



DEMOGRAPHIC STATUS OF ADULT LEUKEMIA PATIENTS IN SULAYMANIYAH, THE KURDISTAN REGION OF IRAQ

Harmand A. Hama

Department of Biology Education, Faculty of Education, Tishk International University, Erbil, Kurdistan Region (Iraq)

**e-mail: Harmand.ali@tiu.edu.iq*

(Received 16 August, 2022; accepted 15 December, 2022)

ABSTRACT

Leukemia is one of the most common cancer types that affects both adults and children. The purpose of current study was to assess the demographic status of adult leukemic patients among Kurdish population in Iraq. The records of 484 adult patients at Hiwa Cancer Hospital in Sulaymaniyah, Kurdistan region (Iraq) between January 2015 and December 2020 were the subject of this retrospective descriptive analysis. The different types of cancer observed at Hiwa Cancer Hospital were acute lymphatic leukemia (ALL), acute myeloblastic leukemia (AML), chronic lymphatic leukemia (CLL), and chronic myeloid leukemia (CML). There were 307 male and 177 female cancer patients (ratio 1.734:1), with age range between 16 and 98 years and mean age of 54.49 years. It was found that 291 (60.1%) patients were non-educated, while 109 (22.5%), 34 (7.0%), and 50 (10.3%) patients were tertiary, post-basic and basic educated, respectively. Based on the employment status, 276 (57.0%) patients were unemployed, 145 (37.0%) employed, and 63 (13.0%) were retired. It was found that both educational status and employment status were correlated with leukemia incidence at p value equal to 0.0001 and 0.002, respectively.

Keywords: Demography, employment status, educational level, Iraq, leukemia incidence

INTRODUCTION

Leukemia is a blood cancer arising from somatic mutations that affect the regulation of blood component formation in bone marrow (Zavala *et al.*, 2020). Leukemia affects more individuals every year (Rifat *et al.*, 2022). The International Agency for Research on Cancer reports have revealed that in 2020 there were roughly 474519 new cases of leukemia worldwide, and 311594 patients died from the disease (IARC, 2020). In Iraq, leukemia has dramatically increased during past decade. As per the data of Iraqi Cancer Registry, leukemia cancer was the 3rd most common cancer type in Iraq in 2012, and in females it was the 2nd most common cancer after breast cancer, while in males it was the 3rd most common cancer type (ICR, 2012). In 2020, 2072 new cases of leukemia were recorded in Iraq and it was rated as the 4th most common cancer (IARC, 2020). As per the rate of leukemia progression, leukemia may be acute (sudden onset) and chronic (slow onset) (Zavala *et al.*, 2020). The acute leukemia may either be acute lymphoblastic leukemia (ALL) or acute myeloid leukemia (AML). ALL constitute a family of genetically heterogeneous lymphoid neoplasms derived from B- and T-lymphoid progenitors (Zavala *et al.*, 2020), while AML is a malignancy of the stem cell precursors of myeloid lineage (RBC, platelets, and WBC other than B and T cells) (Kent *et al.*, 2009). Chronic leukemia has two main types viz., chronic lymphocytic leukemia (CLL) and chronic myeloid leukemia

(CML), CLL is characterized by increased production of mature but dysfunctional B lymphocytes (Koochi *et al.*, 2015), while CML is a myeloproliferative disorder characterized by overproduction of immature and matured myeloid cells in peripheral blood, bone marrow and spleen (Sawyers, 1999; Hussein *et al.*, 2021). Even though significant progress has been made in leukemia treatment, the etiology of its occurrence still remains unknown (Hama *et al.*, 2022). However, diverse factors have been linked to leukemia occurrence and prognosis starts from genetic to environmental variables (Kirtonia *et al.*, 2020). Recent studies have correlated numerous factors including an individual's biological, behavioural, physical, built environment, sociocultural, and health care system with leukemia (Coussens and Werb, 2002). The other category that has strange and sight effect on the increasing of blood cancer include lifestyle, geographic area of residence, etc. (Kent *et al.*, 2009). The quality of lifestyle, diet and outcomes directly associated to the leukemia (Wang *et al.*, 2020). Furthermore, socioeconomic depression may cause late diagnosis and present tumor or last stages of cancer when the patient cannot survive (Le Floch *et al.*, 2020).

