Chromosomal Changes in Childhood Acute Lymphoblastic Leukemia in Mosul

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Abstract

Background and Objectives: To determine the most chromosomal abnormalities seen in Childhood Acute Lymphoblastic Leukemia (CALL) in Mosul, and to evaluate the correlations between clinical haematological and chromosomal abnormalities in CALL.

Pateints and Methods: Clinical notes, haematological parameters and cytogenetic analysis were studied for all patients. Cases were collected from oncology unit at Ibn Al-Atheer Teaching Hospital (ATH) in Mosul.

Results: The frequency of normal karyotype was (42.9%) while the frequency of pseudodiploidy, hyperdiploidy and hypodiploidy were (8.5%), (28.6%) and (20%), respectively. Cases with hyperdiploidy had significantly low Total Leukocyte Count (TLC), higher platelet count with ($P<0.001$), ($P<0.05$), respectively. Massive Hepato-Splenomegaly (MHS) was seen mainly in hypodiploidy group ($P<0.01$).

Conclusion: Normal karyotype was commonly seen in CALL in Mosul followed by hyperdiploidy. Good prognostic parameters were mainly seen in cases with hyperdiploidy.

Keywords: Childhood Acute Lymphoblastic Leukaemia, Chromosomal Changes.

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Introduction

In order to further improve the therapeutic results in (CALL), we have to distinguish between cases with a better and worse prognosis. Both numerical and structural chromosomal abnormalities were considered to be the most reliable prognostic parameters. [1]

Clinically, age, hepatosplenomegaly, tumor mass index, the presence of anterior mediastinal mass and (TLC) have been variably reported to confer prognostic significance. [2, 3]

In (CALL), chromosomal abnormalities have independent prognostic value. Hyperdiploid cases with chromosomal numbers ≥50 is frequent and distinct karotype pattern in malignant cells with good prognosis [4] while pseudodiploidy and hypodiploidy are associated with generally poor outcome, [2, 3, 5] translocation defects were found to be the abnormalities with the most profound impact on treatment outcome. [6]

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The aim of this study is to determine the most chromosomal abnormalities seen in (CALL) in Mosul and to evaluate the correlation between clinical, haematological and chromosomal abnormalities in CALL.

Patients and Methods

This study was undertaken among children attending the Oncology Unit at Ibn Al-Atheer Teaching Hospital who are diagnosed as cases of acute lymphoblastic leukemia during a period of one year from March 2009 to March 2010 and before starting any regim of treatment. 22 males (62.9%) and 13 females (37.1%) were included in the study. For all the cases, complete clinical data, complete blood picture bone marrow aspirate and chest X-ray were taken.

Cytogenetic analysis of the cultured bone marrow aspirate or the peripheral blood sample using conventional methods for cytogenetic analysis including banding techniques at G metaphase [7] were undertaken using PRMI media.

Statistical Analysis

Data are presented as the mean and standard deviation or percentage. Statistical analysis was performed using SPSS (version 17) (Statistical Package for Social Science, Chicago, IL, USA).

T test was used to compare continuous variable, and chi-square test was used where applicable.

Results

The results obtained in this study are the outcome of the analysis of the data from thirty five children with ALL.

Ages of the patients ranged from 1 to 13 years. Males constitute 22 cases (62.9%) and 13 females (37.1%). These patients were divided according to their karyotype into 4 groups: hyperdiploidy, hypodiploidy, normal karyotype and pseudodiploidy.

The mean age (TLC), the presence of (MHS) and mediastinal mass with some haematological parameters were studied among the 4 groups Table (1).

The hyperdiploid pattern as figure (1) shows had significantly low TLC and higher platelet count compared to others P< 0.001, P< 0.05, respectively.

Mediastinal mass and MHS were noted mainly in the hypodiploidy group (P< 0.001) (p0.01).

There was no significant difference in age and Hb level among the 4 groups.

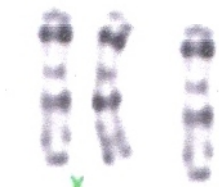
T (9, 22) was seen in 1 (33%) of the pseudodiploidy group, the male who was 12 years old presented with MHS, high (TLC) and severe thrombocytopenia, the child died within 6 months of the diagnosis as shown in figure (2).

T (8, 14) was noticed in other cases of the pseudodiploidy group, there was a male who is 7 years old and without MHS or mediastinal mass as shown in figure (3).

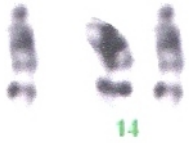
T (1, 19) was demonstrated in a male patient, who was one year old with MHS and bilateral kidney involvement.

Table (1): Clinico-pathological features among (CALL) with different karyotype.

	Pseudodiploidy No.(3)	***% (8.5)***	***Hyperdiploidy No.(10)***	***% (28.6)***	***Hypodiploidy No.(7)***	***% (20%)***	***Normal No.(15)***	***% (42.9%)***	***P-value***
Parameters									
Age (ys) mean ± SD	*9±5*		*8±3*		*5±1*		*6±2*		*NS*
(TLC x10^9/L Mean ±SD	*65±6*		*18±4*		*75±8*		*71±20*		*<0.001*
Platelet count (x10^9/L) Mean ±SD	*20±13*		*75±52*		*19±12*		*28±13*		*<0.05*
Hb(g/dL)	*9±2*		*8±3*		*8±4*		*8±2*		*NS*
MHS		*2(66%)*		*3(30%)*		*6(85%)*		*5(33%)*	*<0.001*
Mediastinal mass		*2(66%)*		*0(0%)*		*4(57%)*		*3(90%)*	*<0.01*



Trisomy of X Chromosome



Trisomy of chromosome 14

Figure (1).

