



Dominant factors and food waste reduction strategies in hospitals: A systematic literature review

Faktor dominan dan strategi reduksi food waste di rumah sakit: Systematic literature review

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Abstract

Food waste in hospitals is a critical issue because of its economic, environmental, and nutritional service implications. Previous studies have reported inconsistent findings regarding the dominant factors influencing food waste, particularly those related to food quality, patient characteristics, and the delivery of services. This study aimed to identify the dominant determinants of hospital food waste and analyze strategies for reducing it. A Systematic Literature Review (SLR) was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The review included 30 national and international articles published between 2020 and 2025, retrieved from Scopus and ScienceDirect based on pre-defined inclusion and exclusion criteria. The findings indicate that hospital food waste is a multifactorial phenomenon influenced by internal and external factors. Food quality, particularly taste and appearance, emerged as the most frequently reported determinant, followed by patient-related factors such as appetite and clinical condition and service-related factors including staff interaction and food distribution systems. Food waste reduction strategies include improving food quality, implementing waste monitoring systems, enhancing staff competency, and optimizing menu planning according to patient preferences.

Keywords: Food waste, life cycle assessment (LCA), nutrition management system, patient satisfaction

Abstrak

Food waste di rumah sakit merupakan isu penting karena berdampak pada aspek ekonomi, lingkungan, dan kualitas pelayanan gizi. Namun, penelitian sebelumnya menunjukkan adanya inkonsistensi dalam mengidentifikasi faktor dominan yang memengaruhi food waste, khususnya pada aspek kualitas makanan, karakteristik pasien, dan pelayanan. Penelitian ini bertujuan untuk mengidentifikasi faktor dominan serta menganalisis strategi reduksi food waste di rumah sakit. Penelitian ini menggunakan pendekatan *Systematic Literature Review* (SLR) dengan mengacu pada pedoman *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA), melibatkan 30 artikel nasional dan internasional yang diterbitkan pada tahun 2020–2025 dan diperoleh dari Scopus, dan ScienceDirect berdasarkan kriteria inklusi dan eksklusi. Hasil penelitian menunjukkan bahwa food waste merupakan fenomena multifaktorial yang dipengaruhi oleh faktor internal dan eksternal. Kualitas makanan, khususnya rasa dan penampilan, menjadi faktor dominan yang paling sering dilaporkan, diikuti oleh faktor pasien seperti nafsu makan dan kondisi klinis, serta faktor pelayanan seperti interaksi staf dan sistem distribusi makanan. Strategi reduksi meliputi peningkatan kualitas makanan, penerapan sistem pemantauan limbah, peningkatan kompetensi staf, serta optimalisasi perencanaan menu sesuai preferensi pasien.

Kata Kunci: Food waste, life cycle assessment (LCA), kepuasan pasien, sistem manajemen gizi

Introduction

Food waste in hospitals has emerged as a critical issue in the broader context of sustainable healthcare systems (Wahyuningrum & Girsang, 2026). As public healthcare institutions with substantial food consumption, hospitals significantly contribute to global food waste generation. According to Mahmoudifar et al. (2025), approximately 30–50% of the food prepared in hospitals remains unconsumed by patients. This phenomenon not only results in considerable economic losses but also generates adverse environmental impacts through increased greenhouse gas emissions and inefficient resource use throughout the food production chain (Prasetyo, 2023).

One of the primary drivers of hospital food waste is patients' consumption patterns and food preferences. Rinninella et al. (2023) reported that reduced appetite, medically prescribed dietary restrictions, and impaired taste perception due to illness are significant factors contributing to inadequate food intake. Furthermore, mismatches between patient preferences and standardized hospital menus may increase plate waste, ultimately reducing operational efficiency within healthcare facilities (Veterini, 2025).

In addition to patient-related factors, the operational and managerial aspects of hospital food service systems also play a substantial role. Cook et al. (2023) demonstrated that inadequate food auditing systems and insufficient workforce training in hospital nutrition services contribute to inefficiencies in food production and distribution processes. Overproduction, often implemented to accommodate uncertain patient demand, is a major source of food waste. Consequently, routine data-driven food audits are essential for minimizing discrepancies between food prepared and food consumed (Judijanto & Wasaraka, 2026).

