

Article

Nutritional Intake in Hospitalized Patients Receiving Texture-Modified Diets: Preliminary Results from an Observational Study

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Abstract

Background: Hospitalized patients often experience reduced dietary intake, leading to malnutrition and worsening clinical outcomes. This study evaluated their dietary intake and its associated factors, focusing on three diets provided by the hospital's kitchen. **Methods:** An observational study was conducted from October 2024 to January 2025 at the Fondazione Policlinico Agostino Gemelli in Rome. Standard, minced, and soft diets were considered. A visual 5-point scale estimation method was used by trained dietitians to measure dietary intake. Face-to-face interviews also assessed food service quality. **Results:** A total of 631 patients were enrolled. The average calorie and protein intake were, respectively, 473.4 kcal and 30.9 g at lunch, regardless of diet type. Over 40% of the patients did not meet the minimum nutritional requirements in terms of meal calories and proteins consumed, regardless of diet type. Correlation analysis showed significant positive associations between dietary intake, breakfast palatability for all diets, and breakfast quantity for standard and soft diets (ORs > 2, $p < 0.05$). Other food service quality factors showed no significant associations with dietary intake. **Conclusions:** These preliminary findings highlight the need for regular dietary assessments to identify barriers to optimal meal consumption. Educating and assisting patients during mealtime could also promote awareness and diet acceptance.

Keywords: hospitalized patients; nutritional intake; hospitalized meal; malnutrition; texture-modified diet; food service quality; prescribed diet



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1. Introduction

Malnutrition in hospitals is a global public health concern, associated with prolonged hospital stay, increased risk of complications, higher readmission rates, higher mortality, and increased healthcare costs [1–3]. Factors contributing to disease-related malnutrition

include loss of appetite, nausea, fatigue, hospital-related factors like meal interruptions, unknown mealtimes, absences for exams, or fasting, and individual factors such as the need for assistance due to physical disabilities [4]. In addition, age-related issues like presbyphagia and edentulism can impair chewing and food breakdown, necessitating modifications in food consistency [5]. Chronic conditions like diabetes, cardiovascular diseases, and chronic obstructive pulmonary disease can also negatively impact appetite, nutrient assimilation, and utilization [6].

Safe food, determined by its nutritional quality, balance, palatability, and temperature, is a primary goal of every hospital food service organization [7]. In this context, hospital food services must have effective management systems to optimize patients' food and nutrient intake, enhance patient satisfaction with food service, and achieve better quality outcomes, cost reduction, and revenue generation [8]. Dietary intake assessments are crucial for indicating the efficiency of food service operations and ensuring nutritional adequacy among hospitalized patients [9]. Studies have consistently shown that patient satisfaction with the quality of food—encompassing appearance, taste, texture, and temperature—significantly affects the rate of dietary intake among hospitalized patients [10,11]. Other factors, such as patients' communication with clinical staff (nurses, dietitians, doctors), the timing of meals, and the need for feeding assistance, have also been reported to affect dietary intake among hospitalized patients.

Texture-modified diets (TMDs) refer to smooth, soft, moist, and chopped foods that are easier to chew [11]. Most of the TMD patients have dysphagia, particularly elderly individuals [11]. TMDs (soft, chopped, minced diets) may also be prescribed for issues like dental problems, pre-/post-surgery requirements, need for feeding assistance, cognitive issues, and refusal to eat [12]. A wide range of terminologies is used to describe texture-modified foods. In 2016, the International Dysphagia Diet Standardization Initiative (IDDSI) introduced a framework to standardize texture terminology [13]. However, many countries and healthcare facilities still use their texture modification standards for TMD preparation [14]. Previous studies on hospitalized patients and long-term care facility residents receiving TMDs have focused on the nutritional value of consumed TMDs [15,16]. At the same time, there is a lack of literature on TMD dietary intake, and up-to-date research on factors contributing to TMD dietary intake is scarce. In this context, this observational study aimed to evaluate the dietary intake of hospitalized patients receiving TMDs compared with the standard diet and determine the factors influencing it. It was hypothesized that dietary intake would be significantly lower among patients receiving TMDs compared to those on standard diets, and that this reduction would be associated with a range of individual and clinical factors.

2. Materials and Methods

2.1. Study Design and Ethical Approval

A cross-sectional observational study was conducted among hospitalized patients from October 2024 to January 2025 in the medical wards at the Fondazione Policlinico Gemelli IRCCS in Rome. The study was conducted under the Helsinki Declaration and good clinical practice and approved by the Ethics Committee of our institution (ID 6935). Informed consent was obtained from all study participants. For patients unable to provide written consent due to physical or cognitive limitations, an impartial witness—independent of the investigator—was present throughout the entire informed consent process. In such cases, the witness personally signed and dated the consent declaration after confirming that the full content of the form and any additional written materials had been clearly read and explained to the participant, who then provided verbal consent to participate in the study.

