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Factors of food waste in adult patients with different diet types in hospital: A Systematic review

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ABSTRAK

Latar Belakang: *Sisa makanan di rumah sakit merupakan isu penting karena berdampak pada biaya operasional dan kesehatan pasien. Tingginya sisa makanan menunjukkan adanya ketidaksesuaian antara makanan yang disediakan dengan kebutuhan, preferensi atau kondisi klinis pasien.*
Tujuan: *Menganalisis tingkat sisa makanan pada pasien dewasa berdasarkan jenis diet serta mengidentifikasi faktor utama yang mempengaruhinya.*
Metode: *Penelitian ini merupakan tinjauan literatur sistematis yang mengikuti pedoman PRISMA. Pencarian artikel dilakukan melalui database Scopus, PubMed, Web of Science, dan Google Scholar pada rentang tahun 2015-2025. Artikel yang memenuhi kriteria inklusi dan eksklusi dianalisis secara deskriptif untuk mengidentifikasi tingkat sisa makanan dan faktor-faktor yang memengaruhinya. Sebanyak 18 artikel memenuhi kriteria inklusi dan dianalisis dalam penelitian ini.*
Hasil: *Hasil penelitian menunjukkan bahwa sisa makanan lebih tinggi pada pasien yang menerima diet lunak dan diet terapeutik dibandingkan dengan diet biasa. Penyebab faktor utama pemborosan meliputi rendahnya nafsu makanan, ketidaksesuaian rasa dan tekstur makanan dengan preferensi pasien, pembatasan medis terhadap konsumsi, serta faktor penyajian seperti waktu distribusi makanan dan kualitas layanan.*
Kesimpulan: *Pengurangan sisa makanan dapat dicapai melalui peningkatan kualitas makanan, penyesuaian menu berdasarkan preferensi pasien, ketepatan waktu penyajian, serta peningkatan komunikasi antara pasien dan tenaga gizi. Pendekatan indivisual dan fleksibal dalam penyelenggaraan makanan di rumah sakit diperlukan untuk meningkatkan konsumsi dan menurunkan tingkat sisa makanan.*

KATA KUNCI*: faktor sisa makanan; jenis diet; pasien dewasa; sisa makanan*

ABSTRACT

Background: *Food waste in hospitals is an important issue because it affects operational costs and patient health. High levels of food waste indicate a mismatch between the meals provided and the needs, preferences, or clinical conditions of patients*

Methods: *This study is a systematic literature review conducted in accordance with the PRISMA guidelines. Articles were retrieved from Scopus, PubMed, Web of Science, and Google Scholar databases published between 2015 and 2025. Studies meeting the predefined inclusion and exclusion criteria were analyzed descriptively to identify the level of hospital food waste and the factors influencing it. A total of 18 articles were included in the final analysis.*

Results: *Food waste was higher among patients receiving soft and therapeutic diets compared with those receiving regular diets. The main contributing factors included reduced appetite, food flavors and textures that did not match patient preferences, clinical restrictions on food intake, and presentation-related aspects such as meal distribution timing and service quality.*

Conclusions: *Food waste reduction can be achieved by improving meal quality, adjusting menus to patient preferences, ensuring timely meal distribution, and strengthening communication between patients and nutrition staff. An individualized and flexible approach to hospital foodservice management is essential for improving food intake and reducing food waste.*

KEYWORD*: adult patients; diet types; food waste; food waste factors*

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INTRODUCTION

Planning menu, forecasting ingredient, budgeting, procurement, storage, preparation, distribution, and evaluation are all part of hospital food service (1). The high amount of patient food waste is a major problem within this system, which has economic and nutritional consequences and requires intensive attention.

According to a research conducted at Jakarta's Koja General Hospital, inpatients left an average of 11.7% plate waste every meal, which resulted in an estimated 314 kcal of nutrient loss and a daily economic loss of IDR 4,335 (2). Similar, a study carried out in three Italian hospitals revealed a high overall food waste rate of 41.6%, with vegetables accounting for the biggest percentage (55%) (3). Food waste in Indonesia is still a problem and frequently surpasses the permissible 20% guideline.

