

Dietary patterns and nutritional risk in cancer patients: An exploratory study at hospital admission in Latin America

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ABSTRACT

Introduction: An inadequate diet and nutritional deterioration influence the progression and prognosis of cancer patients. However, limited data exists on the dietary patterns of oncology patients in Latin America.

Objectives: To describe the dietary patterns and nutritional status of cancer patients upon hospital admission to a specialized oncology center in Latin America.

Methods: An exploratory cross-sectional study including 332 patients with solid and hematologic tumors. Dietary and nutritional assessments were conducted using standardized tools, clinical records, and dietary surveys. The analysis included fruit, vegetables, fiber, saturated fat, and simple sugar intake, along with nutritional status indicators. Missing dietary data were categorized as "Data not available" to ensure transparency.

Results: Low consumption of fruits (38-40%), vegetables (10-13%), and fiber (59-71%) were observed, alongside a high intake of saturated fats and simple sugars. Among patients with solid tumors, 13.7% consumed more than 350 grams of saturated fats per week, compared to 25.6% of those with hematologic tumors. Additionally, 14.2% of solid tumor patients and 28.9% of hematologic

tumor patients reported consuming over 25 grams of simple sugars daily. These dietary patterns are associated with chronic inflammation, oxidative stress, and an increased risk of tumor progression.

Conclusions: Cancer patients exhibited poor dietary patterns and nutritional risk factors that may negatively impact clinical outcomes. These findings underscore the need for culturally adapted nutritional strategies, integrated into oncology treatment and led by multidisciplinary teams, to optimize nutritional status and clinical outcomes.

KEYWORDS

Food Preferences; Hospitals, Special; Neoplasms Dietary intake; Dietary Patterns; Neoplasms.

INTRODUCTION

Cancer risk can be reduced by addressing modifiable factors, with diet playing a crucial role¹. Eating habits influence health and well-being, both in cancer prevention and throughout treatment and recovery¹⁻³. However, in Latin America, socio-economic inequalities, limited access to nutritional counselling, and the rising availability of ultra-processed foods contribute to poor dietary patterns among cancer patients. Understanding these patterns is essential for developing culturally adapted interventions that improve health outcomes.

Scientific evidence links ultra-processed foods, saturated fats, and refined sugars to chronic disease progression and cancer recurrence^{4,5}. Conversely, diets rich in fruits, veg-

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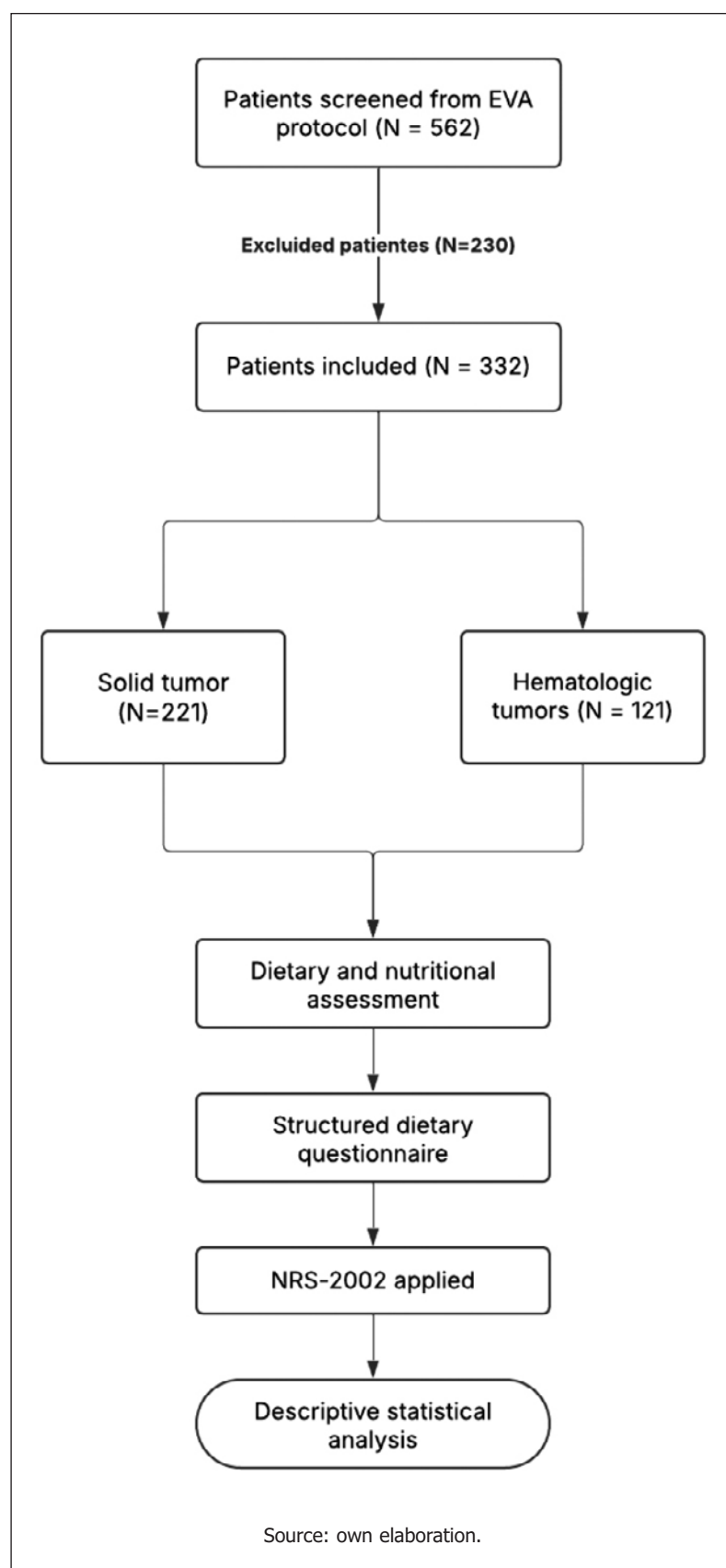


