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IMPACT OF INDUCTION CHEMOTHERAPY ON NUTRITIONAL STATUS AND TREATMENT-RELATED COMPLICATIONS IN ADOLESCENTS AND YOUNG ADULTS (15–39 YEARS): A RETROSPECTIVE ANALYSIS

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Abstract
Background: Adolescents and young adults (AYA) with cancer face unique challenges, including the impact of intensive chemotherapy on nutritional status. This study evaluates the effects of induction chemotherapy on nutritional parameters and associated complications in AYA patients with hematologic malignancies and Ewing sarcoma, comparing findings with international cohorts.
Methods: A retrospective analysis was conducted on 38 AYA patients (15–39 years) diagnosed with B-cell ALL, T-cell ALL, AML, and Ewing sarcoma. Anthropometric and biochemical parameters were assessed at diagnosis, post-induction, and six months post-therapy.
Results: Induction chemotherapy led to a significant decline in nutritional parameters across all cancer subtypes. The AML cohort exhibited the most pronounced deterioration. Patients showed marked reductions in weight, BMI, mid-arm circumference, and serum albumin after induction chemotherapy. Complication rates were higher in patients with greater nutritional declines, particularly in the AML group.
Conclusion: Induction chemotherapy in AYA patients leads to significant nutritional decline, especially in AML cases, which correlates with increased treatment-related complications. Early nutritional assessment and intervention should be integral to treatment protocols.

Keywords: Adolescents and Young Adults (AYA) oncology; Induction Chemotherapy; Nutritional Status; Oncology Nutrition

Introduction

Adolescents and young adults (AYA) aged 15–39 years represent a unique and often underserved group in oncology. These patients face a distinct biological and psychosocial disease profile and are vulnerable to both the acute and chronic impacts of cancer therapies. Among these, induction chemotherapy is known to contribute significantly to nutritional deterioration, particularly due to its intensity and associated toxicities.

Previous studies have highlighted the prevalence and impact of malnutrition in cancer patients. Per Ole et al. reported impaired nutritional status in Russian and Norwegian AML patients during chemotherapy, which led to reduced quality of life and hormonal imbalance (1). Vijya Gandhi Linga et al. emphasized the importance of structured nutritional surveillance in AYA patients to mitigate malnutrition-related complications(2).

This study aims to assess the nutritional impact of induction chemotherapy in a cohort of AYA patients diagnosed with B-cell ALL, T-cell ALL, AML, and Ewing sarcoma. We also compare our findings with global data to understand broader implications for this population.

Materials and Methods

This was a single-center, prospective observational study conducted at a tertiary cancer care center in India between March 2023 and December 2024. The study included 38 AYA patients between 15–39 years who were diagnosed with either B-cell ALL, T-cell ALL, AML, or Ewing sarcoma and underwent induction chemotherapy. Ewing sarcoma was included on the grounds of it being embryonal origin requiring intense multiagent chemotherapy for induction.

Anthropometric parameters (BMI, weight, mid-arm circumference) and serum albumin levels were recorded at three time points: diagnosis, after induction chemotherapy, and six months after initiation of therapy. Standard treatment protocols were followed based on disease subtype, including the BFM 2002 protocol for ALL.

Descriptive statistics were used to evaluate baseline and post-treatment nutritional metrics. Changes were compared across subtypes and analyzed in the context of existing global literature.

Results

Among the 38 patients analyzed, 17 had B-cell ALL, 6 had T-cell ALL, 9 were diagnosed with AML, and 5 with Ewing sarcoma. The average age was 19.5 years. A notable trend across all groups was a significant decline in nutritional parameters following induction chemotherapy. (Table 1)

Table 1: Epidemiology

Total cases (n)	**38**
Mean Age	19 years
Male	22
Female	16
B cell ALL cases	17
T cell All cases	6
AML cases	9
Ewings sarcoma cases	5
Mean BMI	20.85
Mean weight (kg)	54.95
Mean mid arm (cm)	23.85

In the B-cell ALL group, the mean BMI at diagnosis was 20.45. There was a 10.35% reduction in weight and a 16.11% decrease in mid-arm circumference after induction. Serum albumin dropped by 13.11%, reflecting substantial protein-energy malnutrition. (Figure 1)

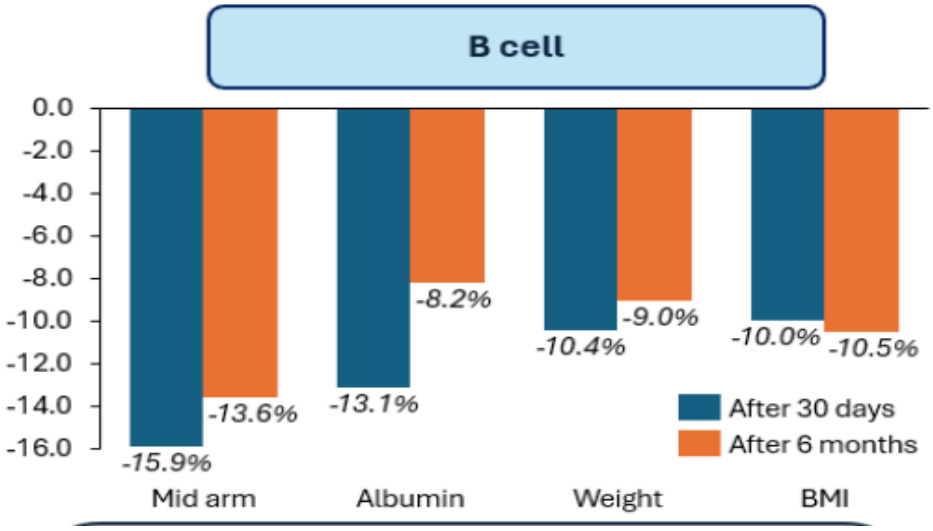

Figure 1: B-Cell ALL analysis

T-cell ALL patients demonstrated a similar trend, with a mean BMI of 21.45 at diagnosis. Weight reduced by 8.34%, and mid-arm circumference decreased by 15%. Serum albumin declined by 17% post-induction.