Another important contributor to food waste is supply chain management and the integration of technology within hospital nutrition services. Joubert and Jokonya (2021) found that digital technologies, including Internet of Things (IoT)-based food monitoring systems and data analytics, can improve demand forecasting accuracy and reduce food wastage. However, the implementation of such technologies continues to face challenges, including limited investment capacity and

organizational resistance to change. Therefore, strengthening human resource capabilities and institutional policy support is essential for facilitating digital transformation in food service management (Zulfikar, 2025).

From environmental and sustainability policy perspectives, hospitals are increasingly expected to adopt proactive food-waste management practices. Hoteit et al. (2024) reported that only a small proportion of hospitals have implemented food donation or recycling programs, despite evidence indicating that such initiatives can reduce institutional carbon footprints by as much as 20%. These findings highlight the importance of strengthening policies that promote food waste auditing and reporting as integral components of sustainable-development agendas. Within the Indonesian context, Nila & Sarita (2025) revealed that most hospitals lack an integrated food waste monitoring system. This condition is largely influenced by limited staff awareness of food efficiency and budgetary constraints associated with waste management. Consequently, educational approaches and multidisciplinary collaboration among healthcare professionals, dietitians, and hospital administrators are required to foster a culture of food efficiency in hospitals.

At the global level, social and cultural dimensions influence food waste generation. Leiblein et al. (2019) emphasized that patients' perceptions of food quality, meal timing, and eating habits significantly affect the amount of food discarded. Dissatisfaction with food taste, appearance, and overall acceptability frequently contributes to lower consumption rates and increased food waste. Although numerous studies have identified the determinants and management strategies for hospital food waste, existing evidence remains inconsistent regarding the most influential factors. Furthermore, the effectiveness of the proposed reduction strategies varies considerably across studies, resulting in a lack of consensus on the most effective approaches. In addition, much of the existing literature remains fragmented and fails to integrate these determinants into a comprehensive analytical framework.

Addressing these gaps, the present study aims to identify the dominant factors influencing food waste and analyze effective reduction strategies in hospital settings through a Systematic Literature Review (SLR). Unlike

previous studies that have largely adopted descriptive approaches, this review provides a systematic synthesis to enhance the understanding of the interrelationships among contributing factors and their strategic implications for hospital food waste management. A systemic approach encompassing all stages of the food supply chain—from menu planning and procurement to food waste handling—has been shown to be more effective in reducing food waste than a single-stage approach. Hospitals that implement sustainable food service systems have reported waste reductions of up to 35%. These approaches integrate the principles of energy efficiency, emission reduction, and optimization of locally sourced food consumption.

Ramos et al. (2025) emphasized that research on hospital food waste continues to face methodological challenges, particularly regarding quantitative waste measurement and evaluation of intervention effectiveness. Therefore, a systematic literature review is an appropriate approach for identifying, analyzing, and synthesizing empirical evidence related to the factors influencing food waste in hospital settings. The findings are expected to contribute to the development of more sustainable food management policies and practices in the healthcare sector.

This study aimed to identify, categorize, and comprehensively analyze the factors contributing to food waste in hospital food services based on previous empirical research. Specifically, this review seeks to provide a comprehensive overview of internal determinants, including patient behavior, nutrition management, and food service systems, as well as external determinants, such as policies, infrastructure, and organizational culture, that influence the occurrence of food waste in hospitals.

Methods

This study employed a qualitative research design using a Systematic Literature Review (SLR) approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure that the identification, selection, and synthesis of the literature were conducted systematically and transparently (Page et al., 2021). This approach

was selected because it enables a comprehensive and structured review of previous studies related to food waste in hospitals.

The research process began with a literature identification stage through a systematic search of international scientific databases, including Scopus, ScienceDirect, PubMed, and Emerald Insight. The search strategy utilized combinations of keywords connected by Boolean operators, such as (“food waste” AND “hospital”) OR (“hospital food waste” AND “factors influencing food waste”) OR (“hospital nutrition management” AND “food service waste”), consistent with approaches adopted in previous studies (Nila & Sarita, 2025).

