# Evaluating nutritional status of children with Cancer (Acute lymphoblastic leukemia – Acute myeloid leukemia) using tube Feeding

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**Research Journal Specific Education**

**Faculty of Specific Education**

**Mansoura University**

***ISSUE NO. 48, OCTOBER. 2017***

**مجلة بحوث التربية النوعية - جامعة المنصورة**

**العدد الثامن والأربعون - أكتوبر ٢٠١٧**

# Evaluating nutritional status of children with Cancer (Acute lymphoblastic leukemia - Acute myeloid leukemia) using tube Feeding

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***Abstract***

The main objective of this study is to Evaluating nutritional status of children with Cancer (Acute lymphoblastic leukemia - Acute myeloid leukemia) using tube Feeding. The study included 36 Egyptian children diagnosed ALL and AML which is the most common form of childhood cancer leukemia. The study continued for two months. All children were matched for age (6.92+1.05) content of 50% boys and 50% girls. Data were collected about Anthropometric measurements, nutritional status and medical tests. The results showed that BMI were indicated normal status and nutritional status score was even more than 100% of Reference Range. for ALL and AML cases. Hb & Lymphoblast were higher in AML than ALL. No difference found in the result between ALT and AST. Urea level of AML and ALL Children were in high level, but AML children were more than the upper limit of the Reference Range. The food intakes in the hospital compared with DRI were more than 100% while the other nutrients were less than DRI, deficiency was particularly evident for selenium (72.14% of DRI), followed by Vit.A (75.75% of DRI) and Vit.C (80.80% of DRI) .

**Key Words:** Acute lymphoblastic leukemia - Acute myeloid leukemia -Tube feeding- Dietary Reference Intakes .

***INTRODUCTION :***

Leukemia remains the most common type of pediatric cancer (<15 years old), and represents 30% of all childhood cancers **(Hunger and Mullighan, 2015)**. Acute leukemia (AL) accounts for more than 95% of all childhood leukemia cases, including acute lymphoblastic leukemia (ALL)

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(78%) and acute myeloid leukemia (AML) (16%) **(Ries *et al*., 1999 and Puumala *et al*., 2013).**

Nutritional status, represented by body composition, is an important consideration in pediatric clinical conditions as it can impact clinical outcomes factors such as infections, quality of life, long term comorbidities and survival. **(Brinksma *et al*., 2015).**

To improve outcomes for pediatric patients, it is important to understand the impact that different conditions may have on nutritional status to allow malnutrition to be effectively treated or potentially prevented. While anthropometry can provide a general indication of a child's growth status or body size in relation to a reference population. **(Loeffen *et al*., 2015).**

Consuming a healthy diet aids in achieving and maintaining a healthy weight and provides nutrients that may aid in preventing cancer, as well as avoidance of foods that may directly or indirectly (through their role in contributing to empty calories) increase cancer risk. **(Weinhouse *et al*., 2010).** Those who consume a healthy diet tend to weigh less and have a lower overall cancer incidence. The ACS considers a healthy diet as one that is high in vegetables, fruits, and whole grains; low in red and processed meats, refined grains, sugar, and alcohol; and relies on food, instead of supplements as a source of nutrients. **(Kushi *et al*., 2012).**

The enteral feeding should be used for nutritional support whenever possible due to the benefits of enteral feeding . Up to 40–70% of children with chronic illness are estimated to have feeding issues. Gastric feeding via a naso-gastric (NG) tube is usually the initial approach when the oral route is not suitable. **(Farrelly *et al*., 2016).**

Tube feeding, via a nasogastric tube may be an efficient way of nutritionally supporting patients with extreme anorexia or dysphagia caused by a head and neck tumor or with an or pharyngeal-esophageal mucositis due to radiation therapy and/or chemotherapy. to achieve good results in allowing the proper completion of the oncologic therapy. **(Sharp *et al*., 2016).**

## *MATERIALS AND METHODS:*

The research sample of Present Work was taken from the Children's at Cairo Cancer Hospital. The sample size amounted to (36) children, Group 1 are (18) children diagnosed with Acute lymphoblastic leukemia (ALL) and Group 2 are (18) children diagnosed with Acute myeloid leukemia (AML), both of them are using tube Feeding and have been giving food from Menu of the hospital.

