

# Nutritional Assessment of Adult Patients with Acute Leukemia in the Hematological Department in Baghdad Hospital at the Medical City 2022

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## Abstract

Background Though the incidence of acute leukemia is low, it has a high mortality. In Iraq, leukemia represents the 5th most common cancer in both males and females with a grave impact on the country due to premature death, and loss of productivity which affects the socioeconomic and health welfare of the population. Malnutrition with leukemia is common and was linked to inferior survival, longer hospital stay, and cost. Aim To evaluate the nutritional status of adult patients with acute leukemia and assess the association between nutritional status with the duration of disease and length of hospital stay. Patients and methods A cross sectional study conducted in Baghdad Hospital, Medical city, involved a convenient sample of 100 adults 18-60 years old patients admitted to the hematology ward with acute leukemia during the time of the study. Verbal consent was ensured before reviewing patients' demography and medical history. Anthropometric measures were done, BMI, TSF and MUAC were calculated accordingly. Statistical Package for the Social Sciences was used for data analysis, independent t-test, Chi square and Fischer exact tests were applied as needed. In all statistical analyses a P-value equal or less than 0.05 was considered significant. Results Malnutrition was diagnosed using BMI classification in 21% of the patients. Age, weight, MUAC showed a significant association with malnutrition. There was a significant difference between the duration of disease, chemotherapy cycle, length of hospital stay, and energy intake between malnourished and well-nourished patients. The study reported a statistically significant association between nutritional state and age, loss of subcutaneous fat, and muscle wasting. No significant difference was reported between malnourished and well-nourished patients according to TSF classification, Weight and weight loss percentage showed lower means in MUAC classification, while the length of hospital stay showed higher means in MUAC classification (p-value<0.001). Conclusion and recommendations Attention should be paid to acute leukemia patients' nutritional needs to achieve better disease outcomes.

**Keywords:** Acute Leukemia ; Adult Patients; nutrition

## 1. Introduction

Leukemia is a production of abnormal leukocytes either as a primary or secondary process. They are classified as acute or chronic, and myeloid or lymphoid based on the rapidity of proliferation and the originator cell respectively. [1] According to the global observatory for cancer trends, acute leukemia incidence reached to 474,519 new cases in 2020 and 311,594 deaths per same year. [2] Though the incidence of acute leukemia is low, but it is of crucial importance due to its high mortality. The mortality rate is between 1.3 and 6.3 per 100,000 in men and 1.1 and 3.8 per 100,000 in women. [3]

Acute leukemias are characterized by greater than 20% blasts in the peripheral blood smear or on

bone marrow leading to a more rapid onset of symptoms. Acute Lymphocytic Leukemia (ALL) is a malignancy of B or T lymphoblasts characterized by the uncontrolled proliferation of abnormal, immature lymphocytes and their progenitors which eventually will take over the bone marrow, lymph nodes and other organs. [4] Acute myelogenous leukemia (AML): is the most common acute leukemia in adults. It is the most aggressive cancer with a variable prognosis depending upon the molecular subtypes. [1]

In Iraq, leukemia represents the fifth most common cancer in both males and females. But it is the first for children less than 15 years of age. [5] With around 2027 new cases diagnosed in 2020, and 1545 deaths yearly. Leukemia has a grave impact on developing countries due to premature death,

loss of caregivers, loss of productivity, disability, and high medical cost that affects the socioeconomic and health welfare of the population. [6]

Adding the burden of malnutrition to leukemia is common, the prevalence of malnutrition in patients with cancer diverges between 20% to more than 70% worldwide, with differences related to age, type, and cancer stage. [7] Despite that, it is still under-recognized and under-treated and almost 50% of people with cancer-related malnutrition are not under the care of a dietitian. [8] Many hypotheses were suggested incriminating malnutrition as the main factor in impairing the immune response against various infections due to cytokine hormone function alterations and micronutrient deficiencies. It also weakens the effectiveness of cancer treatments. Similarly, it has also been associated with a poorer quality of life and poorer physical, social and emotional performances. [9,10] Severe malnutrition was linked to inferior overall survival, and longer hospital stay, cost, and high mortality of 40% associated with malnutrition [11,12] Hence, the knowledge of the nutritional status of the patient with leukemia is an essential part of the clinical treatment. [7]

### Aim

To evaluate the nutritional status of adult patients with acute leukemia by anthropometric measurements

To assess the association between nutritional status with the duration of disease and length of hospital stay.

### Patients and methods

This was a cross-sectional study conducted from the 1st of July 2022 till the end of November 2022 in the Hematology department – at Baghdad Hospital, the Medical city, which involved a convenient sample of 100 cancer patients.

