Original article

Nutritional status of children and adolescents at diagnosis of hematological and solid malignancies

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ABSTRACT

Objective: To assess the nutritional status of child and adolescent patients with cancer at diagnosis.

Methods: A total of 1154 patients were included and divided into two groups: solid and hematological malignancies. The parameters used for nutritional assessment were weight, height, triceps skinfold thickness, mid-upper arm circumference, arm muscle circumference, body mass index and percentage weight loss.

Results: At diagnosis, below adequate body mass index was observed by anthropometric analysis in 10.85% of the patients – 12.2% in the solid tumor group and 9.52% in the hematologic group. The average weight loss adjusted for a period of 7 days was −2.82% in the hematologic group and −2.9% in the solid tumor group.

Conclusions: The prevalence of malnutrition is higher among patients with malignancies than in the general population, even though no difference was observed between the two groups.

Introduction

Pediatric malignancies account for between 1% and 3% of cancer diagnosed worldwide.[1] However, in developing countries, where the proportion of children and adolescents is about 50% of the population, these tumors correspond to from 3% to 10% of all malignant neoplasms;[2] in developed countries this rate is about 1%. According to the Population-Based Cancer Registers (RCBP), the incidence of pediatric tumors in Brazil is between developing and developed countries, accounting for 3% of all malignancies. As nearly 30% of the population is 19 years old or less, it is estimated that approximately 11,530 new cases of cancer occurred in the pediatric and adolescent populations in 2012.[3]

The prevalence of malnutrition among these patients varies from 10% to 50% depending on the assessment method

used, time of evaluation (at diagnosis, during chemotherapy, etc.), tumor stage and histology type, and patient socioeconomic status.[4–12]

Considering the importance of knowing the nutritional status of pediatric patients with malignant neoplasms, this study was performed with the following objectives:

- To evaluate the nutritional state of under 20-year-old cancer patients at diagnosis;
- To compare the nutritional status of patients with solid tumors (ST) to those with hematological malignancies (HM);
- To correlate the diagnosis with the nutritional status of the patient, the caregiver's level of education, family income and place of origin.

Methods

This transversal observational study evaluated the nutritional status of 1154 consecutive children and teenagers with malignant neoplasms treated in the outpatient clinic or admitted as inpatients on the wards or in the intensive care units of the Pediatric Oncology Institute of the Pediatrics Department, Universidade Federal de São Paulo (UNIFESP), from March 2006 to March 2012. This study was approved by the Research Ethics Committee of UNIFESP.

Patients aged 0–19 years with diagnosis of malignant neoplasms or benign tumors of the central nervous system with malignant behavior (i.e. craniopharyngioma, astrocytoma, etc.) were enrolled in this study. Patients with history of treatment of the neoplasm, receiving corticosteroids, those with chronic pre-existent diseases or with physical limitations that would hinder adequate measurement of study variables (in particular height and weight) were excluded.

The patients were divided into two groups according to diagnosis: HM group, comprising lymphoma and leukemia, and the ST group, which included all other tumors.

The Anthro software of the World Health Organization (version 3.0.1; Department of Nutrition, WHO) was used to calculate the nutritional status according to the body mass index (BMI) of up to 5-year-old patients and the WHO AnthroPlus software (version 1.0.2) for patients aged more than 5 years. Nutritional status was classified according to the WHO criteria[13,14] and then categorized into three groups:

- Below adequate – patients with a z-score more than two standard deviations (SD) below the mean BMI for age;

- Adequate – patients with a z-score between two SD below and one SD above the mean BMI for age;
- Above adequate – patients with a z-score more than one SD above the mean BMI for age.

The parameters used for nutritional assessment were weight, height, triceps skinfold thickness (TSFT), mid-upper arm circumference (MUAC) and arm muscle circumference (AMC), BMI and percentage weight loss. TSFT, MUAC and AMC were classified according to the classification of Frisancho[15] as follows:

- Below adequate: ≤5th percentile;
- Adequate: between 5th and 95th percentiles;
- Above adequate: ≥95th percentile.

Weight loss was qualitatively evaluated by questioning the patient or caregiver about whether they had noticed weight loss and quantitatively assessed by the absolute difference between the usual weight of the patient (as reported by the patient/caregiver) and the weight on admission. The relative weight loss was obtained by dividing the weight lost by the usual weight and classified according to the time of occurrence (as reported by the caregiver) using the Blackburn et al. formula,[16] adjusted for a 7-day period.

Statistical analysis

The Chi-square test was used to assess the association between oncologic diagnosis and prevalence of nutritional deficit as identified by the TSFT, MUAC, and AMC exams.

The nonparametric Kruskal–Wallis test was used to assess the association between diagnosis and weight loss and between diagnosis and nutritional deficit as measured by the BMI. The significance threshold (α) was set at 5% (p-value < 0.05).

Results

A total of 1317 patients were admitted to the intensive care units and inpatient facilities or treated in the outpatient clinic during the study period. Of those, 163 were excluded from analysis due to difficulties in weighing or the imprecision of the result. Thus, 1154 patients were included in the study of which 53.09% were male and the mean age was 10.24 years. The distribution of tumor types (HM and ST), age, family income and education level of the caregiver is shown in Table 1.

Table 1 – Demographic data of patients with cancer at the time of diagnosis ($n = 1154$).			
	Hematological tumors	Solid tumors	Total
n (%)	373 (32.49)	781 (67.51)	1154 (100.00)
Age – median (mean ± standard deviation)	8.90 (10.33 ± 9.51)	7.85 (9.84 ± 10.85)	8.10 (10.08 ± 10.05)
Gender – male (%)	54	52	53
Mean family income (R$)	129.00	147.00	202.50
Illiteracy rate of caregiver – n (%)	13 (3.48)	29 (3.71)	42 (3.63)
Student's t-test: the groups did not differ in relation to gender, age, education of caregiver and mean family income. 1 US$ is about R$ 2.23.			