Kurdistan comprises of four distinct regions: the northern part of Turkey (northern Kurdistan), the southern part of Iraq (southern Kurdistan), the eastern part of Iran (north-western Kurdistan), and northern Syria (western Kurdistan) (Kayfi and Abdulrahman, 2021). The entire Kurdish population is estimated to be between 36.0 and 45.0 million (southern Kurdistan). The Kurdistan area of Iraq, however, is now home to an estimated six million Kurds, around 20% live in northern Iraq (Hama *et al.*, 2022). The association between demographic factors of Kurdish people and leukemia is not yet established, even though a number of factors have changed during last decade. Patients with different demographic status develop this condition; we hypothesize that demographic factors have a vital role in leukemia incidence and prognosis. Consequently, the aim of present study was to assess the demographic status of adult Kurdish Iraqi leukemia patients. Further the study aimed to determine how educational background and employment correlate with leukemia occurrence in Kurd population.

MATERIALS AND METHODS

The city of Sulaymaniyah in Iraq's Kurdistan was the site of present research. The 484 patients suffering from leukemia who reported at the Hematology Department of Hiwa Cancer Hospital in between January 2015 and December 2020 were selected for the study using a selective sampling technique. Data on the patient's age and gender based on the prevalence and proportion of different leukemia (ALL, AML, CLL and CML) were documented. The IBM SPSS Statistics (version 19.0) was used for data analysis; and the data generated was subject to frequency, chi-square and correlation analysis. The assumed significance value was considered at $p \leq 0.05$. Besides, descriptive statistical methods (mean, standard deviation, median, minimum, maximum, rate, and frequency) were calculated.

RESULTS AND DISCUSSION

Blood cancers (leukemia) can strike both adults and children. Leukemia cells, which are abnormal white blood cells, overproduce in bone marrow which cause it to develop. Based on the aetiology, origin, occurrence, and prognosis, there are several types of leukemia. Overall, 484 adult patients (from January 2015 to December 2020) at Hiwa Cancer Hospital in Sulaymaniyah were diagnosed with different kinds of leukemia including acute lymphatic leukemia (107), acute myeloblastic leukemia (4), chronic lympho-cytic leukemia (259), and chronic myeloid leukemia (114) (Fig. 1). The age, sex, race, and socio-economic status proved to have effective role in patients diagnosed with

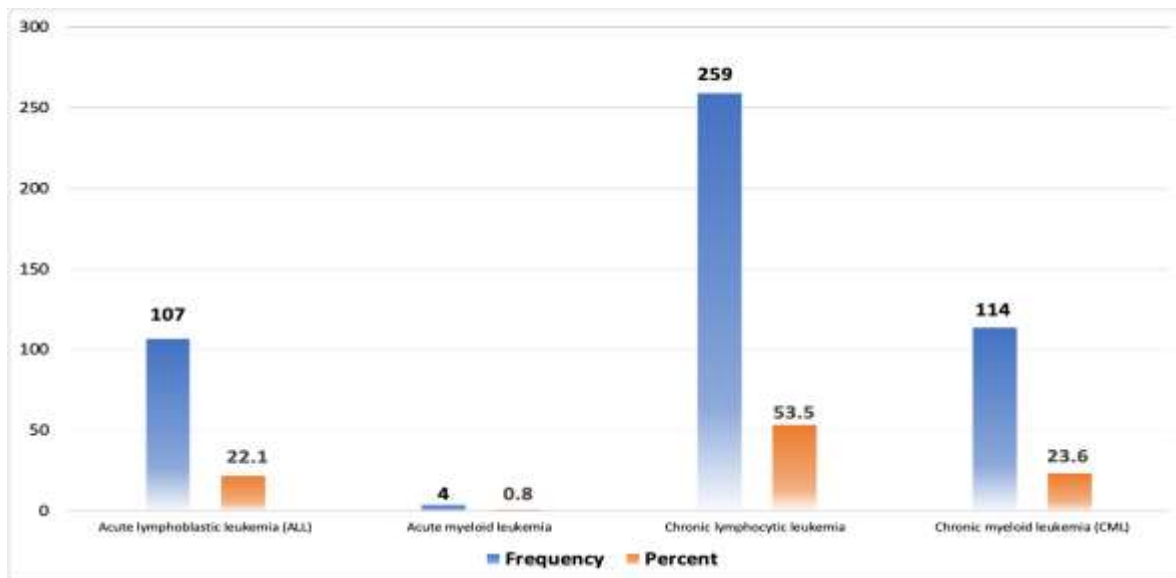


Fig. 1: Frequency and percentage of adult leukemic patients between 2015-2020 in Sulaymaniyah, Kurdistan (Iraq)

Table 1: The frequency and percentage of leukemia patients based on gender and age group in Iraqi Kurdistan

Gender	Frequency	Percentage
Male	307	63.40
Female	177	36.60
Age (yrs)		
16-26	56	11.57
27-36	52	10.74
37-46	56	11.57
47-56	89	18.38
57-66	90	18.59
67->	141	29.13

