Nutritional Status in Patients Newly Diagnosed with Malignancy in Child's Central Teaching Hospital in Baghdad

Dhuhaa Jaasim Mohammed, Matheel Mohammed Jafer, Faten Hameed Rasheed, Allawi Noor Hussien AL-Janabi

ABSTRACT:

BACKGROUND:

Malnutrition is a major problem in children with cancer, Nutritional assessment is an essential component of the history and physical examination. Malnutrition is an unspecific term used to define an inappropriate nutritional condition that is characterized either by a deficiency or an excess of energy, protein, and other nutrients.

AIM OF THE STUDY:

To evaluate the nutritional status of patients newly diagnosed with malignancy, and to show the correlation between malnutrition and different age, type of malignancy, duration of presentation.

PATIENTS AND METHODS:

Prospective study carried out on 150 patients between 2-15 years newly diagnosed with malignancy admitted to Child's Central Teaching Hospital for the period from 1st of April 2020 to 31st of January 2021, exclusion criteria was age less than 2years and patients who receive chemotherapy, nutritional status included weight for age, height for age, triceps skin fold thickness, mid upper arm circumference, Body Mass Index were calculated.

RESULTS:

150 patients &300 control, patients distributed as leukemia were 83 patients (55.3%), lymphoma were 30 patients (20%) and solid tumors were 37 patients (24.7%) , Regarding age and sex distribution, patient aged 2- 15 years mean male to female ratio is 1.25:1 , percentage of malnutrition is weight for age shows 63(42%), triceps skin fold thickness 40(26.6%), mid upper arm circumference 66(44%), Body Mass Index 66(44%) which is statistically significant for malnutrition between case and control except height for age which was not significant.

CONCLUSION:

In this study, there is a high prevalence of malnutrition among cancer patients at time of diagnosis.

KEY WORDS: malnutrition, malignancy, anthropometric measures.

INTRODUCTION:

Malnutrition with malignancy

Malnutrition is a major problem in children with cancer. The reported incidence varies from 6% to 50%, depending upon the nature of the malignancy, the size, location and stage of the disease [1,2,3].

Malnutrition in children with cancer has been considered part of the symptom complex of progressive and active cancer [4]. Only recently has it been recognized as an isolated problem, quite apart from cancer, which must be identified and managed like other complications, such as infection and cytopenias.[5–7]

Malnutrition and nutritional depletion may furthermore be masked in children by edema due to corticosteroid treatment. [4]

Child's Central Teaching Hospital, Baghdad/ Iraq

Nutritional assessment is an essential component of the history and physical examination of children with cancer. Protein-energy malnutrition frequently complicates the clinical course of malignant disease in childhood. Nutritional status is an important factor in treatment response and chemotherapy tolerance.[4]

Nutritional assessment should be at time of diagnosis and then to be carried out longitudinally during treatment as well as survivorship [8,9].

To define nutritional status, weight and height usually are plotted on standardized growth charts and then converted to Z-scores [10].

The aim of our study is to evaluate the nutritional status of patients newly diagnosed with malignancy at Child's Central Teaching Hospital, and to show the correlation between malnutrition and different age, type of malignancy, duration of presentation.

PATIENT AND METHOD:

This is a prospective study that enrolled a total of 150 pediatric patients aged 2-15 years who had been newly diagnosed with malignancy in Child's Central Teaching hospital of pediatrics oncology ward over a period of 10 months from 1st of April 2020 until 31st of January 2021.

Exclusion criteria, Patients less than 2 years old, Patients received chemotherapy.

Control was taken from healthy children, with no chronic illness from kindergarten, primary and secondary schools with the same age and sex.

All patients underwent full assessment of growth parameters including (weight, height, triceps skin fold thickness, mid upper arm circumference, and body mass index).

An inquiry sheet was filled including age, sex, residence, monthly income, diagnosis, and duration of symptoms all were taken from patients at time of diagnosis before starting chemotherapy.

RESULTS:

The total number of study children was 450. They were divided into two main groups: Case group with malignant disease included 150 patients; 83 of them were diagnosed as leukemia, 37 were diagnosed with solid tumors and 30 were diagnosed as lymphoma, and control group included 300 healthy children.

General characteristics

The distribution of study patients by general characteristics is shown in table (1). Study patients' age was ranging from 2 to 15 years with a mean of 6.84 years and standard deviation (SD) of ± 3.74 years. The highest proportion of patients in lymphoma and control groups was aged between 5 - 9 years (50.7% and 36.7% respectively), while 48.2% of patients in leukemia group were aged < 5 years.

