REVISTA ECUATORIANA DE CIENCIA, TECNOLOGÍA E INNOVACIÓN EN SALUD PÚBLICA
CÓDIGO ISSN 2588-0551
DOI: 10.31790/inspilip.v9i29.769

Original Article:

Analysis of food preferences in cancer patients undergoing chemotherapy at the SOLCA cancer hospital, Quito, Ecuador

Análisis de las preferencias alimentarias en pacientes oncológicos en tratamiento con quimioterapia en el hospital oncológico de SOLCA Quito - Ecuador

Open Access

Citation

Taipe K., Villalba C., Charpienter M., Moreno P., Ulcuango E., Tricallotis, Alexander León H., Yuliu Y., Leone P., García M.,
Analysis of food preferences in cancer patients undergoing chemotherapy at the SOLCA Oncology Hospital, Quito, Ecuador.
INSPILIP 2025, Volume 9, Number 28.
URL: https://www.inspilip.gob.ec/index.php/inspi/article/view/750

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Identification of author(s) responsibility and contribution: The authors declare that they have contributed to the study as follows: Conceptualization and design (K.T, C.V, E.U, J.T.), Methodology: (Y.Y-L, M.F.G) Statistical analysis: (Y.Y-L), Writing – Review: (C.V, K.T, E.U, N.N, H.A., Y.Y-L, JT, P.L., M.F.G.) Supervision: (K.T, M.F.G.); Project Manager: (K.T.) All authors have read and agreed to the published version of the manuscript.

Admission date: 12/10/2024.
Approval date: 04/01/2025.
Publication date: 05/01/2025.

Summary

Introduction: In oncology patients, chemotherapy can cause changes in eating habits. Understanding their perception of diet and disease provides important information that could be used to mitigate the symptoms and consequences of treatment through tailored nutritional intervention. **Methods:** A cross-sectional study was conducted using a food preference questionnaire,built and validated by experts in the field of nutrition, in oncology patients at the “Hospital Oncológico de SOLCA – Quito", Ecuador, who were hospitalized between October 2018 and April 2019. Adult patients undergoing chemotherapy were included, and data on demographic characteristics, tumor type, and food preferences were collected. **Results:** The questionnaire was administered by healthcare professionals to 143 patients; 76.92 % were women, with a median age of 51 years (IQR 39-60). 81.87 % of the patients had solid tumors, and 18.18 % had hematological tumors. 53.85% received high-emesis-risk treatment and 46.15% medium-emesis-risk treatment, with an average of 4 chemotherapy cycles. The most frequently reported symptom (58.7 %) was hyporexia. Food preferences showed an inclination towards hot liquid meals for breakfast, such as milk-based colada (52.45 %), and for supper, such as consommé (43.46 %). For cold beverages, the preference was sweet juice (59.44%) at lunch. Regarding proteins, eggs were preferred (69.93 %) for breakfast, and white meat (59.44 %) for lunch. There were no significant differences in food preferences between the groups with solid or hematological tumors. **Conclusions:** The food preferences of oncology patients undergoing chemotherapy are based on sweet liquid meals and proteins such as eggs and white meat. Understanding these preferences could improve strategies that enhance adherence to diet during chemotherapy treatment, thereby promoting an improvement in the quality of life of oncology patients.

Keywords: Neoplasms. Chemotherapy, Food preferences. Diet. Ecuador

Resumen

Introducción En pacientes oncológicos la quimioterapia puede provocar cambios en los hábitos alimenticios. Conocer su percepción sobre la alimentación y su enfermedad proporciona información importante que podría utilizarse para mitigar los síntomas y consecuencias del tratamiento mediante una intervención nutricional adaptada. **Metodología:** Se realizó un estudio transversal utilizando un cuestionario, elaborado y validado por expertos en el campo de nutrición, de preferencias alimentarias en pacientes oncológicos en el Hospital Oncológico SOLCA, Quito, Ecuador, que se encontraban hospitalizados entre octubre del 2018 y abril del 2019. Se incluyeron pacientes adultos en tratamiento con quimioterapia, recopilando datos sobre características demográficas, tipo de tumor, y preferencias alimentarias. **Resultados:** Se aplicó el cuestionario por parte de profesionales sanitarios a 143 pacientes; el 76.92 % eran mujeres, con una edad mediana de 51 años (RIC 39-60). El 81.87 % de los pacientes tenía tumores sólidos y el 18.18 % tumores hematológicos. El 53.85 % recibió tratamiento con alto riesgo de emesis y el 46.15 % con riesgo mediano de emesis, con un promedio de 4 ciclos de quimioterapia. El síntoma más frecuente (58.7 %) reportado fue la hiporexia. Las preferencias alimenticias mostraron una inclinación hacia comidas líquidas calientes en el desayuno, como colada con leche (52.45 %), y en la merienda consomé (43.46 %). En bebidas frías, la preferencia fue el jugo dulce (59.44 %) en el almuerzo. En cuanto a las proteínas, se prefirió el huevo (69.93 %) en el desayuno y la carne blanca (59.44 %) en el almuerzo. No se evidenciaron diferencias significativas en las preferencias alimenticias entre los grupos con tumores sólidos o hematológicos. **Conclusiones:** Las preferencias alimentarias de los pacientes oncológicos en tratamiento con quimioterapia se basan en comidas líquidas dulces y proteínas como el huevo y la carne blanca. El conocimiento de estas preferencias podría mejorar las estrategias que favorecen la adherencia a la alimentación durante el tratamiento de quimioterapia, y de esta forma promover una mejora en calidad de vida del paciente oncológico.

Palabras clave: Neoplasias. Quimioterapia. Preferencias alimentarias. Dieta. Ecuador.