Table 2: Educational level and employment status of leukemia patients in Iraqi Kurdistan

Education	Frequency	Percentage
Basic education	50	10.3
Post basic education	34	7.0
Tertiary	109	22.5
None	291	60.1
Employment		
Employed	145	30.0
Unemployed	276	57.0
Retired	63	13.0

leukemia (Lim *et al.*, 2014). In present study, among the registered cases, 307 were male and 177 female patients (ratio 1.734:1), with an age range of 16 to 98 years and mean age of 54.5 years (Table 1). There was a significant age gap in the occurrence of many cancers. Leukemia and lymphomas accounted for around 50% of all cases of cancer diagnosed in children (Bleyer, 2002). People between the age of 15 and 25 years have higher risk of developing cancer than those younger than 15 years, and the incidence of cancer rises more quickly in this age range. Of 15 to 25 years. The genesis of disease and the reasons for the apparent rise or decrease in cancer risk with increased socioeconomic level could be better understood if the correlation between the two were studied (Heck and Pamuk, 1997). The results showed that the education level significantly correlated with leukemia commonness with p value 0.0001. Subsequently, among the registered adult patients, 291 (60.1%) were uneducated while 103 (22.5%) patients got high school and post-high school education, 34 (07.0%) patients got secondary education, and 50 (10.3%) had only primary education (Table 2). In addition, among the patients there were 276 (57%) non-employed, 145 (30%) employed, and 63 (13%) were retired (Table 2). The correlation analysis showed that the employment

status significantly correlated with leukemia as (p -value = 0.002) based on (Pearson χ^2 $p \leq 0.05$). Across age groups and international boundaries, lower socioeconomic position has been associated with increased risks of illness and death. Evidence suggests that having a higher degree of education reduces your risk of getting cancer in a variety of different body areas. As the education levels rises,

the likelihood of contracting cancer diseases (Mouw *et al.*, 2008). Inflammation biomarkers, potentially causal with respect to cancer and overall mortality, have been demonstrated to be inversely related to schooling in recent research (Coussens and Werb, 2002; Koster *et al.*, 2006). Higher education may be associated with increased risk of developing breast cancer; however, alcohol intake, menopausal age, and hormone therapy may moderate the association (Dong and Qin, 2020). This finding conflicts with the results of our study. Many studies have been performed on different aspects of leukemia; however, there is no study has been conducted related to the demographic status, mainly focusing on the educational status and employment status of adult patients in Iraq. Despite the fact that in Iraq leukemia along with other countries has dramatically raised.

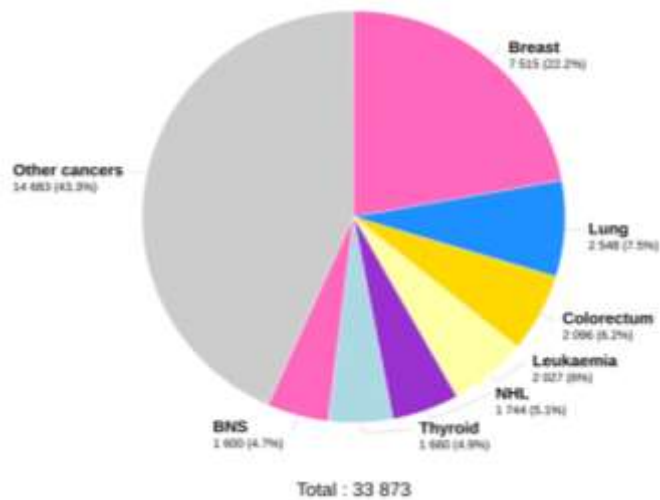


Fig. 2: The most common breast, lung, colorectum, leukemia thyroid and other form of cancer case in Iraq at 2020 (IARC, 2020)

Amongst the people who suffered from leukemia in this study, 63.3% were male and 36.6% were female (Table 1), suggesting that more men than women suffer from a unique form of leukemia. These findings confirm the findings of Sultan *et al.* (2016) who also reported male dominance in their work. Leukemia occurs in any age and its incidence increases with age, mainly in chronic sort. In this study we focused on adult patients, as the mean age of patients was 54.49 years. We found that most patients were older than 67 years. These findings are consistent with those of Sanderson *et al.* (2006) and Yi *et al.* (2020) who reported that aging leads

to more susceptibility to leukemia. This correlation might be as a result of several factors. For instance, immunodeficiency cell time duration is reduced and gene expression changes in aging hematopoietic system like reduction in the production rate of RBC (Chung and Park, 2017).

