

## **Nutritional Problems for Children under Five Years of Age with Leukemia**

Haydar Mohsin Abdulhussein, Abbas Ali AL-Kinani, Rasha Mohammed Jumaah,  
Ali Muhammad Qasim , Hashim Habeeb Hashim, Fadhil Abas Fadhil and  
Zahraa Nasser Abdel Hadi

- 1 Postgraduate student Iraqi at Community Health Techniques,
- 2 Specialist in public health , Wasit Health Department, Iraqi Ministry of Health.
- 3 Specialist in communicable diseases, Wasit Health Department, Iraqi Ministry of Health.
- 4 student at High Institute of Health Professions, Basra Health Department, Iraqi Ministry of Health.

### **Abstract:**

**Introduction** nutrition is a basic human need and a precondition to a healthy life. Nutrients that we get from consuming food have energetic effects on physical growth and development, maintenance of standard body function.

**Aim of study:** In this study we intend to assess the nutritional status of the children with acute leukemia and the malnutrition effect on the evolution of the disease.

**Methodology:** Data collection was conducted in February 2021. Each hospital was visited for 3 times a week for about 5 hours per day.

A special questionnaire form was prepared for the purpose of data collection for this study. It includes 2 parts, the first one consist of socio-demographic information of the studied population and the second part we use Questions about the type of nutritional problems and how to deal with them.

**Results:** Reveals to distribution type of leukemia to study sample were (75%) with ALL and (25%) were with AML. The highest percentage was in healthy weight (40%) (70.8% ALL, 29.2% AML), and followed by underweight were (23.3%) and overweight were (23.3%), the lowest percentage was at risk of overweight ( 13.4%).

**Conclusion:** Most of the children who suffer from leukemia and the development of the disease they have, the parents did not have sufficient care in terms of food or breastfeeding. In the early years there is a need to develop their awareness through educational programs.

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### **Introduction**

Nutrition is a basic human need and a precondition to a healthy life. Nutrients that we get from consuming food have energetic effects on physical growth and development, maintenance of standard body function, physical activity, and health. Our diet necessarily delivers all vital nutrients in the obligatory quantities. Necessities of essential nutrients vary according to age, gender, physiological status, and physical activity. Dietetic intakes are lower or higher than the body supplies can be principal to undernutrition (deficiency diseases) or over nourishment (diseases of affluence) respectively.( 1)

Leukemia is the most common childhood malignancy, accounting for approximately 31% of all cancers occurring in children younger than 15 years of age and 25% of cancers among those younger than 20 ( 2).

Children treated for leukemia underwent changes in nutritional status, as manifested by a reduction in growth, weight gain and weight losses. A child with newly diagnosed cancer appears to have the same average nutritional status as seen in the population from which the child come, if the diagnosis is made in a reasonably timely manner(4).

In the last decade, improved chemotherapy strategies for children with leukemia have resulted in a dramatic improvement in the survival rates. Malnutrition more often develops during intensive induction therapy but it less commonly apparent at diagnosis(5).

### **Leukemia:**

In leukemia, the normal bone marrow cells are replaced by large numbers of immature white blood cells, which leads to the destruction of the bone marrow and as a result, the number of platelets that normally help in the clotting process is reduced. A patient with leukemia suffers from frequent infections due to a weakened immune system, and these infections range from tonsillitis, mouth ulcers, or diarrhea to pneumonia or infections with opportunistic organisms. The number of red blood cells decreases, which leads to anemia, which in turn causes pallor and shortness of breath(6).

### **Types Of Leukemia:**

Leukemia is usually described either as "acute", which grows quickly, or "chronic", which grows slowly. The vast majority of childhood leukemia is acute, and chronic leukemias are more common in adults than in children. Acute leukemias typically develop and worsen quickly (over

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periods of days to weeks). Chronic leukemias develop over a slower period of time (months), but are more difficult to treat than acute leukemias (7) (8).