Introduction

Cancer is a complex disease that represents a significant global public health problem (1). By 2022, the International Agency for Research on Cancer (IARC) estimates that there will be nearly 20 million new cases of cancer and more than 9.5 million deaths attributed to cancer. About one in five people develop cancer during their lifetime, and nearly one in nine men and one in 12 women die from it (1). Based on global demographic data, it is estimated that new cases of cancer will exceed 30 million by 2050 (1). The disease is influenced by a variety of factors, including genetic predisposition, exposure to carcinogens, and lifestyle (2).

One of the main treatments for cancer is chemotherapy, as most chemotherapy consists of the cyclic administration of anticancer agents (3). Cancer itself, or the use of chemotherapy, has been reported to cause taste and smell disturbances in different ways in individuals, which could further affect the dietary intake and nutritional status of patients (3). During and after cancer treatment with chemotherapy, disturbances in the senses of smell (5-60%) and taste (45-84%) have been observed, which are temporary and tend to subside a few months after the end of treatment (4,5). In addition, chemotherapy can cause several side effects, including nausea, vomiting, mucositis, diarrhea, constipation, and loss of appetite. These effects may result in weight loss, especially by reducing the musculoskeletal compartment, affecting the normal mechanics of gastrointestinal transit, aggravating nutritional status and tumor cachexia (6). Economically, this translates into an even higher cost for treatment (7–9).

Various factors have been described that can influence patients' perceptions of the food they receive, such as temperature, flavor, variety, quantity, and even timing. Furthermore, studies of gene variants related to flavor perception associated with a population's ancestry may explain the preference for or rejection of certain foods (10,11).

There is literature on food preferences in patients undergoing cancer treatment, which is based on the quantification of food intake and food leftovers (12,13). However, the foods consumed by patients may not reflect food preferences, as their selection may be influenced by psychological, genetic, social, and nutritional factors, provided to improve symptoms or assist with treatment (14). Thus, a perception survey developed by researchers and validated by experts on food choices allows for a better understanding of food preferences, reducing these biases.

Knowing the perception that cancer patients have about their diet during chemotherapy treatment provides the necessary information that could help mitigate symptoms through effective nutritional intervention (15,16). The objective of this study

was to identify food preferences among patients with solid and hematological tumors who are undergoing chemotherapy, through a survey, at the SOLCA Núcleo Oncology Hospital in Quito in the period from October 2018 to April 2019.

Subjects and methods

Study design

A cross-sectional analytical study was conducted using a food preference questionnaire in cancer patients at the SOLCA Oncology Hospital Quito (SOLCA Núcleo de Quito, in Spanish).

Population

Cancer patients over 18 years of age, hospitalized for at least 5 days between October 2018 and April 2019, and receiving oral nutrition were included. Patients with oral tumors, palliative care, respiratory failure, and those receiving enteral or parenteral nutrition were excluded. Non-probability sampling was used, including all patients who voluntarily agreed to participate during the study period.

Sample

A sample of 143 cancer patients receiving chemotherapy treatment who were hospitalized between October 2018 and April 2019 at the SOLCA Núcleo Cancer Hospital in Quito voluntarily agreed to participate in the study.

A team of five pre-trained nutritionists conducted the survey face-to-face with the patients, confirmed eligibility criteria, obtained written informed consent, and administered the questionnaire. The interviewers were familiar with the instrument and provided further explanations for any questions the interviewees did not fully understand. Four daily meals were prescribed, including breakfast, snack, lunch and afternoon snack, which were well perceived by the participants.

The "Food Preference Questionnaire" instrument was developed for this study and validated by experts in the field of nutrition. It consisted of 40 items and was administered to the study patients by a team of five trained nutritionists.

Variables

Oncologic diagnoses were categorized into groups: gastric, non-Hodgkin lymphoma, Hodgkin lymphoma, cervical, colorectal /anal, osteosarcoma, endometrium, breast, testicular, leukemia, lung, pancreas, ovary, prostate, sarcoma, gallbladder, vulva, myeloma, or other. Diagnoses were then classified as solid tumors or hematologic tumors for analysis. Previous medical history included hypertension (HTN), renal failure (RF), obesity, diabetes mellitus 2 (DM2), liver failure, none, or more than one. The total number of adverse effects of chemotherapy was summed to calculate the average number of effects per patient. The provinces of residence of the participants were grouped according to zones: coast (Esmeraldas, Santo Domingo de las Tsáchilas, Manabí, and Los Ríos), mountains (Pichincha, Tungurahua, Imbabura, Cotopaxi, Chimborazo, Carchi, Loja, and Bolívar), and east (Sucumbíos, Pastaza, and Napo).

Regarding food preferences, the following foods that worsen their conditions were grouped "red meats", "cold cuts", "pork", "fried" and "roasted" under "red meats". Likewise, "processed foods" and "cold cuts" were grouped under "processed foods". To analyze the data on reported satisfaction with organoleptic characteristics, the five options in the survey were consolidated into three: 1. Very Satisfied, which includes "Excellent" and "Very Good"; 2. Neutral, which includes "Good" and "Regular"; and 3. Little Satisfied, which includes "Bad".

