

Clinical and epidemiological characteristics of chronic leukemias in a cohort from the Central Military Hospital

Características clínicas y epidemiológicas de las leucemias crónicas en una cohorte del Hospital Central Militar

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Abstract

Introduction: Chronic leukemias, including chronic myeloid leukemia (CML) and chronic lymphocytic leukemia (CLL), represent a significant challenge in hematologic oncology. While these diseases have been extensively studied in European and North American populations, data in Mexico remain limited. This study describes the demographic, clinical, and survival characteristics of patients with CML and CLL treated at the Central Military Hospital over a 25-year period. **Objective:** This study aims to fill this gap in knowledge by describing the demographic and clinical characteristics of patients with CML and CLL treated at this high-specialty institution. **Material and method:** A retrospective, observational, and descriptive study was conducted based on the clinical records of 153 patients with confirmed diagnosis of CML ($n = 85$) and CLL ($n = 68$). Variables such as age, sex, place of residence, and overall survival (OS) were analyzed using the Kaplan-Meier method. **Results:** The median age at diagnosis was 43 years for CML and 67 years for CLL. Most patients were from the State of Mexico (30.9%) and Mexico City (20.6%). The 15-year OS was 90.8% for CLL and 87.5% for CML. **Conclusion:** This study highlights key differences in the epidemiology and progression of chronic leukemias in Mexico, providing valuable information for resource planning and healthcare strategies.

Keywords: Chronic myeloid leukemia. Chronic lymphocytic leukemia. Survival.

Resumen

Introducción: Las leucemias crónicas, como la leucemia mieloide crónica (LMC) y la leucemia linfocítica crónica (LLC), representan un desafío significativo en la hematología oncológica. Aunque estas enfermedades se han estudiado ampliamente en poblaciones europeas y norteamericanas, los datos en México son limitados. Este estudio describe las características demográficas, clínicas y de supervivencia de pacientes con LMC y LLC atendidos en el Hospital Central Militar durante un periodo de 25 años. **Objetivo:** El presente estudio busca llenar este vacío de conocimiento al describir las características demográficas y clínicas de los pacientes con LMC y LLC atendidos en esta institución de alta especialidad. **Material y método:** Se realizó un estudio observacional, retrospectivo y descriptivo basado en los registros clínicos de 153 pacientes con diagnóstico confirmado de LMC ($n = 85$) y LLC ($n = 68$). Se analizaron variables como edad, sexo, estado de residencia y supervivencia global (SG) utilizando el método de Kaplan-Meier. **Resultados:** La mediana de edad al diag-

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nóstico fue de 43 años para LMC y 67 años para LLC. La mayoría de los pacientes procedían del Estado de México (30.9%) y la Ciudad de México (20.6%). La SG a 15 años fue del 90.8% para LLC y del 87.5% para LMC. **Conclusión:** Este estudio resalta diferencias clave en la epidemiología y evolución de las leucemias crónicas en México, proporcionando información valiosa para la planificación de recursos y estrategias de atención médica.

Palabras clave: Leucemia mieloide crónica. Leucemia linfocítica crónica. Supervivencia.

Introduction

Leukemias are a heterogeneous group of hematological neoplasms characterized by the clonal and deregulated proliferation of hematopoietic cells, either in the bone marrow or in lymphatic tissues. These alterations can originate from immature precursor cells in the bone marrow or from mature lymphocytes in peripheral blood and lymphatic tissues, depending on the leukemia subtype¹. Among chronic leukemias, chronic myeloid leukemia (CML) and chronic lymphocytic leukemia (CLL) represent the most frequent types in adults, with well-defined clinical, molecular, and therapeutic patterns. CML is a myeloproliferative disorder associated with the presence of the Philadelphia chromosome and the *BCR-ABL1* gene fusion, which confers a unique character in its pathogenesis and management. On the other hand, CLL is characterized by the clonal accumulation of mature B lymphocytes, generally with molecular alterations that contribute to their prolonged survival and deregulated proliferation¹⁻³.

Globally, the incidence and prevalence of these leukemias show significant variations depending on factors such as geographical region, available diagnostic resources, and access to specific therapies. In Mexico, epidemiological data on chronic leukemias are scarce, particularly in populations treated at national reference centers, such as Hospital Central Militar. Former studies have addressed general characteristics of leukemias in the Mexican population; however, detailed information on the demographic and clinical characteristics of patients with CML and CLL in key institutions such as Hospital Central Militar is scarce⁴.