2.2. Settings

Data was collected on six wards (gastrointestinal, internal medicine, surgical, oncological, geriatric, rehabilitation). Clinicians entered patients' dietary prescriptions into an electronic food service system. Electronic orders were sent to the kitchen, and individual meal tickets were printed for meal assembly. Main meals were plated cold and heated in temperature-controlled delivery trolleys at the ward level. The two TMDs most frequently prescribed and offered by the hospital's kitchen were considered: minced diet and soft diet. The standard diet was also included in this study. A brief description of each diet type involved in this study, based on the hospital diet manual, is as follows:

- (i) Soft diet: A balanced and normo-energetic diet consisting of semolina, blended proteins (fish, meat), vegetable cream soup—all composed of natural foods with smooth consistency (level 4 according to IDSSI)—and fruit mousse.
- (ii) Minced diet: A balanced and normo-energetic diet consisting of soup, chopped proteins (meat, fish, eggs), chopped vegetables, and stewed fruit. All foods have a chopped consistency (level 6 according to IDSSI).
- (iii) Standard diet: A balanced and normo-energetic diet consisting of pasta or rice, proteins (meat, fish, cheese, eggs), side dishes, and fruit.

2.3. Data Collection

Patients were enrolled by trained dietitians from the Clinical Nutrition Unit by using the hospital's in-house patient information system. The inclusion criteria were adult patients aged 18 years and above who received TMDs or a standard diet orally. Exclusion criteria included those who were on enteral or parenteral feeding, had mental problems or disorders, or were diagnosed with dementia.

A structured questionnaire was distributed to the subjects to obtain the required information for this study, following obtaining consent. Sociodemographic data, food intake, and quality of the food services have been collected. The structured questionnaire used in this study was specifically developed by the research team as a survey-based instrument to obtain data on demographic information, hospital food service quality, and patient satisfaction within a real-world clinical context. Given its applied and exploratory scope, the tool was not formally validated but underwent expert review and pilot testing to ensure clarity and contextual relevance. This approach is consistent with established practices in clinical nutrition and foodservice research, where tailored, non-validated questionnaires have effectively been used to explore patient perceptions without undermining analytical value. Comparable methodologies have been adopted in prior studies, including those by Naithani et al. [17], Williams and Walton [18], and Mills et al. [19], supporting the appropriateness of using context-specific instruments in hospital-based investigations.

As the food weighing method was unfeasible due to time-consuming and high cost, the visual estimation method expressed on a 5-point scale was chosen to measure the percentage of food intake. During lunch, food intake—separated into different food components (first course, second course, vegetables, and fruit)—was observed and recorded in different values—0%, 25%, 50%, 75%, 100% (ranging from none consumed to all consumed). Nutritional intake was assessed exclusively during lunch, as trained clinical staff were not available to perform standardized observations during dinner service.

Indeed, prior to data collection, all trained dietitians received structured training using photographic examples and sample trays to ensure consistency and minimize inter-rater variability. Immediate data entry was performed into a digital tracking system. Successively, intake percentages were converted into estimated caloric and protein values using the nutritional reference data from the Hospital Diet Manual. Each meal component (first course, second course, vegetables, fruit) was assigned a fixed nutritional value, as

shown in Table 1. The observed intake percentage for each component was multiplied by its corresponding energy and protein content to determine the actual intake. For example, a patient consuming 50% of the soft diet's first course (360 kcal and 10 g protein) was recorded as having consumed 180 kcal and 5 g of protein from that component. This process was repeated across all meal components to obtain total estimated dietary intake for lunch meal.

Table 1. Nutritional characteristics of each diet.

Diet type	Energy (kcal)				
	First course	Second course	Vegetables	Fruit	Total
Standard	440	115	60	90	705
Soft	360	115	30	90	595
Minced	350	115	60	90	585
Diet Type	Protein (g)				
	First course	Second course	Vegetables	Fruit	Total
Standard	15	23	4	<0.5	42
Soft	10	23	4	<0.5	37
Minced	10	23	4	<0.5	37

To estimate the minimum nutritional requirements of patients, the average basal metabolic rate values for men and women, as well as protein requirements, were calculated according to the Reference Intake of Nutrients and Energy for the Italian Population (LARN) [20]. Considering 30% of the minimal daily nutritional requirement for lunch, 513 kcal and 30 g were obtained.

