v. 3, n. 66, 2023

International Journal of Health Science

MORTALITY DUE TO LEUKEMIA IN CHIAPAS POPULATION DURING 2015-2019

Sonia Rosa Roblero Ochoa
Full Time Professor. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

Tomasa de los Angeles Jiménez Pirrón
Full Time Professor. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

Zally Patricia Mandujano Trujillo
Full Time Professor. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

Rosa Martha Velasco Martinez
Full Time Professor. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

Ramona del Carmen Guerrero Aguilera
Surgeon. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

René Alejandro Ruíz Luna
Surgeon. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

Maria Fernanda Flores Chiu
Surgeon. Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).

Itzel Castro Padilla. Surgeon
Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, UNACH. Tuxtla Gutierrez, Chiapas.

Abstract: Leukemia in adults was the fifteenth most diagnosed cause of cancer and the eleventh leading cause of cancer mortality in the world in 2018. In Mexico, for 2019, the National Institute of Statistics, Geography and Informatics (Instituto Nacional de Estadística, Geografía e Informática, INEGI; according to its acronym in spanish) reported that mortality leukemia was 5,130 deaths, with 4.1 per 100,000 inhabitants, occupying the 8th place within the main causes of mortality for this group. **Objective:** Identify the sociodemographic characteristics of people who died from leukemia in Chiapas, Mexico in the period 2015-2019. **Method:** Descriptive, cross-sectional and retrospective study. The sample corresponded to the deaths that occurred and were registered in the general population of Chiapas, Mexico. Information from the General Directorate of Health Information was used during the period 2015-2019. **Results and conclusions:** 54.6% of deaths were men. Mortality by age in children under 10 years old and in the 56-65 age group is higher in women, unlike the 11-20 age group and 66 years old and more, where the trend is towards men. The most frequent type was acute lymphoblastic leukemia (ALL) unlike what was reported in other countries. Most of the deceased were affiliated with some health service, had medical assistance and had some degree of basic education. There was an increase in the years 2018 and 2019 in each of the types.

Keywords: Leukemia, mortality, Chiapas, sociodemographic characteristics.

INTRODUCTION

Leukemia is a neoplasm originated from primitive blood-producing cells, frequently from white blood cells, whose main function is to fight infections; growing and dividing in an organized way depending on the external stimuli to which the human body is exposed.

People with excessive production of abnormal white blood cells develop leukemia. (Juliusson, 2016)

"Leukemia is the most common cancer and the leading cause of death in children aged 0 to 14 years old" (Namayandeh et al., 2018). In 2018, 65,111 (32.5%) cases of leukemia were registered in the world out of a total of 200,166 cases of cancer in children between 0 and 14 years old. Worldwide, reported cancer mortality was 74,956 deaths in children 0 to 14 years old, which 29,241 (39%) were due to leukemia. (Namayandeh et al., 2018)

Mexico continues to present an increase in cases of leukemia in children, despite technological advances in medicine, it has not been able to reduce mortality from this disease; even among Latin American countries it represents the country with the highest death rate (Aguilar, 2016). In the year 2010-2014 in Canada, the United States and the United Kingdom, the incidence rates of leukemia in children under 16 years old are 5.8, 4.6 and 4.0 per 100,000 inhabitants/year, respectively, while in Guadalajara, Jalisco it was 6.4 cases per 100,000 inhabitants/year. (Tlacuilo et al., 2017)

Leukemia in adults was the 15th most commonly diagnosed cause of cancer and the 11th leading cause of cancer mortality worldwide in 2018. (Bispo et al., 2019)

In 2019, the INEGI reported that mortality from leukemia in Mexico was 5,130 deaths, with 4.1 per 100,000 inhabitants, occupying the 8th place. An increase in mortality according to age is observed, occupying the first place in the group of children under 5 years old and eleventh in the group of 70 years old and more of malignant neoplasms. (Blutitude, 2022)

In a study carried out in 2016 worldwide based on 29 specific groups of cancer, it was reported that the incidence rate of leukemia was 269,000 men and 197,000 women; regarding mortality, it was 180,000 men, 130,000 women (Fitzmaurice et al., 2018), coinciding with another similar study carried out in 2018 based on 36 types of cancer, where it mentions that the age-standardized incidence rate in men was 6.1/100,000 inhabitants, likewise mortality was higher in men with 4.2/100,000 inhabitants. (Bray et al. 2018). The finding of predominance in the male sex was also reported in studies carried out in: Brazil (Gouveia, 2020), the United States (Siegel, 2017), South Korea (Jung, 2014) and China (Li, B., 2020).

