

Childhood Cancer In Algeria: An Analytical Study Of The Registry Of Children And Adolescents For 2020

Hayat Tahri ¹, Siham Abdelaziz ²

Abstract:

This research undertakes an analytical exploration of childhood cancer in Algeria, aiming to delineate the current landscape and the challenges inherent in addressing and treating this critical condition. Childhood cancer, a grave health issue, demands focused attention due to its profound effects on affected children and their families. This study delineates the prevalence of various cancer types across different age groups and scrutinizes trends in incidence rates among both genders by analyzing data from the national registry for childhood and adolescent cancer for the year 2020. A significant observation from this analysis is the decline in incidence rates of childhood cancer compared to earlier years, with 1,267 cases recorded in 2002 and a reduction to 837 cases for both sexes in 2020. The age bracket of 0-4 years exhibited the highest incidence rates across genders. Predominant cancer types include tumors of the central nervous system, leukemia, and lymphoma.

Keywords: Children, Disease, Cancer, Tumor, Childhood Cancer.

Introduction:

Cancer remains a predominant global health issue and is one of the leading causes of mortality worldwide. Statistical forecasts suggest an unrelenting escalation in cancer incidences globally. As reported by the World Health Organization, the year 2021 marked a significant milestone, with approximately 20 million people diagnosed with cancer, leading to nearly 10 million fatalities.

Beyond its health implications, cancer imposes substantial economic and social burdens on communities and individuals alike. The rise in cancer incidences is largely attributed to several risk factors, including but not limited to, poor dietary habits, sedentary lifestyles, escalating smoking rates, and excessive alcohol consumption, all of which significantly contribute to the onset of cancer.

Cancer indiscriminately affects all age groups, posing a severe risk to children and adolescents alike. Despite notable advances in medical science, cancer continues to be the second most common cause of death in children under the age of fifteen worldwide. According to the World Health Organization, annually, around 400,000 children and adolescents aged 0 to 19 years are diagnosed with cancer (Bouarissa, 2024).

In Algeria, the incidence of childhood cancer has risen to approximately 1,800 annual cases, equating to about five new cases each day as of 2024. The spectrum of cancers affecting children varies widely in type and severity, with leukemia constituting about 50% of these cases, followed by lymphoma and brain tumors.

¹Associate Professor, Demography, Mohamed Lamine Debaghine Setif-2 University (Algeria), E-mail: h.tahri@univ-setif2.dz

²Associate Professor, Demography, Mohamed Lamine Debaghine Setif-2 University (Algeria), E-mail: s.abdelaziz@univ-setif2.dz Received: 24/06/2024, Published: 18/11/2024

Other less prevalent cancers include soft tissue sarcomas, bone cancers, and cancers of the eye, kidney, and liver. These cancers, while aggressive, respond variably to treatments based on their type, with success rates not falling below 50% (Touba, 2014). Childhood cancer not only poses a formidable challenge in terms of early diagnosis and the high costs associated with treatment, including medication, but also exerts considerable psychological and social stresses on the affected children and their families.

This study primarily addresses the fundamental question: What is the extent of the progression of childhood cancer rates in Algeria?

Study Objectives:

The objectives of this study are to:

- Ascertain the prevalence of childhood cancer in Algeria and determine the age groups most adversely affected.
- Identify the most common types of childhood cancer.
- Investigate the contributing factors associated with the increased risk of childhood cancer.

1. Study Concepts:

1.1. Child:

- A. **Language Perspective:** The term 'child' refers to a young individual, often described as soft and delicate. This characterization persists until the onset of puberty, denoting a period of innocence and vulnerability (Sharida Al-Anzi, 2019, p. 312).
- B. **Conventional Perspective:** Childhood, also termed as minority, spans from birth to the threshold of maturity. According to juridical terminology, this term encompasses the duration from birth to puberty, marking the developmental stages of early life (Shtewan, 2024, p. 364).
- C. **Operational Definition:** In demographic terms, children represent the youngest segment within the population structure of any nation, signifying the initial phase of the human lifecycle.