The level of patient satisfaction was measured using a specific questionnaire. It consists of two parts: (i) Part A is the satisfaction of patients with the food quality, and (ii) Part B concerns patients' satisfaction with the quality of food services. There were eight items under the domain of food quality (integrity of tray/plates/cutlery, smell, temperature, palatability, provision quantity, cooking degree, menu variety). In contrast, there were seven items under the domain of food service (mealtimes, time to eat, respect to any food preferences, communication by the clinical staff of the received diet type, level of hungry after eating my meal and between two meals, assistance during the meal). The scoring criteria used in this questionnaire were a 5-point scale (insufficient, sufficient, good, very good, not applicable).

2.4. Statistical Analysis

Data on food intake, satisfaction scores, and calculated energy and protein requirements were initially recorded in Microsoft Excel and subsequently processed using STATA software for statistical analysis. Quantitative variables were reported as means and standard deviations (mean $\pm$ SD), providing insights into central tendency and dispersion. Categorical variables were summarized using absolute (*n*) and relative (%) frequencies to describe the distribution of qualitative characteristics. Statistical inference was performed using the Chi-Square (χ^2) test of independence, a non-parametric approach suitable for evaluating associations between categorical variables. Specifically, the test assessed whether a statistically significant association existed between the prescribed diet type and the adequacy of energy and protein intake, with a significance threshold set at *p*-value = 0.05. A *p*-value below this level was considered indicative of a divergence from expected distributions under the null hypothesis. To quantify the strength and direction of the associations between the overall percentage of dietary intake and key contributing factors, odds ratio (OR) analysis was employed. In order to apply OR analysis appropriately, the 5-point scale

results measuring the food service quality outcomes (insufficient, sufficient, good, very good) were likely transformed into a binary form (insufficient/sufficient vs. good/very good). The results were expressed with 95% confidence intervals (CI), providing a plausible range for the true OR and enhancing the robustness of statistical inference. A formal sample size calculation was not conducted, as this investigation was conceived as a descriptive, exploratory pilot study intended to generate preliminary evidence to inform future, more powered studies [21].

3. Results

3.1. Demographic Data of Patients

A total of 631 patients were included, with age distribution stratified into three groups: 18–45 years, 46–65 years, and over 65 years. Of the total population, 44.8% ($n = 283$) were aged over 65 years, 39.8% ($n = 251$) were between 46 and 65 years, and 15.4% ($n = 97$) were between 18 and 45 years. The cohort included 372 female patients, representing 59.05% of the sample.

3.2. Patients' Dietary Intake and Diet Type

Figure 1 details the estimated percentage of food intake of the lunch tray components per diet type (see Table S1, Supplementary Data). Representative images of fruit and vegetables were supplied to illustrate soft and minced dietary consistencies (see Table S2, Supplementary Data).