Risk factors for leukemia include radiation (therapeutic, occupational, and wartime), chemotherapy, family history, chemical exposures (eg, residential and occupational), lifestyle factors such as smoking (Bispo et al., 2019), syndromes and genetic abnormalities such as Down syndrome (Seth, 2015). In studies carried out in Canada and the United States, they mentioned other risk factors such as socioeconomics and access to health care (Bhatia et al., 2002, as cited in Boonhat, (2020), which reflects the limited diagnostic infrastructure; availability of medical facilities that support morphological, immunohistochemical and cytogenetic profiles (Bispo et al., 2019). In a study based on 57 institutions in Mexico from 2007-2015, it was observed that the average rate of abandonment of treatment was 10%, however, the institutions of the southern states of the country presented 25-50%. (Rivera-Luna et al., 2017). Another risk factor is obesity, which is associated with lower survival rates in high-income countries and malnutrition in low- and middle-income nations. (Barr, 2016; Saraiva et al., 2018)

OBJECTIVE

To identify the sociodemographic characteristics of patients who died from leukemia in Chiapas, Mexico in the period

2015-2019.

METHODOLOGY

A cross-sectional and descriptive study was carried out. The sample corresponded to all deaths caused by leukemia in Chiapas, Mexico, during the period 2015-2019. The data were obtained from the mortality records in the corresponding years, compiled and published by the General Directorate of Health Information (Dirección General de Información en Salud, DGIS; according to its acronym in spanish). These were selected according to the following variables: municipality of registration, socioeconomic zone, year of occurrence, type of leukemia, sex, entitlement (affiliation with health services), schooling, medical care, and occupation.

The database and the statistical analysis were processed in the SPSS version 26 program.

ETHICAL CONSIDERATIONS

As it is a review of data obtained from a public source, in accordance with the Official Mexican Standard 012, the request for informed consent is not necessary.

The project was approved by the Bioethics Committee of the Faculty of Human Medicine Dr. Manuel Velasco Suárez, Campus II, Autonome University of Chiapas (Universidad Autónoma de Chiapas, UNACH, according to its acronym in spanish).

RESULTS

Mortality in Mexico during the 2015-2019 period was 3,471,682, which 135,776 (3.91%) occurred in Chiapas and of these 1,773 (1.30%) were due to leukemia (Tables 1 and 2).

54.6% (968) of the deaths were men and 45.4% (805) women (Figure 1).

Regarding mortality by sex and age, it was observed that in children under 10 years old and in the 56 to 65 age group it was higher in women, unlike the 11 to 20 years old and 66 years old and more, where the trend is towards men (Figure 1).

The minimum age recorded was two months old and the maximum was 100 years old. The mean age was 44.81 with a standard deviation of 25.94. The age group that presented the highest mortality was in children under 10 years old with 217 (12.3%) cases, followed by 141 (8%) cases from 56 to 60 years old, 124 (7%) from 16 to 20 years old, and 120 (6.8%) from 11 to 15 years old (Figure 1).

It was observed that the most frequent types of leukemias were: acute lymphoblastic leukemia (ALL), unspecified non-Hodgkin lymphoma, unspecified leukemia, acute myeloblastic leukemia (AML), multiple myeloma, and unspecified Hodgkin lymphoma (Table 3).

Regarding entitlement, 1,204 (67.91%) had affiliation to some health service, while 321 (18.1%) had none (Figure 2).

Most of the deceased had medical assistance (80.3%), while the rest lacked it or did not specify.

The predominant educational level in the population had some degree of primary education, 40.72% (722); without schooling, 19.40% (344); complete secondary, 11.56% (205); professional, 8.57% (152); not specified, 4.17% (74) and complete preparatory, 4.06% (72).

According to the behavior of leukemias during the years of study, there was an increase in the years 2018 and 2019 in each of the types (Figure 4).