The diet provided to patients at the SOLCA Oncology Hospital, Quito is described below: Breakfast: 200ml of hot drink (colas with milk, colas with fruit, milk with coffee, milk alone or hot aromatic drinks), 200ml of cold drink (natural fruit juices, fruit smoothies, yogurt, gelatin or cold aromatic drinks) carbohydrates of 80 to 100g (bread, made with green plantain, cassava or flours such as empanadas, bolones, muchines or tortillas), proteins of 60 to 80g hard-boiled eggs, scrambled alone, scrambled with vegetables, or cheese). Morning snack: Assorted fruit of 80 to 120g. Lunch and snack: 250 ml of varied soup (thick cereal soups including: quinoa, morocho, oatmeal, with potatoes, legume soups with potatoes, cassava or green plantain, etc.; vegetable creams such as spinach, tomato, celery, etc.; or light chicken and vegetable consommés); main course consisting of: 80 to 100 g of carbohydrates (rice, potato, cassava, green plantain, pasta or ripe plantain), 90 to 120 g of protein (chicken, fish, turkey, beef, offal or pork), 20 to 50 g of salad (fresh vegetables dressed with acidic vinaigrettes), accompanied by a 200 ml cold drink (usually fruit juices, sometimes aromatic or gelatin) and a dessert (fruit or a sweet cake/pie,

flan or gelatin). Snack: Occasionally, a half-meal meal was served at snack time, consisting of a light consommé-type soup and a sandwich, with a cold drink. The established meal times were: breakfast at 8:00 a.m., snack at 10:00 a.m., lunch at 12:00 p.m., and snack at 5:00 p.m.

The preparations are varied and in general the diet for patients undergoing chemotherapy responds to a general diet without dietary restrictions. In case the patients have any underlying pathology such as diabetes, hypertension or kidney failure, the general diet is adapted to the restrictions specific to the disease.

Statistical analysis

The analysis was performed using R Studio version 2023.12.1+402. Qualitative variables were summarized using proportions, while continuous quantitative variables were summarized using mean and standard deviation. Non-normal distributions of quantitative data were summarized using median and interquartile range (IQR). Categorical variables are presented as absolute and relative frequencies. Statistical significance was determined as a p-value < 0.05. Associations between patient characteristics differentiated by solid and hematologic tumor types were analyzed using bivariate analysis; Fisher's exact test was used to compare categorical data when the chi-square test criteria were not met, while Student's t test or the Kruskal-Wallis test were used to compare numerical variables.

Results

General Characteristics

A total of 143 patients (76.92% women) were surveyed, with a median age of 51 years (IQR 39-60). The majority of patients were from the Sierra region (86.01%). 81.82% had solid tumors, and 18.18% had hematologic tumors.

A total of 25.87% had a medical history, the most common kidney failure (12.59%). The mean hospitalization time was 4.34 ± 3.32, and the mean albumin level was 3.68 ± 0.64. A total of 53.85% received high-risk emesis treatment and 46.15% received medium-risk emesis treatment, with a median of 4 cycles (IQR 2–6) of chemotherapy. Side effects were reported by 88.81% of participants. Hyporexia was the most frequently reported symptom (58.74%), followed by constipation (44.06%), nausea (41.96%), and dysgeusia (41.26%), with a median of 3 (IQR 1–4). The baseline characteristics were similar in the solid and hematological tumor groups, except for the high risk of emesis, which in hematological patients was 88.4% compared to patients with solid tumors where it was 46.15%, with a significant difference ($p<0.01$) (Table 1).

Table 1. Baseline characteristics of the study population.

General Characteristics	Total N = 143 (%)	Solid tumors N = 117 (81.82%)	Hematological tumors N = 26 (18.18%)	p-value**
Sex (n [%])				
Female	110 (76.92)	95 (81.20)	15 (57.69)	0.02
Male	33 (23.08)	22 (18.80)	11 (42.31)	
Age (Median [IQR])	51.00 (39.00 – 60.00)	51.00 (39.00 – 58.00)	46.00 (31.25 – 68.00)	<0.01
Geographic Area of Residence (n [%])				
Coast	13 (9.09)	11 (9.40)	2 (7.69)	0.82
Saw	123 (86.01)	99 (84.62)	24 (92.31)	
East	6 (4.20)	6 (5.13)	0	
Galapagos	1 (0.70)	1 (0.85)	0	
Hospitalized Days (Average [SD])	4.34 (3.32)	4.33 (3.35)	4.38 (3.28)	0.17
Albumin * (Mean [SD])	3.68 (0.64)	3.62 (0.64)	3.91 (0.59)	0.51
Risk of Emesis				
High (n [%])	77 (53.85)	54 (46.15)	23 (88.46)	<0.01
Median (n [%])	66 (46.15)	63 (53.85)	3 (11.54)	
Pathological History (n [%])				
None	106 (74.13)	84 (71.79)	22 (84.62)	0.25
Kidney Failure	18 (12.59)	15 (12.71)	3 (11.54)	
Diabetes Mellitus 2	12 (8.39)	12 (10.17)	0	
Obesity	4 (2.80)	4 (3.39)	0	
Hypertension	1 (0.70)	1 (0.85	0	
Liver Failure	1 (0.70)	1 (1.69	0	
Two or more	1 (0.70)	0	1 (3.85)	
Chemotherapy Cycle (Median [IQR])	4.00 (2.00 – 6.00)	4.00 (2.00 – 6.00)	3.00 (2.25 – 4.00)	0.65
Number of side effects per person (Median [IQR])	3.00 (1.00 – 4.00)	3.00 (1.00 – 4.00)	2.00 (1.00 – 3.75)	0.81
Meals per Day (n [%])				
4	60 (41.96)	53 (45.30)	7 (26.92)	0.12
5	43 (30.07)	34 (23.78)	9 (34.62)	
3	34 (23.78)	24 (20.15)	10 (38.46)	
6+	6 (4.20)	6 (51.13)	0	
Hospital Diet (n [%])				
General	90 (62.94)	71 (60.68)	19 (73.08)	0.34
Soft	53 (37.06)	46 (39.32)	7 (26.92)	
Foods that make things worse (n [%])	74 (51.75)	63 (53.85)	11 (42.31)	
Red Meats	23 (16.08)	18 (15.38)	5 (19.23)	0.40
Dairy	16 (11.19)	16 (13.68)	0	
Others	16 (11.19)	13 (11.11)	3 (11.54)	
Processed	11 (7.69)	9 (7.69)	2 (7.69)	
Brussels	8 (5.59)	7 (5.98)	1 (3.85)	

*Missing serum albumin data were removed for this analysis. Results reflect only patients with albumin levels at the time of the survey (N = 123). All other figures include all patients (N = 143).

