

Nutritional Needs and Treatment Adherence Among Children with Cancer Receiving Chemotherapy in the Middle Euphrates Region

Nutritional Needs
and Treatment
Among Children
with Cancer

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ABSTRACT

Objective: To assess nutritional needs and chemotherapy adherence among children with cancer receiving chemotherapy in the Middle Euphrates region and to identify factors associated with nutritional status and treatment adherence.

Study Design: A cross-sectional quantitative study

Place and Duration of Study: This study was conducted in three Oncology Hospitals in AL-Najaf AL-Ashraf, Holly Karbala, and Babylon, Iraq between December 2025 and April 2026.

Methods: A purposive sample of 170 children with cancer aged below 18 years and their parents participated in the study.

Results: The majority of children were male (71.2%), early childhood ages (41.8%), and had been diagnosed with ALL (75.9%). The body mass index was found to be in the normal range in 41.2% of them, but 37.6% of them were underweight. Both parents and children had high nutritional knowledge (73.5%) and only 37.1% of children had high nutritional status. Regarding chemotherapy adherence, the majority of the participants demonstrated high adherence (65.9%), while 31.8% were moderately adherent, and only 2.3% showed low adherence. There were significant correlations between parent knowledge and education for father ($p = 0.022$) and mother ($p = 0.002$). The adherence-related psychological and sensory factors were significantly correlated with child age ($p = 0.001$) and mother's educational level ($p = 0.014$).

Conclusions: The nutritional challenges faced by children are moderate and the knowledge of parents and their adherence to treatment is generally good in the Middle Euphrates region. Educational strategies for mothers are important, not only for nutritional awareness, but also to remove psychological barriers for adherence to chemotherapy. Enhancing nutritional counselling and psychosocial support services can help to enhance the treatment in children with cancer.

Keywords: Childhood cancer, chemotherapy adherence, nutritional status, parental knowledge, pediatric oncology, chemotherapy, nutritional needs.

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INTRODUCTION

The incidence rate of childhood malignancies is a public health problem in Iraq especially in the Middle Euphrates region as evidenced by the recent epidemiologic profiles¹.

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However, the incidence of children's cancers was found to have peaked in recent years in certain governorates, such as Al-Najaf, and bone and blood cancers are common in urban areas in children.² In these patients, chemotherapy treatment can be complicated by a "dual burden": the metabolic stress caused by the malignancy itself and the high level of nutritional vulnerability³.

Nutritional status is one of the basic factors that can predict the clinical outcome in pediatric oncology⁴. Malnutrition is not only a low baseline indicator, but a dynamic problem that can grow worse during induction chemotherapy and can cause a rapid loss of muscle mass and fat stores⁵. This further decrease due to chemotherapy side effects like nausea, vomiting, loss of appetite and oral mucositis⁶. Malnutrition in pediatric cancer patients is linked to poor prognosis in low- and middle-income countries, such as the increased risk of treatment-related toxicities and premature discontinuation of treatment³.

Another diagnostic problem of particular importance in the Iraqi situation is the tendency for nutritional failure to be "masked" by massive tumor masses or edema due to the therapy². Traditional methods of weight monitoring have been shown to be inadequate in many cases, and that measurement of Mid-Upper Arm Circumference (MUAC) and triceps skinfold thickness is a more sensitive early warning indicator of nutritional derailment². In addition, compromised nutritional status is highly associated with reduced chemotherapy tolerance and reduced dose intensity, which can result in less efficacy of anti-cancer medications³.

The people with severe nutrition impact symptoms, they can find it difficult to finish their planned chemotherapy courses⁴. Furthermore, the inappropriate use of nonprescribed antibiotics by caregivers can make gastrointestinal health problems more complicated, and can also hinder a child's appetite and treatment schedule². As long the nutrition has been demonstrated in best method to reduce serious illness and the likelihood of living for five years, there is an urgent need to develop nutrition-specific assessment protocols for the Middle Euphrates region that would provide nutritional stability and rigorously follow life-saving treatment.³

METHODS

Study Design and Duration: The researcher utilized a cross-sectional, applied quantitative research design. This approach allowed for the assessment of specific variables during a defined period, specifically from December 26, 2025, to April 25, 2026.

