

Special Article - Childhood Obesity

Functional Dietary Nutrition Applied to Oncopediatrics in a Philanthropic Hospital

Marinho JD¹, Menezes KKP¹, Rodrigues MLMP² and Serquiz AC^{3*}

¹Potiguar University, Brazil

²Federal University of São Paulo, Brazil

³Federal University of Rio Grande Do Norte, Brazil

*Corresponding author: Serquiz AC, PhD in Health Sciences at UFRN, Professor of Nutrition Course Federal University of Rio Grande Do Norte, Brazil

Received: November 21, 2017; Accepted: December 26, 2017; Published: January 31, 2018

Abstract

The chemotherapeutic or radiotherapeutic treatment to which children are subjected can often lead to clinical manifestations such as: oral mucositis, diarrhea or constipation, as well as vomiting and nausea. In this scenario, food intake is affected, undermining nutritional status, quality of life, and patient survival. The study herein aims to provide functional income preparations for pediatric oncology patients at a philanthropic hospital, assessing acceptability for addition to the local menu. The research was performed with 26 patients of both genders undergoing chemotherapy and/or radiotherapy treatments. The test was carried out by offering five distinct preparations, one each day, in association with the acceptability test using a mixed hedonic scale. The data collection was performed using the *IBM SPSS Statistics 21* software. After this analysis, it was verified that the reduction in the food consumption of the cancer patient is multifactorial, being related to the disease itself, and that the sensorial aspect is often essential for the consumption of foods which bring satisfactory responses through indispensable substances to the organism. In this sense, an adequate diet with the necessary nutrients for good nutritional status will be fundamental for the clinical prognosis of these patients.

Keywords: Food acceptance; Oncopediatrics; Functional foods; Nutraceuticals

Introduction

There is vast evidence that feeding plays an important role in the stages of initiation, promotion and spread of cancer, among other risk factors.

Among the cancer deaths attributed to environmental factors, diet contributes with about 35%, followed by tobacco (30%) and others, such as working conditions and type of work, alcohol, pollution, and food additives, which contribute with less than 5%. It is believed that an adequate diet could prevent three to four million new cases of cancers each year [1].

Childhood cancer is one of the diseases which has most affected children in the world. There has been an increase in incidence rates, mainly neoplasias, such as: Acute Lymphocytic Leukemia (ALL), central nervous system tumors, Non-Hodgkin's Lymphoma (NHL), Wilms Tumor, among others [2].

The chemotherapeutic or radiotherapeutic treatment to which children are subjected can often lead to clinical manifestations such as: oral mucositis, diarrhea or constipation, as well as vomiting and nausea. These most frequent manifestations in the pediatric patient can vary widely, considering the age group, the stress condition to which they have been subject to, and especially the nutritional condition history [2].

As a consequence, loss of body tissues and weight is a frequent condition in cancer patients. This may lead to anorexia, evolving to involuntary weight loss, decreased functional capacity, progressive depletion of lean mass and adipose tissue characterizing cachexia, a condition of severe protein-energy malnutrition [2].

Under the light of these circumstances, adequate nutritional therapy improves the clinical response, the prognosis and, consequently, the patient's quality of life.

Most cancer patients are at great risk of developing a worsening of clinical condition at any time during anti-neoplastic treatment, especially because of increased immune system susceptibility and organic weakness associated with drug toxicities and other therapeutic complications.

During this period, there is a need for an intensive supportive treatment, which includes, among others, nutritional support [3].

These nutritional therapies have as objectives: to offer favorable conditions for the establishment of the therapeutic plan; provide energy, fluids, and nutrients in adequate amounts to maintain vital functions and homeostasis; recover immune system activity; reduce the risk of hyperalimentation; guarantee the adequate protein and energy supply to minimize protein catabolism and nitrogen loss [3].