** P-values were calculated using Fisher's exact test when it does not meet the criteria for calculation by Chi-square.

Note: Values are rounded to the nearest hundredth, so the sum of the values may not equal exactly 100%.

Table 2. Side effects of chemotherapy

General characteristics	Total N = 143 (%)	Solid tumors N = 117 (81.82%)	Hematological tumors N = 26 (18.18%)
People with side effects	127	106	21
Hyporexia	84	69	15
Constipation	63	54	9
Nausea	60	48	12
Dysgeusia	59	49	10
Diarrhea	35	33	2
Others	21	17	4
Mucositis	19	15	4
Dysphagia	15	12	3

Most patients reported more than one side effect. Therefore, the total number in each group is different from the N=143.

Satisfaction of Organoleptic Characteristics

Study Population: Most of the study population reported neutrality in the following categories: flavor 50.35%, color 53.15%, odor 49.65%, texture 53.85%, cooking 50.35%, temperature 51.75%, and presentation 50.35%. In the variety category evaluation, 50.35% were very satisfied with the food.

Solid tumors: In satisfaction of the organoleptic characteristics, 42.77% of the patients felt very satisfied with the flavor, 45.30% with the color, 41.03% with the smell, 46.15% with the texture, 48.72% with the cooking, 48.72% with the temperature, 44.44% with the presentation, and 52.14% with the variety.

Hematological tumors: In the perceived satisfaction of the organoleptic characteristics, 42.31% reported that they were very satisfied with the flavor, 34.62% with the smell, 38.46% with the texture, 42.31% with the cooking, 38.46% with the temperature, 46.15% with the presentation, and 42.14% with the variety.

Table 3. Satisfaction by organoleptic characteristics.

Satisfaction by organoleptic characteristics	Total N = 143 (%)	Solid Tumors N = 117 (81.82%)	Hematological Tumors N = 26 (18.18%)	Value **
Flavor (n (%))				
Neutral	72 (50.35)	61 (52.14)	11 (42.31)	
Very Satisfied	61 (42.66)	50 (42.74)	11 (42.31)	0.17
Not Satisfied	10 (6.99)	6 (5.13)	4 (15.38)	
Color (n (%))				
Neutral	76 (53.15)	62 (52.99)	14 (53.85)	
Very Satisfied	65 (45.45)	53 (45.30)	12 (46.15)	1.00
Not Satisfied	2 (1.40)	2 (1.71)	0	
Odor (n (%))				
Neutral	71 (49.65)	59 (50.43)	12 (46.15)	
Very Satisfied	57 (39.86)	48 (41.03)	9 (34.62)	0.29
Not Satisfied	15 (10.49)	10 (8.55)	5 (19.23)	
Texture (n (%))				
Neutral	77 (53.85)	62 (52.99)	15 (57.69)	
Very Satisfied	64 (44.76)	54 (46.15)	10 (38.46)	0.36
Not Satisfied	2 (1.40)	1 (0.85)	1 (3.85)	
Cooking (n (%))				
Neutral	72 (50.35)	58 (49.57)	14 (53.85)	
Very Satisfied	68 (47.55)	57 (48.72)	11 (42.31)	0.54
Not Satisfied	3 (2.10)	2 (1.71)	1 (3.85)	
Temperature (n (%))				
Neutral	74 (51.75)	58 (49.57)	16 (61.54)	
Very Satisfied	69 (48.25)	57 (48.72)	10 (38.46)	0.59
Not Satisfied	2 (1.40)	2 (1.71)	0	
Presentation (n (%))				
Neutral	72 (50.35)	60 (51.28)	12 (46.15)	
Very Satisfied	64 (44.76)	52 (44.44)	12 (46.15)	0.71
Not Satisfied	7 (4.90)	5 (4.27)	2 (7.69)	
Variety (n (%))				
Very Satisfied	72 (50.35)	61 (52.14)	11 (42.31)	
Neutral	70 (48.95)	56 (47.86)	14 (53.85)	0.13
Not Satisfied	1 (0.70)	0	1 (3.85)	

** P-values were calculated using Fisher's exact test when it does not meet the criteria for calculation by Chi-square.

Note: Values are rounded to the nearest hundredth, so the sum of the values may not equal exactly 100%.

Breakfast (8 am): 94.41% of patients were satisfied with the timing of breakfast, and 89.51% reported that the amount of food was adequate. The majority chose coke with milk (52.45%) as their hot beverage, sweet juice (39.86%) as their cold beverage, whole-wheat bread (33.57%) and prepared cereal (33.57%) as their cereal of choice, and egg (69.93%) as their preferred protein, with no significant differences between solid and hematologic tumors.

Lunch (12 pm): Most patients were satisfied with the timing of their lunch (95.80%) and the quantity (83.92%). Their preferred options were consommé (38.46%), white meat (59.44%), two options with the main course (39.16%), cold salad (47.55%), gelatin (32.87%), and sweet juice (59.44%). No significant differences were found when comparing solid tumors with hematologic tumors.

Snack (5 pm): 86.71% were satisfied with the timing, and 76.92% felt the amount was adequate. Participants preferred the following options: consommé (43.46%) as soup, sandwich (46.85%) as half-meal, standard main course (35.66%), cold salad (24.48%), gelatin (30.77%) as dessert, and hot drink (72.73%).

Snack (10 am): Most patients 99.30% were satisfied with the snack time and 93.01% perceived the amount to be adequate (See Tables S1-S4 in Supplementary Materials).