### *Biochemical Analysis:*

**Blood and liver glucose levels were determined by the method of** (Trinder. 1959)**, using Stanbio enzymatic glucose procedure. Serum total lipids were determined in mg/dl according to the method described by** (Kinight . 1977).

Serum triglycerides (T.G) were determined as mg/dl according to the method described by( **Fossati and Principe . 1982).**

Serum total cholesterol was determined as mg/dl % according to the colorimetric method of **(White *et al*., 1970).**

Serum high density lipoprotein cholesterol (HDL-c) was determined as mg/dl according to the method described by (**Richmond. 1973).**

Serum low density lipoprotein cholesterol (LDL-c) was calculated as mg/dl according to **(Castelli *et al*., 1977)** equation:

LDL - c Concentration (mg/dl) = (Total Cholestesterol) - (HDL - c) - (VLDL - c)

Serum Very low density lipoprotein cholesterol (VLDL-c) was calculated as mg/dl according to **(Srivastava *et al*.,2002)** equation:

$$\text{VLDL - C Concentration mg/dl} = \frac{TG}{5}$$

Serum Glutamate Oxaloacelate Transaminase (S. Got) or (AST) was determined as unit/l according to **(Chawla. 2003).**

Serum Glutamate Pyruvate Transaminase (SGPT) or (ALT) was determined as unit/l according to **(Srivastava *et al*., 2002).**

Serum urea was determined as mg/dl according to the method described by **(Malhotra 2003).**

Serum creatinine was determined as mg/dl according to **(Chary and Sharma. 2004).**

Colorimetric method was used to determine uric acid according to the method by **(Ohkawa *et al.*, 1979).**

Nutrition status score was calculated as follows:

$$\text{Nutritional statues score (Gomez)} = \frac{Current\ Weight}{IBW} \times 100$$

**(Serajul *et al.*, 2008)**

Ideal Body Weight for Children was calculated as follows :

$IBW = (Age * 2) + 8$ **(Geoffrey. 1995).**

***Statistical Analysis:***

Statistical Analysis were performed by using computer program statistical package for social (SPSS) and compared with each other using the suite tests. All obtained results were tabulated. Statistical Analysis has been achieved using IMP-P-C computer by SPSS, program **(SPSS, 1998).**

***Results and Discussion:***

Table (1) shows Demographic, anthropometric and Nutritional Status score data of different studied patient. The Weight, Height and BMI were No difference found in the results between them. Nutritional Status Score was even more than 100% of Reference Range for ALL and AML patient, also Body fat was more than the Reference Range, indicating for better status. Nutritional status, represented by body composition, is an important consideration in pediatric clinical conditions as it can impact clinical outcomes factors such as infections, quality of life, long term comorbidities and survival. **(Bechard. *et al*., 2016).** Also **(Brinksma *et al*., 2015).** showd that Optimal nutritional status is vital in children with clinical conditions to improve short term clinical outcomes and long term health.

Table (2) shows CBC and glucose of different studied patient.The hemoglobin mean value (g/dL) was little bit high for AML patient (11.5±0.33) and for ALL patient was (11.4±0.32) but both of them in the normal Reference Range. WBCs status for AML patient was (7±0.63)

higher than ALL patient (6.4±0.37) also Lymphoblasts for AML patient was(6505.6±3.28) higher than ALL patient (6455.6±3.11), this may indicate for the different chemotherapy protocol they use. Anemia is a frequently encountered complication in cancer, and is associated with fatigue and reduced quality of life. Retrospective analyses of data from patients with hematological malignancies and solid tumors provide evidence that a low baseline hemoglobin (Hb) level is a prognostic factor for poor outcome. **(Caro *et al*., 2011).**

Table (3) shows Lipid profile. All values quantified for lipid profile paranters (TC, TG, VLDL, LDL and also HDL) No difference found in the results between ALL patient and AML patient. Also all values were in the normal Reference Range. In recent years, MS-based lipidomic approaches have been increasingly employed in the search for lipid biomarkers as diagnostic tools for different diseases. Lipids are the building blocks of membranes which form the barriers between the cells. They are involved in signal transduction and nutrient exchange, and establish the contact sites during host-pathogen interactions. Alterations in lipid profiles are used for the diagnosis of hereditary disorders of lipid metabolism including Gaucher disease and acquired disorders such as diabetes. **(Hu *et al*., 2009).**