For the nutritional condition observed in the children foods which present functions of providing energy and essential nutrients, in addition to beneficial physiological effects which may prevent or delay diseases such as cancer are analyzed. The foods containing these properties are called functional foods and can be used as chemopreventive compounds [4].

This paper aims to offer functional based preparations to pediatric oncology patients of a philanthropic hospital, aiming to evaluate their acceptability so as to be added to the local menu.

In this context, chemoprevention through functional foods

Table 1: Distribution of participants' responses according to the acceptance of the preparations.

		N	%
Vegetable cake	Hated it	1	7.14%
	Disliked it	0	0.00%
	Indifferent	0	0.00%
	Liked it	5	35.71%
	Liked it a lot	8	57.14%
	Total	14	100.00%
Chicken croquette	Hated it	0	0.00%
	Disliked it	0	0.00%
	Indifferent	0	0.00%
	Liked it	0	0.00%
	Liked it a lot	12	100.00%
Total	12	100.00%	
Mini pizza	Hated it	0	0.00%
	Disliked it	2	12.50%
	Indifferent	1	6.25%
	Liked it	2	12.50%
	Liked it a lot	11	68.75%
Total	16	100.00%	
Mini hamburger	Hated it	0	0.00%
	Disliked it	0	0.00%
	Indifferent	2	18.18%
	Liked it	3	27.27%
	Liked it a lot	6	54.55%
Total	11	100.00%	
Vegetable Popsicle	Hated it	0	0.00%
	Disliked it	0	0.00%
	Indifferent	2	16.67%
	Liked it	6	50.00%
	Liked it a lot	4	33.33%
Total	12	100.00%	

emerges as an important tool in the prevention and control of cancer, suggesting anticarcinogenic, antioxidant, anti-inflammatory, anti-hormonal, and antiangiogenic mechanisms of action, among others, thus contributing to the improvement of the nutritional status of the pediatric oncology patient.

Methodology

The present study is of a quantitative, descriptive, transversal and exploratory character. The research was conducted at a philanthropic hospital in Natal/RN and the individuals composing the research sample are pediatric patients undergoing oncological treatment and subject to chemotherapy and/or radiotherapy.

The sample was selected for convenience with 26 individuals, male and female, and participation was voluntary, after the investigation and signing of the Free and Informed Consent Form for Children (FICF). The responsible adults were clarified about the study and the

Table 2: Distribution of participants' responses according to the organoleptic characteristics they liked best in the preparations.

		N	%
Vegetable cake	Did not indicate	1	3.33%
	Presentation	8	26.67%
	Flavor	9	30.00%
	Texture	6	20.00%
	Odour	2	6.67%
	Color	4	13.33%
	Total	30	100.00%
Chicken croquette	Did not indicate	0	0.00%
	Presentation	11	29.73%
	Flavor	11	29.73%
	Texture	6	16.22%
	Odour	5	13.51%
	Color	4	10.81%
Total	37	100.00%	
Mini pizza	Did not indicate	2	4.88%
	Presentation	12	29.27%
	Flavor	12	29.27%
	Texture	7	17.07%
	Odour	4	9.76%
	Color	4	9.76%
Total	41	100.00%	
Mini hamburger	Did not indicate	0	0.00%
	Presentation	9	33.33%
	Flavor	9	33.33%
	Texture	5	18.52%
	Odour	4	14.81%
	Color	0	0.00%
Total	23	100.00%	

methodology applied.

Inclusion and exclusion criteria

Among the eligibility criteria are being: a patient at the respective institution; an oncopediometric patient with a proven diagnosis of malignant neoplasia; hospitalized; in chemotherapy and/or radiotherapy treatment; and available to be involved in the research. The exclusion criteria would be: having no diagnosis of neoplasia; not being treated at the hospital; not to show availability and interest in the research; and to present impossibilities to participate in some stage of the research during the research period.