Discussion

This study represents the first analysis conducted in Ecuador on the food preferences of this group of patients. It was observed that the amounts provided were satisfactory and that most participants preferred the established schedules for breakfast, morning snack, lunch and afternoon snack (8:00, 10:00, 12:00 and 17:00) were adequate, reporting satisfaction in their majority, while in another study, proportion preferences were chosen by patients using images of foods representative of portion sizes and different macronutrients (8). Food preferences can be influenced by a variety of factors, such as personal experiences, cultural adaptations, genetic

predispositions and age, among others (17,18). The complex setting highlights the nature of dietary prediction, especially when patients are receiving chemotherapy treatment.

During the study it was shown that cancer patients had moderate hypoalbuminemia, as well as other comorbidities such as DM2, HTN, RF suggesting the urgent need for appropriate nutritional interventions to improve clinical outcomes, as it is related to the risk of mortality and prolonged hospital stay (19,20).

Cancer patients are a population group highly prone to experiencing adverse effects from anticancer therapies. These include alterations in taste and smell, hyporexia, nausea, and digestive disorders, such as constipation (21). Furthermore, poor dietary adherence is common and can be influenced by various factors, including the organoleptic characteristics of foods (22).

In this study, we observed that most patients undergoing chemotherapy experienced appetite disorders, with hyporexia being the predominant symptom in 58.7% of those surveyed. This finding is consistent with the study conducted by Galindo et al., who also identified anorexia as the leading eating disorder in individuals with cancer (23). These results are concerning, as they place patients at risk of additional complications such as malnutrition, leading to poor quality of life and worse physical and socioemotional functioning (22).

In the present study it is shown that oncology patients value much more positively organoleptic characteristics with sweet and sour flavors as evidenced in the breakfast they prefer sweet juices or fruit, in the lunch desserts like gelatin and in the snack hot drinks like coladas or aromatic and afternoon tea. The feeling of well-being that these drinks give is associated with the sensation of dry mouth, the presence of mucositis and the experience of nausea (24). The preference for fruits was also reported by Marino et al., an explanation that is related to the presence of pyridoxine (vitamin B6) that contributes to the relief of nausea and vomiting (25). On the other hand, citrus foods are related to the stimulation of the release of gastrointestinal and pancreatic secretions that aid in the digestion process, preventing or improving nausea and early satiety (26,27). These findings relate to our research, where patients showed a preference for cold salads with lemon vinaigrette, which may help mitigate nausea.

While the preference for consommés and thick soups is related to chemo-sensory disorders in cancer patients, as reported by Potapov et al., which predisposes them to choose products with unsweetened flavor (28).

As for proteins, the preference in our study was in favor of white proteins, which contrasts with what was reported by Hinkelmann, who pointed out that patients showed a greater rejection towards chicken than towards red meat. It is presumed that the change in eating habits towards a healthier diet could be the reason for choosing white meat (29).

However, other studies reported that animal proteins were more rejected by participants, because low gustatory function correlated with lower preference for protein-rich foods and greater preference for low-energy foods (30–32).

Although there are no studies that have shown a good response from chemotherapy patients to egg consumption, we believe that this acceptance is since eggs are a relatively easy food to digest, which can improve the feeling of nausea or stomach discomfort that patients may experience. In addition, their way of consumption is very versatile and can be adapted to the taste of each patient. Finally, its high nutritional content can help maintain strength and energy during treatment (33).

During snack time, appetite is even more diminished; our study reported food preferences for simple dishes such as a hot drink accompanied by cold salads or protein-based sandwiches such as egg, cheese, or processed foods. Previous studies such as that conducted by Guerdoux et al. showed that food preferences in oncology patients were heterogeneous (34). However, this study did not differentiate between the types of malignancy, whether solid or hematological. On the other hand, Guerdoux -Ninot reported preferences for simple dishes such as cold salads and protein-based sandwiches, while many experienced aversions to red meat and dairy products due to treatment-related side effects (35).

Since, to our knowledge, no differentiation in food preferences has been established based on the type of solid or hematologic malignancy in adults, our study aimed to answer this question. However, we found no significant differences in food preferences between patients with solid tumors and those with

hematologic tumors.

Insufficient oral intake has been shown to increase the risk of quality of life, energy intake, and therefore, body composition in cancer patients, especially those receiving chemotherapy. Therefore, a diet tailored to their food preferences, considering nutritional quality along with organoleptic characteristics, has a significant impact on stabilizing or improving appetite and food intake.

To our knowledge, this study is the first of its kind in Ecuador. However, it has certain limitations that should be considered when interpreting the results. First, the observational nature of the study; analysis was conducted by solid or hematologic tumor type, not by cancer type . Finally, preferences were only assessed during hospitalization, with no follow-up throughout chemotherapy treatment.

The main results show that the dietary preferences of chemotherapy patients are based on liquid, cold foods and preferred proteins such as eggs for breakfast and white meat for lunch. Understanding the dietary preferences of cancer patients could have positive results regarding adherence to dietary guidelines and, therefore, may impact adequate nutrition. This study provides a detailed view of the dietary preferences of cancer patients during chemotherapy treatment at the SOLCA Cancer Hospital in Quito.

The findings provide a basis for developing personalized nutritional strategies to improve adherence and nutritional status in cancer patients undergoing chemotherapy treatment. This study highlights the importance of considering individual patient preferences in the nutritional management of cancer patients.

Ethical consideration

The study was conducted according to the guidelines established in the Declaration of Helsinki and was approved by the CEISH-SOLCA Quito Nucleus with approval code CEISHSOLCA1.OBS.18.059. Written informed consent was obtained from all participants. Personal data were anonymized. This manuscript was written in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) declaration (36).

This study allowed for the analysis of the stressors affecting nursing students at the Technical University of Ambato during their hospital internships. Among the stressors, lack of competence stood out as the most predominant. This finding reveals that students face both technical and emotional challenges in hospital environments, which can negatively impact their well-being and performance.