Regarding gender, proportion of females was higher than males in leukemia and control groups (51.8% and 55.3% respectively); while 56.8% of solid group and 73.3% of lymphoma group were males , regarding total malignancies (55%) male (45%) female.

Table 1: Distribution of study groups by general characteristics.

Variable	Study Group			
	Leukemia n= 83(%)	Solid n= 37(%)	Lymphoma n= 30(%)	Total (%) n= 150(%)
Age (Year)				
< 5	40 (48.2%)	16 (43.2%)	5 (16.7%)	61 (40.6%)
5 - 9	33 (39.8%)	16 (43.2%)	18 (60.0%)	67 (44.6%)
≥ 10	10 (12.0%)	5 (13.5%)	7 (23.3%)	22 (14.6%)
Gender				
Male	40 (48.2%)	21 (56.8%)	22 (73.3%)	83 (55.3%)
Female	43 (51.8%)	16 (43.2%)	8 (26.8%)	67 (44.6%)

Parameters of nutritional status

Between case and control groups

The comparison between case and control groups by z-score for parameters of nutritional status is shown in table (2). We noticed that the means of standard deviations of z scale for all parameters of nutritional status were significantly lower ($P < 0.05$) in patients diagnosed with malignancy than that in controls except for height.

Table 2: Comparison between cases and control groups by z-score for parameters of nutritional status, percentage of malnutrition, normal, overnutrition of patients with malignancy.

Z - Score (SD)	Study group		P- Value						
	Case Mean ± SD	Control Mean ± SD		Malnutrition No. (%)		Normal No. (%)		Over-nutrition	
Weight	- 0.4 ± 1.3	0.63 ± 1.1	0.001	63	(42%)	84	(56%)	3	(2%)
Height	- 0.002 ± 1.3	0.24 ± 1.2	0.265	52	(34.6%)	95	(63.3%)	3	(2%)
Triceps Skin Fold Thickness (TSFT)	0.34 ± 1.1	2.17 ± 0.8	0.001	40	(26.6%)	110	(73.3%)	0	(0%)
Mid upper Arm Circumference (MUAC)	- 0.57 ± 1.9	1.41 ± 2.0	0.001	66	(44%)	82	(54.6%)	2	(1.3%)
Body Mass Index (BMI)	- 0.7 ± 1.9	0.71 ± 1.0	0.001	66	(44%)	81	(54%)	3	(2%)

Between leukemia and control groups

The comparison between leukemia and control groups by z-score for parameters of nutritional status is shown in table (3). Means of standard deviations of z scale for weight, Triceps Skin Fold Thickness, mid upper Arm Circumference, and Body Mass Index were significantly lower ($P < 0.05$) in patients diagnosed with leukemia than that in controls.

No statistical significant difference ($P = 0.295$) in mean of standard deviations of z scale for height between leukemic patients and controls.

Table 3: Comparison between leukemia and control groups by z-score for parameters of nutritional status, percentage of malnutrition, normal, overnutrition in patients with leukemia.

Z - Score (SD)	Group		P- Value	percentage					
	Leukemia Mean ± SD	Control Mean ± SD		Malnutrition No. (%)		Normal No. (%)		Over-nutrition No. (%)	
Weight	- 0.38 ± 1.3	0.63 ± 1.1	0.001	41	49.3%	40	48%	2	2.4%
Height	0.1 ± 1.1	0.24 ± 1.2	0.295	29	34.9%	54	65%	0	0%
Triceps Skin Fold Thickness (TSFT)	0.25 ± 0.9	2.17 ± 0.8	0.001	24	28.9%	59	71%	0	0%
Mid upper Arm Circumference (MUAC)	- 0.48 ± 1.9	1.41 ± 2.0	0.001	40	48%	41	49%	2	2.4%
BMI	- 0.79 ± 2.1	0.71 ± 1.0	0.001	43	51.8%	39	46.9%	1	1.2%

Between solid and control groups

Means of standard deviations of z scale for all parameters of nutritional status were significantly lower ($P < 0.05$) in patients diagnosed with solid malignancy than that in controls except for height when the result didn't show significant difference ($P= 0.234$) in z scale between them as shown in table (4).

Table 4: Comparison between solid and control groups by z-score for parameters of nutritional status, percentage of malnutrition, normal, overnutrition in patients with solid tumors.