The present study seeks to fill this knowledge gap by describing the demographic and clinical characteristics of patients with CML and CLL treated at this highly specialized center. In addition to variables such as age, sex, and state of residence, aspects related to survival and geographical distribution patterns are analyzed. This approach will allow identifying epidemiological and clinical differences vs other national and international cohorts, which will contribute to optimizing medical care and public health policies.

Method

We conducted an observational, descriptive, and retrospective study based on the health records of patients with CML and CLL treated at Hospital Central Militar from January 1999 through November 2024. Patients with a confirmed diagnosis were included, excluding those with incomplete records for the variables of interest.

Data were extracted from health records, following the hospital confidentiality guidelines. Variables analyzed included sex, age at diagnosis, state of residence, and type of leukemia, as well as survival data. We conducted a descriptive analysis to characterize the population, using frequencies for categorical variables and measures of central tendency and dispersion for numerical variables. Overall survival (OS) was calculated from the date of diagnosis until death from any cause, censoring cases at the last available follow-up. All survival curves were obtained using the Kaplan-Meier method. Statistical analysis was performed using IBM SPSS statistical software, version 25.0 (IBM, Armonk, NY, USA).

Results

This study included a total of 153 patients diagnosed with chronic leukemia, categorized into 2 main groups: 85 cases (55.6%) of CML and 68 cases (44.4%) of CLL.

Demographic characteristics

The mean age at diagnosis was 44.5 years for CML and 66.2 years for CLL. The median age was 43 and 67 years, respectively. A wide age range at diagnosis was observed, with values between 5 and 76 years in patients with CML and between 35 and 95 years in patients with CLL. Sex distribution was similar in both groups, with a proportion of men at 53% and women at 47% (Table 1).

GEOGRAPHICAL DISTRIBUTION

The analysis of patient residence revealed that most of the cohort came from the State of Mexico (30.9%) and Mexico City (20.6%). Both entities concentrate the highest

number of cases for both CML and CLL (Fig. 1). Other entities with significant representation include Veracruz (7.4%), Puebla (4.7%), and Guanajuato (5.4%) (Table 2).

Survival analysis

CHRONIC LYMPHOCYTIC LEUKEMIA

The median follow-up in patients with CLL was 21 months. The 15-year OS probability was 90.8% (95% confidence interval [95% CI], 85.9-95.7%). The median survival was not reached, indicating prolonged survival in this cohort (Fig. 1).

CHRONIC MYELOID LEUKEMIA

In the CML group, the median follow-up was 70 months. The 15-year survival probability was 87.5% (95% CI, 81.1-93.9%). Similar to the CLL group, the median survival was not reached (Fig. 1).

Discussion

The findings of our study on the demographic and clinical characteristics of patients with chronic leukemias at Hospital Central Militar highlight differences and similarities with former studies conducted in Mexico, Latin America, and other regions of the world. Comparison with these works allows us to contextualize our results and emphasize the relevance of having local data to improve patient care in the country.

A finding that deserves special attention is the higher proportion of CML cases (55.6%) vs CLL (44.4%), which contrasts with incidence data reported globally, where CLL is usually more frequent. However, studies conducted in Mexico have suggested that in some populations, such as mestizos, CML may be more prevalent than CLL, which has been attributed to genetic, environmental factors, and differences in demographic structure. This difference could also be explained by the age profile of patients treated at Hospital Central Militar, a center that historically serves a predominantly young and productive-age population, favoring the detection of CML, whose incidence peak occurs at an earlier age. Similarly, the shorter median follow-up observed in CLL (21 vs 70 months in CML) could be related to a more recent case collection or to differences in clinical surveillance patterns. This epidemiological peculiarity underlines the need for robust national registries that allow contextualizing local trends against international data.

Table 1. Epidemiological characteristics of the studied population

Variable	CML	CLL
Number of cases	85	68
Mean age at diagnosis, years	44.5	66.2
Median age at diagnosis, years	43	67
Age range at diagnosis, years	5-76	35-95
Proportion of men	53%	53%
Proportion of women	47%	47%

CLL: chronic lymphocytic leukemia; CML: chronic myeloid leukemia.