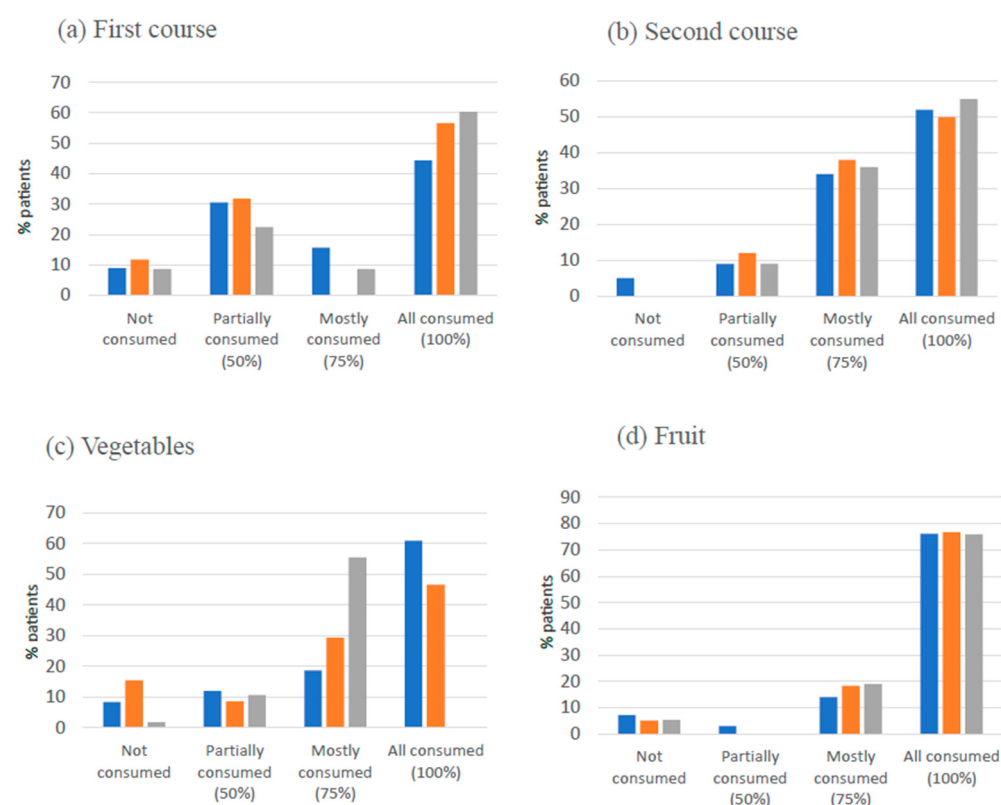


Figure 1. Percentage of dietary intake by tray component and diet type. (a) First course; (b) Second course; (c) Vegetables; (d) Fruit. Blue indicates the standard diet, orange the minced diet, and grey the soft diet.

Regarding the first course (Figure 1a), the highest consumption rate (100% of the meal) was observed across all dietary categories: 52.4% in the standard diet group ($n = 168$), 50.0% in the minced diet ($n = 60$), and 55.2% in the soft diet ($n = 58$). Partial consumption

(50%) was reported by 33.9%, 38.3%, and 36.2% of patients in the respective groups, while minimal intake (25%) ranged from 8.6% to 11.7%. No patients consuming minced or soft diets left their meals untouched, and none consumed exactly 75% across any group.

In the second course (Figure 1b), full consumption was again most common—reported by 44.3% of standard diet patients, 56.6% of minced diet patients, and 60.3% of those on a soft diet. Consumption of 50% was observed in 30.5% (standard), 31.7% (minced), and 22.4% (soft) of patients. Only the standard diet group included patients who consumed nothing (0.6%) or 75% (15.6%), while 25% intake was reported by a similar minority across all groups (8.6–11.7%).

For vegetables (Figure 1c), 60.8% of standard diet patients consumed the entire portion. In the minced diet group, 46.6% did so, while in the soft diet group, the most frequent consumption level was 50% (55.4%).

Fruit intake (Figure 1d) was uniformly high across all diets. Among patients receiving minced and soft diets, 77% and 76%, respectively, consumed the full portion. Similar results were observed in the standard diet group, reflecting fruit's broad acceptability regardless of texture modification.

Table 2 illustrates the calculated average consumed energy and protein quantities of the meal components of the different diets. In total, an average consumption of 473.4 kcal and 30.9 g of protein was found, independently of the type of diet.

Table 2. Calculated average consumed energy and protein quantities of the meal components of the different diets.

		First Course Mean $\pm$ SD	Second Course Mean $\pm$ SD	Vegetables Mean $\pm$ SD	Fruit Mean $\pm$ SD	Total *
Standard diet N = 168	Energy (kcal)	322.1 $\pm$ 144.1	84.4 $\pm$ 31.4	28.9 $\pm$ 14.6	75.4 $\pm$ 28.0	501.2
	Protein (g)	10.7 $\pm$ 4.8	16.8 $\pm$ 6.3	2.9 $\pm$ 1.5	tr.	30.6
Minced diet N = 60	Energy (kcal)	283.9 $\pm$ 124.6	86.7 $\pm$ 33.7	24.5 $\pm$ 15.7	77.3 $\pm$ 25.0	454.2
	Protein (g)	7.2 $\pm$ 2.9	17.3 $\pm$ 6.7	2.5 $\pm$ 1.6	tr.	26.0
Soft diet N = 58	Energy (kcal)	264.0 $\pm$ 99.0	92.2 $\pm$ 30.8	24.2 $\pm$ 11.9	76.8 $\pm$ 25.3	464.9
	Protein (g)	7.5 $\pm$ 2.8	18.4 $\pm$ 6.2	2.4 $\pm$ 1.2	tr.	36.4

Abbreviations: g, gram; kcal, kilocalories; SD, standard deviation; tr.: trace amounts, the nutritional contribution of fruit protein (<0.5 – 1 g/100 g) is minimal and considered insignificant in our dietary evaluations. * Total energy and protein values may not precisely equal the sum of their components due to rounding.

Table 3 shows the number of patients consuming minimal energy and protein intake along the different diets, considering the minimal calculated requirements of 513 kcal and 30 g. Regarding energy intake, only 52.4%, 46.7%, and 48.3% of patients receiving a standard diet, minced diet, and soft diet, respectively, were within the recommendations (≥ 513 kcal). In terms of protein intake, only 52.9%, 56.9%, and 43.3% of patients receiving a standard diet, minced diet, and soft diet, respectively, were within the recommendations (>30 g of protein). There was not a statistically significant association between the adequacy of energy and protein requirements and the prescribed diet (p -value > 0.05).