The socioeconomic zones with the highest number of deaths are: Metropolitana, Soconusco, Altos Tzotzil Tzetzal and Meseta Comiteca.

Regarding occupation, the first three categories were "does not work", "other

	2015	2016	2017	2018	2019	TOTAL
MEXICO	654,593	684,437	693,848	704,803	734,001	3,471,682
CHIAPAS*	26,519 (4.05%)	26,691 (3.90%)	26,986 (3.89%)	27,263 (3.87%)	28,317 (3.86%)	135,776 (3.91%)

Table 1. Mortality in Mexico and Chiapas

Source: Created from the 2015-2019 DGIS Database.

* Percentage of mortality compared to MEXICO.

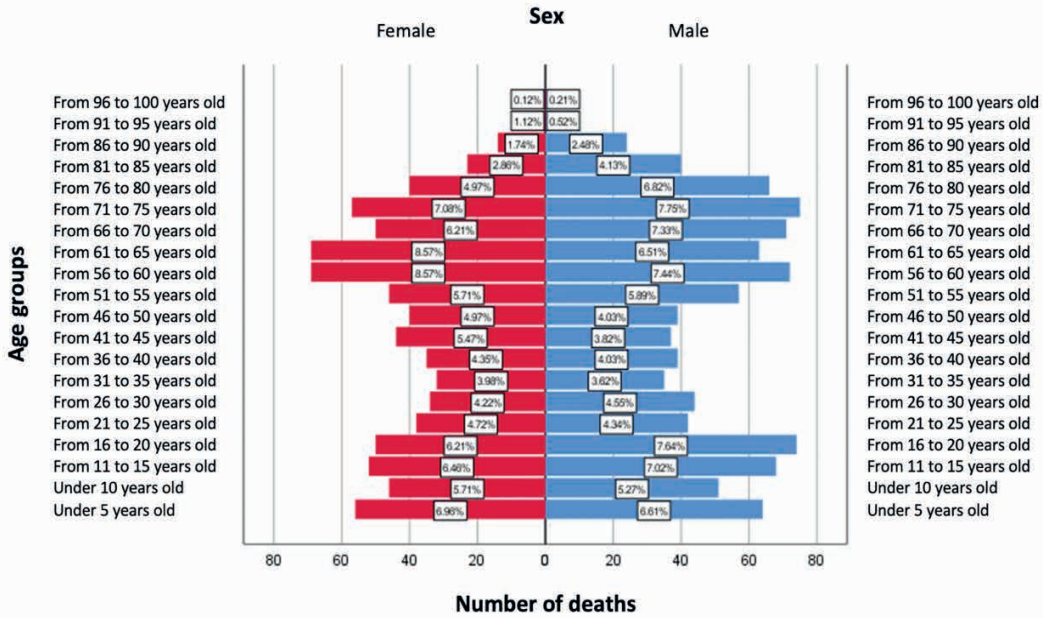
	2015	2016	2017	2018	2019	TOTAL
LEUKEMIA IN CHIAPAS**	316 (1.19%)	337 (1.26%)	329 (1.21%)	419 (1.53%)	372 (1.31%)	1,773 (1.30%)

Table 2. Leukemia mortality in Chiapas

Source: Created from the 2015-2019 DGIS Database.

** Percentage of mortality compared to CHIAPAS.

Figure 1. Deaths due to leukemia by age group and sex



Source: Created from the 2015-2019 DGIS Database.

