

## Anthropometry in Survivors of Childhood Acute Lymphoblastic Leukemia

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**Abstract: Background:** Childhood Acute Lymphoblastic Leukemia survivors may suffer many complications related to their disease or chemotherapy / radiotherapy received. These complications might involve the growth including height and weight.

**Objectives:** To assess weight and height in patients finished treatment of pediatric acute lymphoblastic leukemia (ALL).

**Patients and methods:** Seventy-five ALL survivors were enrolled in this study, those patients were visiting the oncology outpatient clinic of Children Welfare Teaching Hospital (CWTH) / Medical City on Thursdays' clinics as part of their scheduled visits during July, August and September 2018. For each selected case, the weight and height were measured by the researchers in the outpatient clinic together with interviewing the patient and / or the companion for some information regarding the disease and the patients. All the initial data were accessed by the registry books kept in the archives of the oncology unit, including weight and height.

**Results:** Regarding weight, thirty-eight cases (54.3%) of the cases had shown a decrement in the weight measurement as compared to their initial measurement at time of first admission. Thirty cases (42.9%) had shown increment in their measurement as compared with their initial readings. Regarding height, sixty-two cases (88.6%) of the cases had shown a decrement in the height measurement as compared to their initial measurement at time of first admission.

**Conclusion:** Pediatric ALL and / or its treatment influence the growth, especially height.

**Key words:** growth, height, weight, cancer, treatment.

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### I. Introduction

The cure of pediatric acute lymphoblastic leukemia (ALL) approaches more than 85% nowadays. Recent advances in the treatment focuses on reducing the remote effects of therapy. Two-thirds of survivors of malignant diseases are noted to suffer from some of the long term effects of treatment [1]. Those patients are thought to have growth impairment and short stature when they grow into adults because of the treatment (chemotherapy and / or radiotherapy) they received during different treatment phases of the disease. Accusation of these consequences are principally related to their original disease, malnutrition, infections and sometimes the effects of radiotherapy [2].

ALL is the most common childhood malignancy and patients within this group are at risk of energy imbalance and an increased prevalence of obesity [3]. There is a general agreement that the measurement of nutritional status is important in children and adolescents with cancer [4]. Overweight and obesity, measured by body mass index, have been associated with poorer response to chemotherapy [5], higher risk for relapse [6], increased treatment- related toxicity, and worse survival [7] in children with ALL than in those with normal nutritional status.

Pediatric population with malignancy are at susceptible for malnutrition which could influence the final survival and quality of life [8]. Cancer patients usually have insufficient calorie intake, with high metabolic rate and changes in the metabolism of many nutrients. To date, a debate exists concerning the effects of cancer treatment on nutritional state [9]. During the last few years, advances and changes in the protocols of treatment of pediatric leukemias have improved cure rates dramatically [10]. The development of supportive treatment policies has also improved the final outcome of those diseases and balance the recent advances in chemotherapy intensification [11].

**Aims Of The Study**

To assess weight and height in patients finished treatment of pediatric acute lymphoblastic leukemia during follow up visits.

**II. Patients And Methods**

**Patients:** Seventy-five Acute Lymphoblastic Leukemia survivor were enrolled in this study, those patients were visiting the oncology outpatient clinic of Children Welfare Teaching Hospital / Medical City during Thursdays as part of their scheduled visits for checkup or if they have any concern regarding their medical or any other conditions. Thursdays clinics are specialized for oncology cases who finished chemotherapy treatment. The sample collection was carried out during July, August and September 2018.

**Methods:** For each selected case, the weight and height were measured by the researchers in the outpatient clinic together with some information regarding the disease and the patients (gender, phone number, address, date of diagnosis, date of starting treatment, date of finishing treatment). Growth measurements were plotted on the charts available online from the CDC (Center for Disease Control) ([https://www.cdc.gov/growthcharts/cdc\\_charts.htm](https://www.cdc.gov/growthcharts/cdc_charts.htm) ). Additionally, for all those survivors, all the initial data concerning the first admission to the hospital before the start of chemotherapy treatment were accessed by the registry books kept in the archives of the oncology unit, including the initial weight and height. The anthropometric parameters at time of admission were measured by the resident physician.

**Inclusion criteria:** All patients with prior history of treated acute lymphoblastic leukemia visited the outpatient clinic of Children Welfare Teaching Hospital during July, August and September were selected for the study.

**Exclusion criteria:** All patients during active chemotherapy treatment visited the Thursday clinic for fever, bleeding or other concerns were excluded from the study. another five survivor patients were excluded from the study because their initial data about the weight and height at time of first admission were not recorded.

**Statistics:** Data were treated using SPSS (Statistical package for the social sciences) V.20 for mac. Qualitative data were processed as frequency and percentage, while the quantitative data as median and mean. Chi-square test was used to look for the relation between different variables. P-values equal or less than 0.05 were considered significant.