Sidoarjo District Hospital, for example, recorded average food waste over this threshold, with plant-based dishes having the highest amounts (30.72%) and animal-based dishes having the lowest (21.81%) (4). Food waste, which provides information about patients' dietary intake and meal pleasure, is widely acknowledged as a critical indicator of hospital food service performance (5).

According to a research conducted in an acute-care hospital in Australia, kitchen-level waste reached 134.1 kg per day, of which 87.6% was made up of cooked food that was never served, while patient plate waste averaged 41%, or 0.7 kilogram per patient per day (6).

Differences across diet kinds are also noted. According to a study conducted in 57 hospitals in Ontario, Canada, 47% of the hospitals monitored texture-modified menus, 53% examined therapeutic diets, and 58% evaluated the nutritional sufficiency of ordinary foods (7). Tanuwijaya (2018) discovered that a public hospital in Selangor recorded a total patient food waste level of 32.45% (8). while plate waste at Universitas Muhammadiyah Malang Hospital reached 57% throughout three daily meals (9). A study at Petala Bumi Hospital reported varying plate waste across meals and food textures—30.6% at breakfast, 39.8% at lunch, 35.6% at dinner, with soft diets reaching 50% and pureed diets 100%, while diabetes diets showed no waste (0%) (10).

Similarly, studies at Dr. Cipto Mangunkusumo National General Hospital revealed that liquid food waste was higher than the 20% threshold, especially in patients with long-term illnesses such internal problems and stroke (11). These findings indicate suboptimal meal provision. This study therefore aims to assess food waste levels among adult inpatients receiving therapeutic diets and to identify key factors contributing to hospital food waste.

MATERIALS AND METHODS

Search strategy

This study is a literature review systematic literature review examining factors contributing to food leftovers among adult inpatients receiving various hospital diets. The review followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, including topic formulation, source identification, study selection, grouping, and synthesis of published evidence. Literature searches were conducted in Scopus, PubMed, Web of Science, and Google Scholar, limited to articles published within the past 10 years, using the Boolean terms: ((leftovers) AND (adult patients OR hospitalized adults) AND (regular diet OR soft diet OR filter diet OR liquid diet) AND (factors)). Screening was carried out based on titles, abstracts, publication year, and study methodology, followed by the application of predefined inclusion and exclusion criteria. Eligible studies were organized and managed using Covidence, with Mendeley employed for reference management.

To ensure methodological rigor, two independent reviewers assessed study quality using JBI or CASP checklists, depending on the design. Appraisal covered relevance, clarity of objectives, sampling, data collection, and analytical rigor. Disagreements were resolved through discussion or consultation with a third reviewer. The study selection process is summarized in the PRISMA flow diagram (**Figure 1**).

Inclusion and exclusion criteria

Eligible studies were quantitative, used primary or secondary data, examined factors influencing food waste in adult inpatients, were published between 2015–2025, conducted in hospital settings, and written in English or Indonesian. Non-scientific publications, studies published before 2015, studies involving non-adult populations, or those not addressing hospital diets or food waste were excluded.

After removing one duplicate, 389 articles were screened; 293 were excluded for irrelevance, non–peer-reviewed format, inappropriate populations, lack of full-text access, or unsuitable languages. Ninety-six full-text articles were assessed 78 were excluded due to unsuitable settings, irrelevant outcomes, inappropriate populations, incorrect comparators or interventions, wrong indications, or inadequate study design. Screening was managed using Covidence, with reviewer disagreements resolved through discussion or third-reviewer input.