1.2. Disease:

The concept of 'disease' varies among different contexts. It generally refers to a condition where one or more bodily organs are impaired, disrupting normal function or coordination among organs. Webster's International Dictionary encapsulates disease as a condition where an individual's health is compromised, causing discomfort and necessitating rest (El-Meligi, 2006, p. 98).

Alternatively, Petit Larousse Médical describes it as any ailment or disorder that manifests with distinctive features, causes, signs, and symptoms, reflecting the body's inability to operate normally (André & Bourneuf, 1983, p. 155).

1.3. Cancer:

Cancer is characterized by an aberration in cellular function that triggers uncontrolled cell division, culminating in the development of a tumor. This tumorous growth might initially be asymptomatic, especially if distant from neural clusters and non-interfering with vital blood flow. Nevertheless, as the tumor enlarges, it becomes a significant health impediment, exhibiting systemic symptoms (Al-Shaer, 2021, p. 8).

1.4. Childhood Cancer:

Distinct from adult cancer, childhood cancer primarily differs in the common sites affected and the cancer types more prevalent among children. All children, irrespective of age or gender, are susceptible to cancer. Fortunately, due to medical advancements, survival rates among children have significantly improved over the years.

Currently, there are twelve major types of cancers affecting children, with leukemia and brain cancer being the most common. The incidence of cancer is particularly high among infants and tends to decrease as children grow older. Despite extensive research, the exact causes of childhood cancer remain elusive to this day (Saudi Ministry of Health, 2024).

2. Literature Review:

Extensive research has been conducted on the multifaceted aspects of cancer, including its therapeutic, social, and psychological dimensions, particularly in pediatric contexts. A notable study by the "Francophone Virtual Medical University" focused on prominent childhood cancers, aiming to elucidate the principal histological types of childhood tumors.

This research emphasized the critical role of pathological anatomy in diagnosing and refining therapeutic approaches to maximize recovery rates among children afflicted with cancer. The findings revealed that rare tumors represent approximately 1% of all pediatric cancers, most frequently diagnosed in children under five, predominantly males. The study underscored the paramount importance of early diagnosis in enhancing treatment outcomes across all cancer types (Francophone Virtual Medical University, 2013).

Researcher Salwa Haimeur, in her pivotal work "Malignant Bone Tumors in Children," examined the prevalence of primary malignant bone tumors in pediatric patients. Her study encompassed 30 cases over a six-year span from 2008 to 2014. It concluded that bone tumors constitute about 5% of all childhood cancers. Among these, 15% were identified as malignant, with osteosarcoma and Ewing's sarcoma comprising roughly 90% of these cases. The remaining 10% included exceedingly rare tumors like chondrosarcoma, malignant chordoma, and lymphomatous bone tumors (Haimeur, 2014).

Another significant contribution to the field is Abdelnour Mohsen's study "Psychological and Social Effects of Recovery and Treatment in Children with Cancer and Coping Mechanisms," which involved 20 cases from pediatric oncology services. This research highlighted profound psychological impacts and social repercussions experienced by the families of cancer patients. A notable observation was the strong aversion of parents towards conventional treatment modalities, largely due to their adverse side effects.

Moreover, children undergoing treatment exhibited a range of psychological disturbances, including heightened anxiety, irritability, nervous tension from chemotherapy treatments, social withdrawal, emotional suppression, and a profound sense of insecurity. These conditions often resulted in behaviors aimed at garnering attention to their plight, particularly seeking additional care and comfort from their mothers (Abdelnour, 2022).

Our literature review reveals that while there exists a robust body of knowledge addressing the therapeutic, social, and psychological aspects of cancer, there remains a gap concerning the demographic analysis of childhood cancer. Consequently, our study seeks to enrich the existing research by delving deeply into the demographic facets of this disease. We aim to provide detailed insights into the prevalence and incidence rates of childhood cancer, analyzing distribution patterns across genders and other demographic variables, thereby offering a comprehensive demographic perspective on this critical health issue.

