

PLATELET INDICES IN LEUKEMIAS: - A CROSS SECTIONAL STUDY

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ABSTRACT

Objective: To evaluate the pattern of changes in the platelet indices in different Leukemias.

Material and method: This descriptive cross-sectional study was conducted in the Pathology Department of Khyber Teaching Hospital from January 2021 to December 2021 (1-year duration). Diagnosed acute and chronic leukemia cases were included while those receiving therapeutic chemotherapy were excluded. The platelet count was analyzed as a part of complete blood counts by the Sysmex Hematology analyzer in the Hematology section of the Pathology department. The changes observed in the platelet counts in different types of leukemia were recorded in a proforma. Mean, standard deviation, frequency and percentages were used to compute variables.

Results: The age range of the 100 included cases of leukemia was 01 - 50 years. The mean age of the study population was 30 ± 10 SD years. Platelet count was low in acute Leukemias and chronic lymphocytic leukemia. Only in chronic myeloid leukemia, raised platelet count was seen (in 62% of cases). Mean platelet volume and platelet distribution width were decreased in all leukemias.

Conclusion: Platelet indices are decreased in Leukemias, with the exception of chronic myeloid leukemia where platelet count is raised.

Keywords: Platelet count, Acute lymphoid leukemia, Acute myelogenous leukemia, Chronic lymphocytic leukemia, Chronic myelogenous leukemia.

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INTRODUCTION

Leukemia is a malignant proliferation of precursor cells of lymphoid and myeloid lineage where there is uncontrolled proliferation of immature cells, replacing normal hematopoietic tissue in bone marrow^{1,2}. The tumor cells not only occupy the bone marrow but also infiltrate distant body tissues through circulation². The malignant white cells divide abnormally to such an extent that the megakaryocytes and other hematopoietic cells are replaced by these malignant clones of cells^{1,2}. This causes a decreased production of platelets in addition to other hematopoietic cells and thus a low platelet count occurs^{1,2}.

The incidence of leukemias is on the rise in the Pakistani population²⁻⁵. The alarming situation is in Northern areas of Pakistan, where leukemia is the second commonest malignancy^{5,6}. Acute lymphoid leukemia (ALL) commonly occurs in childhood as compared to adults^{3,7,8,9}. Acute myelogenous leukemia (AML) is common in the adult population⁹. The mean age of diagnosis of AML is around 70 years¹⁰⁻¹². The worldwide incidence of ALL is about 3 per 100,000 population [8,13]. In Pakistan, the mean age of ALL patients is about 6 years^{14,15}. The worldwide incidence of Chronic lymphocytic leukemia (CLL) is 5 per 100,000 population^{16,17}.

Generally, leukemia is classified into two broad categories on the basis of the duration of onset of signs and symptoms, i.e. acute and chronic leukemia^{18,19}. Further classification of each type is done by the hematopoietic cells, whether lymphoid or myeloid is involved. So, acute leukemia is further classified either into acute lymphoid leukemia if it affects the lymphoid lineage of hematopoietic cells, or acute myeloid leukemia if the myeloid lineage of cells is affected in the bone marrow¹⁸. In the same way,

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chronic leukemia is classified either into chronic lymphocytic leukemia or chronic myelogenous leukemia depending on whether lymphocytic lineage or myeloid lineage cells are affected in the bone marrow respectively^{19,20}. The complete blood count is the initial routine laboratory investigation for leukemia²¹⁻²⁵. The study of the complete blood count shows that platelet counts are almost always abnormal in leukemic patients^{25,26,27}. Usually, the platelet count is decreased in the case of leukemia, along with a decrease in hemoglobin level and an increase in white cell count^{24,26,27}. Additional investigations which help in the sub-typing of leukemia include flow cytometry and cytogenetic analysis^{21,22,23}. In our setup, there is no such study to determine the pattern of changes in the platelet indices in leukemias. Therefore, this study was conducted to evaluate the pattern of platelet indices in acute and chronic leukemia in our setup.

MATERIALS AND METHODS

This descriptive Cross Sectional study was conducted in Pathology Department, Khyber Teaching Hospital from January 2021 to December 2021 (1-year duration). The study was started after obtaining ethical approval from the ethical board of the institute. Sampling was done using nonprobability purposive sampling. Newly diagnosed cases of leukemia were included in the study. Patients who were getting treatment for leukemia were excluded from the study. Platelet indices were determined by the Sysmex analyzer in the Hematology section and recorded in the proforma. Platelet indices recorded included

platelet count, mean platelet volume, and platelet distribution width. Results were drawn accordingly. Mean and standard deviation was used for quantitative variables. Frequency and percentages were used for qualitative variables.

RESULTS

The gender distribution of 100 cases of Leukemia is shown in Figure 1. Platelet count is low in all leukemias except chronic myeloid leukemia as shown in table 1. On the other hand, mean platelet volume and platelet distribution width are low in all leukemias. Table 2 shows that platelet count was increased only in CML. All the remaining platelet indices were decreased in all subtypes of leukemia

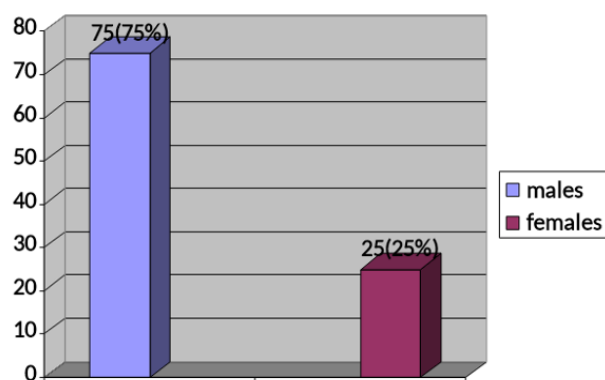


Fig 1: Sex distribution of the study population

Table 1: Platelet indices in leukemia (n=100).