**Acute lymphoblastic:**

The most common form childhood leukemia is acute lymphocytic (or lymphoblastic) leukemia (ALL), which makes up 75-80% of childhood leukemia diagnoses(9)( 7). ALL is a form of leukemia that affects lymphocytes, a type of white blood cells which fights infection. When a patient has ALL, the bone marrow makes too many immature white blood cells and they do not mature correctly. These white blood cells also do not work correctly to fight infection. The white blood cells over-produce, crowding the other blood cells in the bone marrow(8)(10).

**Acute myelogenous:**

Another type of acute leukemia is acute myelogenous leukemia (AML). AML accounts for most of the remaining cases of leukemia in children, comprising about 20% of childhood leukemia"9". AML is cancer of the blood in which too many myeloblasts (immature white blood cells) are produced in the bone marrow. The marrow continues to produce abnormal cells that crowd the other blood cells and do not work properly to fight infection(11).

**Chronic myelogenous:**

Chronic myelogenous leukemia (CML) is a chronic leukemia that develops slowly, over months to years. CML is rare in children, but does occur(9). CML patients have too many immature white blood cells being produced, and the cells crowd the other healthy blood cells. A chromosome translocation occurs in patients with CML. Part of chromosome 9 breaks off and attaches itself to chromosome 22, facilitating exchange of genetic material between chromosomes 9 and 22. The rearrangement of the chromosomes changes the positions and functions of certain genes, which causes uncontrolled cell growth(11)

**Chronic lymphocytic:**

Is a cancerous disease of type B lymphocytes. It affects adults, especially individuals aged between 60-80 years, especially in Europe and North America, and it is more common among males than females (1:2). It constitutes 25% of infections with various leukemia diseases. In North America, the annual incidence rate for men is 3.35-3.69 per 100,000 people, and for women it is 1.61-1.92 per 100,000 people. The disease is characterized by the progressive

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accumulation of lymphocytes in the bone marrow and lymph nodes, and thus the disease gradually spreads to the rest of the blood-producing organs. The disease is attributed to a molecular defect that delays or disrupts the apoptosis process(12)(13).

### **Epidemiological Situation:**

In 2010, globally, approximately 281,500 people died of leukemia(14). In 2000, approximately 256,000 children and adults around the world developed a form of leukemia, and 209,000 died from it. This represents about 3% of the almost seven million deaths due to cancer that year, and about 0.35% of all deaths from any cause . Of the sixteen separate sites the body compared, leukemia was the 12th most common class of neoplastic disease, and the 11th most common cause of cancer-related death((15). Leukemia occurs more commonly in the developed world (16).

□□Iraq:

In Iraq, leukemia represents the fourth common cancer in both male and female. In 2009 Iraqi Cancer Board recorded 13951 cases of leukemia in Iraq in the years from 1991 to 2009 representing 6.59% of new cases (17). In Karbala province which is a town in central Iraq, about 100 km southwest of Baghdad (18), and has an estimated population of 1013254 people in 2009, leukemia was the sixth common cancer with incidence rate 3.26 /100000 Population(17).

### **Eating Habits Of Leukemia:**

Normal nutritional status in children with acute lymphoblastic leukemia (ALL), the most common form of cancer in this age group, is associated with lower burdens of morbidity and mortality than both over- and under-nutrition(22). In high-income countries (HIC), the dominant challenge in children with cancer is with overweight and obesity, though the prevalence and severity of under-nutrition (commonly referred to as malnutrition, defined as “a state of nutrition in which a deficiency of energy, protein, and other nutrients causes measurable adverse effects on tissue/body form and function and clinical outcomes”)( 23) may be underestimated(24). By contrast, malnutrition is much more common in low- and middle-income countries (LMIC) where the prevalence in children with cancer has been reported to be almost as high at 90% at diagnosis (of ALL in Chandigarh in India)( 25) and where the great majority of these children live(26).

A number of observational studies have reported a higher prevalence of overweight and obese individuals among adult survivors of ALL than among adults in the general population(27)( 28).

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Extending these reports from single institutions, investigators reporting on data from the Childhood Cancer Survivor Study (CCSS), a cohort of adult survivors of childhood cancer, reported that both male and female survivors treated with chemotherapy + Cranial Radiation Therapy (CRT) > 20 grays (Gy) were found to be 1.8 and 2.6 times, respectively, more likely to become obese in comparison to a sibling-control group(29). The risk of increased adiposity has also been reported among survivors of childhood lymphoma who were, on average, 11 years post-diagnosis(30).