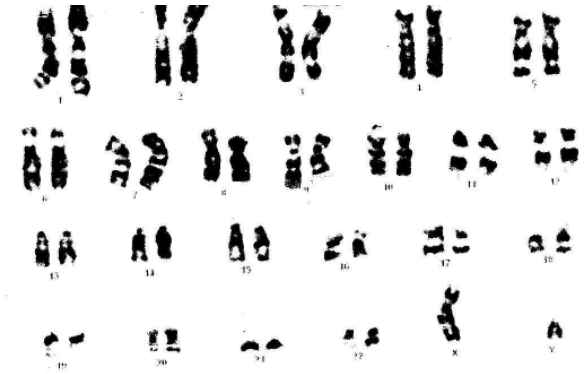


Figure (2): Karyotype: 46, XY, t (9, 22).

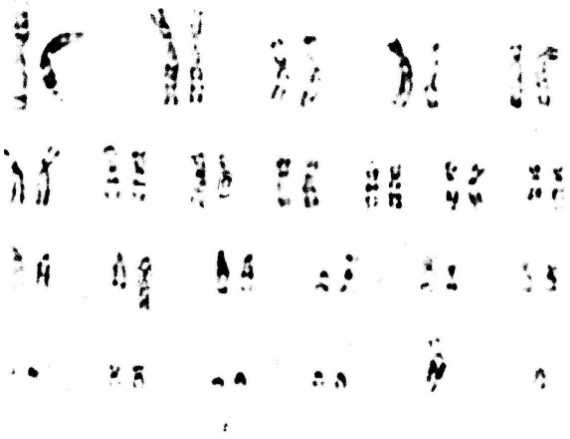


Figure (3): Karyotype 46, XY, t (8, 14).

Discussion

The clinicopathological picture of leukemia is closely related to chromosomal pattern at the time of diagnosis. This pattern reflects the course of the disease. [8- 11]

The hyperploidy (>51) chromosome is one of the most cytogenetic abnormalities (19%). [12] In our study, this group constitutes (28.6%), it is characterized by the presence of extra chromosome usually 17,X, 4,10 and 14 which are mentioned by others, [13, 4] this group had good prognostic indices compared to others. [12,13,4,14]

T (9, 22) and t(1,19) in CALL were already known in these patients and had a bad prognostic value.

T (8, 14) of CALL in the pseudodiploid group was studied by Moore et al. [15] and it could be considered a bad prognosis. [12]

Hypodiploidy and normal karyotype groups encountered (20%) and (42.9%), respectively which were higher than the study undertaken in Egypt, the percentages were (4.7%) and (33.3%), respectively. [12]

These values may be due to the small sample size and to the difficulties in our country concerning this branch of study.

Conclusion

Normal karyotype was commonly seen in CALL in Mosul followed by hyperdiploidy. T (9, 22), t (1, 19) and t (8, 14) had been encountered in the pseudodiploidy group. Good prognostic parameters were seen mainly in the hyperdiploidy group.

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التغيرات الكروموسومية في الأطفال المصابين بابيضاض الدم اللمفاوي الحاد

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الملخص

هدف الدراسة: تحديد اهم التغيرات الكروموسومية الحاصلة في الاطفال المصابين بابيضاض الدم اللمفاوي الحاد فى مدينة الموصل ولتقييم العلاقة بين العلامات السريرية، المعايير الدموية، والتغيرات الكروموسومية غير السوية في هذه الحالات.

طريقة الدراسة: تم دراسة الملاحظات السريرية،المعايير الدموية والتحليل الكروموسومي لجميع حالات ابيضاض الدم اللمفاوي الحاد الجديدة في ردهة الاورام للاطفال فى مستشفى ابن الاثير التعليمي قبل البدء بالعلاج.

النتائج: كانت نسبة المرضى الذين ليس لديهم اي تغير كروموسومي عددي او شكلي 42.9%. نسبة المرضى الذين لديهم تغير كروموسومي شكلي، زيادة في عدد الكروموسومات واخرى قلة في عدد الكروموسومات كانت 8.5%، 28.6% و 20% على التوالي.

الحالات التي كان لديها زيادة في عدد الكروموسومات اكثر من 47 كان لها بصورة مهمة انخفاض في العدد الكلي لكريات الدم البيضاء وزيادة في عددالاقراص الدموية بصورة مهمة مقارنة مع المجاميع الاخرى بقيمة 0.001 و 0 .05 تضخم كبير في الكبد والطحال وجد احصائيا مهم 0,01 عند مجموعة الحالات ذات عدد كروموسومي اقل من 47.

الخلاصة: عدم وجود أي تغير كروموسومي ظهر بصورة شائعة في الاطفال المصابين بابيضاض الدم الحاد في الموصل يتبعه المجموعة التي لديها زيادة بعدد الكروموسومات. المعايير الانذارية الجيدة كانت موجودة في الحالات التي لديها زيادة في عدد الكروموسومات.

الكلمات الدالة: التغيرات الكروموسومية، الاطفال المصابين بابيضاض الدم اللمفاوي الحاد.