# Childhood Acute Lymphoblastic Leukemia A Clinico - Epidimiological Study

**Dr. Ahmed M. Ali Abdulhadi**
drahmedalesawe@yahoo.com
AL-Kadhyimea Teaching Hospital - Department of Pediatrics
**Prof. Sawsan S. Abbas**
sawsansati@yahoo.com
Al-Nahrine University
College of Medicine - Department of pediatrics

**Abstract:** *Acute lymphoblastic leukemia (ALL) is the most common malignancy in children, representing nearly 1/3 of all pediatric cancers. Annual incidence of ALL is about 30 cases per million people, with a peak incidence in patients aged 2-5 years. Although a small percentage of cases are associated with inherited genetic syndromes, the cause of ALL remains largely unknown. Many environmental factors (e.g., exposure to ionizing radiation and electromagnetic fields, parental use of alcohol and tobacco) investigated as potential risk factors, but none definitively shown to cause lymphoblastic leukemia. Improvements in diagnosis and treatment have produced cure rates that now exceed 70%.*

***Aim of the study:*** *Determine the prevalence of childhood Acute lymphoblastic leukemia (ALL),*

*clinical presentation, mode of treatment, response to treatment and outcome.*

***Patient and method:*** *A Retrospective study was performed in the Pediatric ward in Al- Kadhiymia Teaching Hospital, medical records of children aged 4month-15years, who were diagnosed as ALL between 1st /January/2000 till 1st /Jul/2007 were studied, 32 cases was collected, history and physical finding were taken from the medical records as well as investigations including CBP ,bone marrow aspiration, LFT, RFT, uric acid, cerebrospinal fluid exam., chest X-ray.Chemotherapy was given according to the MRC-97 modified 99 groups B protocol .*

***Results:*** *The majority of the patients were from Baghdad 21 cases (65.63%). Peak incidence was in 2001, 7 cases (21.87%). The majority of the patients were between 1- 5 years 13 cases, (40.63%). Males had affected more than females, male to female ratio equal to 1.13:1*

*Concerning the clinical presentation, pallor 24 cases (75%) was the main symptom, while hepatosplenomegaly 30 cases (93.75%) and lymphadenopathy 31 cases (96.88%) were the main*

*signs. According to FAB classification, the majority of the cases were histological type L2, 13 cases (40.63%) . The Remission rate was 28 cases (87.5%). Follow - up for 5 years showed that disease free >5 years is encountered in 23 cases (71.87 %).*

***Keywords: Acute lymphoblastic leukemia, pediatric, malignancy.***

## Introduction

Acute lymphoblastic leukemia (ALL) is the most common malignancy in children, representing nearly 1/3 of all pediatric cancers. Annual incidence of ALL is about 30 cases per million people, with a peak incidence in patients aged 2-5 years. Although a small percentage of cases are associated with inherited genetic syndromes, the cause of ALL remains largely unknown. [1].

Many environmental factors (e.g., exposure to ionizing radiation and electromagnetic fields, parental use of alcohol and tobacco) investigated as potential risk factors, but none had definitively shown to cause lymphoblastic leukemia. Improvements in diagnosis and treatment have produced cure rates that now exceed 70%. [2].

Acute lymphoblastic leukemia (ALL) is derived from lymphoblast, primitive progenitor cells originating in the bone marrow, leukemia can be subdivided into lymphoid (originating from a precursor of B- or T- lymphocytes) and myeloid (originating from a precursor of granulocytes, monocytes, erythrocytes, or megakaryocytes ).[3]

## Aim of the study

To determine the prevalence of childhood Acute lymphoblastic leukemia (ALL), clinical presentation, mode of treatment, response to treatment and outcome.

## Patient and method

A Retrospective study was performed in the Pediatric ward in Al- Kadhiymia Teaching Hospital. Medical records of children aged 4month-15years, who were diagnosed as ALL between 1st /January/2000 till 1st /Jul/2007 were studied, 32 cases was collected, history and physical finding was taken from the medical records as well as investigations including Complete Blood Picture (CBP), bone marrow aspiration, Liver Function Test (LFT), Renal Function Test (RFT), uric acid, cerebrospinal fluid exam and chest X-ray. Treatment given according to the Medical Research Council MRC-97 modified 99 groups B protocol [4]. The remission is indicated by the following:

- All signs and symptoms of leukemia disappear. There are no leukemic cells (Blast) in the blood, bone marrow, and cerebrospinal fluid. The percentage of blast cells in the bone marrow is less than 5% [1].
- Complete remission is considered when the number of the blast cells in the bone marrow is < 5% at day 28.
- Partial remission when the blast is > 5% and < 25%
- No response when the blast count is >25%

Computer software (SPSS& Excel) used to statically analyze and present the results of the study.