Table (4) shows the activity of liver enzymes. The ALT mean value of children with Acute myeloid leukemia cancer (AML) (20.2±3.28) was higher than the upper ALT mean value for children with Acute lymphoblastic leukemia (ALL) (17.6±1.82) , also AST mean value of children with Acute myeloid leukemia cancer (AML) (21.1±2.76) was higher than the upper AST mean value for children with Acute lymphoblastic leukemia (ALL) (19.3±2.54). but both of them were in the normal Reference Range. Liver function biomarkers (gamma-glutamyl transferase, GGT; alanine aminotransferase, ALT; aspartate aminotransferase, AST; alkaline phosphatase, ALP; total bilirubin) are used in clinical diagnosis of various disorders, including those related to liver function impairment and damage. **(Hall *et al*., 2012**). The normal level of alanine aminotransferase (ALT) or aspartate aminotransferase (AST) are indications of normal functioning of liver cells and normal level of alkaline

phosphatase (ALP) shows that there is sufficient level of albumin for the production of protein. **(Rahmioglu *et al*., 2009).**

Table (5) shows the kidney function parameters. Creatinine and Uric acid levels were No difference found in the results between children with Acute myeloid leukemia cancer (AML) and children with Acute lymphoblastic leukemia (ALL), while Urea mean levels (18.3±2.78) were more than the upper limit of Reference Range for children with Acute myeloid leukemia cancer (AML), also Urea mean levels (16.6±4.23) for children with Acute lymphoblastic leukemia (ALL) were near the upper limit of Reference Range. calling for more medical care for children with cancer to avoid losses in the renal function. As many chemotherapy agents undergo renal clearance and require dose adjustment with renal insufficiency. **(Chawla *et al*., 2016).** They state that cancer patient should be re-evaluated for resolution of kidney function and receive good care. **(Chertow *et al*., 2005).**

Table (6) shows food intake. The percentage of Energy, Carbohydrate, Total Protein and Total Fat compared with DRI for children with Acute myeloid leukemia cancer (AML) and children with Acute lymphoblastic leukemia (ALL) were more than the DRI. This indicated that hospital menu was good. While the percentage of Vit. A, Vit. C and Selenium were less than the DRI for children with Acute myeloid leukemia cancer (AML) and children with Acute lymphoblastic leukemia (ALL). This calls for the challenge to feed patients with possibly more nutrients concentrated food, along with awareness programs. "Nutrition" is defined as "the science of food ... in relation to health and disease" **(WHO, 2002).** "Food" is not specifically defined by US agencies. In general, it is a substance that enters the stomach, provides energy, and/or sustains normal metabolism. Minimum daily requirements of food categories (proteins, elements, and vitamins), now called Dietary Reference Intake amounts, have been established **(Food and Nutrition Board, 2010).**

**Table (1) :** Demographic, anthropometric and Nutritional Status score and body fat data for children with cancer Acute lymphoblastic leukemia (ALL) and Acute myeloid leukemia (AML). Result are expressed as (Mean ± SD).

| Parameter | children with Cancer | | |
|---|---|---|---|
| | ALL 4-8y (N=18) Mean ± SD | AML 4-8y (N=18) Mean ± SD | Ref. Range |
| Age (y) | 6.8±1.04 | 7±1.08 | **(4 - 8)** |
| Weight (kg) | 22.4±1.62 | 22.4±1.97 | **(16 - 24)** |
| Hight (m) | 1.1±0.09 | 1.1±.10 | **1.15** |
| BMI (kg/m2) | 19±3.69 | 19.3±3.27 | **(12.1 - 21.2)** |
| Nutritional Status Score % | 103.6±6.79 | 102.4±9.79 | **(90% - 100%)** |
| Body fat % | 19±5.40 | 19.2±4.71 | **15%** |

**Table (2):** CBC and glucose for children with cancer Acute lymphoblastic leukemia (ALL) and Acute myeloid leukemia (AML). Result are expressed as (Mean ± SD).

