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CROSS-SECTIONAL ANALYSIS OF LEUKEMIA IN RELATION TO ABNORMAL BLOOD COUNTS OF PATIENTS AND THEIR ASSOCIATED FACTORS IN NIMRA HOSPITAL, LUMHS

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ABSTRACT

Background: The heterogeneous category of leukemia, which is the top ten most prevalent causes of cancer mortality and morbidity worldwide, comprised of many diverse and physiologically distinct subtypes. There is a scarcity of information in our area, particularly in the research zone, about the prevalence of leukemia and its risk factors. Aim: This research aims to estimate leukemia prevalence among individuals with abnormal hematological parameters in Nimra Medicine ward, Lumhs. **Study Design:** Cross sectional study. Methodology: 414 individuals with aberrant hematological parameters were studied cross-sectionally. Sysmex autohematology analyzer created venous blood CBC. Each patient had peripheral blood morphology and bone marrow aspiration. SPSS version 25 examined the collected data. P0.05 was considered significant for Chi square. **Results:** Out of 414 participants, prevalence of leukemia was found as 53 i.e; 12.8%, while acute myeloid Leukemia (20 i.e. 4.83%), Acute Lymphoid Leukemia (16 i.e. 3.86%), Chronic Myeloid Leukemia (12 i.e. 2.89%), Chronic Lymphoid Leukemia(3 i.e. 0.72%), Myelodysplastic Syndrome, (01 i.e. 0.241%) and undifferentiated leukemia comprises (01 i.e. 0.241%) respectively. AML is related with older age (p=0.001), being male (p=0.017), anemia (p=0.013), and rural location (p=0.017). Data was processed using SPSS 26.0. P0.05 was crucial for Chi square. Leukemia is common among people with aberrant blood counts, prompting more extensive research of important factors and predictors utilising modern diagnostic methods.

KEYWORDS: Leukemia, blood counts, myeloid, lymphoid, ALL; AML; CML; CLL;

INTRODUCTION

Leukemia is a diverse spectrum of blood cancers that incl udes multiple physiologically different subtypes. It is a polyclonal malignancy of myeloid and lymphoid cells caused by a variety of possible causes that induce somatic mutations in pluripotent stem and progenitor cells.

Genetically altered neoplastic cells function similarly to hematopoietic stem cells in that they can selfreplicate, tra nsforms, and nourish progenitor cells into diverse hemat opoietic progenitors. (Leukemic, unipotent stem cells ma y transformto phenocopies of adult blood cells to structur al and functional abnormalities.)[1,2]

As many as 8% to 12% of all cancer cases worldwide are caused by leukemia (blood cancer). Even while it has a larger risk in urbanized populations, it affects all countries and peoples of the globe without discriminating against their demographic and socioeconomic background.[3] In 2012, leukemia cost the lives of nearly 300,000 people globally, of whom over 20,000 were in Europe, nearly 2,040 in Australia, and more than 20,000 in Africa.[4-6]

The specific underlying etiology of leukemia is unknown. Several variables, most notably hereditary transmission, gene abnormalities, epigenetic lesion, ionizing radiation, biochemical and other environmental toxins, pharmaceutical agents, smoking, as well as certain viral agents, have been associated with progression of leukemia.[7-12]

FAB uses morphology and cytochemical labelling to categorise leukemias. WHO evaluates categorization information, cellular morphology, cytochemistry,

immunophenotyping, cytogenetics, and clinical features to define clinically relevant disease entities.[13,14]

To better understand the various types of myeloid leukaemia, a group of French, American, and British experts developed a classification system based on cell type and maturation stage. This system is still used today to classify myeloid leukaemia into AML, CML, and MDS. was based on the appearance of leukaemia cells following routine labelling and certain cytochemical features in the microscope.[9,11,12] All four lymphoid malignancies are based on the age of the cancerous cells and the location of the disease: ALL, CLL, malignant lymphoma and plasma cell tumours, and hairy cell leukaemia.[15]