**Inclusion criteria:** all adult 18-60 years old patients admitted to the hematology ward with acute leukemia during the time of the study

### Exclusion criteria

1. Patients on parenteral therapy
  2. Patients with uncontrolled DM
  3. Chronic leukemias
  4. Patients with severe medical or cognitive issues who could not communicate were excluded
- Data collection was performed meticulously by the researcher, each patient was greeted respectfully and an explanation of the study aims was offered, verbal consent was ensured before reviewing patients' demography, medical history, disease duration (in months), hospital stay (in days), and chemotherapy cycle, dietary assessment, and biochemical investigation were completed for each participant. Anthropometric measures were done. The assessment of the weight and height has been taken using an electronic scale, rounded off to the

nearest 0.1 kg and 0.1 cm.

Basal Metabolic index (BMI) was obtained using the equation  $\text{Weight (Kg)}/\text{Height (m)}^2$ , Mid-upper arm circumference (MUAC) was calculated using an inextensible measuring tape, with a 1 mm resolution. Triceps Skinfold Thickness (TSF) was measured by a skinfold caliper device. Tricipital with a 1 mm resolution. A patient was regarded as malnourished on MUAC and TSF classification when MUAC <25.5 cm in males and <23cm in females and TSF <12.5 mm in males and <16.5 mm in females. [13]

Data were presented by numbers and percentages for categorical variables, while mean and standard deviation were used for numerical variables. Statistical Package for the Social Sciences (SPSS) was used for data analysis, independent t-test was used to demonstrate the difference in energy intake among continuous variables (disease duration, chemotherapy cycle, hospital stay, BMI, TSF, MUAC, HB, WBC and Serum Albumin). Chi-square and Fischer exact tests were applied to demonstrate the association between energy adequacy and demographical variables, in all statistical analyses a P-value equal or less than 0.05 was considered significant.

## 2. Results

Malnutrition was diagnosed using BMI classification in 21% of the patients. Figure (1) describes the BMI distribution among the sample

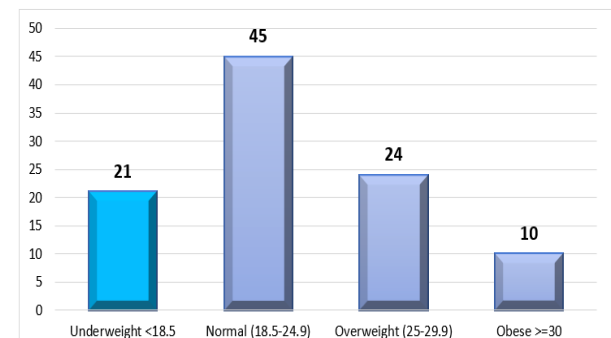


Figure (1) Distribution of acute leukemia patients according to BMI

Malnutrition was detected in 55% and 20% of patients when patients were evaluated according to TSF and MUAC classifications compared to 21.0% by BMI. Figure (2) demonstrates the malnutrition percentage per method.

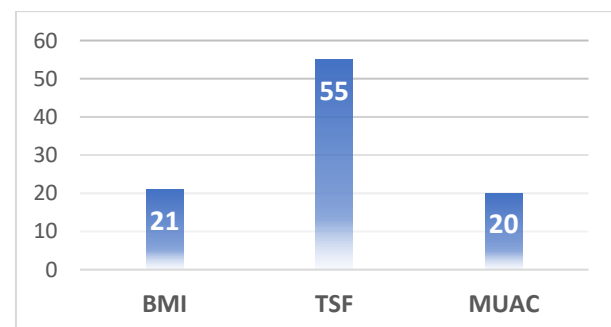


Figure (2) Malnutrition among acute leukemia patients according to BMI, MUAC and TSF

Table (1) demonstrates the distribution of the sample according to the demographic variables.

Variables	Frequency	Percentage
Age	≤40	77
	>40	23
Gender	Male	38
	Female	62
Marital status	Married	61
	Unmarried	39
Employment status	Employed	39
	Unemployed	61
Residency	Urban	53
	Rural	47
Education	Primary and less	37
	Secondary and higher	63
Type of leukemia	ALL	48
	AML	52
Mean ±Standard deviation		
Duration of the disease (in months)		16.9±16.7
Chemotherapy cycle		3.7±2.03
Hospital stay in days		20.8±10.9

Age showed a significant difference between malnourished and well-nourished groups (p-value<0.001) The average duration of the disease was 16.9±16.7 months ranging between two months to seven years. The mean number of chemotherapy cycles was 3.7± 2.0 cycles (range 1-10) cycles. As for the length of hospital stay, the

mean length was 20.8±10.9 days, ranging between five to 52 days. Significant differences between malnourished and well-nourished groups were noted regarding disease duration, chemotherapy cycle, and length of hospital stay. Table (2) illustrates the mean difference between the two groups.