Table 3. Adequacy of energy and protein requirements in the different diets for lunch.

Diet Type	Energy Requirements n (%)			Protein Requirements n (%)		
	<513 kcal *	≥ 513 kcal *	p -value	<30 g *	>30 g *	p -value
Standard	80 (47.6)	88 (52.4)	>0.05	79 (47.1)	89 (52.9)	>0.05
Minced	32 (53.3)	28 (46.7)		25 (43.1)	33 (56.9)	
Soft	30 (51.7)	28 (48.3)		34 (56.7)	26 (43.3)	

Abbreviations: g, grams; kcal, kilocalories; n , number of patients. p -value > 0.05 means non-significant results. * Basal metabolic rate and protein requirements were estimated according to LARN guidelines. Statistical inference was performed using the Chi-Square (χ^2) test.

3.3. Levels of Patients' Satisfaction with Food Quality and Food Service

Satisfaction scores were analyzed according to diet types (Table S3).

3.3.1. Satisfaction with Food Service

The majority of participants rated mealtimes as “Very good” across all diets, with the highest percentage in the minced diet (50.0%) and soft diet (48.3%). A significant percentage also rated mealtimes as “Sufficient” (standard: 30.95%, minced: 28.3%, soft: 31.0%). Most participants rated the time to eat the meal as “Very good” (standard: 53.0%, minced: 71.7%, soft: 65.5%). A smaller percentage found the time “Insufficient” (standard: 1.2%, minced: 0%, soft: 0%). The majority did not find it necessary to be listened to by the staff regarding food preferences (standard: 88.1%, minced: 91.7%, soft: 96.6%). Only a small percentage of patients felt they were “always” listened to (standard: 3.0%, minced: 3.3%, soft: 0%). A significant proportion reported that staff “Always” informed them about the menu and service (standard: 42.5%, minced: 46.7%, soft: 43.1%). However, a notable percentage reported “Never” being informed (standard: 36.3%, minced: 18.3%, soft: 0%). As regards hunger after meals, most patients were “Never” hungry after meals (standard: 71.4%, minced: 70.0%, soft: 72.4%). A small percentage were “Always” hungry (standard: 2.4%, minced: 0%, soft: 1.7%). The majority were “Never” hungry while waiting for the next meal (standard: 56.3%, minced: 36.7%, soft: 50.0%). Only a smaller percentage were “Always” hungry (standard: 4.2%, minced: 3.3%, soft: 3.5%). Regarding assistance during meals, most participants “Always” received assistance during the meals (standard: 89.2%, minced: 79.3%, soft: 75.9%).

3.3.2. Satisfaction with Food Quality

As regards food quality, the majority of participants rated the integrity as “Very good” across all diets regarding the following criteria:

- Integrity (tray /plates/cutlery): standard: 92.3%, minced: 90.0%, soft: 93.1;
- Breakfast smell (standard: 37.4%, minced: 40.0%, soft: 44.8%), breakfast temperature (standard: 72.3%, minced: 73.3%, soft: 77.6%), breakfast presentation (standard: 36.1%, minced: 46.7%, soft: 44.9%) and quantity provision of the breakfast (standard: 69.9%, minced: 63.3%, soft: 67.2%);
- First course smell (standard: 37.9%, minced: 36.7%, soft: 25.9%), first course temperature (standard: 69.1%, minced: 68.3%, soft: 81.0%), cooking degree of the first course (standard: 41.7%, minced: 58.3%, soft: 55.2%);
- Second course smell (standard: 31.9%, minced: 43.3%, soft: 32.7%), second course temperature (standard: 75.6%, minced: 73.3%, soft: 77.6%), cooking degree of the second course (standard: 49.4%, minced: 50.0%, soft: 55.2%), quantity of the second course (standard: 59.5%, minced: 60.0%, soft: 70.7%);
- Vegetables smell (standard: 37.9%, minced: 33.3%, soft: 37.9%), temperature of the vegetables (standard: 72.9%, minced: 60.0%, soft: 76.8%), cooking degree of the vegetables (standard: 51.2%, minced: 46.7%, soft: 55.2%), quantity of the vegetables (standard: 56.0%, minced: 50.0%, soft: 67.2%).

As regards palatability, for the first and second courses as well as vegetables, the majority rated the palatability as “Good”. Most participants rated the variety as “Good” (standard: 47.6%, minced: 30.0%, soft: 51.7%).

3.3.3. Association Between the Different Diets and Food Quality Criteria

Table 4 provides results of the associations between the different diets (standard, minced, and soft) and various food quality criteria such as smell, temperature, palatability, and quantity.