In South-East Asia, leukaemia and non-lymphoma Hodgkin's are far more frequent than in the United States and Europe.[16] In all races and ethnicities, leukaemia is one of the most common malignancies, with a relative incidence of about 40%.[17] Nearly 60 percent of new cases of leukaemia in 2013 were reported to be male.[18] Higher prevalence of variants of leukaemia in males was due to greater exposure to environmental and occupational carcinogens.[19] In Britain, leukaemia is the second leading cause of death from paediatric cancer, however in India, leukaemia continues to be the leading cause of death from cancer in children.[20] CLL patients are typically above the age of 50, with a male to female ratio of 2:119. There are an estimated 0.8 new cases per 100,000 people in Brazil each year of the disease. CLL affects twice as many males as women.[21]

The burden of leukaemia in developing nations is great owing to early death of children, loss of parents, reduced productivity due to a disabilities, and exorbitant medical expense that impacts the financial & mental as well as physical welfare of society as whole.[22–24]

In affluent countries, leukaemia is well-managed. However, there is limited information on the present condition of the illness across Pakistan, and specifically in the study region of the country. In order to confirm the prevalence of leukaemia and its related variables in patients with aberrant haematological parameters, this research is conducted in NIMRA & Medicine ward, LUMHS.

METHODOLOGY

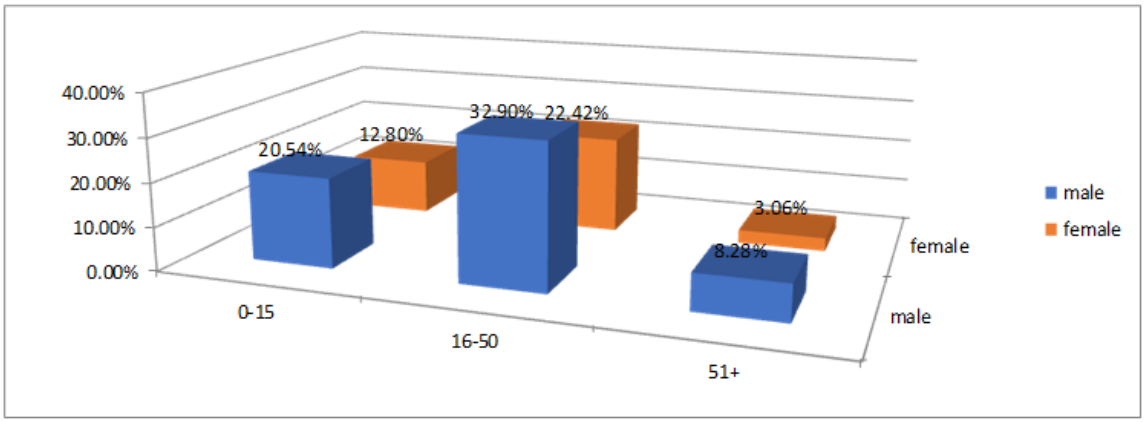
Study setting: From January 3, 2022, to May 30, 2019, a cross-sectional research was done at Nimra and Medicine ward, Lumhs. The research included 414 individuals with abnormal blood counts who met the inclusion criteria.

Sampling: Probability sampling recruited study volunteers. A systematic questionnaire gathered socio-demographic data. Each patient provided 2 cc of venous blood for CBC, peripheral morphology, and cytochemical examination. Laboratory diagnostic techniques followed the diagnostic material provider's SOPs for each test. For patients with below- or above-reference RBC, haemoglobin, WBC, and platelet counts[25], Wright's stain and Sudan Black B (SBB) stain were used to assess peripheral morphology. After peripheral morphology examination, bone marrow aspirate examination was performed using Wright's stain and Sudan black B stain to confirm and categories the specie. Sudan Black B stain was utilised to identify myeloid cell lineages from lymphoid in acute leukaemia patients by analysing the presence of black granular staining granules in myeloid cell lineages. All lab procedures followed manufacturer directions.