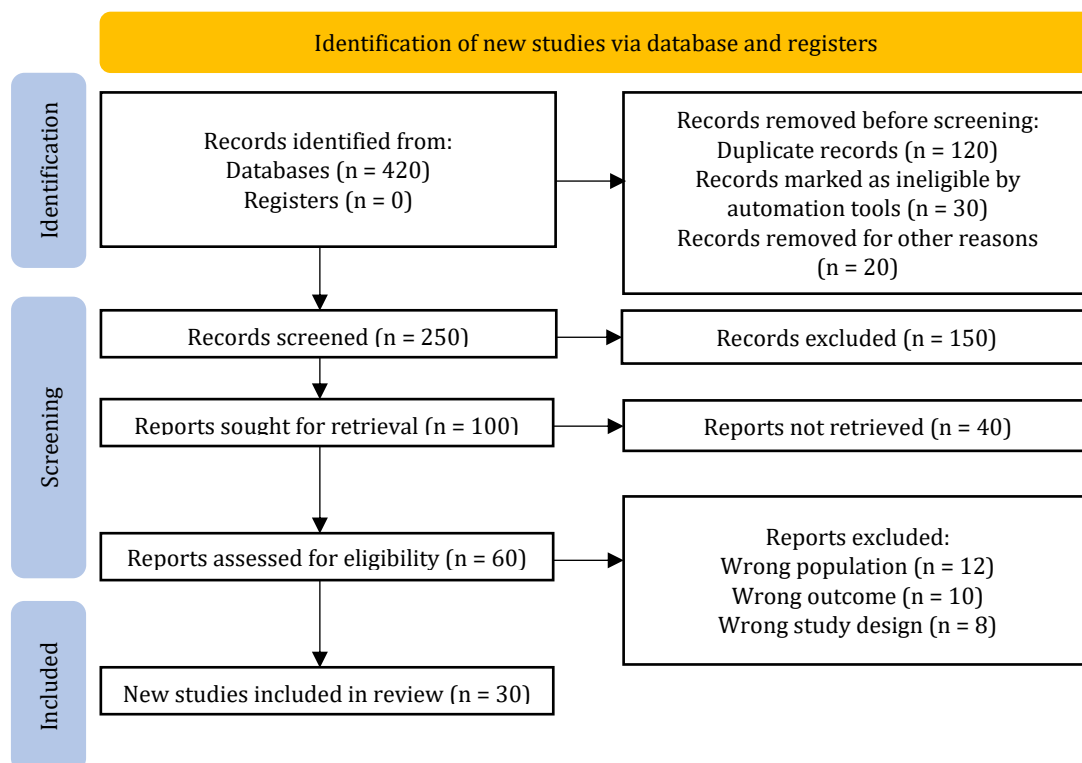
Articles were subsequently screened based on the predefined inclusion and exclusion criteria. The inclusion criteria were as follows: (1) articles published between 2020 and 2025; (2) studies addressing food waste in hospital settings; (3) articles published in English or Indonesian; and (4) studies with full-text accessibility. The exclusion criteria were opinion papers, editorials, reports lacking empirical data, and studies conducted outside healthcare settings. The selection process consisted of three stages: title and abstract screening, full-text review, and final validation to ensure thematic relevance to the research objectives (Cook et al., 2023).

To ensure the quality of the included studies, a quality appraisal was conducted using the Critical Appraisal Skills Program (CASP) framework (CASP, 2018). Each article was evaluated based on the clarity of the research objectives, methodological appropriateness, validity of the findings, and relevance to the study topic. The appraisal results were used to classify the articles into high-, moderate-, and low-quality categories. Only studies with adequate methodological quality were included in the synthesis stage.

The next stage involved data extraction, during which key information was collected from each selected article, including the publication year, study location, research methodology, investigated variables, and principal findings related to the determinants and reduction strategies of food waste. The extracted data were subsequently analyzed using a thematic synthesis approach combined with content analysis techniques to identify recurring themes. This analytical approach was consistent with the methodology employed by

Mahmoudifar et al. (2025), who emphasized the importance of narrative synthesis in explaining

the interrelationships among the factors contributing to food waste.



Gambar 1. PRISMA flow chart

Data analysis was performed by categorizing the factors influencing food waste into four major domains: patient-related, food quality-related, service-related, and system and policy-related factors. This classification is based on the thematic framework proposed by Leiblein et al. (2019). To enhance reliability, the coding and categorization processes were conducted systematically, and the findings across studies were compared to identify patterns, similarities, and variations in research outcomes (Ramos et al., 2025).

The synthesized findings are presented through tables and descriptive narratives to

highlight research trends, literature gaps, and strategic implications for reducing food waste in hospital settings. The validity of the findings was strengthened through source triangulation and cross-study comparisons in diverse research contexts.