**The Study Objectives:** In this study we intend to assess the nutritional status of the children with acute leukemia and the malnutrition effect on the evolution of the disease.

### **Material Patients and methods**

#### **Administrative Agreement:**

Before collecting data, necessary approvals and official permissions were obtained from Basra Directorate general of Health ,and from all administrators of the health facilities that were involved in the present study.

#### **The Study Setting:**

This study which is conducted in big governmental hospital in Basra (Al- Basra Children's Specialist Hospital ).

#### **Period of The Study:**

Data collection was conducted in February 2021. Each hospital was visited for 3 times a week for about 5 hours per day.

#### **Sample Size:**

During a study period a sample of 60 with Leukemia interviewed they are age 5 years or less. They are informed about the study objectives after giving a verbal consent to take part.

#### **Study Design:**

This is a cross-sectional study involving patients with Leukemia , a total of 60 patients were successfully interviewed who was 5 years or less and more. Data were obtained by direct interview and a specially designed questionnaire form was used.

#### **Questionnaire:**

A special questionnaire form was prepared for the purpose of data collection for this study. It includes 2 parts, the first one consist of socio-demographic information of the studied population

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and the second part we use Questions about the type of nutritional problems and how to deal with them( Appendix B,C).

**Data Analysis:**

The data is analyzed by using SPSS(Statistical Package for Social Science)Version 23, the percentage, nonparametric tests are used for analysis of data.

**Results:**

**Table 1**

This table represents the distribution of types of leukemia according to age. The highest percentage was in ages ( three years) (72.2% ALL, 27.8% AML), and the lowest percentage was in the (One year) ( 100% ALL, 0.0% AML), also showed in figure ( 2)

**Table 2**

This table show distribution of type of leukemia according to genders. The highest percentage was in male ( 60%) (72.2% ALL, 27.8% AML), and the lowest percentage was in female (40%) ( 79.2% ALL, 20.8% AML).

**Table 3**

This shows in one side that (56%%) of children live in rural and most of them had ALL (76.5%), and on other side were (44%) of children live in urban and most of them had ALL (73.1%).

**Table 4**

This table show distribution of the type of leukemia according to breastfeeding type, half of the study sample was normal breastfeeding, followed by one-third of children with abnormal artificial milk, and other children were mixed with breastfeeding type.

**Table 5**

reveals that the socio-economic status of the most families for the study sample were at the middle level (47%), followed by (46%) of low socioeconomic status, while (7%) of children were high socio-economic status, also shown in figure ( 4)

**Table 6**

This table represents the distribution of type of leukemia according to weight for height percentiles. The highest percentage was in healthy weight (40%) (70.8% ALL, 29.2% AML), and followed by underweight were (23.3%) and overweight were (23.3%), the lowest percentage was at risk of overweight ( 13.4%) also showed in figure ( 5 )

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### **Discussion:**

The majority of the information on malnutrition in cancer children comes from children who have been on treatment for a long time. Therapy can be nutritionally detrimental in and of itself, especially in adolescents (31). The biggest aspect of these children's nutritional management is early detection and active treatment of their nutritional problems. Showed in our study 60 patients that participant and divided to (75%) were Acute lymphoblastic leukemia (ALL) and (25%) were acute myelogenous leukemia (AML) this result similar to Zalina AZ et al (32) showed in their study Acute lymphoblastic leukemia (ALL) accounts for the majority of the cases (84.3%), followed by acute myelogenous leukemia (AML) (13.7%).

Gender of study to Acute lymphoblastic leukemia (ALL) (57.7%) were male and (52.3%) were female this result matching with Mouroge AL Ani (33) in Iraq / Baghdad the participants in their study were 35 cases 23(65%) were male & 12(35%) female.