Data extraction and analysis

The selected articles were organized and synthesized using the **Covidence** application. Study eligibility was assessed using the **PICO framework**, defining adult patients as the population, hospital diet types as the comparison, and food waste as the outcome **(Figure 1).**

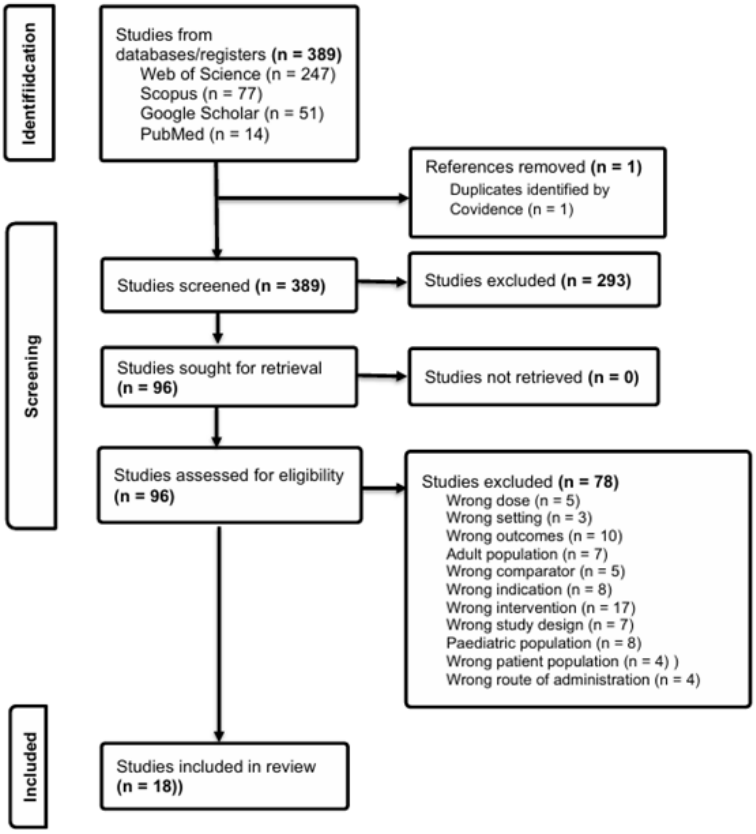

Figure 1. PRISMA Flow Chart Diagram

RESULTS AND DISCUSSIONS

A review of 20 studies showed wide variation in hospital food waste among adult patients, with consistently higher waste found in pureed and liquid diets compared to regular diets (12). Key contributors include unfavorable sensory qualities, poorly timed meal delivery, and restrictive diets that patients perceive as unappealing. These findings emphasize the need for more individualized and flexible dietary strategies to improve acceptance and nutritional adequacy in hospitalized adults.

Table 1 Regarding research design, cross-sectional studies dominated the evidence base, accounting for 91% of all included studies, followed by descriptive correlation (4.5%) and comparative quantitative designs (4.5%). The dominance of cross-sectional designs reflects the emphasis on identifying factors associated with food waste and applying food-waste measurement methods among hospitalized patients. Across the 18 studies, nearly 80% used cross-sectional designs involving adult patients on various therapeutic diets.

Table 1. Characteristics of Eligible Literature (n= 18)

No	Authors & Year	Title	Design	Sample	Variables	Methods	Outcomes
1	Jamhuri et al., 2019 (13)	Food Wastage in Hospital among Cancer Inpatients and its Relation with Nutrition Impact Symptoms	Cross-sectional	337 inpatient cancer patients (4 oncology wards)	Food waste Nutrition Impact Symptoms (NIS)	Food weighing, visual estimation, NIS questionnaire	Food waste was very high: 59.3% (visual) & 41.9% (weighing). The three most wasted foods: vegetables 57.9%, protein 55.7%, and soft carbohydrates 51.6%. NIS significantly associated with increased food waste: nausea, vomiting, loss of appetite, and difficulty swallowing. Loss of energy 20–29.5% and protein 20.5–46.9% of daily needs. Estimated food cost loss: RM17,847–25,259.
2	Eri wiyasti et al., (2019) (14)	Analysis of Factors That Influence Leftovers in Hospital Patients at Second Hospital Dr. Soepraoen Malang	Cross-sectional	78 inpatients	Food waste (Comstock), and Factors that influence: taste, food temperature, portion	Comstock observation, questionnaire interview, Chi-square test	Average food waste remains high (26–40%). Significantly related factors: taste, food appearance, and temperature. Nonsignificant: portion size and aroma.