II. Tools and Methodology:

To thoroughly investigate the research question articulated in this study, we employed the following methodological frameworks:

- **Descriptive Approach:**

This methodology involved a detailed depiction of the condition of children afflicted with cancer, achieved by gathering and assimilating data pertinent to the subject of study.

- **Analytical Approach:**

Utilized for the examination of data and statistics sourced from the national registry for childhood and adolescent cancer for the year 2020. The formal establishment of this registry by the Algerian Ministry of Health commenced on January 1, 2018. It was orchestrated under the stewardship of the Ministry of Health, Population, and Hospital Reform, along with the National Institute of Public Health.

The primary aim of this registry is to delineate the disease characteristics in children, with a specific focus on elucidating the prevalence of childhood cancers, characterizing the continuum of care provided to patients, as well as determining the stage of disease at diagnosis, estimating cure rates, and the survival probabilities of affected children. The registry was meticulously developed through an experimental approach, striving for inclusivity by encompassing all cancer-related records within the Algerian healthcare networks.

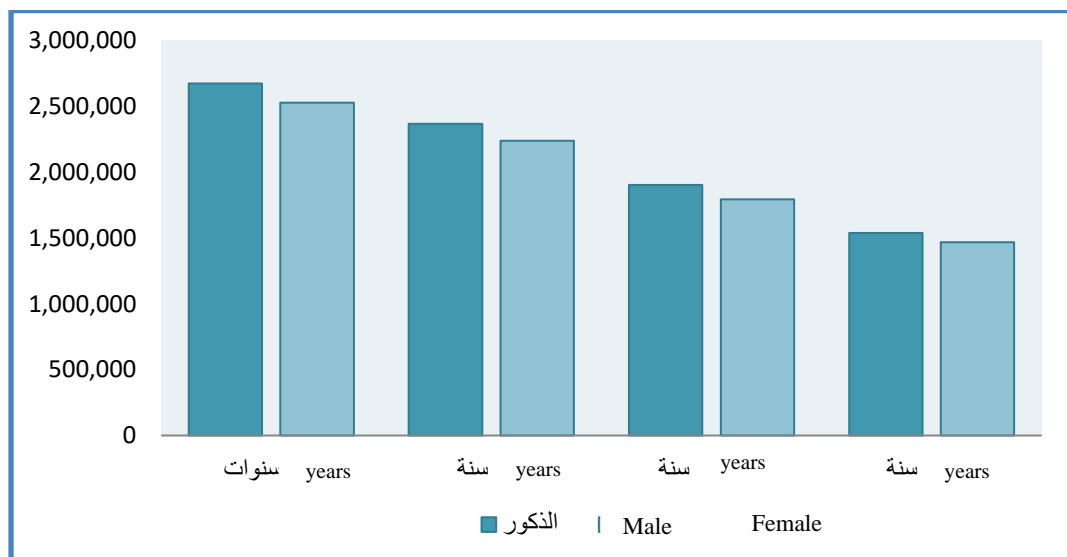
The research cohort comprised individuals receiving treatment in facilities specifically catering to childhood cancer (Ministry of Health, Population, and Hospital Reform, National Institute of Public Health, 2020).

III. Discussion of Results:

1. Demographic Composition of Children and Adolescents in Algeria:

Over the last two decades, Algeria has experienced notable demographic shifts, marked by a predominantly young population, indicative of a vibrant, youthful society with a substantial proportion of children and adolescents.

Figure 01: Distribution of Children by Age Groups and Gender in Algeria, 2020



Source: Prepared by the researchers based on data from the national registry for childhood and adolescent cancer, p. 7.

Analysis of the data reveals that the total number of Algerians under the age of 20 was approximately 16,494,030, constituting 37.23% of the overall population. Of this demographic, 8,473,835 were males and 8,020,195 were females. Children under the age of 15 accounted for one-third of the population, while youths aged between 15 and 19 years

comprised 7% of the population, with a relatively equal distribution between males and females. Following independence, Algeria experienced rapid population growth until the mid-1980s.