Figure 1. Flowchart of patient selection and dietary assessment process

etables, whole grains, and high-quality proteins—particularly from plant sources and fish—offer protective effects, enhancing quality of life and clinical outcomes⁶.

Low fiber and antioxidant intake is associated with metabolic complications and a weakened immune response, exacerbating chronic inflammation and reducing patient well-being⁷⁻⁹. Incorporating fiber-rich foods may help mitigate cachexia and improve treatment response¹⁰.

Dietary patterns also influence mortality. A systematic review by the National Institutes of Health (NIH) found that diets high in fruits, vegetables, legumes, whole grains, and healthy proteins are linked to lower mortality rates, whereas processed foods and unhealthy fats increase chronic disease risk¹¹.

Additionally, dietary choices correlate with specific cancer types, with high consumption of red meat and ultra-processed foods raising the risk, while plant-based diets and healthy fats provide protective benefits¹²⁻¹⁴.

Despite the well-recognized role of diet in recovery and recurrence prevention, cancer patients often lack adequate nutritional guidance and support, underscoring the need for tailored interventions¹⁵.

Moreover, antioxidants, healthy fats, exercise, and obesity reduction contribute to improved outcomes¹⁶.

Therefore, this study does not aim to explore the etiological role of diet in cancer development but rather to describe the dietary patterns and nutritional risk of cancer patients upon hospital admission. This perspective seeks to inform clinical nutrition care and multidisciplinary strategies for early identification and management of disease-related malnutrition in oncology settings.

MATERIAL AND METHODS

Study Design

This descriptive, retrospective observational study characterizes eating habits and nutritional risk in Latin American populations, specifically in Colombia, diagnosed with solid tumors and hematologic malignancies. Each patient is enrolled in the institution's EVA (Evidence - Verification - Analysis) research protocol, re-approved under ACTA CEI-114 to ensure compliance with ethical guidelines, and provides informed consent. The

CTIC Scientific Committee approved a sub-analysis of this specific patient population from EVA.

Selection and Description of Participants

Participants were selected from cases enrolled in the EVA after signing the informed consent form, including patients aged 18 years or older diagnosed with solid tumors or hematological malignancies between August 2022 and August 2024. Cases with incomplete medical records were excluded.

Demographic data—including age, sex, and cancer type—were collected to ensure the sample represented the broader population. Both male and female participants were included, with detailed sex and gender data collected to enhance understanding of population characteristics.

Data Collection and Measurements

Data was systematically gathered through a centralized information platform designed for dynamic reference capture, ensuring logical independence and minimal redundancy via Data Columns (DCs).