3	Schiavone et al., 2019 (3)	Patient Evaluation of Food Waste in Three Hospitals in Southern Italy	Cross-sectional	762 patients in three hospitals in Campania, Italy	Food waste percentage	Structured Acute Care Hospital Foodservice Patient Satisfaction Questionnaire (ACHFPSQ), Likert scale	41.6% of hospital food wasted, highest in vegetables and potatoes (55%). Women waste more food (59.1%) than men (38.2%). Factors: poor food quality, mismatch with patient eating habits .
4	Gomes A, et al., 2020 (15)	Evaluation of Hospital Food Waste A Case Study in Portugal	Cross-sectional descriptive study	105 hospitalized patients, 321 meal observations, 4 wards (Medicine, Pediatrics, Oncology, Orthopedics)	Type of diet, Food waste per meal, and Food waste soup main dish	Physical weighing of solid food, Visual estimation for soup, and 21 day FW evaluation	Main meal intake: Ped 72.6%, Med 47.5%, Onc 46.9%, Ort 58.4% (p=0.027) Soup intake: Ped 67.1%, Med 30.9%, Onc 29.4%, Ort 35.2% (p=0.018) High food waste, especially in the pediatric ward; interventions to improve food management are needed
5	Saragih, 2020 (16)	Does the taste and appearance of food affect food waste in low-salt diet patients?	Cross-sectional	530 patients on a low-salt diet (JK Hospital, Tasikmalaya)	Taste acceptance, food appearance, food waste (%)	Questionnaire, interview, rating scale 1–3	The average food waste in patients was still above the PGRS standard (26%). There was a significant relationship between food waste and taste (p=0.002) and food waste and food appearance (p=0.000). Food taste and appearance significantly influenced the amount of food waste in patients on a low-salt diet.

6	Hoteit et al., 2024 (17)	Food Waste Quantification, Management, and Strategies in Eastern Mediterranean Hospitals	Cross-sectional	6 studies from Iran, Saudi Arabia, Qatar (120-939 patients per study)	Food waste percentage, causes, nutritional status	Dietary Intake Monitoring System (DIMS), Direct weighing, patient satisfaction surveys	25.4% food wasted, highest at dinner (32.7%). 33.3% of patients at risk of malnutrition. Lack of effective waste policies.
7	Schiavone et al., 2020 (18)	Patient Satisfaction and Food Waste in in Three Hospitals in Southern Italy Lebanon	Cross-sectional	550 inpatients from two hospitals in Italy	Socio-demographic characteristics, food expectations, service quality	Acute Care Hospital Foodservice Patient Satisfaction Questionnaire (ACHFPSQ)questionnaire, logistic regression	Higher satisfaction in Northern Italy hospitals, lower waste (15.3%). Southern Italy (41.7%). Menu variety plays a role.
8	Hassan et al., 2024 (19)	Food waste management in Lebanese hospital food services: Findings from a first-of-its-kind cross-sectional study in the Arab region	Cross-sectional	155 inpatients from 16 hospitals	Plate waste, patient satisfaction, determinants (quality, location, meal time)	Questionnaire, weighing, regression analysis	31.4% plate waste (~366 tons annually), highest in rural hospitals. Major factor: low appetite.
9	Antasouras G, et al., 2023 (20)	How to improve food waste management in hospitals through focussing on the four most common measures for reducing plate waste	Cross-sectional	215 inpatients	Portion size flexibility, selective menu, nutritional support, ordering & delivery system, plate waste (%)	Structured questionnaire, plate waste observation (visual + portion), short interview	Average plate waste was 32.8%, highest in the elderly and patients on a soft diet. Flexible portion size was significantly associated with reduced plate waste (p = 0.003). Selective menus increased daily energy intake by +18%.