Z - Score (SD)	Group		P- Value	percentage					
	Solid Mean ± SD	Control Mean ± SD		Malnutrition No. (%)		Normal No. (%)		Over-nutrition No. (%)	
Weight	- 0.28 ± 1.5	0.63 ± 1.1	0.001	12	32%	24	64.8%	1	2.7%
Height	- 0.003 ± 1.6	0.24 ± 1.2	0.234	11	29.7%	23	62%	3	8%
Triceps Skin Fold Thickness (TSFT)	0.4 ± 1.6	2.17 ± 0.8	0.001	11	29.7%	26	70.2%	0	0%
Mid upper Arm Circumference (MUAC)	- 0.78 ± 2.2	1.41 ± 2.0	0.001	15	40.5%	22	59.4%	0	0%
BMI	- 0.61 ± 2.0	0.71 ± 1.0	0.001	13	35%	24	64%	0	0%

Between lymphoma and control groups

Table 7 shows the comparison between lymphoma and control groups by z-score for parameters of nutritional status. Means of standard deviations of z scale for all parameters of nutritional status were significantly lower ($P < 0.05$) in patients diagnosed with lymphoma than that in controls as shown in table (5) except for Height didn't show significant difference P value (0.223) .

Table 5: Comparison between lymphoma and control groups by z-score for parameters of nutritional status, percentage of malnutrition, normal, overnutrition in patients with lymphoma.

Z - Score (SD)	Group		P- Value	percentage					
	Lymphoma Mean ± SD	Control Mean ± SD		Malnutrition No. (%)		Normal No. (%)		Over-nutrition No. (%)	
Weight	- 0.6 ± 1.0	0.63 ± 1.1	0.001	10	33%	20	66%	0	0%
Height	- 0.04 ± 1.3	0.24 ± 1.2	0.223	12	40%	18	60%	0	0%
Triceps Skin Fold Thickness (TSFT)	0.52 ± 0.8	2.17 ± 0.8	0.001	5	16.6%	25	83.3%	0	0%
Mid upper Arm Circumference (MUAC)	- 0.55 ± 1.6	1.41 ± 2.0	0.001	11	36.6%	19	63.3%	0	0%
BMI	- 0.57 ± 1.4	0.71 ± 1.0	0.001	10	33%	18	60%	2	6.6%

(Correlation between age and duration of symptoms of malignancy with parameters of nutritional status)

Statistically significant weak positive correlations were detected between age and z – score of TSFT (r= 0.258, P= 0.001), MUAC (r= 0.235, P= 0.001), and BMI (r= 0.155, P= 0.001).

Statistically significant weak negative correlation was detected between age and z – score of height. (r= - 0. 136, P= 0.004).

No statistical significant correlation (P= 0.299) was detected between age and z – score of weight.

Regarding duration of malignancy, there were significant weak negative correlations with weight (r= - 0.168, P= 0.04) and MUAC (r= - 0.171, P= 0.037).

No statistical significant correlations (P ≥ 0.05) between duration of malignancy and all other parameters as shown in table (6).

Table 6: Correlation between age and duration of malignancy with parameters of nutritional status.

Z - Score (SD)	Age (Year)		Duration of symptoms of malignancy (Day)	
	r	P - Value	r	P - Value
Weight	0.049	0.299	- 0.168	0.04
Height	- 0.136	0.004	- 0.138	0.093
TSFT	0.258	0.001	- 0.016	0.847
MUAC	0.235	0.001	- 0.171	0.037
BMI	0.155	0.001	- 0.093	0.257

DISCUSSION:

This study included 150 patients distributed as leukemia 83 case (55.3%) lymphoma 30 patient (20%) and solid tumors 37 case (24.7%) which Comparable with other study like Illias study in Casablanca[4] there were 58% hematological malignancies 38% solid tumors and 4% CNS tumors. Also comparable with study in Brazil by Karina Viani[11] which included 57% with hematological malignancies, 27% solid tumors and 16% was with CNS tumors, but not comparable with Naurumon Densupsoontor in Thailand [12], which included 50% solid cancer, 45.1% had hematological cancer.

