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INTRODUCTION

Child and adolescent cancer (ages 0-19) is considered rare when compared to neoplasms affecting adults, accounting for between 2% and 3% of all malignancies. Despite the improvement in treatment results in the last decades with an increase in survival rates of more than 80%, childhood and juvenile cancer remains an important cause of death in developed countries. In middle- and lower-income countries, treatment has not yet been so successful, and results have yet to be improved. Malnutrition has been reported as a common problem in pediatric cancer patients. It has been proposed that nutritional status may be a risk factor for increased mortality rate, and may reduce the effectiveness of neoplastic treatment by reducing tolerance to treatment as well as decreasing absorption of chemotherapeutic agents.

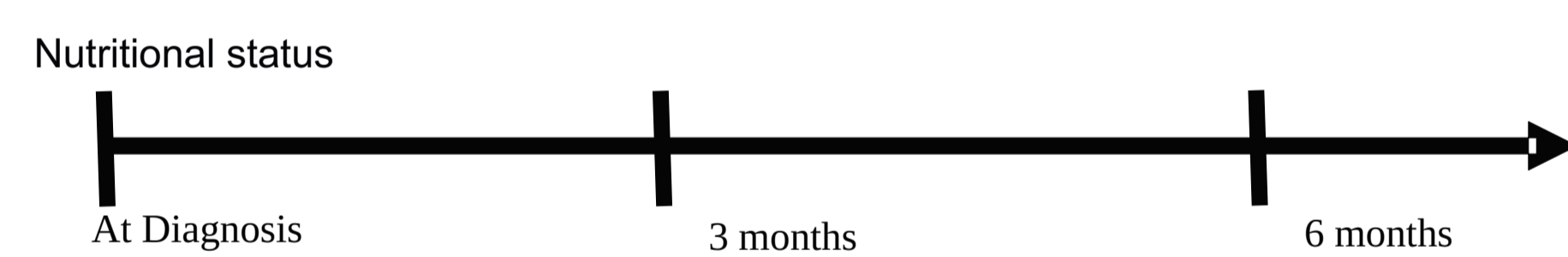
OBJECTIVE

To determine the prevalence and severity of malnutrition in the diagnosis of pediatric cancer and during treatment.

Correlate nutritional status with demographic and clinical characteristics, tumor-related, treatment toxicity and outcome.

METHOD

- Design of Study:** Prospective study of pediatric patients diagnosed with solid tumors enrolled for cancer treatment at the Instituto Nacional de Cancer from June 1, 2017 to May 31, 2018. Nutritional assessments at diagnosis, at 3 and 6 months after initiating the treatment.
- Population:** Children and adolescents up to 18 years and 11 months of age, enrolled in the Pediatric Oncology Department of INCA, with confirmed diagnosis of a solid tumor, having been duly informed of intended proceedings and having signed the consent form and, in children over 11 years of age having signed the assentment form. Patients with previous oncological, chemotherapeutic or radiotherapeutic treatment are excluded from the study.
- Data collection:** Data will be collected during consultations at the pediatric oncology outpatient clinic or in the ward, if the patient is hospitalized. The nutritional status will be evaluated at diagnosis, 3 and 6 months after starting treatment. Measurements of weight, height, arm circumference and triceps skinfold measurement will be collected.



WEIGHT AND HEIGHT

The weight and height values will be calculated (Weight (kg) x Height m2) by means of the WHO Antro and Antroplus software, with the Antro for children up to 5 years of age and Antroplus for children and adolescents up to 19 years of age. The values obtained will be expressed in z-score and classification of nutritional status as recommended by WHO 2006/2007.

- Severe acute malnutrition is defined as very low weight / height (<-3-Z score) or visible severe weight loss (mean arm circumference \leq 11.5 cm), or by the presence of edema in children between 6 months and 5 years.

- Low weight is defined as weight / age <-2 score-Z.

- Chronic malnutrition or stunting is defined by height / age (or length / age) <-2-Z score of the NCHS / WHO reference average.

BODY MASS INDEX

Body mass index (BMI) score Z values are measures of relative mass adjusted for child age and sex. The classification of BMI for age is:

- < Z score -3 severe thinness
- \geq Z score -3 and < Z score -2 thinness
- \geq Z score -2 and < Z score +1 Eutrofic
- \geq Z score +1 and < Z score +2 overweight
- \geq Z score +2 and < Z score +3 Obesity
- > Z score +3 Severe Obesity.

MID-UPPER ARM CIRCUMFERENCE (MUAC)

The mid-upper arm circumference (MUAC) can be used as an independent anthropometric evaluation tool in the determination of malnutrition in children, when compared to the standards developed by the WHO (references in Frisancho percentiles). AC is important for patients whose weight may be affected by lower limb edema, ascites, or corticosteroid use. AC has been indicated as a more sensitive prognostic indicator for mortality than weight / height parameters in malnourished pediatric patients.

To obtain MUAC a flexible, inelastic measuring tape was used, and the measure was taken in the patient's non-dominant arm, just at the mid-point between the acromion and the olecranon, in sitting or standing posture. The value obtained was expressed in centimetres.

TRICIPITAL SKINFOLD

Tricipital skinfold vertically measured at the posterior medial point of the arm, between the acromial neck of the scapula and the lower border of the ulnar olecranon process.

- Variables:

Anthropometric variables: weight, height, body mass index (BMI), arm circumference (AC), triceps skin fold (TSF). Sociodemographic: age in years and months; sex; age of the mother, Mother's educational background, monthly family income. Tumor related, Clinical and Disease treatment: histological type of tumor, stage, type of treatment, treatment toxicity, number of hospitalizations, causes of hospitalization, delay in the chemotherapy cycle.