Additionally, stress levels were examined according to gender and academic area, showing higher levels in female students and those in both basic and professional areas. This suggests the need for timely interventions, including strategies that take into account both individual and group aspects, in order to safeguard students' physical and psychological well-being throughout their training.

The results confirmed that the "lack of competence" was the only stressor that showed a statistically significant difference between male and female students ($p = 0.008$), while "overload" was close to reaching significance ($p = 0.050$). In contrast, none of the stressors showed statistically significant differences regarding academic area or age (all $p > 0.05$). This suggests that these variables do not have a determining impact on the stress levels reported by the students.

These findings highlight the importance of addressing lack of competence as a critical factor—particularly among female students, who were shown to be the most affected. Previous studies have also emphasized the role of insufficient technical preparation, emotional demands, and the structural conditions of the hospital environment in the generation of stress. Therefore, it is essential to implement strategies that strengthen both clinical competencies and emotional management from the early stages of professional training, ensuring that students are well-prepared to provide quality care to others. As Jean Watson states in her fourth assumption: "First, we must love and care for our own behaviors and treat ourselves with gentleness and dignity before providing care for others. Caring for ourselves is a prerequisite to caring for others."

Acknowledgments and Research Collaborators

Special thanks to the scientific journal Revista Científica INSPILIP for supporting the continued advancement of scientific knowledge in our country.

Funding

Self-funded.

Conflicts of Interest

None of the authors have any conflicts of interest to declare.

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Conflict of interest

Taipe, Katherine, has no conflict of interest in the submitted work.

Villalba, Claudia, has no conflict of interest in the submitted work.

Charpentie , María José, has no conflict of interest in the submitted work.

Moreno, Pablo, has no conflict of interest in the submitted work.

Ulcuango , Edison, has no conflict of interest in the submitted work.

Tricallotis , Jennifer, has no conflict of interest in the submitted work.

Alexander-León, Harold A., has no conflict of interest in the submitted work.

Yu-Liu, Yunqi, has no conflict of interest in the submitted work.

Leone, Paola E., has no conflict of interest in the submitted work.

García-Aguilera, María Fernanda, has no conflict of interest in the submitted work.

Acknowledgments

We would like to extend our gratitude to the SOLCA Oncology Hospital – Quito for its contribution that has made this research possible.

Financing

Self-financed.

Annexes

1. Data collection instrument

Date: _____
Time: _____
Responsible: _____ Days of hospitalization: _____

A. GENERAL DATA:

*Mandatory

* Medical record number: _____ # Bed: _____

* Oncological Diagnosis: __ _____

* Clinical diagnoses:

- o Obesity
- o Diabetes
- o Kidney failure
- o Liver failure
- o None

* City of residence: _____

* What type of chemotherapy do you receive? ___ _____

* What cycle of chemotherapy are you on? _____ _____

B. ADVERSE EFFECT TO CHEMOTHERAPY :

* Do you experience any side effects during treatment? (You may select more than one option) *

- ☐ None
- ☐ Constipation

- ☐ Diarrhea
- ☐ Vomit
- ☐ Nausea
- ☐ Hyporexia (low appetite)
- ☐ Mucositis (mouth sores)
- ☐ Dysgeusia (taste disturbance)
- ☐ Dysphagia (difficulty swallowing)
- ☐ Others: ___ _____ _____

C. FOOD PREFERENCES

* How many meals do you prefer per day? (Select one)

o 3: Breakfast, Lunch, Snack

o 4: Breakfast, Lunch, Snack, Snack

o 5: Breakfast, Snack 10 am, Lunch, Snack 3 pm and Snack.

o More than 5: Fractional diet.

* Indicate your food preferences by marking an X: (Select up to 2 options) .

MEAL TIME	TYPE OF FOOD	PREPARATIONS	PREFERS	OBSERVATIONS
BREAKFAST:	Hot drink	"Colada" with milk		
		Aromatic water		
		Coffee with milk		
		Coffee in water		
		Others: _____		
	Cold drink	Citrus juice		
		Sweet fruit juice		
		Aromatic		
		Gelatin		
		Natural fruit		
		Others: _____		
	Cereals	White bread		
		Whole wheat bread		
		Prepared: humitas, mashed greens, cake, soufflé, quiche, tortilla, fillings.		
		Others: _____		
	Proteins	Egg		
		Cheese		
		Meat options		
		Others: _____		
LUNCH:		Creams		
		Consommés		
		Others: _____		
	Proteins	White meat		
		Red meat		
		Vegetarian meat		
		Others: _____		
	Second full	Main course		
		Side dish only: Vegetable stew: potatoes, yuca, greens.		
		Two previous options		
		Others: _____		
	Half diet	Fruit plate		
	Salads	Hot: sautéed		
		Cold: with dressings		
		Others: _____		
	Dessert	Mass		
		Frozen		
		Natural fruit		
		Gelatin		
		Others: _____		
	Drink	Citrus juice		
		Sweet fruit juice		
		Aromatic		
		Gelatin		
		Others: _____ _____		
SNACK	Soups	Thick		
		Creams		
		Consommés		
		Others: _____		
	Half diet	Sandwich , bolón, infusion or cookies.		
		Fruit plate		
	Second full	Main course		
		Others: _____		
	Salads	Hot: sautéed		
		Cold: with dressing		
		Others: _____		
	Drink	Hot:		
		Cold:		
		Others: _____		
	Dessert	Mass		
		Frozen		
		Fruit		
		Gelatin		
		Others: _____		

Do you know of any foods that worsen your illness? YES__ NO__

Please indicate which ones and why:

D. SATISFACTION

* Indicate the SCHEDULE per meal time that you DO NOT consider appropriate:

☐ Breakfast 7-9 AM Why?: _____

☐ Snack 10-11 AM Why?: _____

☐ Lunch 12-15 PM Why?: _____

☐ Snack 5-7 PM Why?: _____

* Please indicate how you consider the QUANTITY of food sent per meal time: (Mark with X).