Variables	Malnutrition	Well-nourished	P value	C.I. 95%	
				Lower	Upper
Disease duration	27.1±19.3	14.1±14.9	0.008	3.62	22.30
Chemotherapy cycle	5.8±1.7	3.37 ±1.9	0.000	0.99	2.81
Length of hospital stay	35.09±10.6	17.03±7.29	0.000	12.97	23.13

There was a significant difference between the energy, protein, carbohydrate, and fat intake between malnourished and well-nourished

individuals. Energy and protein adequacy were significantly lower in malnourished patients. Table (3) illustrates the distribution of patients by nutritional status and dietary assessment

Variables	Malnutrition	Well-nourished	P value	C.I. 95%	
				Lower	Upper
Energy intake	907.2±338.6	1499.4±513.3	0.000	-780.8	-403.5
PTN intake	38.14±10.2	62.64±25.8	0.000	-31.79	-17.21
PTN% intake	15.42±2.81	16.48±4.81	0.204	-2.69	0.589
CHO intake	147.38±55.8	214.4±69.9	0.000	-96.4	-37.7
Fat intake	26.57±8.4	37.43±16.2	0.000	-16.05	-5.65
Energy adequacy	52.93±19.8	70.18±23.6	0.002	-27.54	-6.96
PTN adequacy	44.60±14.7	60.62±27.5	0.001	-24.9	-7.0

Weight and MUAC had a significant difference between malnourished and well-nourished patients, weight loss percentage was higher among malnourished. Table (4) describes a comparison

between well-nourished and malnourished patients based on Body Mass Index classification by anthropometric assessment and investigations.

Variables	Malnutrition	Well-nourished	P value**	C.I. 95%	
				Lower	Upper
Usual weight	62.42±9.8	75.29±14.2	0.000	-18.24	-7.47
Weight loss %	19.5±8.10	7.62±8.15	0.000	7.84	15.96
TSF mm	12.5±3.3	12.9±4.5	0.623	-2.25	1.36
MUAC (cm)	22.4±2.8	29.3±5.7	0.000	-8.74	-5.17
HB	8.44±0.95	8.55±1.25	0.678	-0.61	0.40
WBC	4.10±2.17	5.56±8.42	0.170	-4.33	-0.39
S. Albumin	3.32±0.82	3.49±0.58	0.373	-0.56	0.22

The commonest reported symptom was the loss of appetite 77(77%) followed by nausea 75(75%) and

change of taste 75(75%). No statistically significant association was reported between malnutrition and nutritional symptoms.

Table (5) demonstrates the association between the loss of subcutaneous fat and muscle wasting with malnutrition in acute leukemias

**Table (5) Distribution of patients by nutritional state and the loss of subcutaneous fat and muscle wasting in acute leukemias**

Variable		Malnutrition	Well-nourished	Total	P-value
Loss of subcutaneous fat	Normal	0	47(100%)	47(100%)	0.000
	Mild/Moderate	1(3.7%)	26(96.3%)	27(100%)	
	Severe	20(76.9%)	6(23.1%)	26(100%)	
Muscle wasting	Normal	0	48(100%)	48(100%)	0.000
	Mild/Moderate	0	27(100%)	27(100%)	
	Severe	21(84%)	4(16%)	25(100%)	

No significant difference was reported between malnourished and well-nourished patients according to TSF classification, as seen in the table (6). Weight and weight loss percentage showed lower means in

MUAC classification (p-value<0.001, p-value=0.001 respectively.), while the length of hospital stay showed higher means in MUAC classification (p-value<0.001)

**Table (6) Distribution of patients by nutritional status according to TSF and MUAC classifications.**

Variable		TSF		MUAC	
		Malnutrition N=55	Well-nourished N=45	Malnutrition N=20	Well-nourished N=80
Age	<=40	38(49.4%)	39(50.6%)	13(16.9%)	64(83.1%)
	>40	17(73.9%)	6(26.1%)	7(30.4%)	16(69.6%)
		P-value* = 0.055		P-value* = 0.232	
Usual weight		72.1±13.6	73.1±15.4	62.7±8.8	75.0±14.4
		P-value <sup>§</sup> = 0.717		P-value <sup>§</sup> = 0.000	
weight loss %		11.2±9.8	8.7±8.8	17.4±9.7	8.2±8.5
		P-value <sup>§</sup> = 0.187		P-value <sup>§</sup> = 0.001	
Disease Duration		15.41±13.5	18.7±19.9	18.4±17.2	16.52±16.7
		P-value <sup>§</sup> = 0.349		P-value <sup>§</sup> = 0.664	
Chemotherapy		3.98±2.0	3.53±1.9	4.15±1.9	3.68±2.0
		P-value <sup>§</sup> = 0.273		P-value <sup>§</sup> = 0.361	
Hospital stays		21.0±10.7	20.5±11.2	31.8±11.8	18.07±8.8
		P-value <sup>§</sup> = 0.808		P-value <sup>§</sup> = 0.000	
Energy adequacy		65.1±22.4	68.2±25.6	70.3±28.0	65.6±22.8
		P-value <sup>§</sup> = 0.526		P-value <sup>§</sup> = 0.495	
PTN adequacy		57.5±24.7	56.8±28.1	62.6±29.8	55.9±25.2
		P-value <sup>§</sup> = 0.900		P-value <sup>§</sup> = 0.360	

