Prevalence and incidence of leukemia in Erbil city during (2019-2021)

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ABSTRACT

Because there is a limited published data and studies regarding the recent incidence trends of cancer in Iraqi Kurdistan, we studied the leukemia incidence in Erbil during (2019-2021). This study was conducted on results of samples that examined in Nana-Kaly Hospital in Erbil/Iraq during that period. The total number of male cancer patients was higher than in female patients, and the total incidence of patients with cancer increased between 2019 and 2021. And the highest number of patients were with Acute lymphoblastic leukemia ALL (117) and showed a non-significant increase in number of patients, While the lowest number were with chronic myelogenous leukemia CML (52). in Conclusion, The striking pattern of trends of cancer incidence rates require urgent solutions and great efforts to control risk factors that promote the increasing incidence of cancer in Erbil city

Keywords: Leukemia, leukemia incidence, Erbil city.

INTRODUCTION

Leukemias are a type of hematological cancer that is characterized by the rapid production of abnormal white blood cells. Such atypical white blood cells are not functional immune cells and, by taking up space, eventually impair the bone marrow's ability to produce sufficient numbers of red blood cells, platelets, and normal white blood cells (Nemkov *et al*., 2019). Based on proliferation rate, they can be classified as acute or chronic, and myeloid or lymphocytic, based on the cell

of origin. The main subtypes are acute myelogenous leukemia (AML) and chronic myelogenous leukemia (CML), which affect the bone marrow chain. Acute lymphoblastic leukemia (ALL) and chronic lymphocytic leukemia (CLL) affect the lymphatic system. Leukemia occurs due to the malignant transformation of pluripotent (i.e., can give rise to both myeloid and lymphoid precursors) hematopoietic stem cells (Chennamadhavuni *et al.*, 2022). Acute Lymphocytic Leukemia (ALL) is a B or T lymphoblast malignancy characterized by uncontrolled proliferation of abnormal, immature lymphocytes and their progenitors (Puckett and Chan, 2022). Chronic lymphocytic leukemia (CLL) or small lymphocytic lymphoma (SLL) is a slow-growing cancer that is distinguished by an increase in the production of mature but dysfunctional B lymphocytes. CLL/SLL is a monoclonal lymphoproliferative disorder (Mukkamalla *et al.*, 2022). When leukemia is suspected, the diagnosis should be confirmed or ruled out as soon as possible.

The exact cause of leukemia is unknown. Different kinds of leukemia are believed to have different causes. Both inherited and environmental (non-inherited) factors are believed to be involved. Risk factors of leukemia includes: smoking, ionizing radiation, some chemicals (such as benzene), prior chemotherapy, down syndrome (Roberts *et al.*, 2018). People with a family history of leukemia are also at higher risk. Leukemia like other cancers result from mutations in the DNA. Certain mutations can trigger leukemia by activating oncogenes o deactivating tumor suppressor genes, and thereby disrupting the regulation of cell death, differentiation or division. These mutations may occur spontaneously or as a result of exposure to radiation or carcinogenic substances (Pelcovits and Niroula, 2020).

Increased incidence of leukemia in several Iraqi cities is associated with exposure to depleted uranium used during the Iraq War from 1990 to 2010. (Karim *et al.*,

2016) Approximately 30% of childhood (0-14 years) and 0.10% of adolescent (15-19 years) malignancies are caused by leukemia. (Al-Hashimi, 2021).

A clinical examination, blood counts, and a blood smear are typically used to diagnose or rule out chronic leukemias. Diagnosis of acute leukemia requires morphological evaluation of peripheral blood smear, bone marrow aspirate, core biopsy, cytogenetics, molecular genetics, and immunophenotyping (Gilliland and Tallman, 2002). Early symptoms and signs of CLL include fatigue, decreased exercise capacity, enlarged lymph nodes, Fever, weight loss, bleeding and anemia (Rundles and Moore, 1978). Aim of this study is to study and analyze the prevalence and incidence of leukemia among the male and female population in the Erbil city.