Electronic medical records served as the primary data source, guaranteeing high-quality, structured information. Each variable was consistently defined and measured, with a strong focus on accuracy. All data collectors underwent standardized training to ensure uniform application of the nutritional assessment tool which considered different aspects as risk factors for inadequate food selection and intake. **Figure 2.**

Additionally, artificial intelligence tools—ChatGPT (OpenAI, San Francisco, USA) and Gemini (Google DeepMind, Mountain View, USA)—were utilized to review and refine the data collection process, enhancing clarity, consistency, and adherence to best practices in medical documentation.

Handling of Missing Data

For categorical dietary variables, missing responses were categorized as 'Data not available' to ensure transparency in the analysis. For continuous variables, missing values were handled using median imputation where appropriate. Variables with more than 30% missing data were excluded from the analysis to preserve data quality.

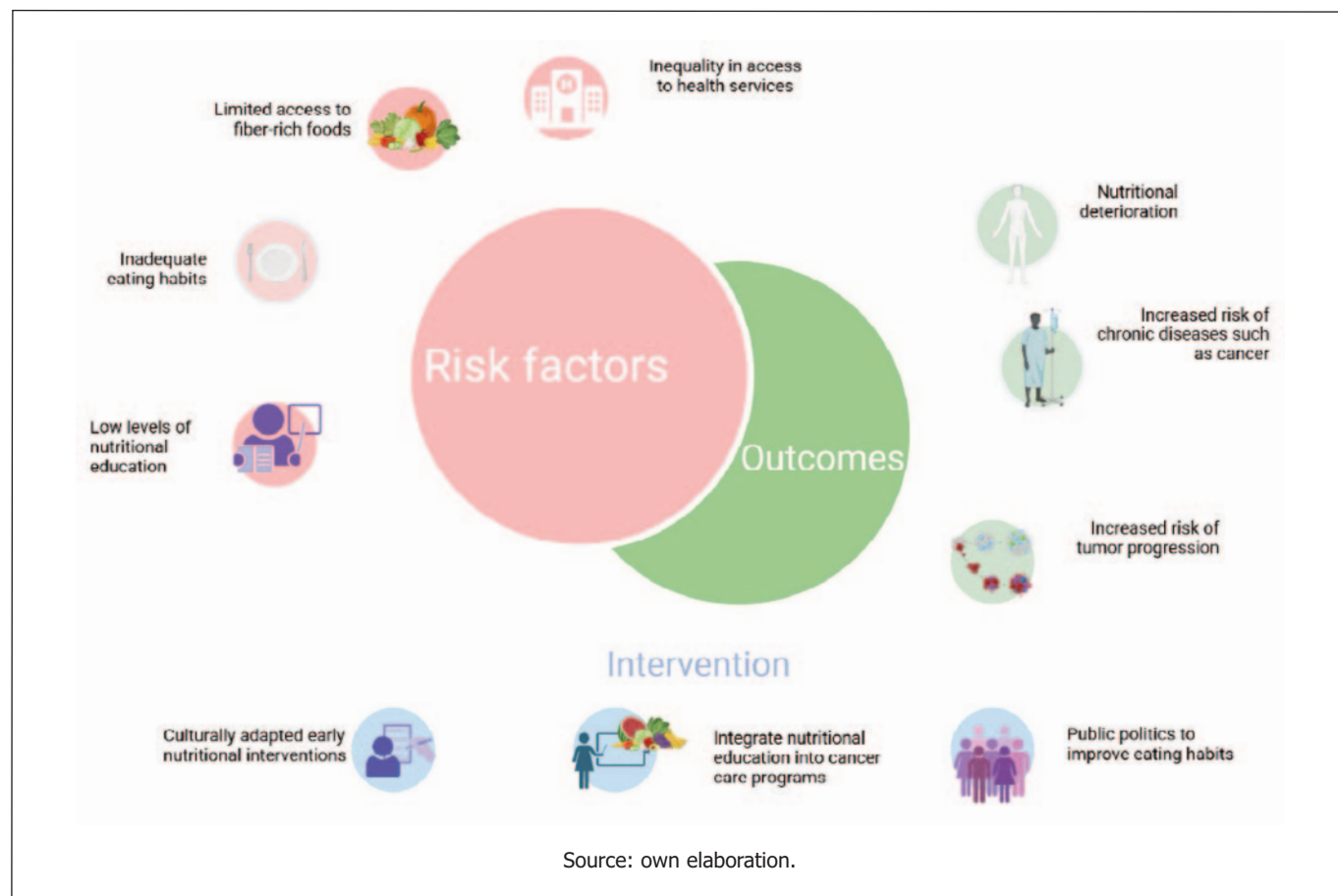


Figure 2. Assessment tool

All data collectors underwent standardized training to ensure uniform application of the nutritional assessment tool.

