

Infection and acute leukaemia in a country with great migration and an increasing incidence of acute leukemias

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Acute lymphoblastic leukaemia (ALL) is the most common cancer in children. In recent years, an increase in the incidence of ALL has been identified in Mexico. During the 90's, in a 10-year period the incidence increased by close to 100%; at the same time many doubted these findings. However, in later studies it was corroborated that the incidence of ALL in Mexico City was higher than that reported in the USA. Currently, Mexico City has one of the highest incidence rates of ALL around the globe.

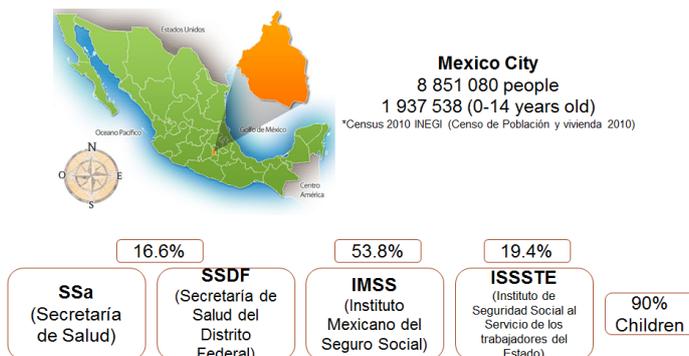
Interestingly, this incidence differs by zones within the country. In the states near to the USA the incidence is relatively lower than in the centre. At the south of the country the incidence of ALL is extremely high.

In 2012, we started activities of our group: MEXICAN INTER-INSTITUTIONAL GROUP FOR THE IDENTIFICATION OF THE CAUSES OF CHILDHOOD LEUKEMIA (MIGICCL). The main activities are related: a) to identifying the factors that contribute to the high incidence of childhood leukaemia in Mexico and b) to elucidating the origin of the high prevalence of prognostic and genetic characteristics of our population in comparison to others, such as the USA.

We are searching for new biomarkers related to the prognosis of ALL in Mexican children and new rearrangements associated with the characteristics of the disease in our population. We have two principal objectives: 1) to prevent the developing of Acute Leukaemia (AL) in Mexican and Hispanic children, and 2) to reduce mortality rates of ALL.

In 2010, we started a study to identify the causes of AL in Mexican children. In Mexico there are different types of Health Insurance Institutions. Formal workers receive medical attention at the Instituto Mexicano del Seguro Social; government workers at the Instituto de Seguridad Social al Servicio de los Trabajadores del Estado, and the Seguro Popular (Secretaria de Salud). Since 2010, treatment of children with cancer has been free in the whole country. In Mexico City, 90% of all cases diagnosed with acute leukaemia attend Public Hospitals.

Public Health Institutions in Mexico City



We have been conducting a prospective cohort study in all the Public Hospitals in Mexico City. At present, we have ~4,000 AL cases and we also have controls matched with cases by age, sex and second-level hospitals from the health institution where they received medical attention.

In addition, we have been working in a model for identifying the risk factors related to the development of AL in children. This model consists of three phenomena: a) the susceptibility gradient, b) the exposition gradient and 3) the vulnerability period.

Down syndrome (DS) children are a population with a high susceptibility for developing AL. In our first studies, we included DS children with AL (cases) and DS children without AL (controls). In an important study, we identified that infections in children with DS during the first year of life, particularly those severe infections requiring for hospitalization, were associated with a high risk of developing AL after 6 years of age. In other studies, we have investigated the participation in AL etiology of virus with B-cell affinity, for example, Human T-Lymphotropic Virus Type 1, Mouse Mammary Tumor-Like Virus, Epstein Barr Virus, Human Citomegalovirus, and Human Herpes family 6 and 7. However, in all cases, these results were negative.

Last year, we published an article on the role of different infectious agents in the development of AL. There are many aspects that englobe the immune system. We mentioned three other action mechanisms: the induction of a stressor answer, and the subsequent proliferation of a cell that in this moment is most vulnerable to those carcinogenic agents that would induce cancer in that cell. One other mechanism is the proliferation of mutated cells, induced by an infection. Another mechanism is that an infection, especially by a virus, induces a cell to a stage previously where it is possible to be reprogramed (iPSCs).

The population mixing (Kinlen's) hypothesis would be very interesting to explore in Mexico, because its frontiers are so complex. Mexico is the neighbour of the USA and all immigrants from Latino American countries need first to cross Mexico. This "mixing" would provoke the highest incidence of ALL among Hispanic children. It is a very interesting question we need to explore.

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