Result and Discussion

This review identified 30 relevant studies related to factors influencing hospital food waste, as summarized in Table 1.

Tabel 1. Results of the analysis of studies on food waste factors

Author(s)	Methods	Results
Yumna et al. (2025)	A quantitative study involving 127 patients.	The study found that the highest level of food waste occurred during dinner, reaching a total of 30,643 kg, which was higher than that observed during breakfast and lunch. The average amount of food wasted per day was 84.23 kg, as approximately 75% of patients (n = 227) did not finish their meals. This condition was influenced by several factors, including inappropriate portion sizes, limited menu variety, and patient activities that interfered with the mealtimes. These findings indicate that plate waste among hospitalized patients remains high and is influenced by appetite, food

Marina et al. (2024)	This analytical observational study had a cross-sectional design and involved 60 adult inpatients.	quality, and menu variety. The findings revealed that most aspects of food presentation and food service were not significantly associated with patient food waste. Meal delivery timeliness ($p = .428$), menu variety ($p = .742$), food texture ($p = .428$), and food presentation techniques ($p = .428$) were not significantly associated with food waste. Similarly, food service staff attitudes ($p = .575$) and dining utensils ($p = .914$) were not associated with food waste. In contrast, food taste was significantly associated with patient plate waste ($p = .031$), suggesting that patient satisfaction is primarily influenced by palatability, and meals perceived as more appealing tend to generate less waste.
Lestari et al. (2023)	This was a descriptive cross-sectional study involving 30 participants.	The study found that the highest average percentage of food waste occurred in staple foods (28%), whereas the lowest was observed in animal-based dishes (12.5%). Food waste among elderly patients (45.83%) and children (39.28%) exceeded the acceptable threshold of $\leq 20\%$. Most patients reported that hospital meals were unattractive, served in excessive portions, insufficiently warm, and lacked variety.
Yanti et al. (2025)	This was a quantitative analytical study with a cross-sectional design involving 42 respondents.	The study found that the average vegetable plate waste among Class III inpatients was 32.7%. Bivariate analysis demonstrated significant associations between food appearance factors and plate waste, including color ($p = 0.022$), food shape ($p = 0.016$), portion size ($p = 0.045$), and serving method ($p = 0.032$). These findings indicate that patient satisfaction with food appearance influences the amount of food that remains uneaten.
Budianingsih et al. (2025)	This was a cross-sectional survey study.	Based on the respondents' evaluations of food taste, 33 participants (61.1%) reported that the food was unpalatable. However, 28 respondents (51.9%) considered the food presentation to be attractive. Statistical analysis revealed a significant association between food taste, food appearance, and plate waste ($p < 0.001$), indicating that sensory food quality strongly influences food consumption.
Aditya et al. (2023)	This was an observational cross-sectional study involving 54 respondents.	Food service quality had no direct effect on plate waste or patient satisfaction with food service. In contrast, food product quality negatively affected food waste and positively influenced patient satisfaction. Patient satisfaction also reduced the food waste. Mediation analysis revealed that patient satisfaction mediated the relationship between food product quality and food waste, but not mediate the relationship between food service quality and food waste.
Sumardilah (2022)	This cross-sectional study included 113 patients.	The findings showed that 79.6% of patients left less than 20% of their meals uneaten, with an average plate waste of 18.5% ($SD = 14.7$). Significant associations were found between food presentation ($p = 0.018$), food temperature ($p = 0.048$), consumption of food from outside the hospital ($p = 0.044$), and plate waste. Portion size ($p = 0.178$) and seasoning use ($p = 0.115$) were not significantly associated with food waste.
Trisnawati & Anasari (2024)	This descriptive analytical cross-sectional study	Hospital environmental conditions were not significantly associated with patient plate waste ($p = .258$). However, consumption of food from outside the hospital was