							Nutritional support (snacks + counseling) reduced animal-based dish waste from 25% to 14%. An electronic ordering system reduced food distribution delays from 27 minutes to 8 minutes, contributing to a reduction in plate waste (p = 0.021). Most influential factors: portion flexibility and selective menus.
10	Haerani et al., 2023 (21)	Diet, Food Acceptance, Plate Waste, and Patient Satisfaction, South Sulawesi, Indonesia	Cross-sectional	62 inpatients	Diet type, food acceptance, plate waste, satisfaction	Questionnaire, medical records, chi-square test	No significant link between diet type and satisfaction. Significant link between food waste and satisfaction (p=0.000).
11	Palimbong et al., 2018 (22)	Effectiveness of Low-Sodium Diets on Hypertensive Patients' Recovery Time, RSUP Prof. Dr. R.D. Kandou, Manado, Indonesia	Comparative	60 hypertensive patients	Diet type, recovery duration	Food recall, medical records, T-test	Low-sodium diet effectively reduced blood pressure in 3 days (p<0.05). Faster recovery with soft food.
12	Kusumawati, et al., 2024 (23)	Meal Distribution Timing, Temperature, and Lunch Waste, RSUD Dr. Soegiri, Lamongan, East Java, Indonesia	Cross-sectional	30 inpatients in Class III wards	Meal timing, temperature, lunch waste	Chi-square test, Comstock method	Significant relation between meal timing (p=0.007) and temperature (p=0.016) with lunch waste.
13	Meliana, et al., 2020 (24)	Determinants of Food Waste in RS Hermina Daan Mogot, Jakarta, Indonesia	Cross-sectional	70 inpatients	Food waste, external food consumption, taste perception	Questionnaire, chi-square test	50% of patients exceeded hospital waste guidelines. Frequent external food intake linked to higher waste (p=0.049).

14	Putricia D, Yuliantini E (2023) (25)	The Relationship of Accuracy of Serving, Ambience, Food Performance, Exterior Food, Taste, Attitude of Server With Regular and Soft Diet Species	Cross-sectional	34 patients (Mina Room – class I, Marwah – class II, Safa – class III)	Timeliness of serving food, ambience, food appearance, exterior food (outside food), taste, attitude of server, leftover staple foods	Questionnaire, food waste observation	There is a relationship between the appearance of food and food from outside and the amount of leftover staple food. There is no relationship between the timeliness of serving, the ambiance of the serving environment, the taste of the food, and the attitude of the server and the amount of leftover staple food. Of the six variables, only two variables are significantly related.
15	Oktaviani et al., 2023 (26)	Food Taste and Menu Variety on Soft Food Waste, RSUD Dr. Soetomo, Surabaya,East Java, Indonesia	Cross-sectional	75 inpatients	Taste, temperature, variety	Questionnaire, chi-square test	52% food waste. Significant factors: aroma (p=0.016), texture (p=0.000), taste (p=0.000), variety (p=0.016).
16	Razalli et al., 2021 (27)	Food Waste Among Patients on Modified Texture Diets, Kuala Lumpur, Malaysia	Cross-sectional	95 inpatients	Plate waste, patient satisfaction	Weighing, interviews	47.5% waste. Highest waste in mixed diets (65%), followed by chopped (56%) and porridge (35%).
17	Yuksel & Önal, 2021 (28)	Plate Waste in Hospital Food Services, Turkey	Cross-sectional	16,722 hospital staff	Waste percentage by food type, meal timing, macronutrient waste	Weighing, ANOVA test	Overall plate waste: 6.2%. Highest protein waste (10.4%). Lower waste at dinner than lunch ($p<0.05$).

18	Jonathan et al., 2023 (29)	Managing Food Waste in the Inpatient Population	Cross-sectional study	60 inpatients in Ward C2, Gastroenterology Unit, Royal Blackburn Hospital	Food waste (%), portion size, patient satisfaction	One time observation of food waste measurements at three meal times; weighing of food scraps; patient satisfaction questionnaire; documentation of portion types	Average food waste was 68%, with the highest rate for soft foods. Patients receiving large portions had higher food waste (74%) than those receiving medium portions (59%). 57% of patients stated that the portions were too large and did not meet their appetite. Factors associated with food waste included portion size, food appearance, and the patient's clinical condition.

Plate waste remained high (26–68%) and exceeded 70% for vegetables, animal-based dishes, and soft or liquid foods.

