecting greater disease severity. Four studies[19,35,38,39] reported that smoking elevated the risk of malnutrition. On one hand, nicotine in cigarettes may suppress appetite, reducing food intake;[51] on the other, smoking may increase resting metabolic rate, thereby elevating energy expenditure in HF patients.[52] One study[36] found that patients taking a greater number of medications had a higher prevalence of malnutrition risk, potentially reflecting more severe disease or a greater burden of comorbidities.

Disease Characteristics

Indicators such as NYHA (New York Heart Association classification) classification, disease duration, comorbidities, oedema, ejection fraction, right atrial pressure and left ventricular posterior wall thickness reflect the progression and severity of HF. The more severe the impairment in cardiac function and the greater the volume overload, the more pronounced the symptoms become, leading to reduced food intake and impaired nutrient absorption, thereby increasing the risk of malnutrition.[33,40,53] In addition, three studies[18,36,49] identified frailty as a significant risk factor for malnutrition.

Clinical Physiological Indicators

A total of 15 indicators were identified and categorized into four groups: cardiac dysfunction markers, inflammation and metabolic stress, nutritional and hematological status and renal dysfunction markers. Twelve studies[14,15,18,19,32,33,36,45–49] referred to BNP biomarkers. Notably, only one study reported an association between lower NT-proBNP levels and increased risk of malnutrition, possibly due to the inclusion of patients with stable chronic HF, in whom NT-proBNP levels were generally low.[15] One study[44] mentioned carotid intima-media thickness, an early indicator of subclinical atherosclerosis. As it reflects systemic arterial changes, it may indicate the progression of cardiovascular disease leading to heart failure.

Inflammation and metabolic stress markers included the neutrophil-to-lymphocyte ratio,[13,49] white cell count,[31,49] C-reactive protein,[19,31,33,35,38–40,44–46] tumor necrosis factor-α,[44] blood glucose[32,37] and triglycerides.[37,49] While the former five indicators were elevated, triglyceride levels were decreased, suggesting a state of immune activation and metabolic disturbance. These changes may contribute to increased energy expenditure, appetite suppression and impaired nutrient metabolism, thereby substantially raising the risk of malnutrition.

Nutritional and hematological status included hemoglobin/anemia,[6,14,15,30,31,34,37,40,44,49,50] total protein,[15,18,34,35,37,49] albumin[20,21,40] and prealbumin,[13] all of which reflect protein reserves and hematopoietic function. Reductions in these markers are often attributed to inadequate dietary intake, hepatic dysfunction, diminished appetite and iron deficiency. Among them, higher prealbumin levels were identified as a protective factor against malnutrition, likely due to its role in nitrogen release during catabolism, contributing to nutritional maintenance.

Renal dysfunction markers comprised urea,[13,18,20,34,49] estimated glomerular filtration rate (eGFR/GFR)[32,44,49] and renal tubular damage.[45] Cardiorenal syndrome is common among patients with HF and may exacerbate protein restriction, accumulation of metabolic waste, anorexia and nausea, thereby worsening negative nitrogen balance, weight loss and nutrient depletion.[54] Moreover, renal impairment is frequently associated with anemia.[55]

Pharmacological Treatment

Three studies identified diuretics, one study identified ACEI/ARB (Angiotensin-Converting Enzyme Inhibitor/ Angiotensin Receptor Blocker), and one study identified digoxin as factors influencing malnutrition in HF patients. The use of diuretics was associated with a higher risk of malnutrition, potentially due to their role in causing or exacerbating electrolyte imbalances and dehydration, as well as serving as an indicator of more severe HF.[7,45,49] The absence of ACEI or ARB therapy was also associated with an increased risk of malnutrition, primarily because these medications can improve cardiac function, reduce intestinal wall oedema, and enhance nutritional metabolic status.[31] Li et al identified digoxin as an independent protective factor against malnutrition.[36] Digoxin enhances myocardial contractility and reduces heart rate, thereby alleviating fatigue, dyspnea and gastrointestinal congestion, which in turn may improve appetite and digestive function.