	involved 67 respondents.	significantly associated with food waste ($p = 0.007$).
Putricia et al. (2023)	An analytical survey with a cross-sectional design was conducted with 34 respondents.	Plate waste from vegetables and plant-based side dishes was not significantly associated with meal distribution, food taste, food service staff attitudes, or ward environmental conditions ($p > 0.05$). However, food appearance and consumption of food from outside the hospital were significantly associated with waste. In addition, the amount of food waste exceeded the hospital service standard of $\leq 20\%$.
Nila & Sarita (2025)	A systematic literature review was conducted using the PRISMA approach, involving 12 articles.	The study demonstrated that Life Cycle Assessment (LCA), menu redesign, staff education, and waste monitoring systems effectively reduced hospital food waste. However, its implementation remains constrained by limited institutional awareness and the absence of binding regulations.
Septidiantari et al. (2022)	This was an observational cross-sectional study using purposive sampling with 30 participants.	The study found that gender was the most dominant internal factor influencing food waste, accounting for 56.66% of the cases. Among the external factors, food aroma was the most influential determinant, contributing 53.33%. These findings indicate that individual characteristics and sensory food quality significantly affect food consumption in hospital settings.
Loditha (2023)	This cross-sectional study used purposive sampling and involved 55 respondents aged 18–60 years.	Food quality was significantly associated with plate waste in patients with gastritis ($p = 0.032$). In contrast, meal frequency was not significantly associated with food waste ($p = 0.769$). These findings suggest that food quality plays a more important role in determining patient food consumption than the meal delivery schedule.
Hartati et al. (2022)	This descriptive cross-sectional study included 46 participants selected through accidental sampling.	The study found that lunch-time plate waste was categorized as acceptable because most respondents consumed the meals. Patients reported that the meals were palatable, visually appealing, and offered an adequate menu variety. These findings suggest that high-quality food presentation enhances patient food intake.
Nawarathna et al. (2024)	This was a quantitative descriptive study involving patients aged 20–60 years who were admitted to the medical wards.	The study found that 48.5% of respondents were dissatisfied with lunch meals, and 57.8% expressed dissatisfaction with food texture. The factors contributing to food waste included dinner serving schedules, food service staff attitudes, dining room conditions, ventilation, and cleanliness during meal service. Inappropriate food temperature and unsatisfactory taste were identified as important contributors to food waste.
Sartika & Saimi (2025)	An analytical observational cross-sectional study was conducted with 90 respondents selected from a population of 952 patients.	Improved friendliness of nutrition staff significantly reduced food waste, with an effect size of 7.122. Attractive food presentation increased food consumption and reduced food waste by up to 28.451 times less. Appropriate nutrient and calorie contents reduced food waste by 16.873 times. Patients with positive attitudes toward hospital meals were 2.585 times more likely to complete their meals. These findings highlight the importance of staff-patient interactions and sensory food attributes, including appearance, aroma, temperature, and texture, in promoting food consumption.
Ambarwati et al. (2024)	This quantitative cross-sectional study used interviews and questionnaires	Internal factors, including age, sex, disease type, length of stay, educational level, and occupation, were not significantly associated with food wastage. In contrast, external factors, particularly the ward environment, had a significantly

	administered to patients hospitalized in June 2024.	negative effect on food waste. Although hospital food quality and external food consumption were not significant predictors, patients' perceptions of ward comfort substantially influenced food waste.
Cook et al. (2023)	A systematic review was conducted according to the PRISMA guidelines using nine literature sources.	The review identified 85 food waste management strategies from 81 Gy literature reports and four peer-reviewed studies. The strategies included composting (34 cases), industrial reuse (11 cases), animal feed utilization (two cases), surplus food donation (21 cases), and other methods (17 cases). These strategies reduce landfill waste, decrease the staff workload associated with waste management, and lower waste transportation costs. However, waste-stream contamination was identified as the primary barrier, whereas effective leadership and operational adaptability were key success factors.
Ronitawati et al. (2021)	This descriptive observational cross-sectional study included 132 respondents.	Spearman correlation analysis showed that food taste, menu variety, variation in animal- and plant-based side dishes, fruit variety, meal schedule accuracy, dining equipment conditions, and patient satisfaction were associated with the costs resulting from food waste. Respondent characteristics, particularly gender, were associated with nutrient losses attributable to food waste. These findings suggest that food service quality and patient satisfaction influence both economic losses and nutrient waste.
Qurrotaa'yun & Ekorinawati (2021)	This was an observational cross-sectional study involving 40 patients.	The study found that 52.5% of patients consumed food from outside the hospital, whereas 65% considered hospital food to be reasonably palatable. Nevertheless, the average plate waste reached 31.85%, exceeding the hospital's Minimum Service Standard. Statistical analysis revealed significant associations between food taste ($p < 0.001$), external food consumption ($p = 0.009$), and food waste.
Parlina & Herat (2024)	Literature review.	The review found that hospital food waste is influenced by food quality and quantity, patient satisfaction, patient characteristics and clinical conditions, meal schedules, consumption of food from outside the hospital and hospital environmental conditions. Recommended waste reduction strategies include improving food distribution systems, enhancing menu design, implementing room service models, improving food quality and presentation, employing dietitians, improving dining environments, and adopting recycling, composting, and anaerobic digestion practices.
Handayani & Srimiati (2021)	This cross-sectional study included 50 patients who met the inclusion criteria.	The average soft diet plate waste was 17.14%, which met the hospital standards. Staple foods (25.9%) and vegetables (21.9%) contributed the largest proportion of food waste. The lowest level of waste occurred at breakfast compared to lunch and dinner. Statistical analysis showed that environmental factors were not significantly associated with food waste, whereas food-related factors were significantly associated with food waste.
Cook et al. (2022)	This qualitative study involved 20 semi-structured interviews.	The study found that the successful implementation of food waste audits in hospital food services was influenced by three key dimensions: capacity, change management, and governance processes. Capacity included the availability of