The AML group exhibited the most significant nutritional deterioration. The mean BMI was 20.9 at baseline. Weight decreased by 10%, mid-arm circumference by 14%, and serum albumin by 11% post-induction. (Figure 2)

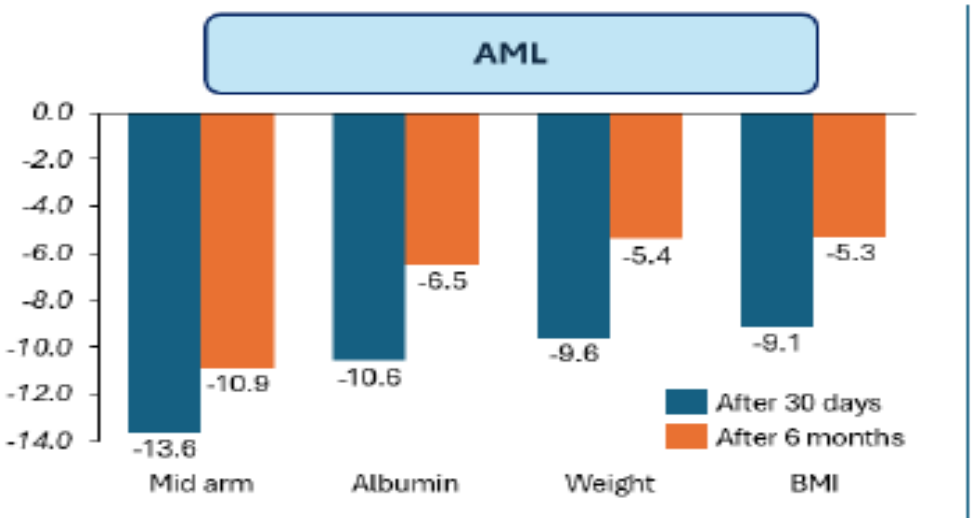

Figure 2 : AML Analysis

In patients with Ewing sarcoma, the nutritional impact was also evident though less severe. The mean BMI was 19.45, with a 7.6% decrease in weight and a 13.2% reduction in mid-arm circumference. Serum albumin dropped by 8.2%.

Patients in the AML group also had a higher incidence of treatment-related complications such as febrile neutropenia, mucositis, and delayed hematologic recovery, often correlating with more profound nutritional deficits.

Discussion

This study highlights the significant nutritional decline experienced by AYA patients undergoing induction chemotherapy. The AML cohort showed the most profound deterioration, consistent with international studies. Per Ole et al. observed that intensive chemotherapy regimens in AML patients impaired nutritional status, adversely affecting quality of life and hormonal balance (1). Linga et al. recommended early and proactive nutritional surveillance to reduce these risks (2).

Malnutrition has been linked to increased rates of infection, prolonged hospitalization, delayed marrow recovery, and reduced survival. Schoon et al. discussed how undernutrition could alter drug pharmacokinetics, thereby compromising chemotherapy efficacy (3). Malihi et al. associated dietary insufficiency with increased complications and poorer survival outcomes in pediatric oncology (4).

Our findings are consistent with previous studies showing that malnutrition independently predicts poor survival outcomes in AML patients, as demonstrated by Liu et al. (5). Moreover, Al-Nawakil et al. emphasized that nutritional concerns in AYA oncology remain underrecognized, despite the critical need for early nutritional support to improve treatment tolerance (6).

The INAYA study demonstrated improved dietary behavior in AYA survivors receiving individualized nutritional counseling, suggesting a strong potential for such strategies during active treatment (7). In comparison, our cohort, although not provided with structured nutritional interventions, showed a marked decline in BMI, weight, mid-arm circumference, and serum albumin post-induction. This highlights a critical gap in supportive care during active treatment in our setting.

Additionally, Landry et al. underscored the prevalence of food insecurity in AYA cancer survivors and advocated for structured nutritional support systems (8), further reinforcing the need for systemic implementation of dietary assessment and intervention strategies across the continuum of care.

In our cohort, the AML subgroup not only showed greater nutritional decline but also experienced more complications, suggesting that early nutritional compromise may exacerbate chemotherapy-related toxicity. This supports a multidisciplinary approach that includes nutritional evaluation and intervention as part of standard oncologic care.

Limitations of our study include the retrospective design and limited sample size. Larger, multicenter prospective studies are warranted to confirm these findings and to establish formal nutritional support protocols.

Conclusion

Induction chemotherapy results in substantial nutritional decline in AYA patients, with the AML group being most affected. This decline is associated with higher rates of complications. Integrating routine nutritional assessments and interventions into treatment protocols could potentially improve outcomes in this vulnerable group.

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