In Mexico, epidemiological studies on CLL are limited. A study conducted in reference centers in the Mexico Valley reported a higher prevalence of CLL in older populations, which is similar to our findings. In our cohort, the median age at diagnosis was 67 years, lower than that reported in American and European cohorts, where the mean age is approximately 70 to 72 years, suggesting that in Mexico the disease might manifest in a younger population, possibly due to genetic or environmental differences; this phenomenon has been previously reported in other Latin American countries⁵⁻⁷. The 15-year OS in our cohort was 90.8%, which is within the ranges reported in other countries⁸.

Epidemiological studies on CML in Mexico have also been limited. The geographical distribution in our cohort reflected a higher concentration of patients from the State of Mexico and Mexico City, which could be influenced by access to specialized medical services in the country's capital⁹.

The median age at CML diagnosis in our study was 43 years and is similar to what has been reported by other Latin American countries such as Brazil and contrasts with data from the United States and Europe, where the median age is reported between 50 and 55 years. This difference is fundamental, because patients with CML depend on continuous treatment to control the disease and reduce the probability of progression to advanced phases, which would mean that Latin American patients depend on a longer treatment time to prolong their survival¹⁰⁻¹².

At a Latin American level, CML has been reported to have a lower incidence rate vs developed countries, probably due to differences in population structure and the lack of specific cancer epidemiological registries¹³.

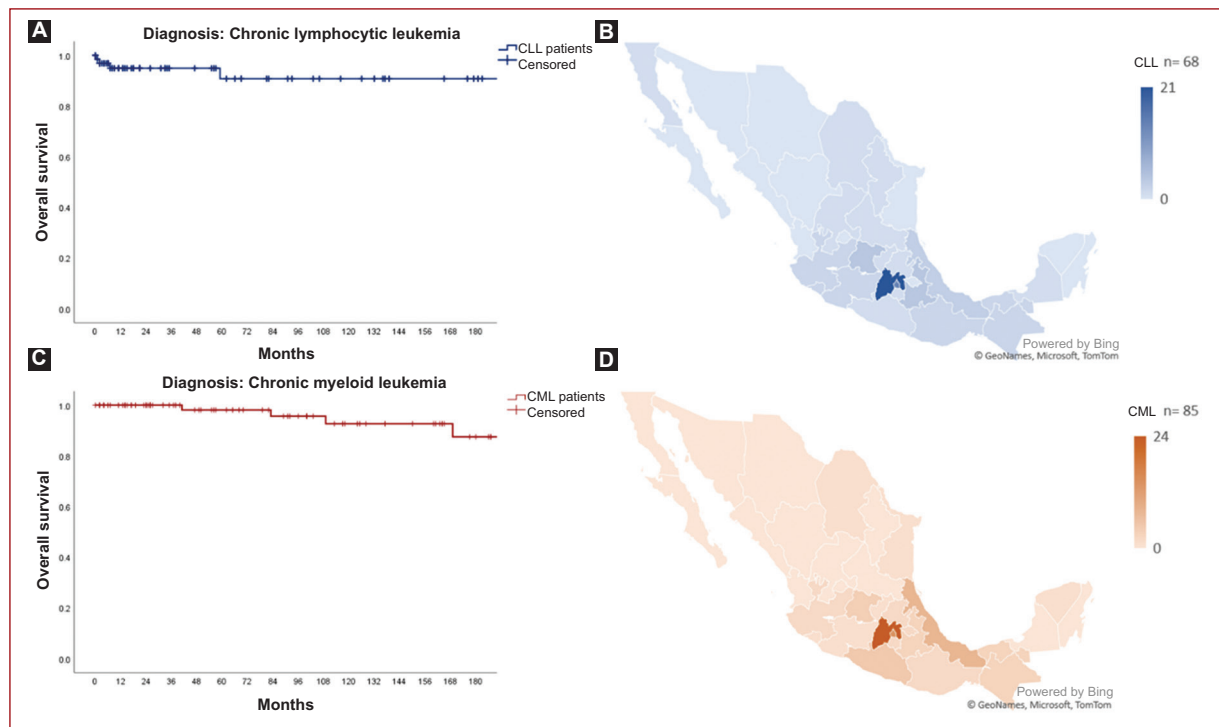


Figure 1. **A:** overall survival of CLL patients. **B:** graphical representation of the geographical distribution of CLL patients. **C:** overall survival of CML patients. **D:** graphical representation of the geographical distribution of CML patients. CLL: chronic lymphocytic leukemia; CML: chronic myeloid leukemia.