		time, workforce, and resources required to conduct the audits. Change-related factors involved staff resistance to audit procedures and efforts to obtain staff support. Governance and leadership factors included organizational structure, senior management support, and institutional policies that facilitate food waste auditing.
Dewi (2023)	This quantitative descriptive study involved 327 patients aged 18–25 years who received regular, high-calorie, and high-protein diets.	The findings showed that most patients were satisfied with the food services provided by the hospital. A total of 79.70% of respondents reported a high level of satisfaction with food services in Class III inpatient wards of Gambiran Regional General Hospital, Kediri.
Dalimunthe et al. (2023)	This descriptive analytical cross-sectional study involved 50 participants selected through purposive sampling.	Most participants were aged 56–65 years (46%) and were female (78%). Approximately 30% of the respondents had acceptable levels of food waste, whereas 70% were categorized as having excessive food waste. Statistical analysis revealed significant associations between food appearance ($p = 0.005$), taste ($p = 0.002$), and waste. In contrast, service provider-related factors were not significantly associated with patient food wastage.
Wijayanti et al. (2026)	This quantitative analytical cross-sectional study involved 370 respondents.	The average food waste among Class III inpatients will reach 20.53% in 2025. Staple foods accounted for the highest proportion of waste (26.37%), followed by vegetables (21.30%), plant-based side dishes (20.93%), animal-based side dishes (18.25%), fruits (11.87%), and snacks (9.25%). Food waste was estimated to cause financial losses of IDR 18,068.54 per patient/day. Age, educational level, food appearance, food taste, and consumption of food from outside the hospital were significantly associated with food wastage.
Ariefah & Sari (2024)	A quantitative study using surveys and observations of patients receiving soft diets.	The findings showed no significant association between food taste and plate waste ($p = .374$). Likewise, meal distribution time was not significantly associated with food waste ($p = 0.634$). These findings suggest that food waste among patients at Dr. Koesma Regional General Hospital may be influenced by factors other than food taste and meal-serving schedules.
Yudismara & Rahma (2025)	This was a pre-experimental, one-group, pretest-posttest study.	Nutrition education significantly improved dietary adherence and reduced food waste in patients with diabetes mellitus. Before the intervention, 65% of participants left more than 20% of their meals uneaten; after the intervention, this proportion decreased to 20% ($p < 0.05$). Furthermore, dietary adherence increased from 30% to 75% after nutrition education.
Mumpuni & Saniyah (2021)	This descriptive analytical cross-sectional study involved 28 inpatients selected through simple random sampling.	Breakfast was identified as the meal with the highest level of food waste among the inpatients. Vegetables contributed the largest proportion of waste, exceeding 52% of the total. This condition was attributed to poor food quality, including excessively sweet, salty, or bland flavors and unattractive food presentation.
Muntaqoh (2025)	This qualitative phenomenological study used semi-structured interviews	The study found associations between food waste and patients' evaluations of food taste, portion size, menu variety, food texture, meal schedules, and food consumption outside the hospital. Additionally, disease condition, eating habits,

	with 19 patients who had food waste exceeding 20%, assessed using the 7-point Comstock scale.	and prescribed diet type influenced the amount of food that remained uneaten.
Porter & Collins (2021)	This was a qualitative study employing semi-structured interviews and thematic analysis. The participants included 40 inpatients, comprising 10 patients each from the oncology, maternity, internal medicine, and subacute wards.	The study found that patients' perceptions of food waste were influenced by previous experiences, with cost considerations serving as the primary motivation for reducing waste. Hospital food waste is associated with patient preferences, food quality and quantity, and food service systems. The authors recommend three primary approaches to reduce food waste: improving food service efficiency, implementing integrated food waste management strategies, and minimizing non-food waste. Waste contamination is a major challenge in hospital food waste management.