METHODOLOGY

I. Diagnosis:

Repeated blood test, Biopsy and Sometimes, Blood tests may not show that a person has leukemia, especially in the early stages of the disease. Following diagnosis, blood chemistry tests can be used to determine the degree of liver and kidney damage or the effects of chemotherapy on the patient.

II. Data collection:

This study will be conducted on results of samples that examined in Nana-Kaly Hospital in Erbil/Iraq from 2019 Till 2021.

III. Statistical Analysis:

Data were analyzed by using GraghPad Prism 8.1. Statistical significance was identified at the 95% confidence level (P values ≤ 0.05) with using of Chi square test for qualitative data.

RESULTS and DISCUSSION:

The stages of cancer disease are classified according to the TNM staging system, and is stratified as 0, I, II, III and IV (Roland *et al.,* 2016). Results of previous studies concluded that two-thirds of global cancer deaths occurred in less developed countries as a result of late-stage diagnoses and lack of adequate treatments (Ferlay *et al.,* 2015). It has been documented that several influencing factors can determine the late-stage diagnosis of cancer, such as inadequate screening tests, education and cultural awareness (Majid *et al.,* 2009).

previous studies focused on risk factors that directly influence the incidence rate of cancer diseases in Iraq, such as the consequences of various wars, changes in lifestyle (Hussain and Habib, 2015), economic crises (Alwan, 2016), environmental pollution and exposure to carcinogenic agents. Moreover, some behavioral factors, such as smoking, alcohol consumption, drug abuse and fast-food consumption have recently been shown to significantly increase the risk of certain types of cancer in KRG (Jemal *et al.,* 2010; Merletti *et al.,* 2011).

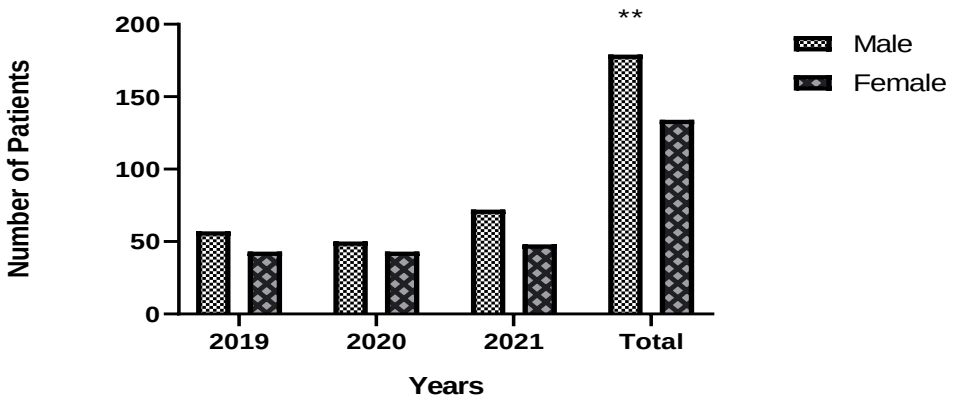
I. Incidence of cancer in the Erbil governorate stratified by sex:

The total number and incidence for all cancer types in Erbil governorate was classified based on sex (Table 1 and Figure 1). In general, the total number of male patients were significantly more than the total number of female patients during the studied period (2019-2021). Furthermore, in all studied years (2019, 2020, and 2021) number of male patients were more than number of female patients. The highest number of male patients was recorded in 2021 (72). Similarly, the highest number of female patients was recorded during the same year (48). Karwan M-Amen *et al*., (2022) recorded different results during the period (2013-2019). They founded that In Erbil, the

number of female patients with cancer between 2013 and 2019 was higher than the number of male patients. The results showed a similar pattern in the Duhok governorate, as the number of female patients was higher than the number of male patients between 2013 and 2019, with the exception of 2014, where there were more cases of cancer amongst males.