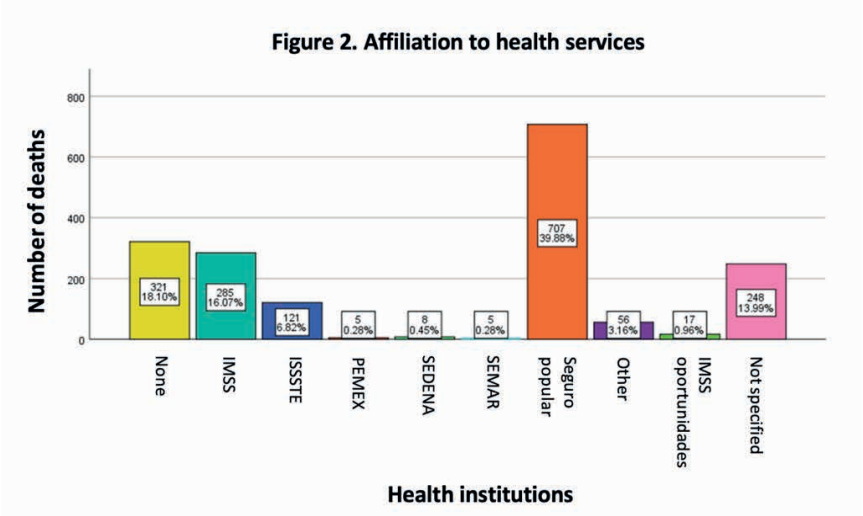
LEUKEMIA TYPE	No.	%
Classic Hodgkin lymphoma with mixed cellularity	2	0.1
Hodgkin lymphoma, unspecified	90	5.1
Grade II follicular lymphoma	1	0.1
Follicular lymphoma, not otherwise specified	7	0.4
Small B-cell lymphoma	6	0.3
mantle cell lymphoma	1	0.1
Large B-cell lymphoma (diffuse)	32	1.8
Lymphoblastic lymphoma (diffuse)	2	0.1
Burkitt's lymphoma	1	0.1

Non-follicular (diffuse) lymphoma, not otherwise specified	9	0.5
mycosis fungoides	1	0.1
Sézary disease	1	0.1
Peripheral T-cell lymphoma not elsewhere classified	8	0.5
Other mature NK/T-cell lymphomas	4	0.2
ALK-positive anaplastic large cell lymphoma	1	0.1
Cutaneous T-cell lymphoma, unspecified	4	0.2
Mature T/NK-cell lymphoma, unspecified	2	0.1
B-cell lymphoma, not otherwise specified	8	0.5
Mediastinal large B-cell (thymic) lymphoma	1	0.1
Other specified types of non-Hodgkin lymphoma	3	0.2
Non-Hodgkin lymphoma, unspecified	289	16.3
Extranodal NK/T-cell lymphoma, nasal type	2	0.1
Blastic NK cell lymphoma	1	0.1
Angioimmunoblastic T-cell lymphoma	1	0.1
Primary Cutaneous CD30-Positive T-Cell Lymphoproliferative Disorders	1	0.1
Waldenstrom's macroglobulinemia	2	0.1
Multiple myeloma	128	7.2
Plasma cell leukemia	5	0.3
Plasmacytoma, extramedullary	1	0.1
Solitary plasmacytoma	1	0.1
Acute lymphoblastic leukemia (ALL)	510	28.8
B-cell chronic lymphocytic leukemia	31	1.7
B-cell prolymphocytic leukemia	1	0.1
Adult T-cell leukemia/lymphoma (HTLV-1 associated)	3	0.2
Lymphoid leukemia, not otherwise specified	21	1.2
Acute myeloblastic leukemia (AML)	149	8.4
Chronic myeloid leukemia (CML), BCR/ABL-positive	45	2.5
Myeloid sarcoma	2	0.1
Acute Promyelocytic Leukemia (APL)	15	0.8
Acute myelomonocytic leukemia	6	0.3
Acute myeloid leukemia with multilineage dysplasia	1	0.1
Myeloid leukemia, not otherwise specified	27	1.5
Acute monocytic/monoblastic leukemia	3	0.2
Chronic myelomonocytic leukemia	1	0.1
Acute erythroid leukemia	1	0.1
Acute megakaryoblastic leukemia	6	0.3
Other specified leukemias	1	0.1
Acute leukemia, cells of unspecified type	58	3.3
Chronic leukemia, cells of unspecified type	9	0.5
Other cell leukemias of unspecified type	3	0.2
Leukemia, unspecified	252	14.2
Malignant neoplasm of lymphatic, hematopoietic and related tissues, not otherwise specified	13	0.7