Selection of functional revenues

The preparations offered to the patients were selected by the staff responsible for the Nutrition and Dietetics Service of the hospital. Therefore, five preparations were elaborated, namely: mini hamburger, mini yam pizza, vegetable Popsicle, yam chicken croquette, and vegetable cake, included in the recipes with functional ingredients. Only one preparation was offered to the pediatric

oncology patients under treatment each day. Thus, all of them could taste the five preparations through the hospitalization period. The meals were elaborated by the Nutrition and Dietetics Service of the hospital themselves.

Obtaining the data

To obtain the data, the medical records of the pediatric patients admitted to the hospital ward were used. Considering the patient's responses, collected through the hedonic scale applied after each recipe offered, the data tabulation was performed using the sum of the answers: I hated it, I did not like it, indifferent, I liked it, and I liked it a lot, as well as some questions about the preparation offered, such as: what they liked most about the preparation, and what they liked least about the preparation. These responses were related to the organoleptic sensorial characteristics, among them: flavor, odor, texture, and color, also emphasizing the presentation. After this tabulation, the analysis was submitted to statistical treatment for the elaboration of the representative tables.

Sensitization

During the sensitization stage, parents and caregivers were sensitized about the importance of adequate food for health promotion. It occurred in the form of direct (verbal) enlightenment performed by the researchers prior to offering the preparations.

Recipe preparation

The elaboration of the functional recipes was carried out with a practical and dynamic approach in the kitchen of the hospital. The aim is to teach and clarify the parents and caregivers on how to prepare the chosen recipes. All the preparations elaborated by the researchers followed the recommendations of the Technical Regulation of Good Practices for Food Services, approved by Resolution - RDC n° 216, from September 15, 2004, in order to guarantee hygienic-sanitary conditions of the prepared foods.

In the elaborated recipes the practicality, ingredients available in the nutrition sector, and food preferences of pediatric oncology patients were observed. Such preparations were previously tested by the researchers at the Potiguar University technical and dietary laboratory to ensure the quality, presentation, and palatability of the preparations. The preparations were sent to the patient after obtaining the data and the sensitization process.

Acceptance test

The mixed hedonic scale was used in order to make the research results more reliable, aiming to follow the adherence to the preparation by the patients through the acceptability test. This was recorded after recipes were tried. The figures responses sum as well as the discursive questions were tabulated and analyzed through the IBM SPSS Statistics 21 software.

Ethical aspects

Those responsible for the subjects were previously informed about the research objectives and signed the Free and Informed Consent Form (FICF), in accordance with resolution 196/96, authorizing its accomplishment. The data were collected after approval by the Research Ethics Committee of the *LIGA Norte Rio-grandense Contra o Câncer*.

Table 3: Distribution of participants' responses according to the organoleptic characteristics they disliked in the preparations.

		N	%
Vegetable cake	Did not indicate	12	85.71%
	Presentation	1	7.14%
	Flavor	1	7.14%
	Texture	0	0.00%
	Odour	0	0.00%
	Color	0	0.00%
	Total	14	100.00%
Chicken croquette	Did not indicate	12	100.00%
	Presentation	0	0.00%
	Flavor	0	0.00%
	Texture	0	0.00%
	Odour	0	0.00%
	Color	0	0.00%
	Total	12	100.00%
Mini pizza	Did not indicate	12	60.00%
	Presentation	2	10.00%
	Flavor	3	15.00%
	Texture	1	5.00%
	Odour	1	5.00%
	Color	1	5.00%
	Total	20	100.00%
Mini hamburguer	Did not indicate	8	72.73%
	Presentation	0	0.00%
	Flavor	2	18.18%
	Texture	1	9.09%
	Total	12	100.00%

Results and Discussion

In the acceptance test, the participation was as follows: 14 participants being 10 female and 4 male tasted the vegetable cake; 12 children were analyzed for the chicken croquette, being 8 female and 4 male; 16 volunteers tasted the mini pizza, being 11 female and 5 male subjects; the mini-hamburger was tried by 11 subjects, being 7 female and 4 male; the vegetable Popsicle was tried by 12 participants, being 7 female and 5 male subjects.