A higher percentage of cancer rates in females is most likely due to the differences in endogenous hormones and exposure to indoor and outdoor pollutants, as well as the complex interactions between these individual factors (Siegel *et al.*, 2020).

Figure 1. Total number and incidence for all cancer types in Erbil governorate was classified based on sex



Year	Sex		Chi square value	P value
	Male	Female		
2019	57 (57%)	43 (43%)	0.834	0.073
2020	50 (53.76%)	43 (46.23%)		
2021	72 (60%)	48 (40%)		
Total	179	134		

Table 1. Total number and incidence for all cancer types in Erbil governorate was classified based on sex

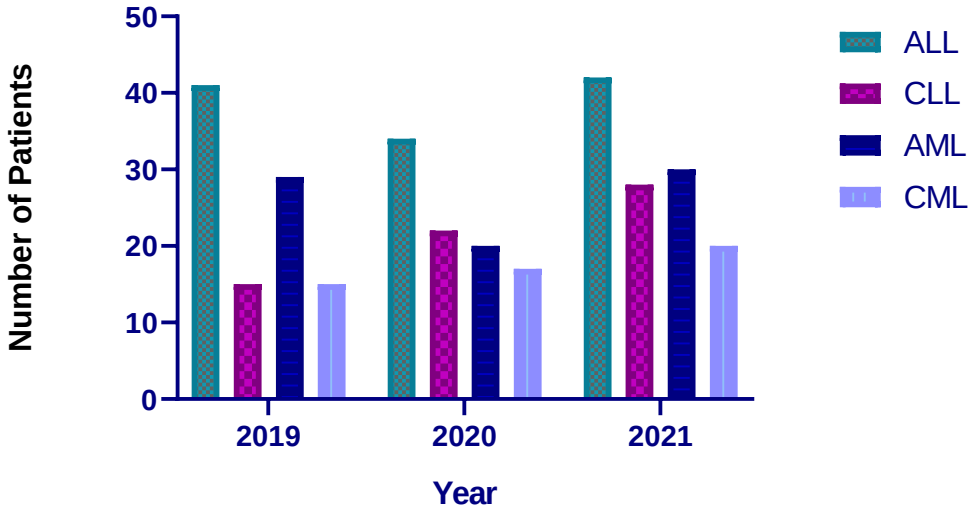
II. Leukemia incidence in Erbil governorate based on type of leukemia:

Table (no. 2) and Figure (no. 2) shows leukemia incidence in Erbil governorate based on type of leukemia. Among the four types of leukemia (All, CLL, AML, and CML) during the studied years, the highest number of patients were with ALL (117) and showed a non-significant increase in number of patients especially in 2021 in compared to the previous years. While the lowest number were with CML (52). In 2019, ALL was the highest (41), while the CLL and CML were the lowest (15). During 2020, also ALL recorded the biggest number of patients (34), while CML recorded the lowest (17). Meanwhile during 2021, ALL again recorded the highest number (42) and the CML was the lowest again (20). Hematological cancers were the most common type of cancer amongst children and adolescents, and were more prominent amongst male than female children. These data were in agreement with previous local studies (Al-Asadi and Ibrahim, 2018; Board, 2018).

Year	Type of leukemia				Chi square value	P value
	ALL	CLL	AML	CML		
2019	41 (41%)	15 (15%)	29 (29%)	15 (15%)	4.294	0.64
2020	34 (36.55%)	22 (23.65%)	20(21.5%)	17 (18.27%)		
2021	42 (35%)	28 (23.33%)	30 (255)	20 (16.66%)		

Table 2. leukemia incidence in Erbil governorate classified based on leukemia type.

Figure 2. Leukemia incidence in Erbil governorate stratified based on type of leukemia



CONCLUSIONS:

We concluded from the following study that number of male patients were more than the female patients during the studied years. Also, increased number of patients in 2021 in comparison to the other years. In addition, All was the highest number of leukemia recorded during all of the studied years. While CML was the lowest.

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