**III. Results**

**Patient characteristics:** The analysis identified 75 patients with prior history of ALL, the analysis was limited to 70 patients after excluding 5 patients to fulfill the aim of the study. The gender distribution showed that 39 survivor were males while 36 survivor were females with a male: female ratio of 1.08:1.00. The current age ranged from 62 months (5.16 years) to 242 months (20.16 years) with a mean of 131.3 months (10.94 years). At time of diagnosis, the age ranged from 6 months (0.5 years) to 167 months (13.91 years) with a mean of 60 months ( 5.0 years). The date of starting treatment ranged from June 2005 to January 2015, the date of finishing treatment ranged from February 2008 to June 2018.

Data	No.	(%)
<b>Gender</b>		
Male	39	52
Female	36	48
<b>Data</b>	<b>Min</b>	<b>Max</b>
<b>Age (months)</b>		
At diagnosis	6	167
Current	62	242

**Table.1: Gender and age characteristics for the study group**

**At time of Diagnosis:** At time of admission, the weight ranged from 7.0 kg to 43.0 kg with a mean of 18.5 kg. The height ranged from 75 cm to 162 cm with a mean of 110.1 cm

**Table. 2: Anthropometric data at time of diagnosis**

Item	N	Min	Max	Mean	Std. Dev.
Weight at first admission (kg)	70	7.00	43.00	18.4486	6.97319
Height at first admission (cm)	70	75.00	162.00	110.0786	18.73183

**At time of data collection:**At time of data collection, the weight ranged from 18.4 kg to 79.5 kg with a mean of 14.1 kg. the height ranged from 110 cm to 180 cm with a mean of 137.8 cm.

**Table. 3: Anthropometric data at time of data collection**

Item	N	Min	Max	Mean	Std. Dev.
Current weight (kg)	70	18.40	79.50	37.2957	14.12463
Current height (cm)	70	110.00	180.00	137.8529	17.44473

**Weight changes:** Regarding weight, plotting the weight on the CDC charts available online and comparing the current measurements with the initial measurements showed that 38 cases (54.3%) had shown a decrement in the weight measurement as compared to their initial measurement at time of first admission. Thirty cases (42.9%) had shown increment in their measurement as compared with their initial readings. Only two cases (2.9%) showed no changes in weight measurements.

**Table. 4: Weight changes**

Item	Frequency	Percent
No change	2	2.9
Increment	30	42.9
Decrement	38	54.3
Total	70	100.0

**Height changes:** Regarding height, plotting the height on the CDC charts available online and comparing the current measurements with the initial measurements showed that 62 cases (88.6%) had shown a decrement in the height measurement as compared to their initial measurement at time of first admission. six cases (8.6%) had shown increment in their measurement as compared with their initial readings. Only two cases (2.9%) showed no changes in height measurement over this period of time.

**Table. 5 Height changes**

Item	Frequency	Percent
No change	2	2.9
Increment	6	8.6
Decrement	62	88.6
Total	70	100.0

#### IV. Discussion

The current study was carried out to look for possible consequences of ALL management on anthropometric measures including height and weight. Current similar studies from limited resource countries have come out with results showing dragging of growth following initial phases of treatment with catch up height and weight after that. However, these reports and figures have shown a great debate, this was possibly due to different times of data collections, different regimens and protocols used among patients and different studied age groups, especially those during their teens of age. Additional factor is the addition of cranial radiation to some patients. This study had shown a decelerated height among the study group after completing treatment as compared with their age norms. Possible reasons is the chemotherapy and / or radiotherapy that were used during treatment. The most commonly encountered endocrine issue in those individuals is growth

hormone deficiency following cranial radiotherapy. additionally, intensive chemotherapy is well known to influence the growth plates development. Maintenance chemotherapy is also indicted to suppress the short term growth because of myelosuppression. These observations were firstly noted during the eighties of the last decade. Similar results were shown by other studies figuring out the decrement in height during disease therapies, being more evident during the first few months after initiating treatment [1, 2]. It was shown in both groups of patients (those who underwent radiotherapy as well as those who did not) [12]. In the scope of weight, many children remained with a lower weight than their standards after finishing treatment. Poor setting nations reported that underweight was noted at the time of initial diagnosis of cancer, ranging from 20 – 57% [13]. The nutritional support is greatly recommended for those underweight children in developing regions as this is a usual finding at time of diagnosis as well as after starting therapy for their malignant disorders.

## V. Conclusion

Pediatric ALL and / or its treatment influence the growth, especially height.

## Recommendation

Close monitoring of anthropometric measurement and nutritional supplement are highly required for patients treated with ALL.

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