MEAL TIME 2	BIT	APPROPRIATE	A LOT/ TOO MUCH	RECOMMENDATIONS
Breakfast				
Lunch				
Snack				
Collation				

ORGANOLEPTIC CHARACTERISTICS

ASPECTS	EXCELLENT	VERY GOOD	WELL	REGULAR	BAD	VERY BAD	OBSERVATIONS
How do you consider the taste of the food?							
How do you consider the color of food?							
How do you consider the smell of food?							
How do you consider the texture of food?							
Do you think the cooking of the food is correct?							
Is the temperature at which the food is served appropriate?							
How do you consider the presentation of the food on the tray?							
Does the variety of food seem right to you?							

* Mark with an X the satisfaction with your diet using the following criteria.

2. Supplementary material

a. Supplement 1. Therapeutic Diet

At the institution, we manage a diet based on the parameters of a healthy or balanced diet, which is defined as " one that provides an adequate and varied amount of food, providing the qualitatively and quantitatively necessary nutrients for the normal functioning of the body..."

The daily caloric intake should be consistent with an individual's energy expenditure, with neither excess nor deficiency. The required amount of minerals and a minimum of 1,500 ml of water should be consumed daily. According to the FAO expert group (Helsinki, 1988), the recommendations for a healthy diet are expressed in the following distribution:

- Carbohydrates: 55-60%
- Lipids 25-30%
- Proteins 12-15%

The calories will be distributed throughout the day in four meals a day as follows:

- Breakfast provides 20-25% of the VCT
- Lunch 35-40%
- Snack 10%
- Snack 25-30%

Nutritional care of hospitalized patients requires a well-structured diet with the following characteristics.

- Energy quantification 1600 to 2220kcal
- Nutritional balance with a content of 60-80g protein, 80-100g fat, 180-300g carbohydrates, in addition to including all RDA recommendations.
- Variation is recommended to be elective in order to allow the patient the freedom to choose their menu, while still having some control over whether the diet is adequate.
- Good presentation
- Adequate temperature
- Optimal hygiene conditions and organoleptically acceptable.

b. Table S1. Breakfast preferences

Variables	Total (N = 143)	Solid tumors (N = 117, 81.82%)	Hematological tumors (N = 26, 18.18%)	p-value *****
Schedule Satisfaction (%)				
Satisfying	135 (94.41)	112 (95.73)	23 (88.46)	0.13
Not Satisfactory	7 (4.90)	5 (4.27)	2 (7.69)	
Not Specified	1 (0.70)	0	1 (3.85)	
Perception of Quantity (%)				
Appropriate	128 (89.51)	104 (88.89)	24 (92.31)	0.65
Bit	9 (6.29)	7 (5.98)	2 (7.69)	
Too much	6 (4.20)	6 (5.13)	0	
Hot Drinks (%)				
Strained milk	75 (52.45)	60 (51.28)	15 (57.69)	0.18
Aromatic	25 (17.48)	24 (20.51)	1 (3.85)	
Coffee with milk	22 (15.38)	17 (14.53)	5 (19.23)	
Coffee in water	7 (4.90)	6 (5.13)	1 (3.85)	
Wash	7 (4.90)	6 (5.13)	1 (3.85)	
Others	5 (3.50)	3 (2.56)	2 (7.69)	
None	2 (1.40)	1 (0.85)	1 (3.85)	
Cold Drink (%)				
Sweet Juice	57 (39.86)	45 (38.46)	12 (46.15)	0.22
Fruit	51 (35.66)	46 (39.32)	5 (19.23)	
Citrus Juice	18 (12.59)	14 (11.97)	4 (15.38)	
Gelatin	12 (8.39)	8 (6.84)	4 (15.38)	
Aromatic	5 (3.50)	4 (3.42)	1 (3.85)	
Cereals (%)				
Prepared	48 (33.57)	37 (31.62)	11 (42.31)	0.44
Whole wheat bread	48 (33.57)	41 (35.04)	7 (26.92)	
White bread	34 (23.78)	26 (22.22)	8 (30.77)	
Others	7 (4.90)	7 (5.98)	0	
None	6 (4.20)	6 (5.13)	0	
Proteins (%)				
Egg	100 (69.93)	83 (70.94)	17 (65.38)	0.26
Cheese	23 (16.08)	19 (16.24)	4 (15.38)	
Meats	10 (6.99)	7 (5.98)	3 (11.54)	
Others	4 (2.80)	2 (1.71)	2 (7.69)	
None	6 (4.20)	6 (5.13)	0	

Note: Values are rounded to the nearest hundredth, so the sum of the values may not equal exactly 100%.

c. Table S2. Lunch preferences

Table S2. Lunch preferences.