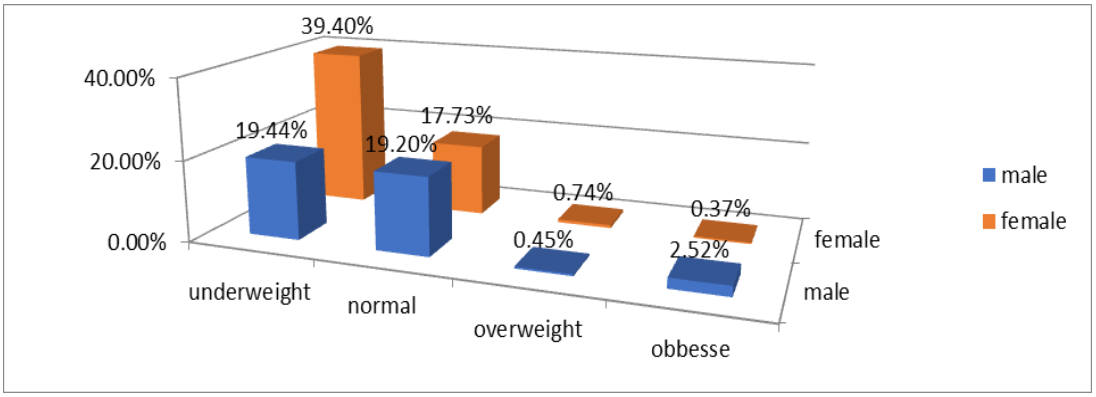
Statistic. SPSS version 26 examined the collected data. Charts, tables, and figures accompanied data outputs. P0.05 was crucial for Chi square.

ERC LUMHS gave ethical approval. DR LAB LUMHS approved the research. Before data collection, patients gave written permission.

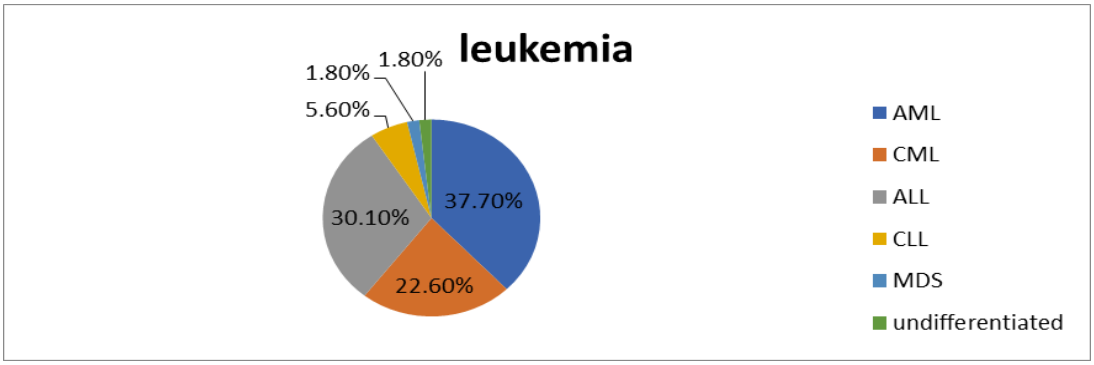
RESULTS



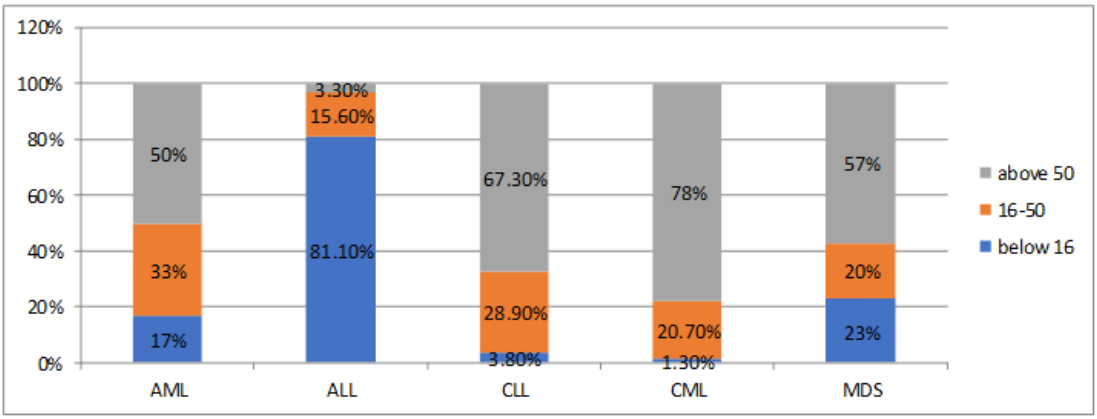
Graph 1: Showing Age wise distribution of sample population (n=414).



