Original article

Prevalence of Leukemia Subtype in the Western Area of Libya: A Focus on Tripoli and Sabratha Cities

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ABSTRACT

Background and aims. *Leukemia significantly contributes to the global cancer burden. Research about leukemia types is limited. In this study, we aimed to evaluate the types of leukemia prevalence related to age, gender, and family history in the western area of Libya.* ***Methodology.*** *A cross-sectional study was conducted involving 100 patients who have leukemia. a questionnaire was filled out for each patient. Descriptive statistics for the prevalence of leukemia types were analyzed to assess associating factors including age, gender, and family history. Statistical calculations were performed using the Microsoft Excel Software Version 2010.* ***Results.*** *Of all ages, the highest rate for all leukemia types was age (46 – 65 y) at 29%, however most prevalent leukemia type was CML with 48% of total cases and ALL was the commonest in children (1-10y). Moreover, AML and CLL were the lowest cases. By both genders, male cases were equal to female cases (50% _ 50%). Only 9% of all types have a family history.* ***Conclusion.*** *It is clear, that the most prevalent leukemia type was CML, especially in adults and ALL type was high in children. Only 9% of cases had a family history and by gender the percentage of males to females was equal. Leukemia is a critical cancer that requires further research on associated risk factors.*

Keywords: Leukemia, Types, Age, Gender, Libya.

الخلفية والأهداف. يساهم سرطان الدم بشكل كبير في عبء السرطان العالمي. الأبحاث حول أنواع سرطان الدم محدودة. هدفنا في هذه الدراسة هو تقييم أنواع انتشار سرطان الدم المرتبطة بالعمر والجنس والتاريخ العائلي في المنطقة الغربية من ليبيا. **طرق الدراسة.** أجريت دراسة مقطعية شملت 100 مريض مصاب بسرطان الدم. وتم ملء استبيان لكل مريض. تم تحليل الإحصائيات الوصفية لانتشار أنواع سرطان الدم لتقييم العوامل المرتبطة بما في ذلك العمر والجنس والتاريخ العائلي. تم إجراء الحسابات الإحصائية باستخدام إصدار برنامج Microsoft Excel 2010. **النتائج.** من بين جميع الأعمار، كان أعلى معدل لجميع أنواع سرطان الدم هو العمر (46 - 65 سنة) بنسبة 29٪، ولكن نوع سرطان الدم الأكثر انتشارًا كان سرطان الدم النخاعي المزمن بنسبة 48٪ من إجمالي الحالات وكان كل ذلك هو الأكثر شيوعًا عند الأطفال (1-10 سنوات). علاوة على ذلك، كانت حالات AML و CLL هي أقل الحالات. ومن كلا الجنسين تساوت حالات الذكور مع حالات الإناث (50% _ 50%). 9% فقط من جميع الأنواع لها تاريخ عائلي. **الخاتمة.** من الواضح أن أكثر أنواع سرطان الدم انتشارًا هو سرطان الدم النخاعي المزمن، خاصــة عند البالغين، وكانت جميع أنواع سرطان الدم مرتفعة عند الأطفال. 9% فقط من الحالات كان لها تاريخ عائلي، وحسب الجنس كانت نسبة الذكور إلى الإناث متساوية. سرطان الدم هو سرطان خطير يتطلب المزيد من البحث حول عوامل الخطر المرتبطة به.

INTRODUCTION

Leukemia is a malignant tumor that arise from the abnormal proliferation of developing leukocytes. These abnormal leucocytes are not able to fight infection and impair the ability of the bone marrow to produce erythrocytes and thrombocytes. Classifiable, it occurs as either acute or chronic based on the rapidity of proliferation and as myelocytic or lymphocytic based on the cell of origin [1,2].

Generally, there are four main subtypes of leukemia: acute myeloid leukemia (AML), acute lymphoblastic leukemia (ALL), CML, and CLL [3]. In 2020 the incidence of leukemia was 474,519 cases and mortality; 311,594 related deaths were reported. The global age-standardized rate of incidence was 5.4 per 100,000 and there was an almost five-fold variation worldwide.

Globally, the frequency of new cases and deaths is more marked among males compared to females (269,503 vs. 205,016; 177,818 vs. 133,776,

respectively) [4]. Moreover, it was found that countries with higher income levels had a higher incidence of 1.5 times higher than low-income countries [6]. GLOBOCAN 2020 estimated that leukemia was the 15th most frequently diagnosed cancer worldwide and it is ranked as the 11th leading cause of cancer-related mortality, accounting for about 4.7% of all cancer-related deaths [4,7].