Major contributors included digestive symptoms, psychological factors, reduced appetite, and external aspects such as taste, aroma, texture, temperature, and serving timeliness. Patients with more severe clinical conditions showed the highest waste levels (3,17).

Factors that affect food waste

Food waste is driven by both external factors and internal patient factors, which shape food acceptance according to health status, preferences, and psychological conditions (**Table 2**).

Internal Factors

Appetite Disturbance and Swallowing Difficulty

Table 2. Internal factors that affect food waste

Article no/country	Author	Geographic Region/continent	Results	Ref
1/IMalaysia	Razalli et al. (2021)(27)	Asia	Low appetite, dysphagia, and texture-modified diets increased food waste, especially in mixed diets (65%).	27
2/Indonesia	Jamhuri et al. (2019)	Asia	NIS symptoms nausea, vomiting, appetite loss, taste changes, and dysphagia increase food waste in cancer patients.	13
3/Portugal	Gomes et al. (2020)	Europe	Food waste was highest in oncology and pediatric patients due to clinical condition and reduced appetite.	15
4/Lebanon	Hoteit, et. al. (2024)	Asia	31.4% of hospital dish waste is caused by low appetite related to the patient's psychological condition	17

A study in Malaysia found that low appetite, dysphagia, and texture modified diets increased food waste, especially mixed diets (65%) (27). This aligns with global evidence showing that patients with swallowing disorders eat less due to uncomfortable textures and the greater effort required to eat.

Psychological Factors and Appetite Loss

Research by Hoteit et al. (2024) found that 31.4% of food waste was driven by appetite loss linked to anxiety and stress. (17). Gomes et al. (2020) reported that clinical conditions and diet shape food waste levels, with oncology and pediatric patients showing the highest waste due to reduced appetite, digestive issues, and chronic disease symptoms (15).

External factors

External factors such as presentation, service quality, and the eating environment also drive hospital food waste. Understanding these is essential to improve patient food acceptance (**Table 3**).

Table 3. External factors that affect food waste

Article no/country	Author	Geographic Region/continent	Results
1/Indonesia	Eri Wiyasti et al., (2019) (14)	Asia	Taste, food appearance, food temperature significantly increased food waste; portion size & aroma not significant
2/Italy	Schiavone et al., (2019) (30)	Europe	Poor food quality, mismatch between menu & patient eating habits; vegetables & potatoes most wasted (55%)
3/Portugal	Gomes et al., (2020) (15)	Europe	Type of diet & menu suitability; high waste especially in pediatric ward due to menu–preference mismatch
4/Indonesia	Saragih, et al., (2020) (16)	Asia	Food taste & appearance strongly affect food waste (p=0.002; p=0.000)
5/Yunani	Antasouras et al., (2023) (20)	Europe	Portion size flexibility, selective menu, better ordering system, and nutritional support reduce waste
6/Italy	Schiavone et al., 2020 (18)	Europe	Menu variety & service quality influence satisfaction and reduce waste
7/Lebanon	Hassan et al., (2024) (19)	Asia	Meal time, food quality, and hospital location influence plate waste; rural hospitals had higher waste

Sensory Quality of Food (Taste, Appearance, Temperature)

Several studies identify taste, appearance, and temperature as key sensory drivers of hospital food waste. Eri Wiyasti et al. (2019) and Saragih (2020) found taste and appearance to significantly influence waste. (14) (16). Schiavone et al. (2019) similarly reported that poor food quality and mismatched menus increased waste, especially for vegetables and potatoes (30).

Menu Suitability and Menu Variety

Mismatch between menus and patient needs increases waste, especially in oncology and pediatric wards (15). Greater menu variety reduces waste and improves satisfaction (18). These results suggest that lack of choice and repetitive meals contribute directly to reduced intake and more uneaten food.

Portion Size and Portion Flexibility

Flexible portion sizes significantly reduce waste ($p = 0.003$), particularly among elderly and soft diet patients (20). Large, non adjustable portions lead to higher waste.