Statistical Analysis

Statistical analyses were conducted using Python (version 3.11.4), with Pandas and NumPy for data manipulation and evaluation. Continuous variables (e.g., age) were summarized as medians with interquartile ranges (IQRs), while categorical variables were reported as frequencies and percentages. Differences in dietary habits by cancer type and demographic factors were assessed using descriptive statistics.

Ethical Considerations

The study was conducted in accordance with the Helsinki Declaration, guaranteeing thorough review and approval of all ethical considerations by the local ethics committee.

RESULTS

A total of 332 patients were included, with 55.7% women and a median age of 60 years (IQR: 46.8–69.4). Among 150 patients with available education data, 32.7% had primary education, 28.7% secondary education, 18.6% university education, 12% technical education, and 8% had no formal education recorded.

Cancer types and nutritional risk

Of the total sample, 211 patients (63.5%) had solid tumors, with breast cancer being the most common diagnosis (68 patients; 32.2%), followed by gastrointestinal tumors (59 patients; 28%). Among 121 patients (36.5%) with hematologic malignancies, non-Hodgkin lymphoma was the most prevalent diagnosis (56 patients; 46.3%).

Nutritional risk was assessed using the Nutritional Risk Screening (NRS) 2002. Among patients with solid tumors, 38% were classified as high nutritional risk, while 50.4% of patients with hematologic malignancies were at high nutritional risk.

Protective dietary patterns

Table 1 summarizes the dietary patterns related to protective factors, stratified by tumor type.

Overall, fruit and vegetable consumption was low across both groups, with a considerable proportion of patients reporting intake below recommended levels. Although patients with hematologic malignancies showed slightly higher frequencies of fruit and vegetable consumption compared to those with solid tumors, data completeness was a major limitation, particularly among solid tumor patients, where over two-thirds of data for fruit and vegetable intake were missing.

Water consumption exceeding 4 glasses per day was infrequent, especially among solid tumor patients. Fiber intake

Table 1. Dietary consumption patterns of cancer patients – protective by tumor group

Consumption variable	Solid tumors	Hematologic tumors
	n=211	n=121
	n (%)	n (%)
Fruit consumption*		
No	8(3,8)	6(5)
1-3 times	30(14,2)	34(28,1)
4-7 times times	24(11,4)	35(28,2)
More than 7 times	6(2,8)	8(6,6)
Data not available	143(67,8)	83(32,1)
Vegetable consumption*		
No	9(4,3)	10(8,3)
less than once a week	4(1,9)	-
1-3 times	28(13,3)	30(24,8)
4-7 times times	23(10,9)	37(30,6)
More than 7 times	6(2,8)	6(4,9)
Data not available	141(33,2)	83(31,4)
Water intake more than 4 glasses *		
No	36(17,1)	36(29,7)
Yes	31(14,7)	47(38,8)
Data not available	144(68,2)	83(31,5)
Fiber consumption 400 gr **		
No	59(28)	71(58,7)
Yes	10(4,7)	12(9,9)
Data not available	69(67,3)	83(31,4)

* Consumption per week.

** Consumption per day.

Data not available refers to patients for whom dietary intake data was not recorded or was incomplete at the time of evaluation.

was alarmingly low, with less than 10% of patients in both groups meeting the recommended levels.

These findings highlight limited adherence to protective dietary habits, particularly among patients with solid tumors, where data completeness issues further challenge a comprehensive assessment of nutritional patterns.

Dietary patterns associated with increased risk

Table 2 presents the consumption patterns of foods associated with increased cancer risk.

A substantial proportion of patients in both groups reported high intake of saturated fats, simple sugars, and high-sodium foods, with hematologic patients generally reporting higher frequencies than solid tumor patients.

Consumption of red meat exceeding recommended levels was common in both groups, while intake of processed meats and nitrosamine-rich foods was reported at lower rates. However, regular consumption of non-refrigerated foods, a known dietary risk factor, was noticeably more frequent among hematologic patients.