The history of breastfeeding indicators in patients with Acute lymphoblastic leukemia were (25) breastfeeding, (13) artificial milk and (7) mixed feeding and ordinary diet, our results agree with Rula Ahmed Abdul Kadir et al (34) in Iraq / Basra shows a child's early feeding history, which includes Breast, bottle, and mixed feeding (breast and bottle feeding) results show that nineteen newly diagnosed ALL patients with breast feeding and a normal diet. Seven patients were given a mixed diet and a regular diet.

The residence for ALL patients were Rural 26(57.7) and urban 19(52.3) in our study. Fifty-seven patients (68%) were living in rural areas that showed in the article Abdurrahman et al.(35) in the patients with Acute lymphoblastic leukemia at Iraq / Kurdistan region.

reveals that the socio-economic status of the most families for the study sample to Acute lymphoblastic leukemia patients were at the middle level (24), followed by (17) of low socioeconomic status, while (4) of children were high socio-economic status. This result confirming with David G. et al. (6) The majority of children on the country live in underdeveloped countries, many of whom are malnourished members of poor households. As a result, the impact of socioeconomic status (SES) on the therapeutic response of children with cancer is undeniably important.

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In this study, it was discovered that while the majority of patients had an adequate BMI throughout all treatment stages, half of them had inadequate fat stores as determined by the triceps skinfold. 12(26.6%) Camila G. et al. (37) observed similar findings, with a high prevalence of body fat depletion detected by anthropometric measures. shows most of the patients (85.7%) had normal weight at the beginning of the treatment, and this did not change significantly during the 28 days. Energy and nutrient intakes improved from the start of the treatment to the midpoint, according to the ghrelin levels (from  $511.1 \pm 8.3$  to  $519.3 \pm 6.6$  pg/ml;  $P = 0.027$ ).also our finding matching with Jaimepe, Carlos et al. (38) Patient distribution by percentile of BMI was: underweight, 12 patients (11.8%); normal, 66 (64.7%); at risk of overweight, 9 (8.8%); and overweight, 15 (14.7%).

### **Conclusion:**

- Children from one year to six years be injured by ALL more than AML.
- Males are less affected by ALL than females.
- Males have more AML than females.
- We note that children of families who live in rural areas (regular – irregular) are more affected by ALL than those who live in the city.
- Children who eat a diet rich in protein, such as legumes and nuts, have few side effects, and growth is close to normal or completely normal.

### **Recommendation:**

- We recommend mothers to breastfeed because breast milk is the best food for the child and protects him from diseases.
- Show the child to the doctor if you notice any symptoms and do not tolerate his health condition.
- Take care of the health and nutrition of the affected child and present him to a nutritionist.
- Psychological support for injured children by families and health staff.
- Educate the family of the affected child and teach them more about the disease.

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**Table (1 ): distribution of type of leukemia according to age groups (years).**

		Type of leukemia			
		ALL	AML	Total	
Age group	One year	Count	2	0	2
		% within Age group	100.0%	0.0%	100.0%
Two years	Count	11	2	13	
		% within Age group	84.6%	15.4%	100.0%
Three years	Count	13	5	18	
		% within Age group	72.2%	27.8%	100.0%
Four years	Count	8	5	13	
		% within Age group	61.5%	38.5%	100.0%
Five years	Count	11	3	8	
		% within Age group	72.2%	27.8%	100.0%
Total	Count	45	15	60	
		% within Age group	75.0%	25.0%	100.0%
		Mean	3.6		
		Std. Deviation	1.26		

**Table (2 ): distribution of type of leukemia according to gender.**

		Type of leukemia			
		ALL	AML	Total	
Gender	Male	Count	26	10	36
		% within gender	72.2%	27.8%	100.0%
	Female	Count	19	5	24
		% within gender	79.2%	20.8%	100.0%
Total	Count	45	15	60	
	% within gender	75.0%	25.0%	100.0%	

**Table (3 ): distribution of type of leukemia according to residence .**

**Crosstab**

		Type of leukemia			
		ALL	AML	Total	
Residence	Rural	Count	26	8	34
		% within residence	76.5%	23.5%	100.0%
	Urban	Count	19	7	26
		% within residence	73.1%	26.9%	100.0%