Variables	Total (N = 143)	Solid Tumors (N = 117, 81.82%)	Hematological Tumors (N = 26, 18.18%)	p-value **
Schedule Satisfaction (%)				
Satisfying	137 (95.80)	113 (96.58)	24 (92.31)	0.22
Not Satisfactory	5 (3.50)	4 (3.42)	1 (3.85)	
Not Specified	1 (0.70)	0	1 (3.85)	
Perception of Quantity (%)				
Appropriate	120 (83.92)	99 (84.62)	21 (80.77)	0.48
Too much	20 (13.99)	16 (13.68)	4 (15.38)	
Bit	3 (2.10)	2 (1.71)	1 (3.85)	
Soups (% [n])				
Consommés	55 (38.46)	47 (40.17)	8 (30.77)	0.78
Thick	48 (33.57)	38 (32.48)	10 (38.46)	
Creams	30 (20.98)	23 (19.66)	7 (26.92)	
Others	6 (4.20)	5 (4.27)	1 (3.85)	
None	4 (2.80)	4 (3.42)	0	
Proteins (%)				
White Meat	85 (59.44)	70 (59.83)	15 (57.69)	0.02
None	42 (29.37)	38 (32.48)	4 (15.38)	
Others	9 (6.29)	5 (4.27)	4 (15.38)	
Red meat	6 (4.20)	3 (2.56)	3 (11.54)	
Vegetarian Meat	1 (0.70)	1 (0.85)	0	
Main Course (%)				
Two Options	56 (39.16)	40 (34.19)	16 (61.54)	0.06
Side Dish Only	40 (27.97)	36 (30.77)	4 (15.38)	
None	39 (27.27)	35 (29.91)	4 (15.38)	
Main Course	7 (4.90)	5 (4.27)	2 (7.69)	
Others	1 (0.70)	1 (0.85)	0	
Salad (%)				
Cold	68 (47.55)	54 (46.15)	14 (53.85)	0.64
None	45 (31.47)	39 (33.33)	6 (23.08)	
Hot	23 (16.08)	19 (16.24)	4 (15.38)	
Others	7 (4.90)	5 (4.27)	2 (7.69)	
Dessert (%)				
Gelatin	47 (32.87)	40 (34.19)	7 (26.92)	0.62
Fruit	45 (31.47)	35 (29.91)	10 (38.46)	
Mass	21 (14.69)	17 (14.53)	4 (15.38)	
Frozen	20 (13.99)	17 (14.53)	3 (11.54)	
Others	5 (3.50)	3 (2.56)	2 (7.69)	
None	5 (3.50)	5 (4.27)	0	
Drink (%)				
Sweet Juice	85 (59.44)	71 (60.68)	14 (53.85)	0.63
Citrus Juice	27 (18.88)	20 (17.09)	7 (26.92)	
Gelatin	15 (10.49)	12 (10.26)	3 (11.54)	
Aromatic	12 (8.39)	11 (9.40)	1 (3.85)	
Others	3 (2.10)	2 (1.71)	1 (3.85)	
None	1 (0.70)	1 (0.85)	0	

Note: Values are rounded to the nearest hundredth, so the sum of the values may not equal exactly 100%.

d. Table S3. Snack preferences

Table S3. Snack preferences.

Nutrition Variables	Total (N = 143)	Solid Tumors (N = 117, 81.82%)	Hematological Tumors (N = 26, 18.18%)	p-value **
Schedule Satisfaction (%)				
Satisfying	124 (86.71)	104 (88.89)	20 (76.92)	0.12
Not Satisfactory	19 (13.29)	13 (11.11)	6 (23.08)	
Perception of Quantity (%)				
Appropriate	110 (76.92)	88 (75.21)	22 (84.62)	0.25
Too much	30 (20.98)	27 (23.08)	3 (11.54)	
Bit	3 (2.10)	2 (1.71)	1 (3.85)	
Soup (%)				
Consommés	62 (43.36)	49 (41.88)	13 (50.00)	0.92
Thick	27 (18.88)	22 (18.80)	5 (19.23)	
None	25 (17.48)	22 (18.80)	3 (11.54)	
Creams	21 (14.69)	17 (14.53)	4 (15.38)	
Others	8 (5.59)	7 (5.98)	1 (3.85)	
Average Diet (%)				
Sandwich	67 (46.85)	58 (49.57)	9 (34.62)	0.08
None	54 (37.76)	39 (33.33)	15 (57.69)	
Fruit Plate	22 (15.38)	20 (17.09)	2 (7.69)	
Main Course (%)				
None	81 (56.64)	70 (59.83)	11 (42.31)	0.27
Main Course	51 (35.66)	39 (33.33)	12 (46.15)	
Fruit Plate	10 (6.99)	7 (5.98)	3 (11.54)	
Soup and Aromatic	1 (0.70)	1 (0.85)	0	
Salad (%)				
None	88 (61.54)	76 (64.96)	12 (46.15)	<0.01
Cold	35 (24.48)	26 (22.22)	9 (34.62)	
Hot	17 (11.89)	15 (12.82)	2 (7.69)	
Others	3 (2.10)	0	3 (11.54)	
Dessert (%)				
Gelatin	44 (30.77)	40 (34.19)	4 (15.38)	0.14
Fruit	37 (25.87)	30 (25.64)	7 (26.92)	
None	27 (18.88)	23 (19.66)	4 (15.38)	
Mass	19 (13.29)	13 (11.11)	6 (23.08)	
Frozen	14 (9.79)	10 (8.55)	4 (15.38)	
Others	2 (1.40)	1 (0.85)	1 (3.85)	
Drink (%)				
Hot	104 (72.73)	89 (76.07)	15 (57.69)	<0.01
Cold	31 (21.68)	21 (17.95)	10 (38.46)	
None	7 (4.90)	7 (5.98)	0	
Others	1 (0.70)	0	1 (3.85)	

Note: Values are rounded to the nearest hundredth, so the sum of the values may not equal exactly 100%.

e. Table S4. Collation preferences

Table S4. Collation preferences.

Nutrition Variables	Total (N = 143)	Solid Tumors (N = 117, 81.82%)	Hematological Tumors (N = 26, 18.18%)	p-value**
Schedule Satisfaction (% n)				
Satisfying	142 (99.30)	116 (99.15)	26 (100.00)	1.00
Not Satisfactory	1 (0.70)	1 (0.85)	0	
Perception of Quantity (% n)				
Appropriate	133 (93.01)	109 (93.16)	24 (92.31)	0.41
Bit	6 (4.20)	4 (3.42)	2 (7.69)	
Too much	4 (2.80)	4 (3.42)	0	

Note: Values are rounded to the nearest hundredth, so the sum of the values may not equal exactly 100%.