| Parameter | children with Cancer | | |
|---|---|---|---|
| | ALL 4-8y Mean ± SD | AML 4-8y Mean ± SD | Ref. Range |
| Hb (g/dL) | 11.4±0.32 | 11.5±0.33 | **(11.0 - 14.0)** |
| WBCs ({10} 3cell/ml) | 6.4±0.37 | 7±0.63 | **(4.5 - 10.5)** |
| Lymphoblasts | 6455.6±3.11 | 6505.6±3.28 | **(6000 - 9000)** |
| Lymphoblasts % | 6.5±0.31 | 6.5±0.33 | **(6 - 9)%** |
| Glucose (mg/dL) | 89.8±7.63 | 85.6±6.06 | **(70 - 110)** |

**Table (3) :** Lipid profile (Cholesterol, Triglycerides, HDL, LDL, VLDL and Atherogenic Index) for children with cancer Acute lymphoblastic leukemia (ALL) and Acute myeloid leukemia (AML). Result are expressed as (Mean ± SD).

| Parameter | children with Cancer | | |
|---|---|---|---|
| | **ALL 4-8y Mean ± SD** | **AML 4-8y Mean ± SD** | **Ref. Range** |
| Cholesterol (mg/dL) | 140.3±3.94 | 139.9±2.90 | **(135 - 200)** |
| Triglycerides (mg/dL) | 34.8±1.85 | 35.7±1.11 | **(20 - 150)** |
| HDL (mg/dL) | 58±3.28 | 60.2±2.61 | **(38 - 75)** |
| LDL (mg/dL) | 70.7±2.59 | 71±2.56 | **(64 - 130)** |
| VLDL (mg/dL) (Tr/5) | 6.9±0.98 | 7±0.91 | **(4 - 30)** |
| Atherogenic Index (AI) Ratio (LDL/HDL) | 1.2±0.07 | 1.2±0.07 | **(1.78 - 2.13)** |

**Table (4) :** Liver function {ALT(GPT) and AST(GOT)} for children with cancer Acute lymphoblastic leukemia (ALL) and Acute myeloid leukemia (AML). Result are expressed as (Mean ± SD).

| Parameter | children with Cancer | | |
|---|---|---|---|
| | **ALL 4-8y Mean ± SD** | **AML 4-8y Mean ± SD** | **Ref. Range** |
| ALT(GPT) (u/L) | 17.6±1.82 | 20.2±3.28 | **(7 - 40)** |
| AST(GOT) (u/L) | 19.3±2.54 | 21.1±2.76 | **(7 - 37)** |

**Table (5) :** Kidney function (Creatinine, Urea and Uric Acid) for children with cancer Acute lymphoblastic leukemia (ALL) and Acute myeloid leukemia (AML). Result are expressed as (Mean ± SD).

| Parameter | children with Cancer | | |
|---|---|---|---|
| | ALL 4-8y Mean ± SD | AML 4-8y Mean ± SD | Ref. Range |
| Creatinine (mg/dL) | 0.7±0.07 | 0.7±0.08 | **(0.3-0.9)** |
| Urea (mg/dL) | 16.6±4.23 | 18.3±2.78 | **(7-17)** |
| Uric Acid (mg/dL) | 3.8±0.56 | 3.9±0.42 | **(2-7)** |

**Table (6) :** Food intake (Energy, Carbohydrate, Total Protein, Total Fat, Vit. A , Vit. C, Vit. E and Selenium) for children with cancer Acute lymphoblastic leukemia (ALL) and Acute myeloid leukemia (AML). Result are expressed as (Mean ± SD).