Notably, soy consumption was almost absent in both groups, representing a missed opportunity for potential di-

Table 2. Dietary consumption patterns associated with increased risk of cancer by tumor group

Consumption variable	Solid tumors	Hematologic tumors
	n=211	n=121
	n(%)	n(%)
Consumption of saturated fats more than 350 gr *		
No	40(19)	52(43)
Yes	19(13,7)	31(25,6)
Data not available	152(67,3)	38(31,4)
Consumption of sausages 50 gr or more**		
No	61(28,1)	65(53,7)
Yes	10(7,4)	18(14,9)
Data not available	140(64,5)	38(31,4)
Consumption of cured meats		
No	62(29,4)	76(62,8)
Yes	7(3,3)	7(5,7)
Data not available	142(67,3)	38(31,5)
Raw food consumption		
No	54(25,6)	70(57,8)
Yes	15(7,2)	13(10,7)
Data not available	142(67,2)	38(31,5)
Consumption of foods rich in nitrozanines		
No	50(23,7)	70(57,8)
Yes	19(9)	13(10,7)
Data not available	142(67,3)	38(31,5)
Regular consumption of non-refrigerated foods		
No	38(18)	47(38,8)
Yes	30(14,2)	36(29,7)
Data not available	143(29,8)	38(31,5)

Consumption variable	Solid tumors	Hematologic tumors
	n=211	n=121
	n(%)	n(%)
Red meat consumption + 500 gr *		
No	46(21,8)	64(52,9)
Yes	27(12,8)	19(15,7)
Data not available	138(65,4)	38(31,4)
Dairy Consumption more than three servings **		
No	60(28,4)	70(57,8)
Yes	10(4,7)	14(11,6)
Data not available	141(66,9)	37(30,6)
Eating high sodium foods more than twice *		
No	41(19,4)	58(47,9)
Yes	26(12,3)	25(20,7)
Data not available	144(68,3)	38(31,4)
Consumption of simple sugars more than 25 gr **		
No	37(17,5)	48(39,7)
Yes	30(14,2)	35(28,9)
Data not available	144(68,3)	38(31,4)
Consumption of protein of animal origin 3 times **		
No	39(18,5)	48(39,7)
Yes	28(13,3)	35(28,9)
Data not available	144(68,2)	38(31,4)
Soy consumption more than 2 times *		
No	63(29,9)	83(68,6)
Yes	4(2)	-
Data not available	144(68,1)	38(31,4)

* Consumption per week. ** Consumption per day.

Data not available refers to patients for whom dietary intake data was not recorded or was incomplete at the time of evaluation.

Source: own elaboration.

etary protective factors. Similarly, nutritional supplement use was low, particularly among hematologic patients.

These data reflect a consistent pattern of suboptimal dietary practices, with frequent consumption of foods linked to cancer risk and poor adherence to protective dietary recommendations across both patient groups.

DISCUSSION

This exploratory analysis focuses on clinical nutrition rather than etiological causation. The findings highlight the importance of early nutritional screening and intervention to address disease-related malnutrition in oncology patients, emphasizing the clinical implications of inadequate dietary patterns observed at hospital admission.

A significant proportion of patients exhibited poor dietary habits, particularly low intake of fruits, vegetables, and fiber, contributing to nutritional deterioration and increased disease risk. According to the “1 + X” principle in cancer etiology, inadequate consumption of these protective foods exacerbates the impact of primary risk factors, such as the intake of ultra-processed foods high in saturated fats and refined sugars¹⁷. Additionally, low fiber intake is linked to a higher risk of colorectal cancer due to its essential role in gut health and microbiota regulation¹⁷. Likewise, insufficient antioxidant intake from fruits and vegetables limits the body’s ability to counteract oxidative stress, contributing to tumor progression^{18,19}. These findings underscore the importance of integrating dietary education and nutritional monitoring into cancer care programs^{20,21}.

The poor dietary patterns observed are likely influenced by social determinants of health, such as limited access to fresh, nutritious foods, low levels of nutritional education, and economic constraints—factors particularly relevant in the Latin American context²². Previous studies have shown how inequities in access to healthy foods perpetuate health disparities, disproportionately affecting vulnerable populations, including cancer patients^{22–24}.