## Results

The majority of the patients were from Baghdad 21 cases (65.63%) as shown in table 1. Peak incidence in 2001 was 7 cases (21.87%) as it is shown in fig. 1.

The majority of the patients were between 1- 5 years 13 case, (40.63%) followed by age group (>5-10 years) 11 cases (34.37%) as showed in table 2. Males had affected more than females 17 cases (53.30%) male to female ratio equal to 1.13:1 as shown in fig 2.

Concerning the clinical presentation, pallor 24 cases (75%), fever 22 cases (68.75%), bleeding tendency 8 cases (25%), bone pain 2 cases (6.25%), weight loss 28 cases (87.5%), hepatosplenomegaly 30 cases (93.75%), and lymphadenopathy 31 cases (96.88%) as shown in table 3. Mediastinal mass was seen in 4 cases (12.5 %), 3 cases of them were males, (75%) and whose ages were above 10 years and mainly having ALL-L2 (high risk group).

The majority had W.B.C. count < 10000 / mm3 14 cases (43.75%) as shown in table 4. According to FAB classification of histological subtype of ALL, the majority of the cases were histological subtype L2, 13 cases (40.63%) followed by L1, 10 cases (31.25%) as shown in table 5. The Remission rate after induction with chemotherapy protocol in this study was 28 cases (87.5%) as shown in fig. (3).

Follow - up for 5 years showed that Disease free >5 years is 23 cases (71.87 %), relapse rate 4 cases (12.5 %), and discontinue treatment 2 cases (6.25 %) as shown in fig. (4).

***Table (1) Shows Patients Residence***

| Governments | No. | % |
|---|---|---|
| **Baghdad** | **21** | **65.63** |
| **Al-Nasseryea** | **6** | **18.75** |
| **Kirkuk** | **2** | **6.25** |
| **Others** | **3** | **9.371** |

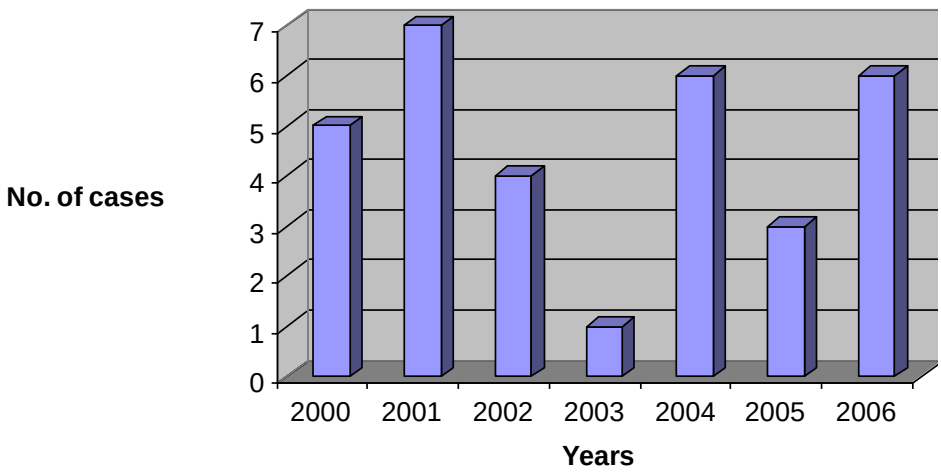


*Fig. 1 Histogram shows the no. of cases of ALL admitted according to the years*

*Table (2) Age Distribution*

| Years | No. | % |
|---|---|---|
| < 1 year | 3 | 9.38 |
| 1 – 5 years | 13 | 40.63 |
| > 5- 10 years | 11 | 34.37 |
| > 10 years | 5 | 15.62 |
| Total | 32 | 100 |

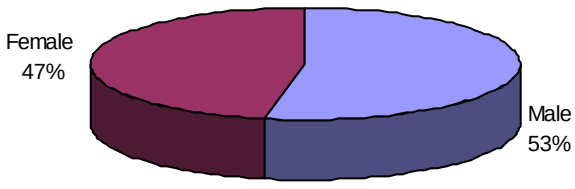


*Fig. 2 Sex distribution*

*Table (3) Clinical presentation with physical finding in ALL*

| Clinical presentation | No. | % |
|---|---|---|
| fever | 22 | 68.75 |
| pallor | 24 | 75 |
| Bleeding Tendency | 8 | 25 |
| Bone Pain | 2 | 6.25 |
| Weight Loss | 28 | 87.5 |
| Hepatosplenomegaly | 30 | 93.75 |
| Lymphadenopathy | 31 | 96.88 |