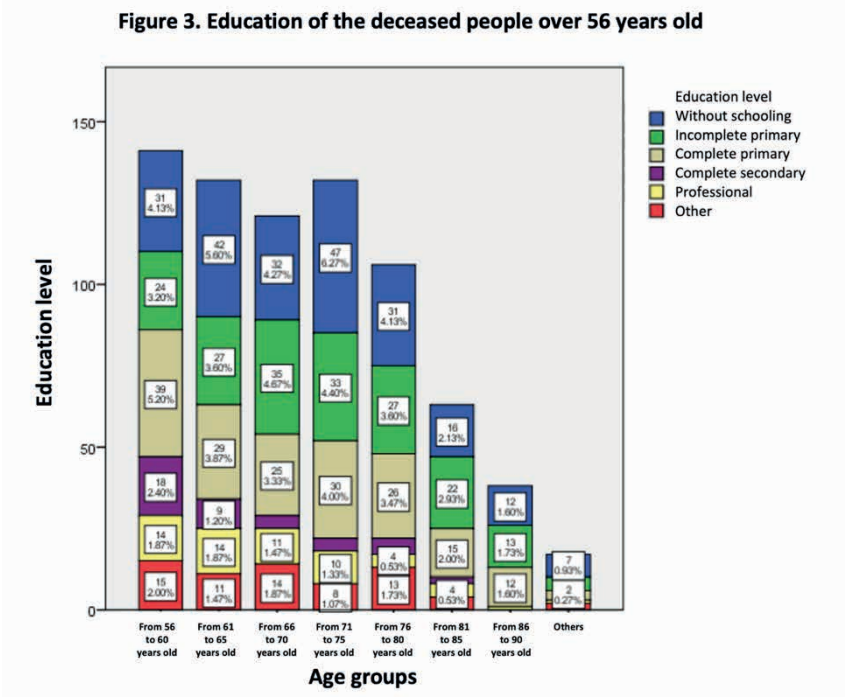
TOTAL	**1,773**	100

Table 3. Types of leukemias as cause of death in Chiapas during 2015-2019

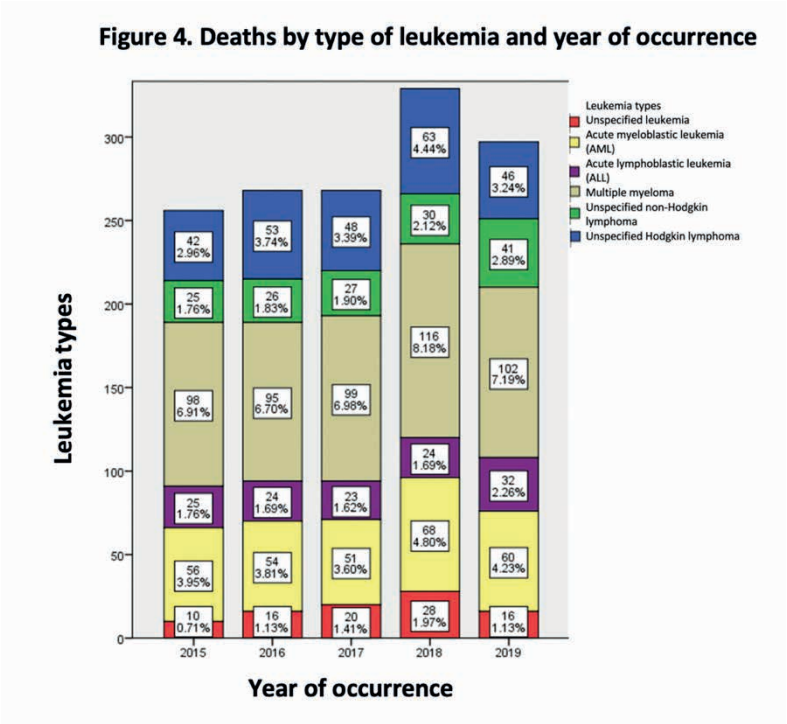
Source: Created from the 2015-2019 DGIS Database.



Source: Created from the 2015-2019 DGIS Database.