These findings further support the need for public health policies aimed at improving access to fiber-rich foods, antioxidants, and essential micronutrients in low-resource settings^{20,22,23}. Implementing early, culturally tailored nutritional interventions—including systematic screenings and personalized dietary education—could help prevent malnutrition, improve treatment adherence, and enhance clinical outcomes^{25,26}. These strategies should be adapted to patients’ cultural and socioeconomic contexts, with continuous nutritional monitoring throughout the care process to optimize prognosis and quality of life²⁷.

Beyond individual interventions, strengthening public policies to promote accessible, affordable, and healthy food environments is crucial. Improving institutional food environments within healthcare settings and integrating nutrition-focused

interventions into national cancer care programs could enhance population-level outcomes. These findings reinforce the importance of embedding nutrition services into oncology care pathways from diagnosis through survivorship.

Dietary risk factors and clinical implications

This study also highlights frequent consumption of foods associated with increased cancer risk, including saturated fats, simple sugars, processed meats, and red meat, which may further contribute to chronic inflammation, oxidative stress, and poorer clinical outcomes. Among patients with solid tumors, 13.7% reported consuming more than 350 grams of saturated fats per week, compared to 25.6% among hematologic patients. Excessive intake of simple sugars (more than 25 grams per day) was also common, reported by 14.2% of solid tumor patients and 28.9% of hematologic patients, exceeding international recommendations. Although only 14.2% of solid tumor patients and 28.9% of hematologic patients reported consuming more than 25 grams of simple sugars per day, these findings should be interpreted cautiously. The Warburg effect reflects intrinsic metabolic alterations in tumor cells, which preferentially utilize glycolysis even in the presence of oxygen. Therefore, dietary sugar intake does not directly induce this effect but may indirectly influence energy balance, systemic inflammation, and overall metabolic health²⁸.

International guidelines, including those from the American Cancer Society³³, the World Health Organization (WHO)^{29,30} and the Dietary Guidelines for Americans 2020–2025³¹ recommend limiting added sugars to less than 10% of total daily calories, with WHO suggesting a further reduction to 5%^{32–34}. Regarding red meat consumption, 12.8% of solid tumor patients and 15.7% of hematologic patients exceeded 500 grams per week, increasing exposure to carcinogenic compounds such as heterocyclic amines and polycyclic aromatic hydrocarbons, particularly in grilled and processed meats^{35,36}. The World Cancer Research Fund (WCRF) advises limiting red meat intake to 500 grams per week, though some modeling approaches propose a more conservative threshold of 350 grams per week, despite limited empirical evidence³⁷.

Limitations and future directions

This study has several limitations. Its cross-sectional design precludes the ability to evaluate causal relationships between dietary patterns and clinical outcomes. Additionally, self-reported dietary data may be subject to recall bias, particularly given the stress and information overload often experienced by newly diagnosed cancer patients. Importantly, the study faced high rates of missing data, particularly for key protective dietary variables such as fruit, vegetable, fiber, and water intake, which limits the generalizability of some findings.

Future research should prioritize the development of standardized, oncology-specific dietary assessment tools that can

be easily applied in clinical practice. Prospective cohort studies, with longitudinal tracking of dietary patterns and their impact on nutritional status, treatment adherence, and clinical outcomes, will be essential to fully understand the role of nutrition in cancer care in Latin America.

Concluding remarks

This study reinforces the relevance of nutritional assessment and intervention as a cornerstone of comprehensive oncology care. The results reveal suboptimal dietary patterns and significant nutritional risk among hospitalized cancer patients, supporting the integration of dietitian-led strategies for early identification and management of malnutrition throughout cancer treatment.

This study underscores the urgent need to integrate nutrition services as a fundamental component of comprehensive oncology care in Latin America, given the suboptimal dietary patterns and high nutritional risks observed in cancer patients at hospital admission. Addressing these challenges requires personalized dietary education, systematic nutritional screening, and continuous monitoring, all tailored to patients' cultural and socioeconomic contexts. Strengthening institutional capacities and fostering collaboration among multidisciplinary teams—including oncologists, dietitians, nurses, social workers, and psychologists—is essential to ensure coordinated nutritional care throughout the cancer continuum.

Beyond individual interventions, these findings also highlight the need for region-specific clinical nutrition policies in Latin America, where socioeconomic inequalities, cultural dietary practices, and limited access to professional dietetic services can exacerbate malnutrition risk in oncology populations. Evidence-based public health strategies that promote equitable access to healthy foods and integrate clinical nutrition into national cancer control programs are crucial to improving treatment outcomes and patients' quality of life across the region.

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