Administrative and Ethical Considerations: Formal administrative agreements were secured prior to data collection. Key approvals and requisitions included:

- Initial agreement from the University of Babylon, College of Nursing through first presentation to attain the approval of higher studies committee.
- Protocol approved by the ethical and scientific research committee at the University of Babylon/college of nursing.
- Official permissions from the Health directorate/Development and Training centers in Babylon, AL-Najaf AL-Ashraf, and Holly Karbala governorates.
- Data collection agreements from Al-Imam Al-Sadiq Teaching Hospital, Al-Watney Oncology Hospital, and Al-Imam Al-Hasan Al-Mujtaba Teaching Hospital.

Study Setting and Population: The study was carried out in the Middle Euphrates region and the study area consisted of only three hospitals that accept pediatric patients in cancer namely; Al-Watney (Najaf), Al-Imam Al-Sadiq (Babylon), and Al-Imam Al-Hasan Al-Mujtaba (Karbala). The study consists of 170 children aged <18 years diagnosed with chemotherapy

distributed on hospitals Al-Watney (Najaf) (81child), Al-Imam Al-Hasan Al-Mujtaba (Karbala) (50child) and Al-Imam Al-Sadiq (Babylon) (39child).

The Study Tools: A questionnaire in English translated to Arabic with four different components in addition to scale and tape measurement:

1. Part One: a socio-demographic section (8 items), anthropometric section (weight, height, BMI, 3 items), and clinical history (4 items).
2. Part 2: Parents' knowledge of nutritional needs (4 items) and Nutritional needs (25 items) with sections for appetite, dietary preference, side effects affecting eating and behaviors.
3. Part Three: Assesses Chemotherapy Adherence (21 items) and Parent Follow-Up.
4. Part Four: Explores issues that influence adherence including psychological/behavioral cooperation with the healthcare team (6 items).

Validity and Reliability: Validity: Content is validated by 11 experts from different Iraqi universities.

Pilot Study: Al-Imam Al-Sadiq Teaching Hospital was used to conduct a pilot study with 19 participants from January 03 to January 15, 2026. In this phase, the tool proved to be reliable and it has been found that it takes 20-30 minutes to complete.

Reliability: The instrument showed statistically acceptable reliability in all items with Cronbach's Alpha of 0.606 and 0.703 for nutritional needs and treatment adherence respectively.

Data Collection and Analysis: Collection: February 21 - April 29, 2026 Face-to-face interviews were used with parents who were unable to read and self-administered questionnaires were used with parents who could read.

Analysis: Data were analyzed using SPSS version 28, frequencies, percentages and chi-square tests were used to meet the objectives of the study.

RESULTS

This part presents the results of the data analysis systematically in tables and these correspond with the objectives of the study as follows:

Table 1 showing that Socio-demographic characteristics showed that most participants resided in urban areas (77.1%), with the majority of parents aged 30–39 years. Regarding socioeconomic status, 42.4% reported sufficient monthly income, and 58.2% had two affected children.

Table 2 shows most children have a normal body mass index (BMI) (41.2%), (37.6%) are underweight. Acute lymphoblastic leukemia (ALL) is the most common diagnosis 75.9% of cases. The majority of participants were newly diagnosed (42.4%).

Table No. 1: Demographical Data of Children with Cancer and Their Parents (N = 170)

Demographic Characteristic	Category	Frequency	Percentage
Child's Age	Early Childhood (< 6 years)	71	41.8%
	School Age (6-12 years)	67	39.4%
	Adolescent (13-17 years)	32	18.8%
Sex	Male	121	71.2%
	Female	49	28.8%
Residence	Urban	98	57.6%
	Rural	72	42.4%
Address	Najaf	81	47.7%
	Karbala	50	29.4%
	Babylon	39	22.9%
Father's Education Level	University or higher	56	32.9%
	Secondary school graduated	42	24.7%
	Middle school graduated	38	22.4%
	Primary school graduated	19	11.2%
	Do not read/write	15	8.8%
Mother's Education Level	University or higher	55	32.4%
	Primary school graduated	41	24.1%
	Secondary school graduated	34	20.0%
	Middle school graduated	30	17.6%
	Do not read/write	10	5.9%

Table No. 2: Anthropometric Measurements and Clinical Profile (N = 170)