Meal Timing, Hospital Location, and Environmental Factors

Inappropriate meal timing and rural hospital settings contribute to higher waste (31.4%) due to infrastructure and cultural factors (19).

Service Quality, Ordering Systems, and Food Delivery Timeliness

Electronic ordering systems reduce distribution delays and plate waste (20). Better service quality improves intake, while delayed delivery reduces food acceptability (18). Distribution delays ($p = 0.007$) at RSUD Dr. Soegiri were significantly associated with increased plate waste, as food that cools or changes texture becomes less appealing to patients (23). Key external drivers of hospital food waste include sensory quality, menu suitability and variety, portion size, service quality, delivery systems, and meal timing. Sensory attributes (taste, appearance, temperature) and portion size are the most consistently significant factors across studies. Improving menu design, offering flexible portions, ensuring timely delivery, and providing culturally appropriate meals are essential strategies to reduce waste and enhance patient nutritional intake.

Differences in adult patient food waste based on type of diet and influencing factors

Patient plate waste varies by diet type. Regular, soft, filtered, and liquid diets each have characteristics that influence consumption levels. Their waste potential is shaped by internal and external factors, including taste, aroma, texture, temperature, and the patient's psychological state (**Table 4**).

Table 4. Differences in food waste factors by type of diet

Influencing factors	Regular diet	Soft diet	Filter diet	Liquid diet	References
Food flavor	v	v	v	v	Eri Wiyasti et al. (2019) (14); Saragih (2020) (16); Schiavone et al. (2019) (18); Gomes et al. (2020) (15); Jonathan et al. (2023) (29)
Food aroma	v	v	x	x	Eri Wiyasti (2019) (14); Oktaviani et al. (2023) (26); Hoteit et al. (2024) (17)
Food texture	v	v	v	x	Eri Wiyasti (2019) (14); Saragih (2020) (16); Razalli (2021) (27); Oktaviani (2023) (26)
Food temperature	v	v	v	v	Kusumawati (2024) (23); Gomes et al. (2020) (15)
Portion Size	v	v	v	v	Antasouras et al. (2023) (20); Jonathan et al. (2023) (29)
Menu Variety / Suitability	v	v	v	v	Schiavone et al. (2020) (3); Gomes et al. (2020) (15)
Meal Timing / Time of consumption	v	v	v	v	Kusumawati (2024) (23)
Type of Diet Restrictions	v	v	v	v	Gomes et al. (2020) (15); Razalli et al. (2021) (27)
Menu variations	v	v	v	v	Schiavone et al. (2019) (3)
Delay in Food Distribution	v	v	v	v	Kusumawati (2024) (23); Antasouras et al. (2023) (20)
Psychological Factors (appetite, nausea, clinical condition)	v	v	v	v	Jamhuri et al. (2019) (13); Hassan et al. (2024) (19); Jonathan et al. (2023) (29)
External Food Consumption	v	v	x	x	Meliana et al. (2020) (24)
Service Quality (ambience, attitude)	v	v	v	x	
Precision of food distribution	v	v	v	v	Kusumawati (2024) (31).

Differences in plate waste among adult inpatients reflect the physiological, sensory, and operational challenges of each diet type. Across 18 studies, sensory factors especially taste, aroma, and texture consistently emerged as the strongest predictors of food acceptance. In regular diets, flavor mismatch frequently led to unfinished meals (14,16). In soft diets, texture issues dominated, with overly mushy or unappealing foods often rejected (26,27). In liquid diets, texture matters less, but palatability remains crucial for patients to consume the prescribed volume. Studies from Indonesia and Lebanon showed that poor or inconsistent textures significantly increased plate waste (26,32). Food temperature was also critical, as meals served cold or at suboptimal temperatures were more likely to be wasted (23).

Operational factors serving temperature, meal timing, and distribution delays affect all diet types. Meals that arrive

too cold, too hot, or late lose sensory appeal and reduce intake across regular, soft, and texture-modified diets (15,23). In texture modified and liquid diets, improper temperature can also alter consistency. Evidence from Indonesia and Europe shows that improving serving punctuality significantly reduces plate waste (20,33). Portion size and menu suitability also play major roles. Large portions increase waste in regular and soft diets, whereas in filtered and liquid diets, volume tolerance mismatch reduces intake (27,29). Limited menu variety and cultural mismatch further contribute to waste, particularly in European hospitals, where repetitive and non-personalized menus lead to reduced consumption (15,30).