This growth can largely be attributed to various economic and social developments that elevated living standards, the proliferation of health centers, significant advancements in healthcare resulting in lower mortality rates, particularly among children, and the creation of ample employment opportunities, ultimately boosting the population to 44 million by the year 2020.

2. Risk Factors for Childhood Cancer:

Childhood cancer exhibits unique risk factors that distinctively differ from those in adults, with many causes of pediatric cancers remaining largely enigmatic. Nevertheless, several factors have been identified that may elevate the risk of developing cancer in children:

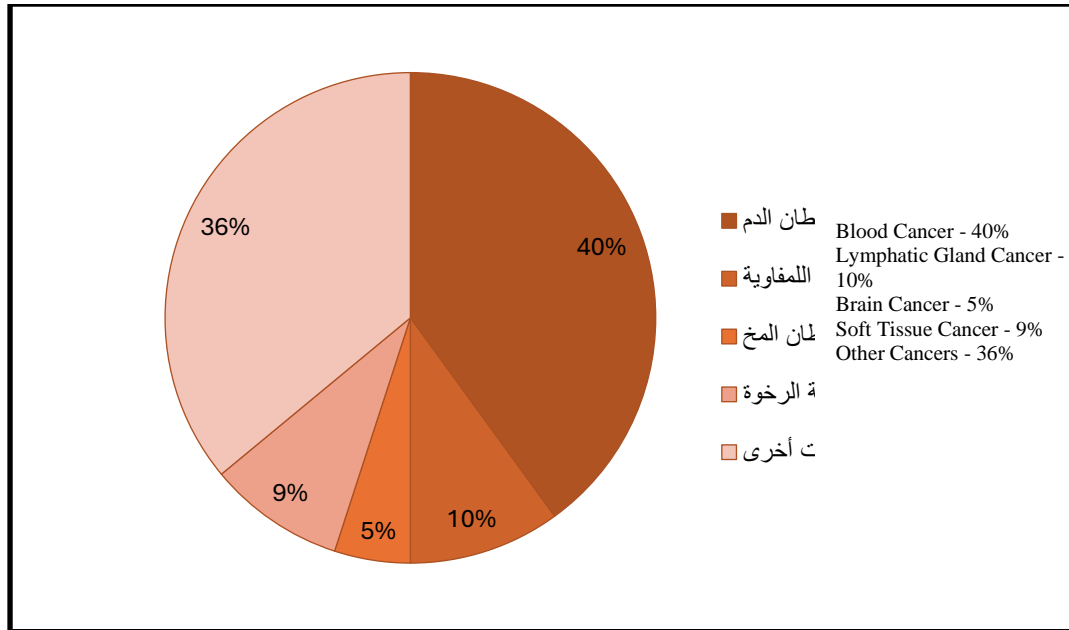
- **Genetic and Familial Factors:** Approximately 5% of childhood cancers are attributed to genetic mutations that parents can pass to their offspring, highlighting the hereditary component of these diseases.
- **Environmental Factors:** Pinpointing specific environmental causes of childhood cancer is inherently complex. This complexity arises not only from the infrequency of cancer among children but also from the challenges in determining their early-life exposures to potential carcinogenic factors.
- **Immature Physiological Systems:** Children's bodies are still developing, which includes the systems that metabolize or filter out environmental substances. These immature systems often do not fully protect children from environmental risks.
- **Growth and Development:** Referred to as "developmental windows," these critical growth phases may introduce heightened periods of vulnerability, where the developing tissues are more susceptible to cancerous transformations (World Health Organization, 2014).
- **Exposure to Radiation and Chemicals:** Children who have been subjected to significant doses of radiation, or who have had extensive exposure to certain chemicals and drugs, are at a heightened risk. Additionally, children with immunodeficiency diseases, whether hereditary or acquired, have been shown to have a significant correlation with an increased incidence of leukemia (Saudi Cancer Foundation, 2013).