Variations in some other demographic factors including age, sex, race, and occupations impacted the incidence and prognosis of leukemia. Our results revealed that 60.1% patients were uneducated. We found that educational status had a significant impact on leukemia occurrence and prognosis with p value <0.0001 . These results might be explained based on different factors like how much their diet is healthy, as mostly uneducated people may not take care of food quality or its expiry date and also they do not participate in sports activities or exercises. Besides, people with less or no education might not trust the doctors so they don't visit the doctors properly (Kapoor *et al.*, 2015). Another demographic factor which we have worked on was the employment status of leukemia patients. The results revealed that 57% patients were unemployed. The employment status significantly correlated with leukemia as p value <0.002 , nearly the same results were reported by Kapoor *et al.* (2015). Environmental risk factors including radiation, fumes, smoking, etc. and genetic risk factors appear to be the major contributors to these differences. About 10% people with a family history of chronic lymphocytic leukemia get the disease themselves. Further, unemployment exerts pressure on human psychology and promotes stress, and the stress has been found as the main reason of many diseases including cancer. Individual outcomes are depending on the person's job. Therefore, non-employed means no outcome and all that cause delayed illness detection, irregular diagnosis, all of that increases the risk of disease in the patients. Thus it may be concluded that the educational status greatly influences the leukemia risk in patients, so cancer education must be delivered to everyone, even uneducated people, which may increase their awareness about the signs of cancer and the risks that they may face.

Conclusions: Leukemia is a blood cancer that affects the regulation of blood component formation in the bone marrow. Leukemia in Kurdish population is seen in both young and old generations showing its increase with age. Males are more affected with almost all types of leukemia than females. The education level was found correlated with leukemia occurrence, also the uneducated people have higher risk of leukemia. Employment status was found interconnected with leukemia incidence.

Conflict of interest: There are no conflicts of interest to declared.

Acknowledgments: The author applaud the exceptional services provided by Hiwa Cancer Hospital to cancer patients throughout Iraq, as well as the researchers for giving the data and being helpful.

Ethical statement: Ethical approval for this work was granted by the Ethical Committee of the Education Faculty, Tishk International University on 22 /02/2022.

REFERENCES

- Bleyer, W.A. 2002. Cancer in older adolescents and young adults: Epidemiology, diagnosis, treatment, survival, and importance of clinical trials. *Medical and Pediatric Oncology: The Official Journal of SIOP - International Society of Pediatric Oncology (Société Internationale d'Oncologie Pédiatrique)*, **38**(1): 1-10.
- Chung, S.S. and Park, C.Y. 2017. Aging, hematopoiesis, and the myelodysplastic syndromes. *Blood Advances*, **1**(26): 2572-2578.
- Coussens, L.M. and Werb, Z. 2002. Inflammation and cancer. *Nature*, **420**(6917): 860-867.
- Dong, J.Y. and Qin, L.Q. 2020. Education level and breast cancer incidence: a meta-analysis of cohort studies. *Menopause*, **27**(1): 113-118.
- Hama, H.A., Hamatahir, S.K. and Sirwan, Y. 2022. Distribution of ABO blood groups in acute leukemia patients in Sulaymaniyah, Kurdistan region of Iraq. *Applied Biological Research*, **24**(2): 119-125.
- Heck, K.E. and Pamuk, E.R. 1997. Explaining the relation between education and postmenopausal breast cancer. *American Journal of Epidemiology*, **145**(4): 366-372.
- Hussein, S.N., Shukur, M.S., Yassin, M.I. and Zangana, I.K. 2021. A typical case of chronic myeloid leukemia (CML) in a native shepherd dog in Duhok province, Iraq. *Journal of Applied Veterinary Sciences*, **6**(3): 1-6.
- IARC. 2020. *Cancer Today*. [Retrieved from https://gco.iarc.fr/today/online-analysis-pie?v=2020&mode=cancer&mode_population=continents&population=900&populations=935_900&key=total&sex=0&cancer=39&type=0&statistic=5&prevalence=0&population_group=0&ages_group%5B%5D=0&ages_group%5B%5D=17&nb_items=7&group_cancer=1&include_nmsc=1&include_nmsc_other=1&half_pie=0&donut=0#collapse-group-0-3].
- ICR. 2012. *Iraqi Cancer Registry*. [Retrieved from https://bccru.uobaghdad.edu.iq/wp-content/uploads/sites/41/uploads/My%20Files/PDF/2012Iraqi%20cancer_Arabic.pdf].
- Kapoor, J., Agrawal, N., Ahmed, R., Sharma, S.K., Gupta, A. and Bhurani, D. 2015. Factors influencing adherence to imatinib in Indian chronic myeloid leukemia patients: A cross-sectional study. *Mediterranean Journal of Hematology and Infectious Diseases*, **7**(1): [10.4084/MJHID.2015.013].
- Kayfi, S. and Abdulrahman, M.D. 2021. Ethnopharmacology of plants in Choman, the Kurdistan region of Iraq. *Applied Biological Research*, **23**(4): 322-330.
- Kent, E.E., Sender, L.S., Largent, J.A. and Anton-Culver, H. 2009. Leukemia survival in children, adolescents, and young adults: Influence of socioeconomic status and other demographic factors. *Cancer Causes & Control*, **20**(8): 1409-1420.