*Note: Patients had more than one sign and symptoms*

*Table (4) Leukocytes Count in Relation to the Sex*

| Sex | Male | | Female | |
|---|---|---|---|---|
| Count X $10^9/cm^3$ | No. | % | No. | % |
| < 10000 | 7 | 41.18 | 7 | 46.67 |
| 10000 - 50000 | 6 | 35.29 | 5 | 33.33 |
| > 50000- 100000 | 1 | 5.88 | 2 | 13.33 |
| > 100000 | 3 | 17.65 | 1 | 6.62 |

*Table (5) Shows FAB Classification*

| ALL Subtype | No. | % |
|---|---|---|
| L1 | 10 | 31.25 |
| L2 | 13 | 40.63 |
| L3 | 3 | 6.25 |
| Unclassified | 7 | 21.87 |

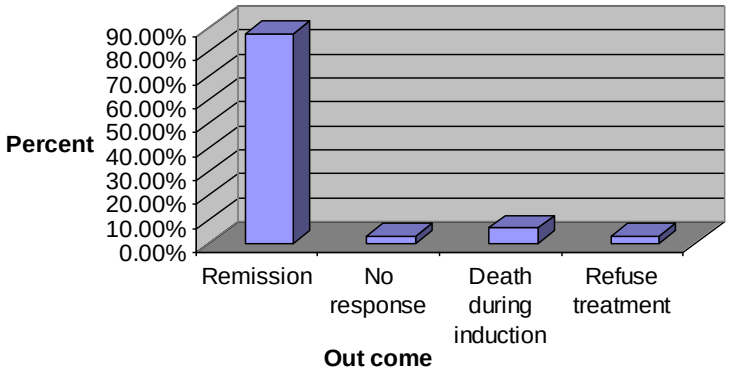


*Fig. 3 Patient's response to first induction*

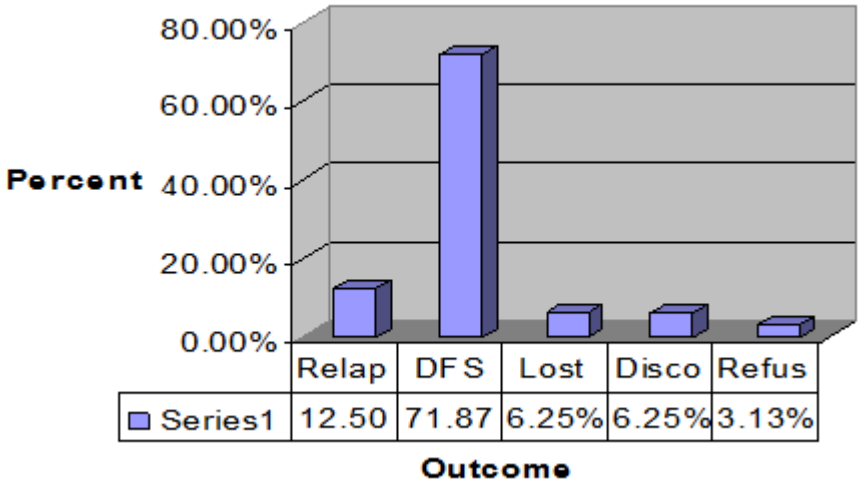


*Fig. 4 Outcome after five years*

## Discussion

In the study herein, the number of cases is limited and does not represent the general population but it can be observed that peak incidence was found in 2001. It can be attributed to the exposure to various environmental substances including chemicals, mutagenic and carcinogenic substances [5, 6]. As well as, exposure to

irradiation mainly low dose [7, 8]. Exposure to viral infection [9, 10] and change in dietary habit [9] and living condition [10].

In this study, the majority of the affected patients were between (1– 5) years of age, followed by (>5 - 10) years of age, both constitute the group of standard risk which tend to be in agreement with previous studies [11-12, 13, 14, 15, 16].

The predominance of male involvement also in agreement with previous studies [17, 18, 11, 12, 19, 13, and 14] and this can be due to the fact that boys may be genetically more susceptible to environmental leukemogenic factors during the antenatal periods [19].

