Blood Counts of Paediatric Acute Lymphoid Leukemia at Diagnosis: Potential Pitfall

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Introduction. Acute lymphoid leukemia (ALL) is the most common paediatric malignancy (30% of tumors occurring under the age of 15) with excellent response to therapy. Its classical manifestation (leukocytosis with blast cells and reduction of normal hemopoesis) is similar in adults and children and is easily diagnosed by routine clinical blood test, thus making laboratory screening the foremost diagnostic option. In children, however, at least 20% cases of ALL present with pancytopenia and without peripheral blastosis. There is no statistics on laboratory features of primary paediatric ALL in Latvia; diagnostic problems arising from untypical ALL presentation have not been studied.

Aim. The aim of the study is to retrospectively analyze clinical blood tests of paediatric ALL patients at diagnosis in order to characterize diagnostic values of the main blood counts and to identify problematic cases.

Material and Methods. Complete data of laboratory testing are available from the Children's Clinical University Hospital LIS "Dialab" since 2008, 85 consecutive cases of ALL diagnosed in 2008–2014 entered the study. Patients' age varied between 2 weeks and 17 years (median = 4), 48 patients were boys and 37 girls. Leukocyte (WBC), neutrophil (NEU), platelet (PLT) counts and hemoglobin (HGB) were obtained from clinical blood test report, and blast cell percentage (BC) from blood microscopy report. In addition, the form of admission to diagnosis and the number of blood tests performed during that interval were analyzed. MS Excel database was designed; nonparametric Spearman correlations were calculated by IBM SPSS v.21.

Results. WBC median was 11.0×10^9/L, WBC were normal at diagnosis in 24.7% cases, decreased in 24.7% and increased in 50.6%. NEU, respectively, 0.8×10^9/L, 26.5%, 67.5% and 6.0%. HGB – 7.7g/dL, 15.3%, 83.5% and 1.2%. PLT – 65×10^9/L , 7.1%, 89.4% and 3.5%. BC median was 30%, no blasts were found in 32% cases. All main parameters were abnormal in 30 patients (35.3%), at least one parameter was critical in all these cases. In contrast, all parameters were normal in 3 patients, no critical changes were found in another 9 cases. 0 to 59 days were needed for the diagnosis (median = 2), the first blood test was diagnostic in only 38 cases (44.7%); in 10 patients (12.0%) the diagnosis was proven in more than a week, including 3 cases that needed more than a month. The number of blood tests performed till diagnosis varied from 1 to 24 (median = 2), more than 10 tests were performed in 2 cases. Time to diagnosis highly significantly correlated with severity of changes of blood counts: there was negative correlation with WBC ($p = 2.8 \times 10^{-13}$) and BC ($p = 2.1 \times 10^{-15}$), positive correlation with normal HGB ($p = 0.009$), normal PLT ($p = 0.002$) and lack of critical values ($p = 1.3 \times 10^{-6}$).

Conclusions. The problem of untypical laboratory profile at presentation of paediatric ALL may be seriously underestimated. In this cohort, only half of the patients were presented with leukocytosis and only two thirds had recognizable blasts in periphery. As the result, "the first look" diagnosis was possible in less than half of the patients; 12% of the cases needed multiple repeated testing and considerable time till commencing therapy. Predictably, diagnostic problems were directly related to unconvincing blood tests.