Regarding age and sex distribution, this study included patient aged 2- 15 years mean 6.84 years + 3.7 years. The highest proportion of patients in lymphoma was aged 5 - 9 years (36.7%), while patients with leukemia group aged < 5 years (48.2%). The sex distribution was males 83 (55%) and females were 67 (45%), leukemia included 40 (48.2%) males, 43 (51.8%) females, lymphoma included males 22(73.3%) females 8 (26.8%), solid tumors 21(56.8%) males and 16(43.2%) were females. In comparable with Rula Ahmed in Basra[13], this study included patients their age range from (1 – 14) years mean age was (5.4 + 3.4 SD), 16 were males and 14 were females reveal that 16 (53.3%) of patients were males and 14 (46.6%) in the study were females more than (60%) of patients lies in the age group (1-5) for both males and females. According to Illias

in Casablanca[4], the patients included in this study were aged (1-18 years) with mean age was 7 years, and sex distribution was (60%) males of total cases and (40%) females while hematological malignancies shows 24 (41.3%) females and 34(58.6%) were males, solid tumors were 24(63.1%) males and females were 14(36.8%) according to Karina Viani in Brazil [11] patient with cancer diagnosis aged 3 months to 18 years. In comparison to Narumon in Thailand [12], patients included in this study were aged (1 month to 14 years and 11 months the mean age was 6 years and 11 months), sex predilection was of total cases 56 (68.2%) were males and 26 (31.7%) were females distributed as hematological cancer 26 patients were males (70.2%) and females 11 (29.7%), solid cancers were 27 males (65.8%) and females were 14 (34.1%). The difference in age & gender distribution may reflect the incidence of different types of malignancy according to age and gender.

According to hematological malignancies, leukemia in this study shows percentage of malnutrition was weight/age (49.3%) height/age (34.9%), mid upper arm Circumference (48%), Body mass index (51.8%) which is comparable to Rula Ahmed at Basra [13] study which shows (50%) underweight, and (46.7%) of total newly diagnosed ALL are malnourished according to Body mass index and 10 patient (33.3%) are malnourished according to mid upper arm Circumference. Similar study in Casablanca by Illias [4] shows hematological malignancy (leukemia and lymphoma) according to weight/age which shows (39.6%) height/age (20.7%) Body mass index (36.2%) Triceps Skin Fold Thickness (46.5%) mid upper arm Circumference (32.7%) patients are malnourished, also there is another study in Brazil by Karina Viani [11] regarding hematological tumors found patients with lymphoma and leukemia have Body mass index (17%), mid upper arm Circumference (24%) are undernourished, while in this study we found patients with hematological malignancies are malnourished according to weight/age (45%) height/age (36%) Body mass index (47%) Triceps Skin Fold Thickness (25.6%) mid upper arm Circumference (45%) are undernourished which is statistically significant and may reflect the low socioeconomic status of most of our patients with the unstable condition of our country, according to Narumon in Thailand [12] found patient with hematological malignancies with weight/age (35%) Triceps Skin Fold Thickness (30.5%), while we found leukemia and lymphoma patients weight/age (45%) Triceps Skin Fold Thickness (25.6%). So this study shows higher prevalence of malnutrition; these results may reflect patients at a high nutritional risk due to reduced dietary intake and symptoms of disease itself such as nausea and vomiting, decreased appetite which leads to the significant malnutrition before diagnosis is made.

Regarding solid tumors in comparison with Illias (4)which found weight/age (31%) , height/age (18.4%), in this study we found weight/age (32%) height/age (29.7%) according to Body mass index Illias found (28.9%) are underweight while Triceps Skin Fold Thickness (52.6%) mid upper arm Circumference (44%), in our study, we found Body mass index (35%) Triceps Skin Fold Thickness (29.7%), mid upper arm Circumference (40.5%) which is comparable, regarding Karina VIANI in Brazil [11] shows Body mass index (15%), mid upper arm Circumference (23%) while we found patients with solid tumors have Body mass index (35%) and mid upper arm Circumference (40.5%) which is highly significant, these results are due to delayed diagnosis in some patients with poverty of most of our patients. According to Naurumon in Thailand [12] found patients with solid tumors have weight/age (34%) Triceps Skin Fold Thickness (21%) while we found weight/age (32%) Triceps Skin Fold Thickness (29.7%) which is comparable.

We found that Measurement of arm anthropometry including mid upper arm Circumference and Body mass index detected a higher prevalence of malnutrition in most of malignancies than the conventional weight and height based parameters especially in Wilms tumor and neuroblastoma. This can be explained by the fact that the presence of large tumor mass, edema or ascites can mask the effect of nutritional depletion on body weight, when faced with nutritional restrictions, the body first utilizes its nutritional reserves stored in the form of skeletal muscle protein and fat reflected by an early decline in mid upper arm Circumference and Triceps Skin Fold Thickness values.

CONCLUSION:

1- High prevalence of malnutrition in patients with cancer who are newly diagnosed including Weight, Triceps Skin Fold Thickness and Mid Upper Arm Circumference, and Body Mass Index
2- Height parameter is the last and least one to be affected in hematological and solid malignancies.

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