- Kirtonia, A., Pandya, G., Sethi, G., Pandey, A.K., Das, B.C. and Garg, M. 2020. A comprehensive review of genetic alterations and molecular targeted therapies for the implementation of personalized medicine in acute myeloid leukemia. *Journal of Molecular Medicine*, **98**(8): 1069-1091.
- Koohi, F., Shamlou, R., Eslami, S., Ghogh, Z.M., Kor, Y. and Rafiemanesh, H. 2015. Leukemia in Iran: Epidemiology and morphology trends. *Asian Pacific Journal of Cancer Prevention*, **16**(17): 7759-7763.
- Koster, A., Bosma, H., Penninx, B.W., Newman, A.B., Harris, T.B., Van Eijk, J.T.M. and Rooks, R.N. 2006. Association of inflammatory markers with socioeconomic status. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, **61**(3): 284-290.
- Le Floch, A.C., Eisinger, F., D'Incan, E., Rey, J., Charbonnier, A., Caymaris, L. and Patrick, S. 2020. Socioeconomic deprivation is associated with decreased survival in patients with acute myeloid leukemia. *Cancer Epidemiology*, **66**: 101699 [10.1016/j.canep.2020.101699].
- Lim, J.Y.S., Bhatia, S., Robison, L.L. and Yang, J.J. 2014. Genomics of racial and ethnic disparities in childhood acute lymphoblastic leukemia. *Cancer*, **120**(7): 955-962.
- Mouw, T., Koster, A., Wright, M.E., Blank, M.M., Moore, S.C., Hollenbeck, A. and Schatzkin, A. 2008. Education and risk of cancer in a large cohort of men and women in the United States. *PloS one*, **3**(11): e3639. [10.1371/journal.pone.0003639].
- Rifat, R.H., Poran, M.S., Islam, S., Sumaya, A.T., Alam, M.M. and Rahman, M.R. 2022. Incidence, mortality, and epidemiology of leukemia in South Asia: An ecological study. [10.21203/rs.3.rs-1615020/v1].
- Sanderson, R., Johnson, P., Moorman, A., Roman, E., Willett, E., Taylor, P., Proctor, S.J., Bown, N., Ogston, S. and Bowen, D. 2006. Population-based demographic study of karyotypes in 1709 patients with adult acute myeloid leukemia. *Leukemia*, **20**(3): 444-450.
- Sawyers, C.L. 1999. Chronic myeloid leukemia. *New England Journal of Medicine*, **340**(17): 1330-1340.
- Sultan, S., Zaheer, H.A., Irfan, S.M. and Ashar, S. 2016. Demographic and clinical characteristics of adult acute myeloid leukemia-tertiary care experience. *Asian Pacific Journal of Cancer Prevention*, **17**(1): 357-360.
- Wang, C., Yan, J., Chen, J., Wang, Y., Lin, Y.C., Hu, R. and Wu, Y. 2020. Factors associated with quality of life of adult patients with acute leukemia and their family caregivers in China: A cross-sectional study. *Health and Quality of Life Outcomes*, **18**(1): 1-9.
- Yi, M., Li, A., Zhou, L., Chu, Q., Song, Y. and Wu, K. 2020. The global burden and attributable risk factor analysis of acute myeloid leukemia in 195 countries and territories from 1990 to 2017: Estimates based on the global burden of disease study 2017. *Journal of Hematology & Oncology*, **13**(1): 1-16.
- Zavala, V.A., Bracci, P.M., Carethers, J.M., Carvajal-Carmona, L., Coggins, N.B., Cruz-Correa, M. R., Melissa D., Adam J.S., Julie D., Jane C., Rena F., Kristi D.G., Scarlett L.G. and Figueiredo, J.C. 2020. Cancer health disparities in racial/ethnic minorities in the United States. *British Journal of Cancer*, **124**(2): 315-332.