Table 4. Correlation analysis of diet type and the contributing factors towards food quality.

Contributing Factors	Standard Diet		Minced Diet		Soft Diet	
	OR (95% CI)	<i>p</i> -Value	OR (95% CI)	<i>p</i> -Value	OR (95% CI)	<i>p</i> -Value
Breakfast—smell ≤Suff. vs. ≥Good	0.82 (0.49–1.38)	0.45	0.75 (0.43–1.31)	0.31	0.88 (0.51–1.55)	0.67
Breakfast—temperature ≤Suff. vs. ≥Good	1.23 (0.43–3.53)	0.69	1.38 (0.48–3.99)	0.55	1.39 (0.48–4.08)	0.54
Breakfast—palatability ≤Suff. vs. ≥Good	2.12 (1.26–3.58)	<0.01 *	2.22 (1.27–3.87)	<0.01 *	2.03 (1.16–3.57)	<0.02 *
Breakfast—quantity ≤Suff. vs. ≥Good	2.48 (1.24–4.97)	0.01 *	1.68 (0.77–3.65)	0.19	2.56 (1.23–5.29)	<0.02 *
First course—smell ≤Suff. vs. ≥Good	1.39 (0.49–1.84)	0.46	1.01 (0.64–1.59)	0.96	0.97 (0.61–1.53)	0.91
First course—cooking degree ≤Suff. vs. ≥Good	0.95 (0.49–1.84)	0.88	0.94 (0.58–1.52)	0.80	0.86 (0.54–1.39)	0.56
First course—temperature ≤Suff. vs. ≥Good	0.48 (0.14–1.72)	0.26	0.31 (0.11–0.88)	0.03	0.35 (0.12–1.03)	0.06
First course—palatability ≤Suff. vs. ≥Good	1.36 (0.64–2.89)	0.41	0.97 (0.64–1.49)	0.91	1.08 (0.70–1.66)	0.70
First course—quantity ≤Suff. vs. ≥Good	1.47 (0.71–3.06)	0.29	1.13 (0.62–2.08)	0.67	0.97 (0.52–1.79)	0.93
Second course—smell ≤Suff. vs. ≥Good	1.95 (0.75–5.08)	0.17	1.00 (0.65–1.56)	0.98	1.34 (0.86–2.09)	0.18
Second course—degree cooking ≤Suff. vs. ≥Good	0.62 (0.27–1.46)	0.28	0.71 (0.41–1.23)	0.23	0.67 (0.39–1.15)	0.15
Second course—temperature ≤Suff. vs. ≥Good	0.84 (0.26–2.61)	0.76	1.28 (0.51–3.21)	0.59	1.22 (0.47–3.14)	0.67
Second course—palatability ≤Suff. vs. ≥Good	0.69 (0.31–1.53)	0.36	0.87 (0.57–1.32)	0.52	0.76 (0.49–1.15)	0.19
Second course—quantity ≤Suff. vs. ≥Good	0.87 (0.37–2.05)	0.77	1.14 (0.61–2.15)	0.67	0.97 (0.52–1.81)	0.93
Vegetables—smell ≤Suff. vs. ≥Good	0.99 (0.41–2.41)	0.99	1.03 (0.65–1.63)	0.89	1.02 (0.65–1.61)	0.92
Vegetables—cooking degree ≤Suff. vs. ≥Good	0.95 (0.39–2.34)	0.91	1.12 (0.59–2.09)	0.72	1.09 (0.57–2.06)	0.79
Vegetables—temperature ≤Suff. vs. ≥Good	2.64 (0.52–13.48)	0.24	1.13 (0.40–3.21)	0.81	1.24 (0.42–3.68)	0.68
Vegetables palatability ≤Suff. vs. ≥Good	1.16 (0.49–2.71)	0.73	0.73 (0.48–1.11)	0.14	0.80 (0.53–1.21)	0.29
Vegetables: quantity ≤Suff. vs. ≥Good	1.42 (0.59–2.29)	0.42	1.65 (0.79–3.43)	0.18	1.53 (0.74–3.21)	0.25

Abbreviations: CI, confidence interval; OR, odds ratio; ≤Suff. = Insufficient or Sufficient; ≥Good = Good or Very Good; vs., versus. * *p*-value < 0.05 means significant results.