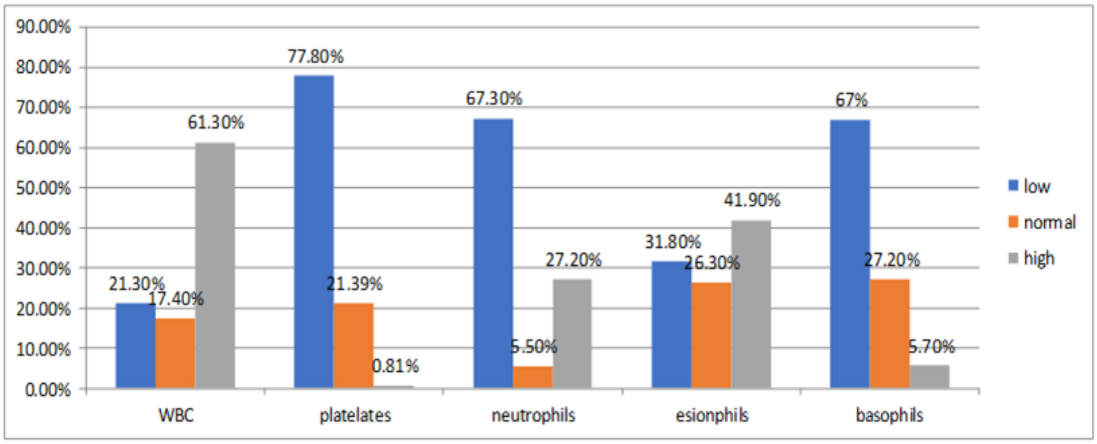
Graph 2: Showing BMI wise distribution of sample population (n=414).



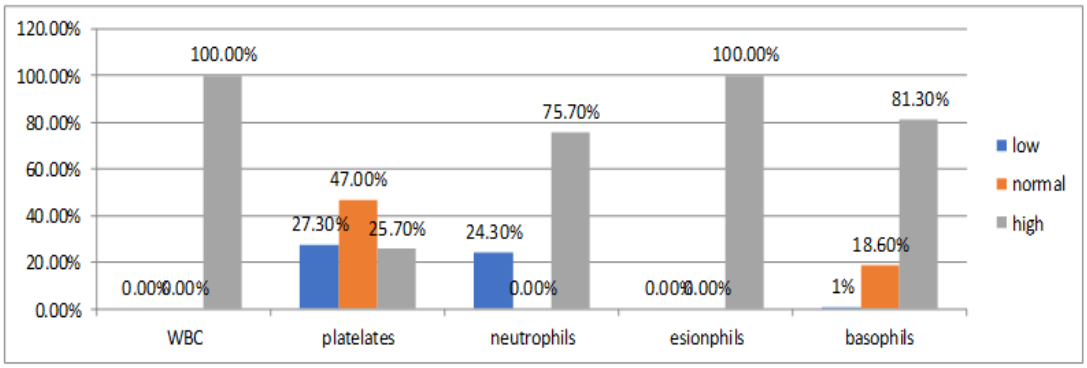
Graph 3: Represents distribution of different types of leukemia's n=53 (diagnosed cases).



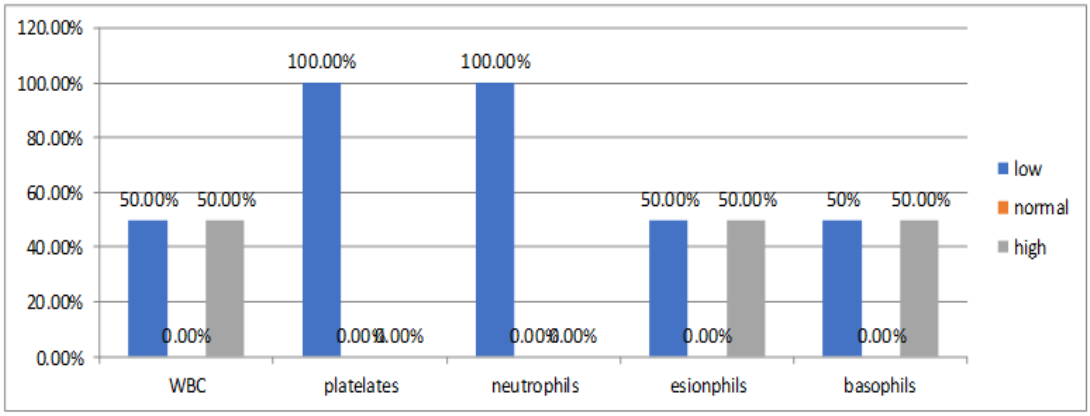
Graph 4: Showing variability of leukemia according to age.