In regular diets, taste and aroma are the main drivers of food waste. Unsuitable flavors bland, overly salty, or too spicy significantly increase waste (26,32,34). and reduced aroma acceptance further elevates waste levels (17,26). Whereas, Clinical and psychological conditions nausea, early satiety, gastrointestinal symptoms, stress, and reduced appetite elevate food waste across all diet types (13,19). These issues are most pronounced in oncology, post operative, and chronically ill patients. In filtered and liquid diets, comorbidities such as dysphagia and impaired digestion strongly limit consumption capacity. Plate waste patterns are shaped by the unique challenges associated with each type of diet. Taste, quantity size, and menu variation are important factors in regular diets dull, culturally inappropriate, or overly large meals are frequently left unfinished. Soft diets are very sensitive to temperature, scent, and texture; foods that are too mushy or prepared incorrectly are often rejected. Viscosity and serving circumstances are crucial in filtered diets since slight variations in thickness or temperature drastically lower palatability. Taste acceptance, volume tolerance, and medical issues like nausea or dysphagia are major factors in liquid diets. Waste is efficiently reduced and nutrient intake is supported by targeted measures, such as texture modification for dysphagia, portion adjustment for low appetite, and better menu variety for regular diets. Due to desire, dietary preferences, and serving habits, soft and special diets generally exhibit greater waste levels, highlighting the need for customized interventions to increase intake and guarantee ideal nutritional adequacy.

Strengths and Limitations of the Study

This review has a number of noteworthy advantages. Studies from Asia, Europe, and the Middle East were included thanks to the systematic search across several reliable databases, providing wide geographic coverage. Meaningful comparisons among diet types were made possible by the integration of eighteen research, the majority of which were cross-sectional. A new, diet specific understanding of waste determinants can be obtained by classifying results by diet type (regular, soft, filtered, and liquid). The explanatory framework is strengthened and its applicability to clinical nutrition and hospital

foodservice practice is increased by the integration of sensory, operational, and psychological aspects. Several limitations must be acknowledged. The predominance of cross-sectional designs limits causal interpretation. Variability in measurement methods introduces heterogeneity and limits comparability.

Most studies originated from Indonesia and other developing countries, reducing generalizability to high-income settings. Incomplete reporting of diet composition, serving protocols, and clinical characteristics restricted deeper subgroup analysis. Finally, limiting inclusion to English and Indonesian publications may have excluded relevant studies in other languages.

CONCLUSIONS AND RECOMMENDATIONS

This review shows that food waste among adult inpatients remains a significant issue across all hospital diet types. Sensory factors taste, aroma, and texture are the strongest predictors of plate waste, followed by operational factors such as temperature, timing, portion size, menu suitability, and distribution delays. Psychological and clinical conditions, including nausea, poor appetite, and disease-related symptoms, further reduce intake, especially in therapeutic or texture-modified diets. Overall, food waste results from the interaction between patient characteristics, diet type, and foodservice operations. Addressing these factors together is essential to improve nutritional outcomes and hospital foodservice efficiency.

Reducing food waste and improving intake in hospitalized adults requires integrated strategies. Enhancing sensory quality and aligning menus with cultural and therapeutic needs improves acceptance. Portion optimization and menu flexibility help match intake to appetite.

Proper temperature and timely delivery maintain palatability. Strengthened nutrition support including texture modification, oral supplements, and individualized counselling is crucial for high risk patients. Routine plate waste monitoring supports continuous improvement. Future research should use stronger designs and standardized measurement methods.

Use of AI tools declaration

The authors acknowledge the use of AI-assisted tools, specifically Covidence and Cochrane's AI screening tools to support data extraction and screening. All AI assisted outputs were thoroughly reviewed and edited, and the authors take full responsibility for the final published content.

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