Prognostic Role of Body Weight at Diagnosis in Children with Acute Lymphoblastic Leukemia: A Systematic Review and Meta-Analysis

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Introduction

The impact of body mass index (BMI) on outcomes in pediatric cancers, particularly acute lymphoblastic leukemia (ALL), remains unclear. Given the rising global burden of childhood malnutrition, understanding the prognostic role of BMI at ALL diagnosis is clinically important.

Aim

To evaluate the impact of body weight at diagnosis, including underweight, overweight, and obesity on clinical outcomes in pediatric patients with acute lymphoblastic leukemia. Primary outcomes assessed were overall survival (OS), event-free survival (EFS), and risk of relapse.

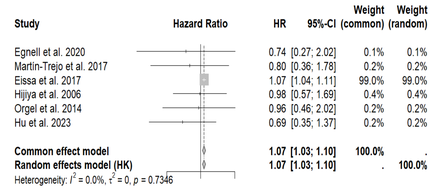
Methods

A systematic review and meta-analysis were conducted according to PRISMA guidelines. A comprehensive search of PubMed, Scopus, Web of Science, Embase, and Google Scholar databases was performed from inception to May 2025. Eligible studies included clinical trials and observational studies that reported outcomes of pediatric ALL patients stratified by BMI categories at diagnosis. Data extraction and quality assessment were conducted independently by multiple reviewers. Statistical analysis was performed using R software version 4.3.2, and hazard ratios (HRs) with 95% confidence intervals (CIs) were combined using random-effects models.

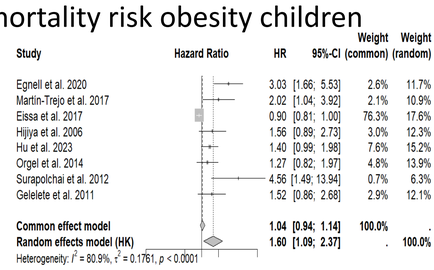
Results

Ten studies were included in the meta-analysis. Underweight children had a higher mortality risk (HR = 1.07; 95% CI: 1.03–1.10), while overweight was not significant (HR = 0.99; 95% CI: 0.89–1.09). Obesity was associated with increased mortality (HR = 1.60; 95% CI: 1.09–2.37). For event-free survival, underweight (HR = 1.12; 95% CI: 1.03–1.22) and obesity (HR = 1.53; 95% CI: 1.03–2.30) showed worse outcomes; overweight was non-significant (HR = 1.07; 95% CI: 0.96–1.19). Relapse risk was not significantly associated with BMI: underweight (HR = 1.02), overweight (HR = 0.96), and obese (HR = 1.15).

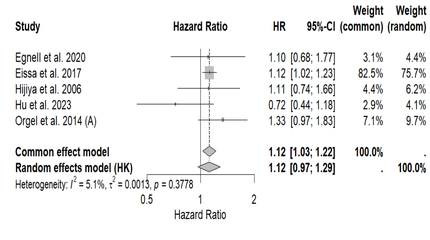
A) mortality risk in underweight children



B) mortality risk obesity children



C) Event-free survival in underweight children



Summary

This meta-analysis shows that both underweight and obesity at diagnosis are linked to worse outcomes in children with ALL, particularly regarding overall and event-free survival. Obesity was consistently associated with increased mortality, while overweight showed no significant effect. These findings underscore the importance of incorporating nutritional assessment and management into the routine care of pediatric ALL patients to help improve prognosis.

The authors declare no competing interests