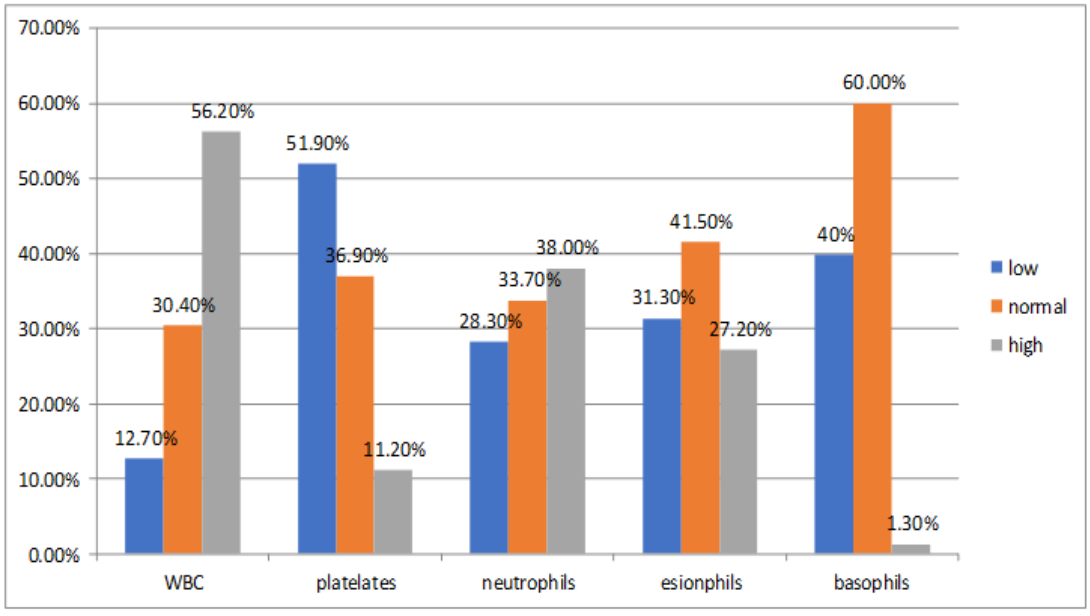
Graph: 5 showing blood Counts variation among Acute Leukemias.



Graph 6: Showing blood Counts variation among Chronic Leukemias.



Graph 7: Showing blood Counts variation among Myelodysplastic syndrome.



Graph 8: Showing blood Counts variation among non-malignant patients.

DISCUSSIONS

Leukemia prevalence can forecast causative theories for disease control and assist treat leukaemia and other haematological malignancies. In underdeveloped nations, notably Pakistan, little is known about leukemia's burden and trend. This study shown leukaemia prevalence as 12.8%. (95% CI = 8.8%–9.8%), which is significantly higher than a report of Australian (p = 3.7%).[26] GLOBOCAN estimates for 2018, leukaemia prevalence in Pakistan was 4.7%, while this research suggests a higher rate. at 95% confidence interval.[19] Differences in the origin population and demographic structure may be responsible for these variations. Because of biological differences, the prevalence of leukaemia is considered to vary across gender. Even though women accounted for a small majority of the participants in this research, the

male-to-female ratio was about equal, with 414 patients—a number that is not statistically significant given the prevalence of leukaemia among males who are somewhat overweight. ($p = 0.147$). This figure is in line with study from Australia, Ireland, Canada, and Ethiopia.[27,28,29] Distinct kinds of leukaemia have different age distributions, however the disease may occur at any age.[30] Mean age was 33 +16.5 years, however participants ranged in age from zero to eighty-one years old. The largest percentage of leukaemia (37.70 percent) was found in individuals over the age of 50, whereas the percentages for age groups 0–15 and 16–20 were almost identical. ($p < 0.0001$). Leukemia is more common in elderly people, which may be attributed to the increased frequency of environmental exposures to toxins, radiation, and mutations that cause cancer owing to clonal expansion.[31,32]