Subtypes of Leukemia	Platelet count (x103/ μ L)		Mean platelet volume (fL)		Platelet distribution width (%)	
	Range	Mean \pm SD	Range	Mean SD	Range	Mean \pm SD
Acute Myeloid Leukemia	4-198	35 \pm 11	5.1-7.5	7.1 \pm 2	7-9	7.6 \pm 2.1
Acute Lymphoblastic leukemia	7-498	75.9 \pm 18	4-7.1	5 \pm 1	5-9	8 \pm 3.2
Chronic myeloid Leukemia	140-187	600 \pm 167	5-7.5	7.0-7.4 \pm 3	6-9	8.1 \pm 2.3
Chronic Lymphocytic Leukemia	2-400	156 \pm 87	6.1-7	6.9 \pm 1	4-8	7.2 \pm 1.2

Table 2: Pattern of changes in platelet indices in leukemias (n=100).

Leukemia subtype	Platelet count			Mean platelet volume			Platelet distribution width		
	Increasedn (%)	Decrease n(%)	Normal n(%)	Increased n(%)	Decrease n(%)	Normal n(%)	Increased n(%)	Decrease n(%)	Normal n(%)
Acute Myeloid Leukemia	0(0%)	36(92.3%)	2(7.7%)	3	65(65%)	32(32%)	5(5%)	74(74%)	21(21%)
Acute Lymphocytic leukemia	6(12%)	44(88%)	0(0%)	0	75(75%)	25(25%)	0(0%)	85(85%)	15(15%)
Chronic myeloid Leukemia	5(62.5%)	0(0%)	3(37.5%)	0	64(64%)	36(36%)	0(0%)	75(75%)	25(25%)
Chronic Lymphocytic Leukemia	0(0%)	7(58%)	5(42%)	2	74(74%)	24(24%)	3(3%)	87(87%)	10(10%)

DISCUSSION

Worldwide, leukemia is being reported to become one of the commonest malignancies, as there is a trend toward a gradual increase in the number of cases diagnosed over time²⁸. The first test done in cases of leukemia is the complete blood count²⁴. Platelet indices are determined from the complete blood count. The pattern of variation in the platelet indices in leukemia is basically the projection of the changes that happen in bone marrow stroma due to malignant clones of cells²⁴. Changes in the platelet indices in leukemic cases are quite characteristic and the clinician must be aware of it in order to not miss the diagnosis in tricky cases^{24,25}.

The pattern of changes in the platelet indices in leukemia is basically due to the changes brought about by leukemia in the bone marrow stroma²⁴. Malignant clones of cells divide in the bone marrow to such an aggressive extent that the normal hematopoietic cells in the bone marrow are replaced by these malignant cells^{1,2}. Replacement of hematopoietic cells in bone marrow by the malignant cells causes a decreased number of megakaryocytes in the marrow^{30,31}. This reflects in peripheral blood counts as the decreased value of platelet indices. A decrease in values of all platelet indices is the usual finding in almost all cases of leukemia^{24,29,30,31}

In the present study, it was found that platelet indices were decreased in most cases of ALL. A decrease in values of all platelet indices in ALL has been reported in the literature as well^{29,31}. Moussavi F from Iran 2014 reported a decrease in the platelet count in 89.7% of cases of ALL patients²⁴. Perez JC from Spain also reported the same findings²⁶.

When platelet count was analyzed in the cases of CML, it was found that the platelet count was increased in the majority of cases of CML. Similar data is reported by Amer AH in his study in 2017³⁰. He has reported an elevated platelet count in CML, which is much more than that in the present study³⁰. The increase in the platelet count in CML patients is due to the fact that it is a myeloproliferative condition. It means that all the hematopoietic cells in the bone marrow, including the megakaryocytes, are dividing in an uncontrolled fashion. The excessive abnormal proliferation of megakaryocytes in the bone marrow leads to increased platelet count in CML³⁰. So, CML differs from other leukemias in this regard where platelet count is decreased^{30,32}

In the present study, it was found that platelet indices were decreased in the majority of cases of CLL. Zee-shan 2015 also presented in his study the same finding of low platelet count in CLL patients³². It is a well-established fact that thrombocytopenia is a bad prognostic factor in CLL because it represents an advanced stage of CLL³².

CONCLUSION

The platelet indices are mostly decreased in leukemias. It is only in chronic myeloid leukemia, that the platelet count is raised.

It is recommended to do further comparative studies where the changes in platelet indices are compared in cases of thrombocytopenia caused by leukemia (hyper productive thrombocytopenia) with that caused by excessive peripheral platelet destruction (hyper destructive thrombocytopenia).

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

- Riaz H:** Conception of idea, critical analysis, proof reading
- Idrees M:** Literature search, Data collection, Final approval of draft, overall supervision
- Qayyum S:** Write up, Proof Reading
- Waqas M:** Statistical analysis and data handling
- Hussain Z:** Literature search and bibliography
- Khan MI:** Literature search, statistical analysis

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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