For breakfast, palatability and quantity show significant associations across all diets, with odds ratios (OR) greater than 2 and *p*-values less than 0.05, indicating a strong positive relationship. Specifically, the standard diet has an OR of 2.12 for palatability and 2.48 for quantity, both with significant *p*-values (0.005 and 0.01, respectively). The minced and soft diets also show significant associations for these attributes. As regards the first course, temperature is significantly associated with the minced diet (OR = 0.31, *p* = 0.03), suggesting a notable impact. However, no significant associations are observed for the second course and vegetables across all diets, indicating that these attributes do not have a strong relationship with the diets in these meal categories. Overall, the data highlights the importance of palatability and quantity for breakfast in influencing dietary choices.

4. Discussion

Hospital malnutrition remains a widespread and underrecognized issue, with recent data estimating prevalence rates of 20–50% among inpatients [2,3]. Malnutrition has been consistently associated with increased morbidity, mortality, length of hospital stay, and healthcare costs [1]. Despite the widespread use of TMDs in clinical settings, particularly among older or dysphagic patients, there is a paucity of high-quality evidence evaluating their effectiveness in meeting nutritional needs. As highlighted in a recent systematic review [12], only a few studies assessed TMD adherence or patient-centered outcomes such as food satisfaction. Dietary intake of hospitalized patients receiving TMDs remains an area with limited research. This study aimed to evaluate the dietary intake of hospitalized patients and its associated factors, focusing on two types of TMD and a standard diet provided by the hospital's kitchen.

First, the subjects' average calorie and protein intake were 473.4 kcal and 30.9 g of protein at lunch, regardless of diet type. However, alarmingly, over 40% of the patients did not meet the minimum nutritional requirements in terms of calories and proteins, regardless of the diet type. These concerning findings align with Massoulard et al.'s results, which indicated that calorie consumption among elderly nursing home residents in France fell below recommended intakes, irrespective of diet texture [22]. Similarly, Dahl et al. discovered that in-house prepared pureed diets often lacked adequate protein levels for long-term care residents [15]. Dupertuis et al. found that 43% of hospitalized patients consumed below the minimum nutritional requirements needed to maintain basal metabolism [23]. Several factors may explain these results. Disease-related anorexia and side effects from medications—such as opioids or antibiotics—often reduce appetite [24]. Dysphagia, particularly prevalent in older adults, can lead to fear of choking and reduced intake, especially when TMDs lack palatability [25]. Cognitive impairment, depression, fatigue, and diminished taste or smell may also contribute [26]. As suggested in our previous systematic review, implementing individualized and multidisciplinary nutritional strategies is crucial to enhance patient food intake and reduce hospital costs, such as room service, protected meals, voluntary food assistance, improved food presentation, and nutrition counseling [10].

This study also compared the dietary intake percentages based on different diet types. Among the three diets studied, a higher percentage of patients receiving a soft diet consumed their entire second course compared with those on standard and minced second-course protein diets, indicating a greater acceptance of the soft diet. This finding underscores the importance of paying special attention to the soft (or pureed) diet and the minced diet among other TMDs provided in hospitals. The second course intake was lowest for the minced diet. Few studies have compared dietary intake between inpatients receiving soft/blended diets and those on minced diets. Our results are consistent with Shahr et al.'s earlier local study among elderly inpatients, which found that protein minced dishes were the most wasted food component compared with soft second course [27]. The better consumption of protein in the soft diet may be due to its softer texture, where protein is cooked together with vegetables and semolina in a single dish, compared to the separate chopped protein dish for the minced diet. Soft or pureed diets are often better accepted by patients with impaired chewing or swallowing due to their smooth, cohesive texture, which requires no chewing and lowers aspiration risk. They also retain heat well and offer more uniform flavor, enhancing palatability. In contrast, minced diets require greater oral effort, may appear fragmented, and are less visually and sensorially appealing, which can contribute to reduced intake. Moreover, although minced diet protein dishes are often served with soup, kitchen staff must ensure the protein is cooked until tender before mincing. Preparation of minced diets should focus not only on the appropriate food

size of protein, vegetables, and fruit to minimize chewing or digestive effort but also on ensuring that each component is moist enough for consumption. On the other hand, fruit and dessert components were well appreciated across all diet types, a trend observed in other studies both locally and globally. Regardless of diet texture, fruits and desserts are among the most enjoyed food items by hospitalized patients [28].

Our study also investigated factors influencing dietary intake regarding food quality and food service through a patient satisfaction questionnaire. The preliminary results indicated high satisfaction with mealtimes and the duration of meals, with most patients feeling adequately supported during meals. Regarding food quality, the majority of participants rated most attributes as “Very good”, although there is scope for improvement in terms of palatability of breakfast as well as first and second courses and vegetables. Using colorful garnishes and good presentation could encourage patients to consume their meals. The preparation of minced and soft diets requires ensuring that protein and vegetables are cooked until soft and moist, rather than simply boiling protein and blanching vegetables before mincing and serving them with soup. Cooking proteins and vegetables in soup before straining and chopping them to the appropriate size would also enhance the taste and presentation of TMDs.