Environmental conditions, even while not fully stated, im pact the likelihood of having leukaemia Leukemia subtypes were identified using the FAB classification system, morphological examination stained with Wright's dye, and cytochemical examination stained with Sudan Black B stain. Acute myeloid leukaemia (AML), Acute Lymphoid Leukemia (ALL), Chronic Myeloid Leukemia (CML), Chronic Lymphoid Leukemia (CLL), and Myelodysplastic Syndrome (MDS) were all subclassified in this research into particular forms of leukaemia (MDS).The prevalence of while acute myeloid Leukemia (20 i.e. 4.83%), Acute Lymphoid Leukemia (16 i.e. 3.86%), Chronic Myeloid Leukemia (12 i.e. 2.89%), Chronic Lymphoid Leukemia (3 i.e. 0.72%), Myelodysplastic Syndrome,(01 i.e. 0.241%) and undifferentiated leukemia comprises (01 i.e. 0.241%) respectively (is was in line with the other finding from Nepal and Pakistan**[33,34],** while it was in contrast with a study from Albania.**[35]**

Regarding the distribution of some hematological parameters with types of leukemia. In acute leukemia, neutropenia (67.30%) and thrombocytopenia (77.80%) were found, while in chronic leukemia, Neutrophilia (75.70%), Basophil leukocytosis (81.30%), and eosinophilia (100%) were observed. The biological mechanism that causes peripheral neutropenia, anaemia, and thrombocytopenia in acute leukaemia owing to the invasion of malignant immature cells in the bone marrow and maturation arrest supports this finding.[36,37] Chronic leukaemia, on the other hand, is defined by a considerable increase in bone marrow activity, resulting in an increased number of white blood cells in the bone marrow and circulation, and for CLL in the lymph nodes.. Granulocytes, mostly composed of neutrophils and myelocytes, are morphologically and functionally normal in CML. CML is characterised by basophil leukocytosis, but eosinophilia is also present.[38]

Most common was AML (37.70%), whereas MDS (1.8%) was uncommon. One instance was undifferentiated, neither AML nor ALL. ALL, CML, and CLL account for 30.10, 22.6%, and 5.6%, respectively. This result was different from the American Cancer Society's finding that CLL was 32.36 percent, CML 14.4 percent, and ALL 9.6 percent, from C. S. Hodgson's finding from Canada that CLL (44%), AML (24%), CML (12%), ALL (5%), and other undefined subtypes (15%), and from a research from Albania (61.01 percent CLL, 10.4 percent ALL, 20.21 percent AML and 8.3 percent CML).[29, 34, 35]

However, it matched Nepalese data.[33] This discrepancy may be due to Ethiopia's population structure and low life expectancy relative to rich countries.[39]

AML was the most common sub-type in males (63.71%) and women (36.29%). It was frequent among over-50s (50 percent). 81.1 percent of ALL was diagnosed before 15 years old. Half of all CML and CLL cases were in persons over age 50. This finding was supported by Ireland and Haryana–India.[28,40]

CONCLUSIONS AND RECOMMENDATIONS

According to GLOBOCAN (Global Cancer Incidence, Mortality, and Prevalence; a project of the International Agency for Cancer Research (IARC)), the prevalence of leukaemia in Pakistan was estimated at 4.7% in 2018, although this study shows a higher figure at 95% confidence interval. A full population evaluation is essential for better planning and managing healthcare facilities, which helps identify and treat leukaemia.

Age (16-51), male sex, and anaemia may indicate leukaemia risk. Laboratory professionals should assess peripheral morphology in individuals with abnormal blood levels.

The researchers advocate examining any relevant factors to fully understand leukemia's frequency and trend in the population. Better leukaemia diagnosis, subtype identification, and treatment management need novel methodologies.

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