The survival of CML patients in Mexico has improved over time and is similar to what has been reported in other parts of the world. Our results show a 15-year survival probability of 87.5%, which can be explained by access to tyrosine kinase inhibitors^{14,15}. A recent study on access to imatinib in Mexico demonstrated a significant improvement in the survival of CML patients, supporting the importance of ensuring access to targeted therapies in our context¹⁶.

Our results describe a higher number of patients with CML than with CLL, in addition to a younger population. These findings underline the importance of generating local data on chronic leukemias in Mexico. The characterization of our population allows identifying specific needs in terms of medical care and access to innovative treatments. Furthermore, these data can be used to design public health strategies focused on improving early diagnosis and the availability of advanced therapies in different regions of the country.

A significant limitation of this study is the absence of a detailed analysis of the treatment patterns used in both cohorts. This omission is due to the fact that the main purpose of the work was to analyze the variability

in therapeutic registration over 25 years, so it was not possible to systematize this information in this first phase of the analysis. Treatment patterns and their impact on disease evolution will be addressed in a complementary publication currently in preparation, which will broaden the understanding of the clinical management of these entities in our context.

Conclusions

This analysis highlights key differences between the 2 most common forms of chronic leukemias in terms of age, sex distribution, residence, and survival. These findings are useful for planning medical resources and developing care strategies focused on the specific characteristics of each group.

Funding

None declared.

Conflicts of interest

None declared.

Table 2. Geographical distribution of the studied population

State	CML n = 85 (%)	CLL n = 68 (%)	Total n = 153 (%)
Aguascalientes	0	0	0
Baja California	0	1 (1.5)	1 (0.7)
Baja California Sur	0	0	0
Campeche	0	1 (1.5)	1 (0.7)
Chiapas	3 (3.5)	2 (3)	5 (3.4)
Chihuahua	0	0	0
Ciudad de México	14 (16.5)	14 (20.6)	28 (18.9)
Coahuila de Zaragoza	1 (1.2)	1 (1.5)	2 (1.4)
Colima	1 (1.2)	2 (3)	3 (2)
Durango	0	0	0
Estado de México	24 (28.2)	21 (30.9)	45 (30.4)
Guanajuato	4 (4.7)	4 (5.9)	8 (5.4)
Guerrero	5 (5.9)	1 (1.5)	6 (4.1)
Hidalgo	2 (2.3)	1 (1.5)	3 (2)
Jalisco	2 (2.3)	2 (3)	4 (2.7)
Michoacán de Ocampo	1 (1.2)	2 (3)	3 (2)
Morelos	2 (2.3)	1 (1.5)	3 (2)
Nayarit	0	0	0
Nuevo León	0	1 (1.5)	1 (0.7)
Oaxaca	2 (2.3)	2 (3)	4 (2.7)
Puebla	3 (3.5)	4 (5.9)	7 (4.7)
Querétaro	1 (1.2)	1 (1.5)	2 (1.4)
Quintana Roo	0	0	0
San Luis Potosí	0	1 (1.5)	1 (0.7)
Sinaloa	0	0	0
Sonora	0	0	0
Tabasco	3 (3.5)	2 (3)	5 (3.4)
Tamaulipas	1 (1.2)	0	1 (0.7)
Tlaxcala	2 (2.3)	0	2 (1.4)
Veracruz de Ignacio de la Llave	8 (9.4)	3 (4.4)	11 (7.4)
Yucatán	1 (1.2)	0	1 (0.7)
Zacatecas	0	1 (1.5)	1 (0.7)

CLL: chronic lymphocytic leukemia; CML: chronic myeloid leukemia.

Ethical considerations

Protection of persons and animals. The authors declare that no experiments on human beings or animals have been performed for this research.

Confidentiality, informed consent, and ethical approval. The authors have obtained approval from the Ethics Committee for the analysis of routinely obtained and anonymized clinical data, so informed consent was not necessary. Relevant recommendations have been followed.

Declaration on the use of artificial intelligence. The authors declare that they did not use any type of generative artificial intelligence for the drafting of this manuscript.

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