The analysis of the 30 studies summarized in Table 1 indicates that hospital food waste is a multifactorial phenomenon influenced by patient-related factors, food quality, food service systems, environmental conditions, and institutional factors. Overall, food quality and patient-related factors were the most dominant and consistently reported determinants, followed by service-related and management system-related factors.

Food Waste Volume and Patterns

Several studies have shown that hospital food waste remains relatively high and varies according to meal timing. Yumna et al. (2025) reported that the highest level of food waste occurred during dinner, with an average of 84.23 kg per day, and approximately 75% of patients did not finish the food provided. A similar pattern was reported by Handayani and Srimati (2021), who found that food waste was lower at breakfast than at lunch and dinner.

These findings suggest that meal timing, patient condition, and daily activity patterns may influence food intake in a hospital setting. Higher waste during dinner may be associated with reduced appetite, fatigue, clinical discomfort, and lower motivation to eat later in the day. Therefore, meal scheduling and portion planning should consider patients' physiological conditions and daily care routines to improve food consumption and reduce food waste.

Sensory Factors: Taste, Appearance, and Aroma

Most studies identified sensory factors as the dominant determinants of food waste. Taste,

appearance, color, aroma, and food temperature were reported to be significantly associated with patient plate waste. Marina et al. (2024) and Budianingsih et al. (2025) found that food taste was significantly associated with the amount of food left uneaten ($p < 0.05$). Anggraini and Sholichah (2023) also found that visual attributes, including color, shape, and presentation, contributed to patient food consumption. Septidiantari et al. (2022) further emphasized that food aroma, as an external factor, had a substantial influence on food waste occurrence, accounting for 53.33% of the variance.

These findings indicate that sensory food quality is the most important factor in determining hospital food waste. Taste and appearance are directly related to patients' acceptance of meals, especially among patients whose illnesses may affect their appetite and taste perception. Thus, improving sensory quality through menu variation, appropriate seasoning, attractive presentation, suitable temperature, and acceptable aroma should be prioritized as a core strategy for reducing food waste in hospitals.

Psychological and Behavioral Factors

Psychological and behavioral factors also influence food consumption levels. Yanti et al. (2025) found that appetite and patient attitudes significantly affected eating behavior ($p = 0.001$). This finding is consistent with that of Sartika and Saimi (2025), who demonstrated that staff interaction and empathy could improve patient food intake.

These findings suggest that food waste is not solely determined by the food provided but also by patients' motivation, perceptions, emotional condition, and willingness to consume hospital meals. Positive interpersonal relationships between patients and nutrition staff may improve trust, meal acceptance, and dietary adherence in patients with CKD. Therefore, a patient-centered approach is needed in hospital food service management, particularly through nutrition counseling, empathetic communication, and individualized attention to patients' eating difficulties.

Service and Distribution System Factors

Service-related factors have varying effects on food waste. Several studies have indicated that food quality is significantly associated with the amount of food waste (Loditha, 2023); however, technical aspects, such as meal distribution timeliness, did not consistently show significant effects (Ariefah & Sari, 2024). Marina et al. (2024) reported that patient satisfaction was more strongly influenced by food quality than by other service-related aspects.

These findings indicate that service factors may act as supporting determinants that strengthen or weaken the effect of food quality on food consumption frequency. Although timely distribution is important for maintaining food temperature and service quality, its effects may depend on hospital workflow, staffing capacity, and patient care schedules. Therefore, improving service systems should not only focus on timeliness but also on food presentation, staff responsiveness, communication, and coordination between nutrition units and inpatient wards.

Environmental Factors and Food from Outside the Hospital

Environmental conditions and food consumption outside the hospital also contribute to food waste. Ambarwati et al. (2024) found that the ward environment had a significant influence on food waste levels. Other studies have shown that the consumption of food from outside the hospital is significantly associated with increased food waste ($p < 0.01$; Qurrota'yun & Ekorinawati, 2021; Trisnawati & Anasari, 2024).