Pathophysiological, leukemia occurs due to the malignant transformation of pluripotent hematopoietic stem cells (both myeloid and lymphoid precursors). Acute leukemias are malignant clonal disorders that are generally undeveloped, poorly differentiated, abnormal leukocytes (blasts) that can either be lymphoblasts or myeloblasts. These disorders are marked by the diffuse replacement of bone marrow with abnormal immature and undifferentiated hematopoietic cells, resulting in decreased numbers of red blood cells (RBC) and platelets in the peripheral blood. In acute lymphoid leukemia (ALL), mutations occur by chromosomal translocation or abnormal chromosome numbers in precursor lymphoid cells leading to lymphoblasts. In acute myeloid leukemia (AML), chromosomal translocations, reorganizations, and increase or loss of chromosomes can lead to mutations and abnormal production of myeloblasts. On the other hand, chronic leukemias, cells are partly mature; therefore, cells do not function effectively and divide too quickly. They accumulate in the lymphoid organs, peripheral blood, leading to anemia thrombocytopenia, and leukopenia. In chronic leukemias, hematopoietic stem cell abnormalities that are precursors to leucocytes are the most common reason for chronic leukemia. In CML, mutations mostly affect granulocytes and however in CLL, they mainly affect lymphocytes (especially B lymphocytes) [8,9].

Actually, the main cause of leukemia is unknown but multiple risk factors may identify in the development of leukemia, these include familial and genetic risks as well as environmental and lifestyle factors. Undoubtedly, genetics plays a critical role in the etiology of leukemia. Different studies are available on the relationship between genetic factors in normal hemopoiesis and transition to acute leukemias and mechanisms of leukemogenesis [8,9]. The incidence of leukemias is affected by age and race. About 70% of the leukemias are seen in patients over 50 years. Patients diagnosed with AML, CML, and CLL are frequently adults and the elderly. ALL, though, is more common in early childhood. Studies have revealed that several environmental, and lifestyle factors may raise the risk of leukemias. Chemical exposure and radiation raise the risk of leukemias and cigarette smoking is also associated with an increased risk of leukemia [8,10]. Of all types of leukemia, males are slightly more common than females, but the reason for this is unknown.

Typically, racial differences in incidence vary between the types of leukemia. Infections may have a role in developing leukemia such as the Human T-lymphotropic (HTLV-1) Virus and HIV which have been shown to have an association with Leukemia [11].

The epidemiological evolutions and demographic variations have led to an increased ranking of malignant tumors. According to GLOBOCAN 2022, leukemia is the 7th cancer in Libya, with 4.1 % new cases, mortality is 4.5%, and 5-year prevalence is 4.8 per 100.000 [12].

In Libya, evidence regarding the leukemia incidence, prevalence, and disease burden related to hematologic malignancies is limited. The purpose of this study is to evaluate the types of leukemia prevalence related to age, gender, and family history in in the western area of Libya.

METHODS

Study design and study population

A cross-sectional study was conducted at the Tripoli University Hospital and National Cancer Institute Sabratah, interviews with different patients and their relatives were performed using the questionnaire. The cases included in the current study were from both genders, different age groups, and family history from the Department of Oncology and the National Institute for Cancer Treatment.

Data collection and variables

In this study, 100 cases of different types of leukemia were collected directly from patients. The questionnaire contains mainly of both genders, age groups, and family histories. Ethical approval for the study was obtained from the local ethics committees of the Director of Medical Services at Tripoli University Hospital and the National Institute for Cancer Treatment.

Statistical analysis

Statistical calculations were performed using the Microsoft excel Software Version 2010. Descriptive statistical analysis was made, including sums, frequency percentage, mean and standard deviations.

RESULTS

This study involved 100 patients diagnosed with leukemia. Of all patients, male cases were equal to female cases (50% each) (Table 1).

According to the age group, the highest rate for all leukemia types was for ages (46 – 65 y) at 29%, followed by the age group (26 – 45 y) at 27%. Nearly a quarter of cases were aged between 1 and 10 years (23%). Yet the percentage of cases above 65 years was only 10%. The highest acquisition type rate for leukemia was CML with 48% of total cases, with a slight relative difference between AML and ALL for 25% and 24% of total cases respectively. However, the lowest percentage was CLL at 10%. The study showed that family history is an ineffective factor for having leukemia in 91% of patients and only 9% of them have a family history.

Table 1. Patient's demographics

Demographics		Frequency (n)	Percentage (%)
Gender	Male	45	(50%)
	Female	45	(50%)
Age groups	(1-10)y	23	(23%)
	(11-25)y	11	(11%)
	(26-45)y	27	(27%)
	(46-65)y	29	(29%)
	(>65)y	10	(10%)
	ALL	24	(24%)

Types of leukemia	AML	25	(25%)
	CLL	10	(10%)
	CML	48	(48%)
Family history	Yes	9	(9%)
	No	91	(91%)

In table 2, the most common cases were females in CML 27% and males 21%. In both genders, the cases number of All and AML were closed, followed by CLL, males 3%, and females 6%.

Table 2. Types of leukemia among to gender

Types	Male		Female	
	(n)	(%)	(n)	(%)
ALL	12	12%	13	13%
AML	11	11%	13	13%
CML	21	21%	27	27%
CLL	3	3%	6	6%

The most cases in the group aged 45-65 years was CML followed by 26-45 y and ALL was the commonest in children (1-10y). Of all ages, AML and CLL were the lowest cases (table 3).