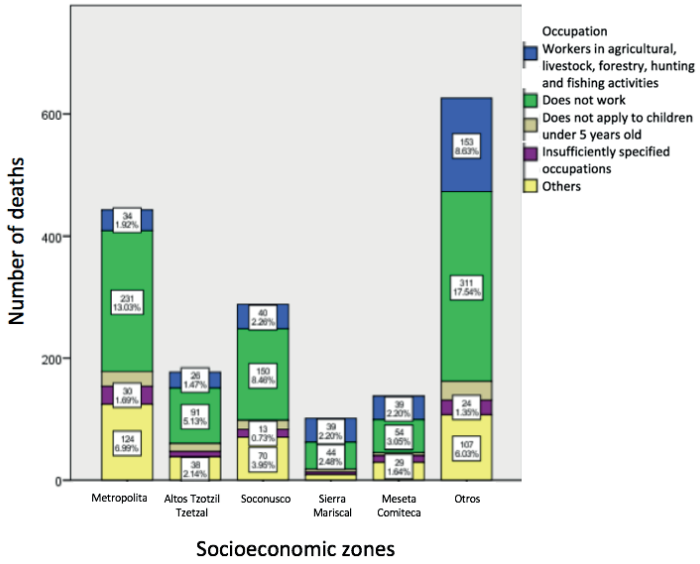


Source: Created from the 2015-2019 DGIS Database.



Source: Created from the 2015-2019 DGIS Database.

Figure 5. Mortality according to socioeconomic zones and occupation



Source: Created from the 2015-2019 DGIS Database.

occupations" and "workers in agricultural, livestock, forestry, hunting and fishing activities".

DISCUSSION

Statewide, leukemia mortality has increased, an increase in reported cases was observed in 2018 in relation to the period studied, however, no information was found to determine the cause.

In studies carried out worldwide, mortality from leukemia predominated in men (Bray et al., 2018; Fitzmaurice, 2018; Jung, 2014; Li, B., 2020) as well as in American countries and the state of Chiapas, Mexico (Siegel, 2017; Gouveia, 2020).

Regarding the most frequent types of leukemia, ALL ranks first in Chiapas, which differs from the studies carried out globally in the general population in 2018 by Bray et al. and Fitzmaurice, where the corresponding reports do not mention it as one of the most frequent.

Regarding age, an increase in mortality was observed from the age of 56, which coincides with a similar study carried out in Brazil in the general population during the period 2010-2016, where a progressive increase in mortality rates was found with the advancement of age in both sexes, especially in those over 60 years old (Gouveia, 2020). Similarly, in a study reported in a rural population in China, mortality leukemia presented a statistically significant increase in men aged from 55 to 74 years old during 2003-2017. (Li, B., 2020)

Leuraud et al., (2015, cited in Hernández and Pernalete, 2017) in a study made up of 297 workers in France, the United Kingdom and the United States, demonstrated that prolonged exposure to low doses of ionizing radiation can cause leukemia, lymphoma, myeloma multiplex and mortality in adults who are exposed to radiation at work. Bispo et al., (2019) also mentioned that exposure to ionizing radiation in nuclear workers and radiologists increases mortality from leukemia, as well as occupational exposure to formaldehyde, a chemical used in many construction materials, household products, and industrial disinfectants. This contrasts with what was found in the present study, where most of the registered deaths reported "does not work", it is unknown if they did not have work due to the disease itself, caused by the disabling nature of the morbid process. Followed by "other occupations" and lastly "workers in agricultural, livestock, forestry, hunting and fishing activities".

FINAL COMMENTS

The present analysis reports mortality frequencies and socioeconomic factors associated in the Chiapas population; however, some data may be altered due to underreporting problems in the General Directorate of Health Information database.

REFERENCES

AGUILAR, M. et al. Principales causas de mortalidad durante la fase de inducción a la remisión en los pacientes pediátricos con leucemia linfoblástica aguda. Rev Med Inst Mex Seguro Soc, v. 55, n. 3, p. 286-291.

BARR, D. et al. Importance of Nutrition in the Treatment of Leukemia in Children and Adolescents. Archives of Medical Research, v. 47, n. 8, p. 585–592. doi:10.1016/j.arcmed.2016.11.013

BISPO, J. et al. Epidemiology and Etiology of Leukemia and Lymphoma. Cold Spring Harbor Perspectives in Medicine, 2019. a034819.doi:10.1101/cshperspect.a034819

BLUTITUDE. Informe ejecutivo sobre las tendencias de mortalidad por cáncer en México a nivel nacional. All.Can: México, 2022.