### 3. Discussion

Malnutrition was diagnosed as positive by BMI in 21% of the patients. Our result is in alignment with results posted by Ali SA et al 2020 Egypt [14] where malnutrition was 21.1% in acute leukemia patients. While results by Turedi A et al showed the prevalence of malnutrition was 18.5% Using the BMI classification. [15] Our results were lower than that reported by Li J et al and Yilmaz M et al malnutrition in leukemia was 27.9% and 29.2% respectively. [11, 16] While a study by Li Z et al showed a malnutrition prevalence using a BMI classification of 34%. [17] and another by Silva T and Costa de Oliveira L [7] where the prevalence of malnutrition was 65.2%. These differences are related to the age of the sample. As our current results showed a significant association between age and malnutrition.

Older patients were malnourished compared to those less than 40 years old, agreeing with the results stated by Li J et al, where malnutrition was correlated with age (P = 0.041) [11] and results by Silva T and Costa de Oliveira L, malnutrition was

more expressive in older adults (p=0.023). [7] as older age is known to be at risk of protein-energy malnutrition. [18] Other variables didn't show any statistical significance agreeing with the results stated by Yilmaz M et al [16]

The current study showed a statistical difference between malnourished and well-nourished patients regarding disease duration, chemotherapy cycle, and length of hospital stay. Agreeing with findings from a study by Ali SA et al [14] and Yilmaz M et al [16] Where malnourished patients had significantly longer disease duration, longer means of hospital stay, and higher mean number of chemotherapy cycles. In the same context, A study by Kaegi-Braun N et al 2021 showed increasing evidence that nutritional interventions significantly reduced mortality, length of hospital stay, and risk for hospital unplanned readmission in the population of medical inpatients at nutritional risk. [19]

The commonest reported symptom was the loss of appetite followed by nausea and change of taste. This is in accordance with a study by Wang C et al Appetite loss, and other symptoms affected around 24–83% of patients with acute leukemia; this can significantly lower their health-related

quality of life. [20]

Although no statistical significance was reported between nutritional symptoms or biochemical indicators and malnutrition which is similar to findings from a study by Ali SA et al 2020 Egypt [14] The current study showed clearly a significant difference between mean energy, protein, carbohydrate, and fat intake between malnourished and well-nourished individuals. Energy and protein adequacy were significantly lower in malnourished patients. Likewise reported by Ali SA et al 2020 Egypt [14] malnourished patients had lower energy and protein intake than well-nourished.

Weight was lower among malnourished patients, as weight loss percentage was higher among them. This is in accordance with the result reported by Shaw C et al, Cancers with the highest percentage of weight loss patients were leukemia (39%), and a strong association between weight loss and experience of treatment modification leukemia. [21] MUAC also showed a significant association with malnutrition and a comparable percentage (20%) to BMI classification (21%). It had been stated that MUAC and BMI correlate in patients complaining of acute diseases. [22] our results are aligned with that reported in a study by Yilmaz M et al [16] where patients with malnutrition had significantly low BMI and MUAC. Our result also was comparable to that presented by Brotelle T et al. [23] MUAC was significantly more likely to be decreased in the malnourished group than in the well-nourished group. While using TSF, malnutrition prevalence was 55%. No significant difference was reported between malnourished and well-nourished patients according to the TSF classification. As for MUAC, it was also associated with lower weight and higher weight loss percentage among malnourished. In the same context, the study showed a significant association between muscle wasting, loss of subcutaneous fat, and malnutrition which is in accordance with results forwarded by Ali SA et al 2020 Egypt [14] The percentage of muscle mass was significantly lower among malnourished patients.

#### 4. Conclusion and Recommendations

malnutrition is present among acute leukemia patients, it is highly associated with disease duration, chemotherapy cycle, and extend hospital stay. Early recognition through periodic monitoring of oncology-ward patients would help in swift diagnosis and correction to the nutritional status which is an important aspect of patients' care. Consideration should be paid to acute leukemia patients' nutritional requirements to achieve better disease outcomes.

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