Psychological Factors

Emotional Status

One study[20] reported that anxiety may affect the nutritional status of HF patients with. Anxiety can impair vagal nerve function and place the patient in a prolonged state of stress. Over time, this leads to insufficient nutritional reserves and increased metabolic demand, thereby exacerbating malnutrition.[20] Conversely, malnutrition may further intensify negative emotional states.

Cognitive Function

One study[18] reported an association between risk of malnutrition and dementia or impaired cognitive function. On the one hand, cognitive impairment is an independent predictor of dysphagia in patients with HF,[56] directly limiting food intake. On the other hand, there is a bidirectional physiological relationship between cognitive dysfunction and malnutrition, with their interaction potentially forming a vicious cycle.[57]

Behavior

Three studies reported on activities of daily living,[18,40,43] and three addressed quality of life.[36,41,49] Additionally, dietary attitudes[40] and self-management behaviors[41] were each examined in one study. Collectively, these factors reflect an individual's capacity and motivation to engage in nutrition-related health behaviors. Lower scores indicate reduced functional independence, which may lead to unhealthy lifestyle habits and, consequently, an increased risk of malnutrition.

Social Factors

Support System

Two studies[21,41] indicated that social support plays an important role in improving malnutrition. Low levels of social support can increase psychological burden, trigger anxiety and reduce appetite, elevating the risk of malnutrition.[58]

Conversely, strong social support can enhance patients' self-care abilities and treatment adherence, which may partly explain its association with better nutritional outcomes.[59] One study[41] found that caregivers' adherence to medical advice directly influenced the dietary practices of older patients. Inadequate caregiving quality may hinder disease management and exacerbate malnutrition.

Living Environment

One study reported that patients living in rural areas, and another that living alone, were associated with a higher risk of malnutrition. In rural settings, limited access to nutritional and healthcare resources, along with socioeconomic and educational constraints, may contribute to poor health awareness.[7] Additionally, individuals living alone often exhibit irregular eating behaviors, lack caregiving support and social interaction, and may experience appetite loss driven by emotional factors, all of which can lead to malnutrition.[40]

Discussion

Nutritional status is a key indicator of recovery and prognosis in HF patients, yet standardized and disease-specific assessment tools are still lacking. Based on the findings of this scoping review, the prevalence of malnutrition in HF patients is relatively high, and its influencing factors span biological, psychological and social domains. These factors were categorized into nine groups: demographic characteristics, disease characteristics, clinical physiological indicators, pharmacological treatment, emotional status, cognitive function, behavior, support system and living environment.

Biological factors were the most frequently reported, reflecting the high level of attention given to the pathophysiological mechanisms underlying malnutrition in current research.[5] These factors can be categorized into modifiable and non-modifiable components. Among those most frequently cited were age, NYHA classification, BNP biomarkers, hemoglobin and C-reactive protein. Age appeared as the most common factor, with older patients often being the primary focus of the included studies.[6,7,13,18,19,36,41,42] The proportion of older individuals among HF patients to rise, and this population frequently presents with age-related conditions such as appetite loss, impaired digestive function and sarcopenia.[60] These issues interact with the progression of cardiac disease and jointly impact nutritional status. Among modifiable biological factors, cardiac function indicators, biochemical markers, inflammatory mediators, and nutritional parameters are often interrelated in the pathophysiological context of HF and malnutrition, demonstrating a pattern of synergistic fluctuation.[49] Evidence suggests that malnutrition in HF results from a multifactorial interplay, forming a complex pathological state characterized by abnormal energy metabolism, inflammatory activation and tissue wasting.[61] While changes in biological markers may signal increased nutritional risk, interpretation requires a comprehensive approach. It is recommended that healthcare professionals strengthen the holistic identification and integrated assessment of biological factors. Particular attention should be given to older adults and patients with more advanced disease, with increased awareness of nutritional risk and recognition of the bidirectional relationship between nutrition and disease progression.