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Total	Count	45	15	60
	% within residence	75.0%	25.0%	100.0%

**Table (4): distribution of type of leukemia according to Breastfeeding type .**

		Type of leukemia		Total	
		ALL	AML		
Breastfeeding type	Breastfeeding	Count	25	5	30
		% within breastfeeding type	83.3%	16.7%	100.0%
	artificial milk	Count	13	8	21
		% within breastfeeding type	61.9%	38.1%	100.0%
	Mix	Count	7	2	9
		% within breastfeeding type	77.8%	22.2%	100.0%
Total	Count	45	15	60	
	% within breastfeeding type	75.0%	25.0%	100.0%	

**Table (5): distribution of type of leukemia according to socioeconomic status.**

		Type of leukemia			P- value
		ALL	AML	Total	
Socioeconomic status	Low	Count	17	11	28
		% within SES	60.7%	39.3%	100.0%
	Middle	Count	24	4	28
		% within SES	85.7%	14.3%	100.0%
	High	Count	4	0	4
		% within SES	100.0%	0.0%	100.0%
Total	Count	45	15	60	
	% within SES	75.0%	25.0%	100.0%	

Chi-Square Tests = 0.047

**Table (6): distribution of type of leukemia according to weight for height percentiles.**

		Type of leukemia		Total	
		ALL	AML		
Weight for height percentiles	Percentile<=5 : underweight	Count	12	2	14
		% within weight for height percentiles	85.7%	14.3%	100.0%
	Percentile>=5 and <85 : healthy weight	Count	17	7	24
		% within weight for height percentiles	70.8%	29.2%	100.0%
	Percentile>=85 and <95 : at risk	Count	7	1	8
		% within weight for height percentiles	87.5%	12.5%	100.0%

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of overweight	% within weight for height percentiles	87.5%	12.5%	100.0%
Percentile>=95 : overweight	Count	9	5	14
	% within weight for height percentiles	64.3%	35.7%	100.0%
Total	Count	45	15	60
	% within weight for height percentiles	75.0%	25.0%	100.0%

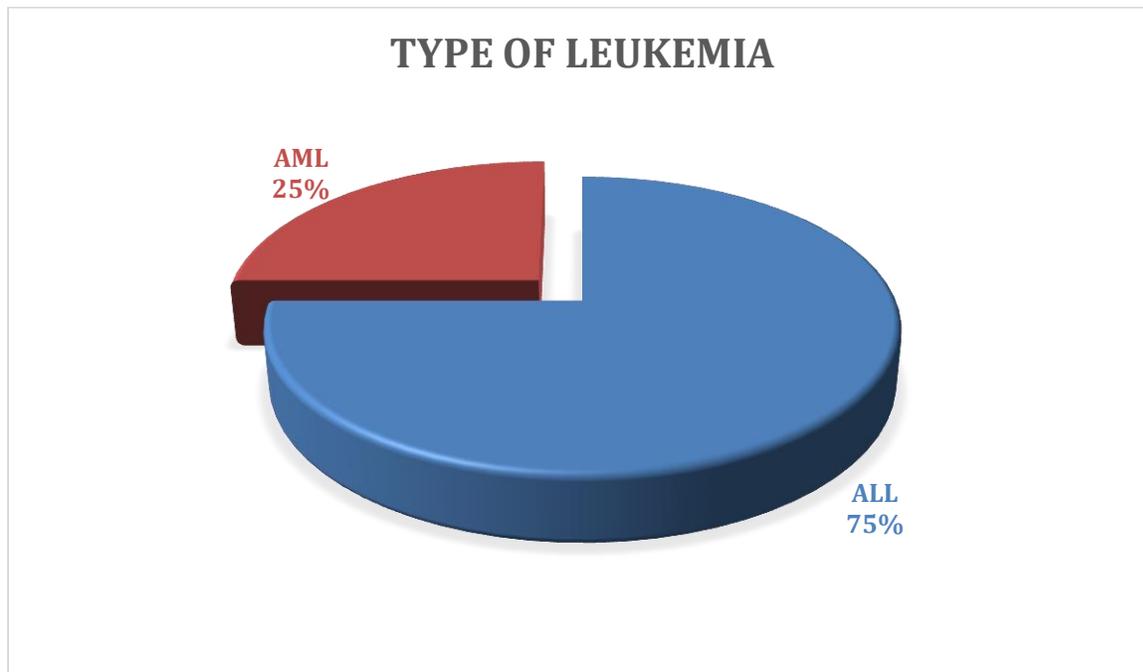


Figure (1 ): distribution type of leukemia to leukemia patients children.