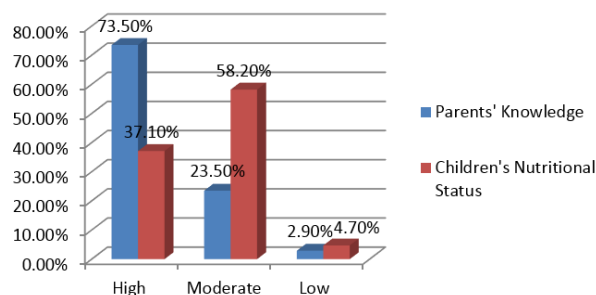
Characteristic	Category	Frequency	Percentage
Body Mass Index (BMI)	Underweight (< 5 th %)	64	37.6%
	Normal weight (5 th – 85 th %)	70	41.2%
	Overweight (> 85 th %)	36	21.2%
Type of Cancer	Acute Lymphoblastic Leukemia	129	75.9%
	Lymphoma	9	5.3%
	Neuroblastoma	8	4.7%
	Breast cancer	6	3.5%
	Others (e.g., Wilms tumor, Thyroid, etc.)	18	10.6%
Duration since Diagnosis	< 6 months	72	42.4%
	6 - 12 months	60	35.3%
	13 - 24 months	20	11.8%
	> 24 months	18	10.6%
Main Meals per Day	1 meal	5	2.9%
	2 meals	25	14.7%
	3 meals	130	76.5%
	4-5 meals	10	5.9%
Snacks per Day	0 snacks	10	5.9%
	1 snack	42	24.7%
	2 snacks	101	59.4%
	3-4 snacks	17	10.0%

Table No. 3: Responses of Parents regarding Knowledge and their Children's Nutritional Status (N = 170)

Domain	Mean Score	Std. Deviation	Interpretation
Knowledge (K)	2.53	0.36	High Knowledge
Appetite & Intake (A)	2.46	0.31	Good Intake
Dietary Preferences (D)	2.41	0.50	Varied Diet
Side Effects (S)	1.87	0.34	Occasional Symptoms
Behavioral Factors (B)	2.42	0.38	Positive Support

Cutoff points: Low=1-1.66, Moderate= 1.67-2.33, High= 2.34-3

Table 3 show parents had good nutritional knowledge ($M = 2.53$, $SD = 0.36$) in the Knowledge domain. high mean scores were obtained for Appetite and Intake ($M = 2.46$, $SD = 0.31$) indicating good dietary intake among the children. Dietary Preferences domain ($M = 2.41$, $SD = 0.50$). The Behavioral Factors ($M = 2.42$, $SD = 0.38$) showed positive aspects. The lowest mean score was found on the Side Effects domain ($M = 1.87$, $SD = 0.34$).



Cutoff points: Low=1-1.66, Moderate= 1.67-2.33, High= 2.34-3

Figure No. 1: Overall Assessment of Parents' Knowledge and their Children's Nutritional Status

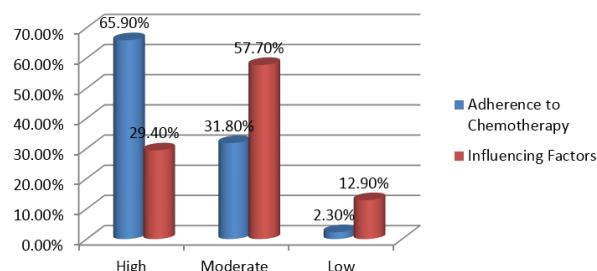
Figure 1 indicate a high percentage of parents (73.5%) who have High Knowledge about nutritional needs, but very few children (37.1%) were at High Nutritional Status level.

Table No. 4: Association of Demographic and Anthropometric Factors with Overall Assessments of Parents' Knowledge and their Children's Nutritional Status (N = 170)

Factor	Variable	χ^2	df	p-value	Significance
Parents' Knowledge	Child's Age	3.89	4	0.421	NS
	Sex	3.25	2	0.196	NS
	Residence	4.15	2	0.125	NS
	Father Education	11.41	4	0.022	S
	Mother Education	16.82	4	0.002	HS
	BMI Category	3.78	4	0.436	NS
Children's Nutritional Status	Child's Age	5.12	4	0.815	NS
	Sex	0.41	2	0.815	NS
	Residence	2.31	2	0.314	NS
	Father Education	4.20	4	0.380	NS
	Mother Education	1.06	4	0.901	NS
	BMI Category	2.51	4	0.644	NS

S = Significant ($p < 0.05$); HS = Highly Significant ($p < 0.01$); NS = Non-Significant

Table 4 show there is a strong association between parental knowledge and their education levels, especially the mother's education ($X^2 = 16.82$, $p = 0.002$) and the father's education ($X^2 = 11.41$, $p = 0.022$), there is no statistically significant association between the nutritional status of children and all the measured demographic and anthropometric variables ($p > 0.05$).



