Acute lymphoblastic leukemia (ALL) is the most common childhood cancer. Both chemotherapy & radiotherapy have serious potential side effects, especially when used in children. The endocrine system is especially prone to secondary treatment-induced injury, and a variety of endocrine abnormalities may develop in survivors of childhood ALL.

**Objective**
- To evaluate growth & pubertal patterns in patients diagnosed with childhood ALL.
- To identify risk factors for impaired growth & puberty.

**Patients & Methods**

**Study design:** A retrospective chart review with longitudinal assessment of anthropometric measurements & pubertal status of childhood ALL survivors diagnosed between 1985 & 2011.

**Inclusion criteria:** Age 8-30 years at data collection
Continuous first complete remission
Follow-up ≥3 years since diagnosis.

**Exclusion criteria:** Death/disease recurrence
Hematopoietic stem cell transplant
Syndromes associated with impaired growth.

**Data collected from medical charts:**
- Demographic parameters
- Chemotherapy & radiotherapy exposure
- Age of pubertal onset; Menarche & menstrual regularity (females)
- Occurrence of endocrine complications
- Use of hormone replacement therapy (GH, sex-hormone, etc.)
- Parental height
- Anthropometric measurements; Assessment of pubertal stage

**Evaluated potential risk factors for adverse endocrine outcome:**
- Gender
- Patient age and pubertal stage at diagnosis
- Cranial irradiation (yes/no),
- Type of chemotherapy protocol

**Background**
- Acute lymphoblastic leukemia (ALL) is the most common childhood cancer.
- Both chemotherapy & radiotherapy have serious potential side effects, especially when used in children.
- The endocrine system is especially prone to secondary treatment-induced injury, and a variety of endocrine abnormalities may develop in survivors of childhood ALL.

**Results**

**Characteristics of childhood ALL survivors**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire ALL cohort</th>
<th>chemo+</th>
<th>chemo-</th>
<th>Radiation</th>
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<tr>
<td>Gender</td>
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**Conclusions**
- Although most patients treated with chemotherapy-alone attained normal adult height & puberty, those treated with adjuvant cranial irradiation are at increased risk for short stature and precocious puberty (in girls).
- Hopefully, with recent treatment with reduction of radiotherapy doses or replacement of radiotherapy by intensive chemotherapy, the prevalence of impaired final height and other endocrine disorders in these survivors will further decrease.
- Childhood ALL survivors are at an increased risk for overweight, especially those with increased BMI at diagnosis. Therefore, clinicians need increased awareness & screen for overweight & its associated health conditions early in survivorship. Interventions as changes in lifestyle habits are required to address weight control early during treatment.

**Note:**
- Data are expressed as mean ± standard deviation (SD) for normally distributed variables and median (interquartile range) for skewed variables.
- Data above age of pubertal onset were available for all patients, and educational measures were available for all females.
- P-value represents a within-sex comparison of all variables and blood hormone levels with chemotherapy-alone.

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**Disclosure Statement:** All authors have nothing to disclose.

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**Final Height**

Adult height was attained in 115 patients (62.8%) from the study cohort at their last visit. In these patients, short stature was present in 13% of patients treated with chemotherapy + cranial irradiation & in 2.2% of patients who were treated with chemotherapy-alone.

**Puberty**

The occurrence of precocious puberty was higher in girls who got cranial irradiation vs. those treated with chemotherapy-alone (30% vs. 9.4%).

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**Endocrine disturbances of ALL survivors**

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**Predictors of endocrine disorders in childhood ALL survivors**

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