Comparing the clinical features of ALL in this study done in St. Jude children Research Hospital, fever found in (53%), bleeding tendency (52%), bone pain (40%) [19]. While another study showed that fever occur in (61%), bleeding tendency (48%), bone pain (23%), lymphadenopathy (50%), splenomegaly (63%), hepatomegaly (68%) [20]. this difference in the clinical presentation reflects the degree of bone marrow involvement and extra medullary manifestation [1, 23].

The total white cells count at the time of presentation were <10,000/mm3 in most of the cases (14 case, 34.75%), which is in agreement with other studies [22, 24, 25, 26, 13] and only few cases had white cells count >100,000/mm3 (4 cases, 12.5%), a finding similar to other studies [21, 27, 28], most of them were males, more than 10 years of age at diagnoses, all are significant predictors of poor outcome and classify the patients as high risk group [28, 29, 30].

The great majority were L2 (40.63%), followed by type L1 (31.25%) which is in agreement with previous studies done in Iraq [16, 14, 17, 27], but against other studies [28, 31, 32], which indicate that Leukemia in our country is more aggressive.

Mediastinal mass was encountered in 4 cases (12.5 %) in comparison with (13.1%) reported by Wa,il in Iraq [27] and (10%) reported by Ching Hon Pui in Memphis Tennessee [20], only 3 cases of them were males, (75%) whose age above 10 years and mainly having ALL-L2 (high risk group).

Remission rate after first induction with chemotherapy protocol was 28 cases (87.5%) which was in agreement with previous study [33]. After 5 years follow-up a high cure rate was noticed which was 23 cases (71.87%) due to applied the role of daunorubicin in induction chemotherapy, the role of post-induction intensification, the efficacy of different methods of CNS-directed therapy and the effects of an additional intensification. The role of different steroids in induction and different thiopurines through continuing chemotherapy [4]. Resulted in a major improvement in outcomes and this achieved by using the MRC-97 modified 99 group B in which more aggressive treatment where used.

## Conclusions

The peak cases of ALL were in 2001 year. Majority of an effective patient was between 1-5 years old, male to female ratio was 1, 13:1. Most common clinical presentation fevered pallor; lymphadenopathy, hepatosplenomegaly and total white cells count at time of presentation less than 10000 /mm3 in most of cases. The greater majority of cases are L2, which classified as high-risk group. Mediastinal mass mainly in 12.5%. There is a high remission rate 78.5% after first indication of chemotherapy and after 5 years follow up a high cure rate noticed 71.8%.

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# دراسة سريرية شاملة للأطفال المصابين بمرض سرطان الدم الأبيض اللمفي الحاد

**د. احمد محمد علي عبد الهادي العيساوي**
drahmedalesawe@yahoo.com
مستشفى الكاظمية التعليمي - قسم طب الأطفال
**أ. د سوسن عباس الحيدري**
sawsansati@yahoo.com
جامعة النهرين - كلية الطب - قسم طب الاطفال

**المستخلص:**

أجريت هذه الدراسة المرجعية في مستشفى الكاظمية التعليمي، قسم طب الاطفال، تم خلالها مراجعة الملفات الطبية للمرضى الذين تتراوح اعمارهم من 4 شهر – 15 سنة والمصابين بسرطان الدم الابيض اللمفي الحاد و أُدخلو وحدة الاطفال من سنة 2000-2007. تم جمع 32 حالة وقد لوحظ ارتفاع معدل الاصابة لعام 2001 (7) حالة، (21.87%). كانت الاصابة في الذكور أعلى من الاناث وبنسبة (1.13 : 1) لجميع الاعمار. لوحظ ارتفاع نسبة الاصابة بين (1-5 سنة) 13 حالة (40.63%)، غالبية الاعراض السريرية كانت شحوب 24 حالة (75%) بينما تضخم الكبد والطحال 30 حالة (93.75%) تضخم العقد اللمفاوية 31 حالة (96.88 %) كانت اكثر العلامات المرضية. وباعتماد النظام الفرنسي الامريكي البريطاني للتصنيف كان معظمها نوع ل 2 ,13 حالة (40.63%).

كانت الاستجابة للعلاج الكيميائي بنسبة عالية 28 حالة (87.5%) ومتابعة المرضى طيلة فترة خمسة سنوات كانت النتائج بنسبة عالية تشير الى خلوهم من المرض 23 حالة (71.87%).

**الكلمات الرئيسية: -سرطان الدم الليمفاوي الحاد، امراض أطفال، اورام.**