Table 3. Types of leukemia among age group (year)

Age group	1-10 y		11-25y		26-45y		46-65y		>65	
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
ALL	15	15%	4	4%	1	1%	5	5%	0	0%

DISCUSSION

Across of world, leukemia remains a major public health concern, and while it is declining, they are still on the rise in many countries. In developing countries, especially in Africa, there is little information on the burden and the pattern of hematological malignancies, specifically, leukemia. This study provides the evaluation of four types of leukemia by some factors including age, and gender.

The prevalence is due to biological factors thought to be different across genders. In this study, there were 100 patients where the male-to-female percentage was practically equal (1: 1), even though it is not statistically significant. These results aligned with studies from Australia, Ireland, Canada, and Ethiopia [13,26].

In the UK, for leukemia, there are few established risk factors therefore differences between countries largely reflect differences in diagnosis and data recording. Therefore, 40% of leukemia cases in the UK are in females, and 60% are in males [14].

Some research indicates that men appear to be at increased risk for all leukemia types 30. The reason for this is more common in men than women is still unknown but it is likely to be revealed that genetic differences between males and females. Deferent studies reported that leukemia is more common in men than women, including AML and the reason for this is not clear [15,16]. A study in 2023, states a higher frequency of AML in males, highlighted the influence of mutational factors, and confirmed the importance of variables such as age, race, and treatment in survival [17]. Other web sources reported that males are slightly more likely to have CLL than females and ALL also occurs more frequently in males than females [18].

Leukemias may occur at all ages, but different forms have different age distributions. From the findings, comparing within each age group, the highest proportion of leukemia (29%)) was seen among patients aged between 46-65 years (29%), while in pediatrics aged 1-10 years was 23% for all leukemia types. Different studies reported that leukemia is the most common cancer in children, and about 30 percent of pediatric cancers are leukemia [15,19]. Worldly, acute leukemias (ALL and AML) are more common than chronic hematological cancers (CLL and CML). According to National Cancer Institute ALL is more prevalent type in children's teenagers than adults followed by AML and rates of pediatric ALL are slightly higher among males than females. However, AML also represent in adolescents and young adults by 33% [19-21]. Due to biological factors and risk factors, ALL may rise again after the age of 50 years. The American Cancer Society (ACS) estimates that 9 out of 10 with CLL are aged 50 years or older [22].

The risk of most leukemias increases with age. The median age of a patient diagnosed with AML, CLL, and CML is 65 years and older. However, most cases of ALL occur in people under 20 years old. The median age of an ALL patient at diagnosis is 15

years. AML may occur at any age, but it becomes more common as people get older [17,23]. Cancer Research UK stated that Age-related incidence rates of leukemia reduction gradually from age 0-4 and remain steady throughout childhood and young adults, rates increase sharply from around age 55-59 [24].

A study in Benghazi 2021 shows that AML was more prevalent than ALL in adults, also AML was common in middle age whereas ALL in the children [25]. Other study in Ethiopia 2020 estimated that the highest proportion of leukemia seen among patients older than 50 years of age however there was a similar proportion between age groups 0–14 and 15–49. The high ratio of older adults for leukemia may be mostly due to the advancement of age where many environmental exposures to carcinogens, irradiations, and malignant mutations due to clonal expansion occur more frequently [26].

Some risk factors may play a role in leukemia occurrence including age, hereditary, environmental, and lifestyle. this study shows that just 9% of cases have a family history of leukemias. Most leukemia has no familial link. However, patients who a first-degree relative of a CLL patient, or have an identical twin who has AML or ALL, the patient may be at an increased risk for developing the disease. However, AML is not thought to have a strong genetic link, having a close relative with AML increases your risk of getting the disease [27,23]. The risk of leukemia is increased by people who inherit genetic features, but this does not mean they will develop the condition [28].

A study in 2020 shows that the incidence of AML and CLL significantly increased in most countries, suggesting that these types of leukemia may become a major global public health concern [29]. Geographically, the distribution of leukemia burden is patterned by country-level development, with age-standardized incidence, and mortality higher in more developed countries. In this study, some risk factors are not included due to data missed however, many factors may be important to evaluate leukemia occurrence such as exposure

chemicals to radiation, chemotherapy, genetic syndromes, and lifestyle factors like smoking [7].

CONCLUSION

In summary, for four types of leukemia, most cases were CML by age group 26-45 years (19%), followed by all in children with a rate of 15%. the ratio of males to females was equal. Results shows that family history. The results show that family history has a slight effect on the leukemia occurrence. Globally, still, evidence regarding the disease incidence, prevalence, and disease problems related to blood cancer is limited, and also a few local studies have reported about leukemia. However, in Libya, a more comprehensive and accurate understanding of the magnitude and trends of all leukemia is not yet available. Therefore, massive research is needed to evaluate different factors that may lead to leukemia in addition to evidence-based epidemiological studies to become necessary for healthcare decision-making and cancer management.

Compete of interest. Nil

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