Reveals to distribution type of leukemia to study sample were (75%) with ALL and (25%) were with AML .

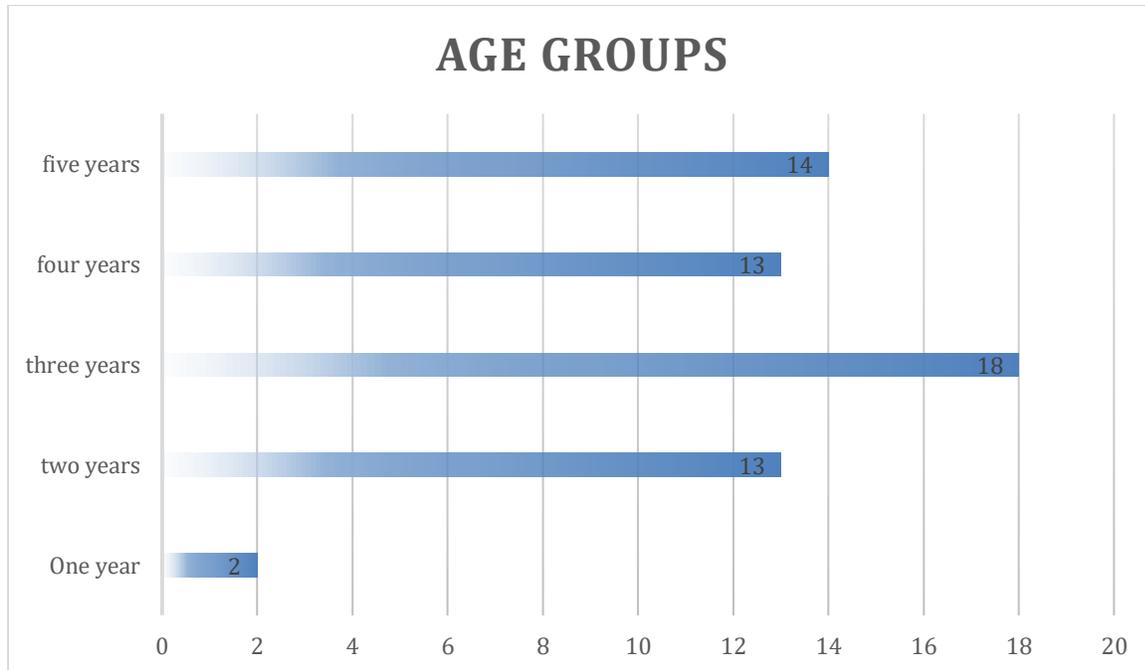


Figure ( 2): distribution age group to leukemia patients children .