BOONHAT, H. & LIN, R. Association between leukemia incidence and mortality and residential petrochemical exposure: A systematic review and meta-analysis. 2020. Recuperado el 9 de octubre de 2022];145(106090):106090. Citado de: https://reader.elsevier.com/reader/sd/pii/S0160412020320456?token=992157A1B02E8A3FD0A628C48C72BE65830884951A370D6A93BCF99A498E464D48C6A7396C3F8F40E074FFA22BAEAA7B&originRegion=us-east-1&originCreation=20221009223427

BRAY, F. et al. Global Cancer Statistics 2018: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA: A Cancer Journal for Clinicians. 2018. doi:10.3322/caac.21492

DIRECCIÓN GENERAL DE INFORMACIÓN EN SALUD. Defunciones por año de registro. Sistema de Información de la Secretaria de Salud. Recuperado el 20 de Mayo de 2023. Citado de: http://sinaiscap.salud.gob.mx:8080/DGIS/

FITZMAURICE, C. et al. Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-Years for 29 Cancer Groups, 1990 to 2016. JAMA Oncology, v. 4, n. 11, p. 1553. (2018). https://doi.org/10.1001/jamaoncol.2018.2706.

GOUVEIA, M. et al. Comparison of factors associated with leukemia and lymphoma mortality in Brazil. Cad Saude Publica, v. 36, n. 8. 2020. doi: 10.1590/0102-311x00077119. Epub 2020 Aug 3. PMID: 32756763.

HERNÁNDEZ, A. & PERNALETE, M. Leucemia ocupacional: importancia de la prevención. Comunidad y Salud, v. 15, n. 1, p. 86-90. 2017. Recuperado el 14 de junio de 2023. Citado de http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S1690-32932017000100010&lng=es&tlng=es.

JULIUSSON, G. & HOUGH, R. Leukemia. Tumors in Adolescents and Young Adults, p. 87–100. 2016. doi:10.1159/000447076

JUNG, K. et al. Cancer statistics in Korea: incidence, mortality, survival, and prevalence in 2014. Cancer Res Treat, v. 49, p. 292-305. 2017.

LI, B. et al. The Current Situation and Future Trend of Leukemia Mortality by Sex and Area in China. Frontiers in Public Health, v. 8. 2020. doi:10.3389/fpubh.2020.598215

NAMAYANDEH, S. et al. GLOBAL leukemia in children 0-14 statistics 2018, incidence and mortality and Human Development Index (HDI): GLOBOCAN sources and methods. Asian Pac J Cancer Prev, v. 21, n. 5, p. 1487–94. 2020. Disponible en: http://journal.waocp.org/article_89094_439fb53eadaa109a8e988b41a558e4f7.pdf

RIVERA, R. et al. Current outlook of childhood cancer epidemiology in a middle-income country under a public health insurance program. Pediatric Hematology and Oncology, v. 34, n. 1, p. 43–50. 2017. doi:10.1080/08880018.2016.1276236

SARAIVA, D. et al. Leukemia mortality trends in children and adolescents in Brazilian state capitals: 1980-2015. Tendência de mortalidade por leucemias em crianças e adolescentes nas capitais dos estados brasileiros: 1980-2015. Epidemiologia e servicos de saude: revista do Sistema Unico de Saude do Brasil, v. 27, n. 3. 2018. e2017310. https://doi.org/10.5123/S1679-49742018000300004

SETH, R. & SINGH, A. Leukemias in Children. The Indian Journal of Pediatrics, v. 82, n. 9, p. 817–824. 2015. doi:10.1007/s12098-015-1695-5

SIEGEL, R. et al. Cancer statistics, 2017. CA: A Cancer Journal for Clinicians, v. 67, n. 1, p. 7–30. 2017. doi:10.3322/caac.21387

TLACUILO, A. et al. Geographical distribution and cluster detection of childhood leukemia in the metropolitan area of Guadalajara, Mexico. Rev Invest Clin, v. 69, n. 3. 2017. Recuperado el 11 de octubre de 2022. Citado de: https://clinicalandtranslationalinvestigation.com/files/ric_2017_69_3_159-165.pdf