| Parameter | children with Cancer | | | | |
|---|---|---|---|---|---|
| | ALL 4-8y | | AML 4-8y | | *DRI |
| | Mean ± SD | % | Mean ± SD | % | |
| Energy (kcal/day) | 1522.39±95.68 | 125.04 | 1507.58±141.91 | 123.82 | **1217.57** |
| Carbohydrate (g/d) | 209.33±13.16 | 125.1 | 207.29±19.51 | 123.88 | **167.33** |
| Total Protein (g/d) | 76.12±4.78 | 125.05 | 75.38±7.10 | 123.84 | **60.87** |
| Total Fat (g/d) | 42.29±2.66 | 127.07 | 41.88±3.94 | 125.83 | **33.28** |
| Vit. A (mg/d) | 304.48±19.14 | 76.12 | 301.52±28.38 | 75.38 | **400** |
| Vit. C (mg/d) | 20.30±1.28 | 81.19 | 20.10±1.89 | 80.4 | **25** |
| Vit. E (mg/d) | 6.92±0.43 | 98.86 | 6.85±.0.65 | 97.89 | **7** |
| Selenium (ug/d) | 21.75±1.37 | 72.49 | 21.54±2.03 | 71.79 | **30** |

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# تقييم الحالة الغذائية للأطفال المصابين بالسرطان (ابيضاض الدم الليمفاوى الحاد – ابيضاض الدم النخاعى الحاد) المعتمدين على التغذية الانبوبية.

خالد على شاهين * أحمد كريم سيد حسن*

## الملخص العربي

الهدف الرئيسى من هذه الدراسة هو تقييم الحالة الغذائية للاطفال المصابين بالسرطان (ابيضاض الدم الليمفاوى الحاد – ابيضاض الدم النخاعى الحاد) المعتمدين على التغذية الانبوبية. وشملت الدراسة ٣٦ طفل مصرى مصاب بالسرطان (وكان عدد المرضى من كل تشخيص ١٨ مريض، وكانت نسبة الاولاد ٥٠٪ ونسبة الفتيات ٥٠٪ ) . ويعتبر تشخيص (ابيضاض الدم الليمفاوى الحاد – ابيضاض الدم النخاعى الحاد) هو الشكل الأكثر شيوعا من أشكال سرطان الدم التى تصيب الأطفال. واستمرت الدراسة لمدة شهرين. وتتراوح اعمار الاطفال بين (٦,٩٢ ± ١,٠٥). وتم تجميع البيانات الخاصة بالمقاييس الجسمية والحالة الغذائية وكذلك التحاليل المعملية المتعلقة بالبحث. حيث اوضحت اهم النتائج بالنسبة للمقاييس الجسمية أن مؤشر كتلة الجسم كان يمثل الوضع الطبيعي، وكانت درجة مستوى الحالة الغذائية أكثر من (١٠٠٪) بالمقارنة مع المدى المرجعي بالنسبة لكل المرضى (ابيضاض الدم الليمفاوى الحاد – ابيضاض الدم النخاعى الحاد). وكانت نسبة Hb & Lymphoblast فى سرطان الدم من نوع ابيضاض الدم النخاعى الحاد أعلى بالمقارنة مع ابيضاض الدم الليمفاوى الحاد . ولم يظهر فرق فى نتيجة تحليل ALT و AST . وكان مستوى البولينا فى سرطان الدم من نوع ابيضاض الدم النخاعى الحاد و ابيضاض الدم الليمفاوى الحاد في مستوى عالى ، ولكن كان فى سرطان الدم من نوع ابيضاض الدم النخاعى الحاد أكثر من الحد الأعلى مقارنة مع المدى المرجعي. وكان المأخوذ من الغذاء في المستشفى مقارنة مع المرجع الغذائى للمأخوذ أكثر من (١٠٠٪) ، في حين كان المأخوذ من بعض العناصر الغذائية الأخرى أقل من المرجع الغذائى للمأخوذ ، حيث كشفت النتائج عن وجود نقص واضح بشكل خاص لكل من السيلينيوم وكانت نسبة الماخوذ من الغذاء هى (٧٢,١٤٪) بالمقارنة مع المرجع الغذائى للمأخوذ ، تليها نسبة المأخوذ من فيتامين أ حيث كانت (٧٥,٧٥٪) بالمقارنة مع المرجع الغذائى للمأخوذ وتليها نسبة المأخوذ من فيتامين ج حيث كانت(٨٠,٨٠٪) بالمقارنة مع المرجع الغذائى للمأخوذ.

الكلمات المفتاحية : ابيضاض الدم الليمفاوى الحاد - ابيضاض الدم النخاعى الحاد – التغذية الانبوبية – المأخوذ الغذائي .

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