The association between dietary intake and factors such as food quality and food service was found to be not significant, except for breakfast palatability for all diet types. However, considering that over 40% of patients did not meet the minimum nutritional requirements, further improvements in food quality and service are essential to increase dietary intake. Kitchen staff must prepare TMDs with a consistent texture or consistency, but at the same time should consider diet appearance and food variety, predictors of TMD plate waste, as suggested by Razzalli et al. [14]. Offering visually appealing TMDs and a variety of foods that can accommodate different eating habits and preferences to increase dietary intake and contrast the high prevalence of malnutrition in hospital settings is important. The observed association between breakfast palatability and overall intake represents a notable finding and could be explored further for clinical impact. Limited sample size, unmeasured confounders, and cross-sectional design may have hindered the detection of other significant associations.

Moreover, reduced smell or taste—common in hospitalized or elderly patients—may lower appetite and food intake [29]. Emotional factors such as eating alone, lack of assistance, or an uninviting environment can further diminish eating enjoyment, especially in those with cognitive or functional impairments [30]. This highlights the need to address not only food delivery logistics but also the sensory and psychosocial aspects of hospital mealtimes.

An additional factor that may have influenced patients’ dietary intake is the method of meal delivery. In our hospital, meals are delivered cold and subsequently reheated on the ward prior to serving. While this approach is logistically efficient, it may negatively impact the palatability, appearance, temperature, and texture of the food, all of which are known to affect patients’ acceptance and consumption of hospital meals [19,31].

This study has some limitations. Firstly, data collection was focused on food consumption during lunch meals, excluding beverages and dinner meals. For a more comprehensive analysis, future research should include all mealtimes to calculate the daily patients’ dietary intake. Additionally, while the visual estimation method used in this study is validated and used by other studies [14,23], it tends to have a higher error percentage compared with more precise methods like weighing food. Future studies should consider incorporating more accurate methods to monitor food intake to improve the reliability of the data. The calculation of average energy and protein values was based on the categories provided by the Hospital Diet Manual and the Reference Intake of Nutrients and Energy for the Italian

Population. These values were tailored for a healthy adult population, which may not be fully representative of a hospital setting population. Therefore, future research should take into account the specific nutritional needs of the hospital's patient demographic to provide more accurate recommendations. To improve data precision, future studies should include the age, weight, and height of patients. This would allow for a more accurate calculation of basal metabolic rates. Moreover, the use of intake of oral nutritional supplements should be considered to provide a complete picture of patients' nutritional intake. Future studies should also take into account patients' dental status and duration of hospital stay. In particular, calculating and comparing the average length of stay across groups may offer valuable insights into how hospitalization impacted their ability to consume meals.

Considering metabolic demands, functional impairments, and disease-specific needs is essential to ensure appropriate and achievable intake. Our findings support the need for personalized nutritional targets. Enhancing and expanding research in the management and prescription of therapeutic diets is crucial for addressing hospital malnutrition, as the nutrition provided by hospital food services serves as an effective treatment by supplying essential calories, macronutrients, and micronutrients [32].

5. Conclusions

These preliminary results indicate that, alarmingly, the energy and protein intakes do not meet the required levels for over 40% of patients, regardless of diet type, while patients have reported high levels of satisfaction with the hospital food service. This underscores the importance of regularly conducting dietary intake assessments to identify factors that may prevent patients from consuming their meals optimally. It is also crucial to implement patient education on the importance of consuming the appropriate textured diet to increase awareness and acceptance at the ward level.

Hospital management must play a pivotal role by encouraging and providing full support to their food service providers, particularly in the use of food textures and other technologies in the provision of texture-modified meals. Dietary management should be prioritized for all patients, particularly in patients receiving TMD. Further research should be conducted to determine the necessity of therapeutic diets and effective strategies to enhance dietary intake and reduce the risk of malnutrition among hospitalized patients.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/dietetics4030040/s1>, Table S1: Estimated percentage of food intake of the tray components per diet; Table S2: Representative images and nutritional characteristics of fruit and vegetables illustrating soft and minced dietary consistencies; Table S3: Satisfaction scores according to different criteria of food quality and food service (mean $\pm$ SD).

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Abbreviations

The following abbreviations are used in this manuscript:

CI	Confidence intervals
IDDSI	International Dysphagia Diet Standardization Initiative
LARN	Reference Intake of Nutrients and Energy for the Italian Population
OR	Odds ratio
SD	Standard deviation
TMDs	Texture-modified diets

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