PRELIMINARY AND EXPECTED RESULTS

- Preliminaries

Study approved by the Ethics and Research Committee - INCA on October 10, 2016.

Data was collected from 17 patients upon confirmed diagnosis of cancer, from June 2017 to August 2017, as listed below, classification of types of cancer according to ICC3-3 (Table 1), regarding physical characteristics (Table 2), and classification of malnutrition according to the WHO Classification using the Z score (Table 3) and Nutritional Status of patients with cancer according to WHO score-Z (Table 4).

Table 1: Cancer diagnosis according to ICC3-3*

Cancer	N
III. CNS and miscellaneous intracranial and intraspinal neoplasms	6
a.1 Ependymoma	1
b. Astrocytoma	3
d.2 Glioma	2
IV. Neuroblastoma and other peripheral nervous cell tumors	2
a. Neuroblastoma	2
VI. Renal tumors	1
a.1 Nephroblastoma	1
VII. Hepatic tumors	1
a. Hepatoblastoma	1
V. Retinoblastoma	1
V. Retinoblastoma	1
VIII. Malignant bone tumors	1
a. Osteosarcoma	1
X. Germ cell tumors, trophoblastic tumors, and neoplasms of gonads	2
a.1 Germ cells tumors of CNS	1
c.2 Germ cells tumors	1
IX. Soft tissue and other extrasosseous sarcomas	1
a. Rabdomiossarcoma	1
XI. Other malignant epithelial neoplasms and malignant melanomas	1
b. Thyroids carcinomas	1
XII. Other and unspecified malignant neoplasms	1
a.6 Appendiceal neuroendocrine tumors	1

*International Classification of Childhood Cancer, third edition

Table 2: Patients' physical characteristics upon confirmed diagnosis of cancer

Physical Characteristics	N		
	17 Total	9 Male	8 Female
Age (years)	7,2 +- 5,1	6,6 +- 5,0	7,9 +- 5,3
Weight (kg)	26,3 +- 17,8	26,5 +- 20,2	26,1 +- 16,1
Height (cm)	117,1 +- 33,4	113,4 +- 36,2	121,3 +- 31,8
BMI (kg/m2)	17,1 +- 3,4	17,8 +- 3,3	16,3 +- 3,5
Body Surface	0,9 +- 0,5	0,8 +- 0,5	0,9 +- 0,4
SCORE Z (W/A)	-0,1 +- 1,6	0,0 +- 1,6	-0,3 +- 1,7
SCORE Z (H/A)	-0,2 +- 1,4	-0,4 +- 1,5	0,0 +- 1,4
SCORE Z (BMI/A)	0,0 +- 1,8	0,5 +- 1,5	-0,5 +- 2,0
SCORE Z (W/H)	-0,2 +- 0,5	-0,2 +- 0,6	-0,2 +- 0,4
AC	17,9 +- 4,5	18,2 +- 4,9	17,7 +- 4,3
Triceps skinfold (mm)	8,4 +- 4,2	7,1 +- 2,5	9,9 +- 5,4

Table 3: Description of patients with malnutrition at diagnosis, according to WHO score-Z weight-for-age, Z-score height for age and Z-score BMI for age.

Patients	EDP	Z-SCORE (W/A)	Z-SCORE (H/A)	Z-SCORE (BMI/A)	Classification
1		-2,48	-	-4,10	Severe thinness
2		-2,12	-2,64	-	Chronic malnutrition
3		2,70	-	3,59	Severe Obesity
4		3,08	-	2,94	Obesity
5		-3,08	-3,33	-	Chronic malnutrition
N (total)	17	5/17 (29,4%)	3/17 (17,6%)	3/17 (17,6%)	

Low weight-weight / age <-3 Z score. Chronic malnutrition or stunting: height / age (or length / age) <-2 Z score. BMI for age: < Z score -3 severe thinness / \geq Z score -3 and < Z score -2 thinness / \geq Z score -2 and < Z score +1 Eutrofic / \geq Z score +1 and < Z score +2 overweight / \geq Z score +2 and \leq Z score +3 Obesity / > Z score +3 Severe Obesity

Table 4: Nutritional Status of patients with cancer according to WHO score-Z

Z Score	Height			
	Severe thinness	Thinness	Eutrofic	Obesity
Z Score (W/A)*	1 (N=13)	2 (N=13)	7 (N=13)	2 (N=13)
Z Score (H/A)**				14 (N=17)
Z Score (BMI/A)***	1 (N=17)	2 (N=17)	9 (N=17)	4 (N=17)

* Patients under 10 years. Severe thinness <-3 Z score, thinness >-3 and \leq -2 Z score, Eutrofic >-2 and \leq 1 Z score and obesity >+1 Z score

** All patients. Proper \geq -2 Z score and Improper <-2 Z score.

*** All patients. Severe thinness <-3 Z score, thinness >-3 and \leq -2 Z score, Eutrofic >-2 and \leq 1 Z score and obesity >+1 Z score

- Next steps

Maintain patient consultations at the time of diagnosis until May 31, 2018.

Next step, start the consultation with 3 months of treatment and afterwards, carry out consultations with 6 months of treatment.

PRELIMINARY CONCLUSION

It is hoped that the results of this study contribute to the foment of new knowledge regarding nutritional status and its impact on the treatment of cancer patients, with the objective of improving the outcome of oncological treatment and, consequently, quality of life and survival. As well as to contribution to better planning of provided care and malnutrition prevention.

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