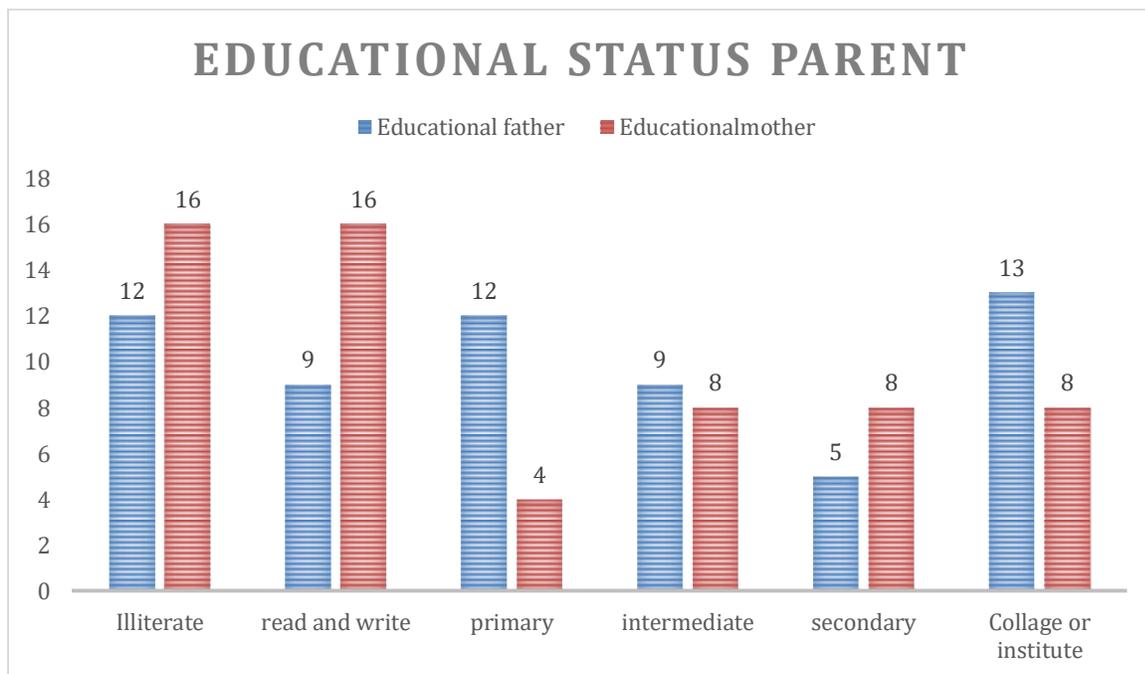


Figure ( 3 ): distribution educational status parent to leukemia patients children .

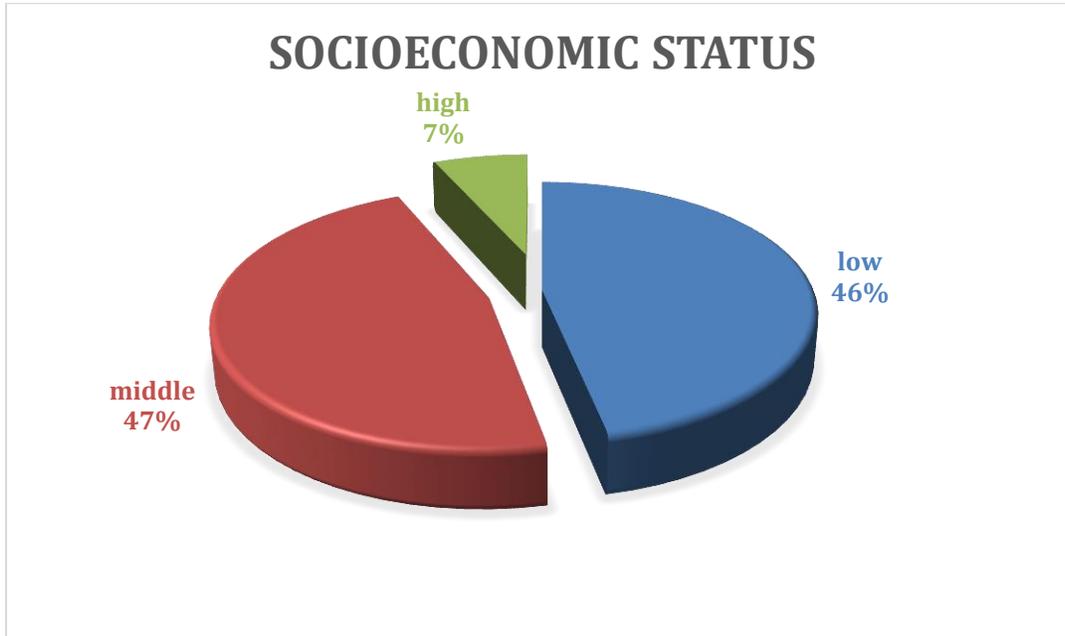


Figure (4) : distribution socioeconomic status to leukemia patients children .