During the course of the research, the variables suffered alterations due to instability of the periods of hospitalization, displacement of patients for clinical and surgical procedures or other complications to the treatment, further to the commemorative dates. In this way, some preparations were adapted and some of them were offered at a later date.

For the criterion of acceptability from the hedonic scale (Table 1) it was observed that all the preparations showed good acceptance between "liked" and "liked very much". Many of the available preparations are sources of protein. Chalamaiah, et al. [5] report that hydrolysates or peptides of proteins derived from foods with

immunomodulatory and anticancer activities were observed from a variety of sources of dietary proteins, such as milk, eggs, fish, rice, soy, peas, spirulina, oyster and mussel. Furthermore, milk has high levels of conjugated linoleic acid, which may help prevent cancer [6]. Milk and eggs are among the ingredients of the preparations.

Glover-Amengor [7] in his study, fortified a lunch preparation with dry leaves of the moringa oleifera at a school where children were vulnerable to malnutrition in the district of Ada-East. The leaf was a source of copper, manganese, iron, zinc and β -carotene, the latter being rich in antioxidant properties, important at cellular level. An acceptability test was also applied on a 5-point scale, ranging from "I loved it" to "I really disliked it", and the result that it was very well accepted. Akther, et al. [8] highlighted that Korea has a long tradition of daily adding fermentation to foods, since these have a differentiated nutritional value. This habit was used to add fermented samples of jeotgal (common fermented food with salty taste made with squid) with a small amount of soy milk, presenting excellent anticancer activity, as well as nutritional enrichment. As for palatability, no undesirable bitterness or astringency was noted in the preparation. Therefore, the method of enriching foods in order to bring functional benefits is used in different countries, both locally and nationally. This enrichment is seen primarily in situations of more vulnerable life cycle, and the oncopediatric group of the study fits this condition.

Pediatric patients who receive chemotherapy and/or radiation therapy against cancer have developed aversion to family foods in their usual diet, especially when these foods are consumed before the treatment. These aversions are observed due to the association that the children make when consuming food and then presenting symptoms such as nausea and vomiting. In addition, the prisological aspects regarding the hospital environment and negative attitudes can also be envisaged [9,0]. In the study by Skolin, et al. [10] it was possible to notice a dual viewpoint, in which the children and parents reported that the predominant cause of food rejection was altered taste. This conclusion was made through the taste test, which presented higher threshold for the bitter taste, producing flavor error when compared to the control group. When Bernstein, et al. [9] offered an innovative flavored ice cream, noted that there was no increase in rejections and suggested that the ice cream may have blocked the development of aversions to the diet. Also, when up to two items were consumed a few hours before treatment it helped to reduce aversion when compared to consumption of three to five items. This change in taste may be justified by the fact that the body associates the internal effects of unbalanced toxins and nutrients with the taste of the foods consumed, and the change in taste is an attempt at adjustment. However, this mechanism may occur at inappropriate times, as in the case of patients being treated for cancer.

Therefore, some simple interventions can be effective to improve this acceptability, some of them giving priority to presentations in a playful way, using different colors, offering innovative flavor and taking advantage of multiple combinations. It is known that these techniques facilitate the adherence and food consumption of healthy children [11]. Thus, children on cancer treatment may also benefit from these nutritional methods. The flavor and presentation of the preparations (Table 2) were the organoleptic characteristics best identified by the studied children. These sensory criteria are

combined in view of their potential for acceptability and reduction of aversion levels as to the diet offered at the hospital level. Odor and color are among the features liked by few children. This fact may be associated with treatment, since alterations in smell are due to changes at the cellular level. Surgeries, nausea and vomiting can also be negative factors. The coloration may be associated with the fact that the innovative preparations would be modified as to the color which they are normally accustomed to being in contact with, arising the non-recognition of the preparation.