Psychological factors influencing nutritional status are common across various chronic conditions.[62,63] A prolonged disease course and excessive burden can lead to anxiety, depression, cognitive decline and reduced self-efficacy, all of which negatively impact dietary behavior.[64] According to the findings of this review, these psychological issues primarily stem from emotional distress and insufficient nutritional cognition. Declines in cognitive function, quality of life and self-management ability were reflected in patients' limited understanding of nutrition, misinterpretation or poor adherence to dietary recommendations and unbalanced dietary patterns—all contributing to an increased risk of malnutrition.[65] In addition, poor dietary attitudes and anxiety emerged as key emotional drivers. Due to the effects of HF, some patients exhibited behaviors such as delayed eating, food refusal, lack of interest in food and irregular eating patterns, which, over time, resulted in inadequate energy and nutrient intake.[66] Psychological factors are often subtle and cumulative, highlighting the need for healthcare professionals to integrate nutritional risk screening with the assessment of psychological wellbeing in clinical practice.

Social factors were relatively limited in the study and primarily focused on the individual level, including social support, caregiver management and living environment. These factors reflect both the accessibility of nutritional and healthcare resources and the emotional support provided by others. Disparities in the distribution of healthcare resources between regions mean that patients in rural or low-income areas often face difficulties in accessing timely, structured nutritional counselling and support services—a concern particularly relevant given the overrepresentation of such populations among HF patients.[7,67] Current research, with its emphasis on individual-level social factors, tends to overlook the broader impact of societal structures, resource availability, and institutional support on nutritional status.[68] Future studies should expand this dimension to include more structural-level determinants of nutritional outcomes. In practice, nursing professionals should actively identify barriers to patients' access to social resources and collaborate with social workers, community organizations, and other external support systems to develop integrated nutritional intervention models.

Limitations

This study has several limitations. (1) Only studies published in English and Chinese were included, which may have introduced language bias; however, these two languages reflect the primary distribution of research in this field and the accessibility of major academic databases, and existing meta-research has not identified systematic bias resulting from English-language restriction.[69] (2) The included studies primarily focused on biological factors, with limited exploration of psychological and social dimensions. (3) Most studies adopted cross-sectional designs, making it difficult to establish clear causal relationships. Future research should adopt a more integrated, multi-dimensional perspective, supported by large-scale prospective studies. Longitudinal cohort designs and mechanistic modelling are recommended to systematically explore the interrelations among factors, integrate objective and subjective measures, and improve the sensitivity of nutritional screening tools for patients with heart failure.

Conclusion

Malnutrition in patients with HF is shaped by both subjective and objective factors and is closely linked to disease progression. Guided by the biopsychosocial model, this scoping review synthesized evidence from 30 studies and categorized the influencing factors into nine domains: demographic characteristics, disease characteristics, clinical physiological indicators, pharmacological treatment, emotional status, cognitive function, behavior, social support systems, and living environment. These findings emphasize that beyond traditional biomedical factors, psychosocial and environmental determinants play a critical role in the nutritional status of HF patients, yet are often underrecognized in clinical practice. These multidimensional factors provide a foundation for establishing precise nutritional risk assessment and continuous management pathways, thereby facilitating early risk identification and personalized support to ultimately reduce the disease burden on patients and their families. Future studies may build upon these findings to develop heart failure–specific nutritional assessment instruments and design intervention models that integrate biological, psychological, and social determinants, further enhancing the precision and sustainability of nutritional management.

Funding

This work was supported by the National Natural Science Foundation of China [grant number 72464022]; the Chinese Nursing Association [grant number ZHK202321]; and the Jiangxi Provincial Health Committee [grant number 20203149].

Disclosure

The authors report no conflicts of interest in this work.

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