Cutoff points: Low=1-1.66, Moderate= 1.67-2.33, High= 2.34-3

Figure No. 2: Overall Assessment of Adherence and Influencing Factors

As shown in Figure 2, the study variable, chemotherapy adherence, was classified as high (2.51 ± 0.47), with 65.9% of participants demonstrating high adherence to treatment plan and medication regimen.

Contributing factors were moderate level (1.95 ± 0.66), and the proportion of children classified as high (low resistance) 29.4%.

Table No. 5: Association of Adherence and Influencing Factors (N = 170)

Factor	Variable	χ^2	df	p-value	Significance
Adherence to Chemotherapy	Child's Age	2.65	4	0.214	NS
	Sex	0.79	2	0.672	NS
	Residence	4.64	2	0.098	NS
	Mother Education	6.64	4	0.156	NS
	Father Education	3.81	4	0.432	NS
	BMI Category	1.18	4	0.881	NS
Influencing Factors	Child's Age	18.43	4	0.001	HS
	Sex	1.74	2	0.418	NS
	Residence	2.98	2	0.225	NS
	Mother Education	12.51	4	0.014	S
	Father Education	7.34	4	0.119	NS
	BMI Category	2.97	4	0.563	NS

S = Significant ($p < 0.05$); HS = Highly Significant ($p < 0.01$); NS = Non-Significant

Table 5 shows that adherence to chemotherapy is statistically similar across all demographic and anthropometric groups ($p < 0.05$). However, the child's age (chi-squared = 18.43, $p = 0.001$) and the mother's education level (chi-squared = 12.51, $p = 0.014$) are strongly associated with the influencing factors.

DISCUSSION

A significant sex imbalance (71.2% male) and a high proportion of early-childhood cases (41.8%) were observed, consistent with recent epidemiological trends among children with cancer in Al-Najaf governorate¹. Children with hematological malignancies such as ALL also showed more pronounced nutritional derailment than those with solid tumors, likely reflecting the systemic disease burden and the intensity of induction chemotherapy⁷.

Regarding nutritional status, 41.2% of children had a normal BMI while 37.6% were underweight, a pattern broadly comparable to, though somewhat less severe than, cohorts undergoing induction chemotherapy for acute leukemia elsewhere⁸, and contrasting with reports of rising overweight/obesity in some European ALL populations⁹. This supports the view that malnutrition in pediatric oncology is not a fixed baseline but a progressive complication that can worsen after induction³. Traditional weight monitoring may also mask nutritional failure in children with large tumor masses or treatment-related edema; MUAC and triceps skinfold thickness are therefore recommended as more sensitive early indicators of muscle and fat loss¹⁰.

Although parents reported high nutritional knowledge ($M = 2.53$) on a 3-point scale, this awareness did not consistently translate into practice, as reflected by the "Occasional Symptoms" score for side effects ($M = 1.87$)⁴. This gap is consistent with the broader Iraqi context, where maternal education and healthcare-provider contact are closely linked to nutritional knowledge¹¹. Even when macronutrient intake appears adequate, chemotherapy-related nausea, vomiting, and taste alteration can still compromise micronutrient adequacy¹⁰, and the absence of structured dietary counselling at discharge may contribute to ongoing "home-based nutritional failure"³.

Chemotherapy adherence was high overall ($M = 2.51$) and was not significantly associated with demographic or anthropometric factors¹². However, the psychological and sensory barriers domain which capturing fear, anxiety, and treatment aversion was significantly associated with the child's age ($p = 0.001$) and maternal education ($p = 0.014$), aligning with evidence that behavioral and psychosocial interventions, rather than education alone, are often needed to address adherence rooted in fear or distress¹³. More broadly, parental education and socioeconomic status shape the quality of provider communication and, in turn, adherence to outpatient regimens¹⁴, a pattern

echoed in large Nordic registry studies linking parental socioeconomic status to childhood cancer survival and mortality¹⁵. Taken together, poor nutritional status remains a reliable predictor of adverse outcomes including greater infection risk, reduced treatment tolerance, and higher rates of dropout or delay¹⁶.

CONCLUSION

The nutritional challenges faced by children are moderate and the knowledge of parents and their adherence to treatment is generally good in the Middle Euphrates region. Educational strategies for mothers are important, not only for nutritional awareness, but also to remove psychological barriers for adherence to chemotherapy. Enhancing nutritional counselling and psychosocial support services can help to enhance the treatment in children with cancer.

Author's Contribution:

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Agreement to accountable for all aspects of work:	All the above authors

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