The majority of the children did not indicate the food they least liked, subtending that most accepted well the offered preparations. Flavor was the main characteristic which was not well accepted (Table 3). This fact is justified by the taste change in the taste buds level, derived from a side effect of the cancer treatment. Some foods may have different taste, not have much flavor or simply the taste can be similar for different foods. These individuals may taste flavors than they did before treatment, and may even recognize metallic or chemical taste in the mouth [12]. Bernstein [13] in his study with children exhibiting neoplastic diseases offered an unusual ice cream prior to their drug treatments and noted that patients with gastrointestinal toxicity due to drugs were less likely to choose this ice cream than the control groups. This suggests that symptom-induced aversions derived from drug use may contribute to the loss of appetite experienced by cancer patients.

Conclusion

The reduction in food consumption by the cancer patient is multifactorial, being related to the own disease, its treatment and anorexia. The meals consumed in hospitals are usually evaluated in a negative way and the therapeutic meal is often prioritized, disregarding the sensorial aspect, often indispensable for the consumption of foods bringing satisfactory answers. Among the functional preparations made for children undergoing cancer treatment, good acceptability and adherence were observed.

References

1. Garófalo A, Avesani CM, Camargo KG, Barros ME, Silva SRJ, Taddei JAAC, et al. Dieta e câncer: um enfoque epidemiológico. *Revista de Nutrição*. 2004; 17: 491-505.
2. Instituto Nacional de Câncer. Consenso nacional de nutrição oncológica. Rio de Janeiro: INCA, 2008.
3. Garófalo A. Diretrizes para terapia nutricional em crianças com câncer em situação crítica. *Revista de Nutrição*. 2005; 18: 513-527.
4. Padilha PC, Pinheiro RL. O Papel dos Alimentos Funcionais na Prevenção e Controle do Câncer de Mama. *Revista Brasileira de Cancerologia*. 2004; 50: 251-260.
5. Chalamaiyah M, Yu W, Wu J. Immunomodulatory and anticancer protein hydrolysates (peptides) from food proteins: A review. *Food Chemistry*. 2018; 245:205-222.
6. Maynard LJ, Franklin ST. Functional Foods as a Value-Added Strategy: The Commercial Potential of "Cancer-Fighting" Dairy Products. *Applied Economic Perspectives and Policy*. 2003; 25:316-331.
7. Glover-Amengor M, Aryeetey R, Afari E, Nyarko A. Micronutrient composition and acceptability of Moringa oleifera leaf-fortified dishes by children in Ada-East district, Ghana. *Food Science & Nutrition* 2017; 5: 317-323.
8. Akther F, Cheng J, Yang SH, Chung G. Differential anticancer effect of fermented squid jeotgal due to varying concentrations of soymilk additive. *J Appl Biol Chem*. 2017; 60: 133-136.

9. Bernstein IL, Webster MM, Bernstein ID. Food Aversions in Children Receiving Chemotherapy for Cancer. *Cancer*. 1982; 50:2961-2963.
10. Skolin I, Wahlin YB, Broman DA, Hursti UKK, Larsson MV, Hernell O. Altered food intake and taste perception in children with cancer after start of chemotherapy: perspectives of children, parents and nurses. *Supportive Care in Cancer*. 2006; 14: 369-378.
11. Maier-Nöth A, Schaal B, Leathwood P, Issanchou S. The Lasting Influences of Early Food-Related Variety Experience: A Longitudinal Study of Vegetable Acceptance from 5 Months to 6 Years in Two Populations. *PLoS ONE*. 2016; 11: 1-17.
12. Cohenab J, Laingb DG, Wilkes FJ, Chan A, Gabriel M, Cohn RJ. Taste and smell dysfunction in childhood cancer survivors. *Appetite*. 2014; 75: 135-140.
13. IL Bernstein. Learned taste aversions in children receiving chemotherapy. *Science*. 1978; 200: 1302-1303.