These findings suggest that dissatisfaction with hospital food may encourage patients to seek alternative food sources for their nutritional needs. Patients with access to

external food may become more selective about hospital-provided meals, thereby increasing plate waste. In addition, ward comfort, room atmosphere, cleanliness, and patients' physical condition may influence appetite and food acceptance of patients. Therefore, reducing hospital food waste requires attention not only to meal quality but also to the broader eating environment and control of external food consumption, when clinically appropriate.

Food Waste Management and Reduction Strategies

Various strategies have been identified to reduce food waste in hospitals. Cook et al. (2022) emphasized the importance of a systemic approach through food waste audits and the implementation of Life Cycle Assessment (LCA)-based strategies. Strategies such as improving food quality, strengthening waste management, and implementing food donation programs have been shown to reduce waste volumes. Yudismara and Rahma (2025) found that nutrition education significantly reduced food waste.

These findings indicate that integrated strategies are more effective than isolated interventions. Food waste reduction should combine improvements in meal quality, data-based waste monitoring, patient preference assessments, staff training, and nutrition education. However, implementation may be limited by resource constraints, low organizational commitment, and the absence of an integrated monitoring system. Therefore, hospitals need structured food waste management programs supported by routine audits, measurable indicators, and policy.

Estimated Economic Impact

From an economic perspective, food waste significantly impacts hospital operational efficiency. Wijayanti et al. (2026) estimated that losses due to food waste reached IDR 18,068.54 per patient per day, indicating substantial potential monthly losses.

This finding highlights that food waste is not only a nutritional and environmental issue, but also an economic burden for hospitals. Accumulated daily losses may reduce cost efficiency in food service operations and increase unnecessary expenditures on procurement, production, labor, and waste disposal. Therefore, economic evaluation should be integrated into hospital food waste monitoring to support

evidence-based decision making and cost-effective nutrition service planning.

Organizational and Leadership Dimensions

Organizational and leadership dimensions play an important role in the success of food waste management. Cook et al. (2022) showed that resource capacity, management support, and organizational governance were key factors in implementing food waste audits. Leadership support and inter-staff coordination are essential for maintaining the sustainability of hospital food waste management programs.

These findings suggest that food waste reduction requires strong institutional commitment, not merely technical improvements at the food-service level. Effective leadership can facilitate resource allocation, staff engagement, workflow adjustments, and policy implementation. Coordination among nutrition units, nurses, physicians, waste management teams, and hospital administrators is necessary to ensure that food waste reduction becomes part of a sustainable hospital management system.

Overall, this review demonstrates that hospital food waste results from multidimensional interactions among food quality, patient characteristics, service systems, environmental conditions, economic considerations and institutional factors. The variation in findings across studies indicates that no single approach can be universally applied. Therefore, adaptive and context-specific strategies that integrate technical, behavioral, managerial, and policy dimensions are required to improve the efficiency and sustainability of hospital nutrition services in China.

Conclusion

The findings of this review indicate that hospital food waste is influenced by the interaction of multiple factors, with food quality and patient characteristics being the most dominant determinants. Sensory attributes, particularly taste and appearance, were consistently identified as the primary factors affecting patient food consumption, whereas clinical conditions, appetite, and individual preferences were found to strengthen or weaken these relationships. The hospital food waste cannot be explained by a single determinant but rather

results from the complex interplay of technical, behavioral, and managerial factors. The variation in findings across studies suggests that the effectiveness of food waste reduction strategies is highly dependent on the operational context and patient characteristics of individual hospitals.

The principal contribution of this review lies in its integration of diverse empirical findings to identify the most consistently reported determinants of hospital food waste and clarify the interrelationships among factors that have previously been examined in isolation. These findings underscore the importance of balancing food quality improvement initiatives with interventions that simultaneously address patient-related conditions and food-service systems.

From a practical perspective, effective hospital food waste management requires a structured and data-driven approach. The implementation of food waste monitoring systems, patient preference-based menu evaluations, and continuous capacity building for nutrition professionals may enhance service efficiency and reduce food waste. Strengthening managerial processes and organizational support is also essential to ensure the sustainability of these strategies.

Future studies are warranted to develop more robust quantitative approaches for evaluating the effectiveness of food waste interventions and to incorporate economic and environmental impact assessments into hospital-food-waste-management frameworks.

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