3. Types of Childhood Cancer in Algeria:

Current statistics up to the year 2024 indicate that approximately 1,800 children are diagnosed with cancer annually in Algeria, averaging about five new cases each day. This statistic includes 450 cases among adolescents aged 15 to 17 years and over 1,000 cases among young people aged 18 to 25 years. Despite the relative rarity of cancer in these age brackets, it stands as a leading cause of death among individuals under 20 years old (Bouarissa, 2024).

Factors contributing to these statistics include population growth, aging, environmental pollution, smoking, lifestyle changes, and insufficiently healthy diets. The types of cancers affecting children are diverse, potentially impacting any body part and manifesting across various age groups. The genesis of these cancers is often linked to genetic alterations within some cells. Prominent among the cancers affecting Algerian children are leukemia, lymphoma, kidney cancer, bone cancer, brain tumors, among others.

Figure 02: Prevalent Types of Childhood Cancer in Algeria (2018)



Source: Developed by the researchers based on data from the National Cancer Spread Plan 2015-2019.

The table presents leukemia as the predominant type of cancer, accounting for 40% of childhood cancer cases in Algeria. It is followed by lymphoma (10%), brain cancer (5%), and soft tissue sarcomas (9%). Other cancers collectively comprise 36% of cases. It is imperative to recognize that early detection and effective treatment are critical and can substantially enhance recovery prospects for afflicted children.

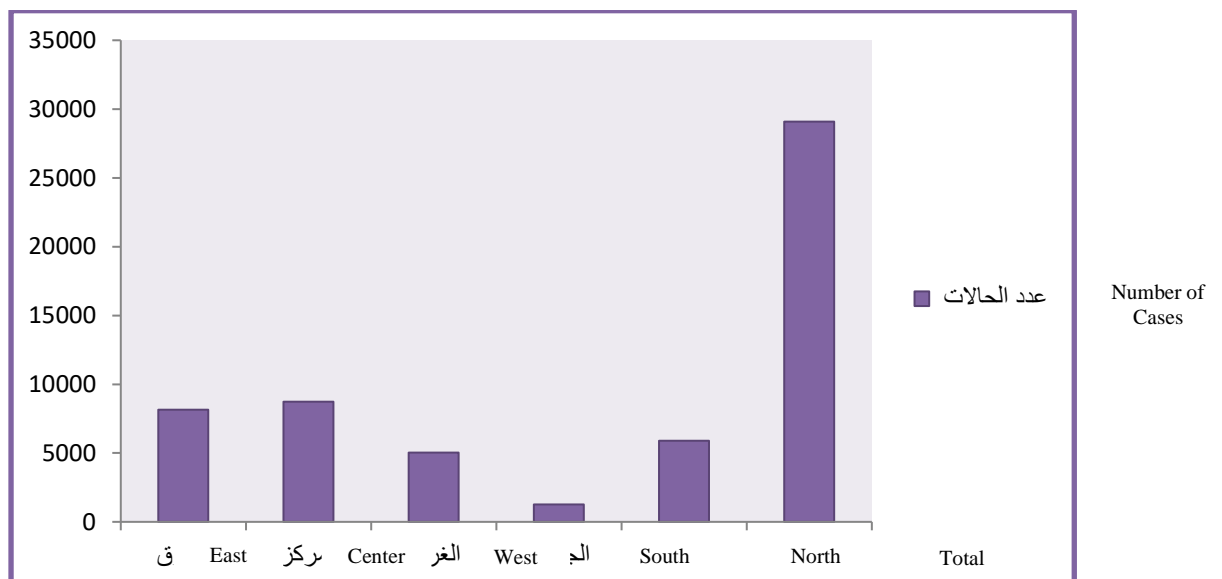
4. Development of Childhood Cancer Rates in Algeria:

Algeria has experienced significant changes in childhood cancer rates, which vary by region, gender, and age group.

1.4. Distribution of Cases by Region of Residence:

In recent years, according to the national cancer survey and the national registry for childhood cancer, Algeria has seen a number of cancer cases across different regions as shown in the following figure:

Figure 03: Distribution of Cancer Cases by National Regions in Algeria, 2002



Source: National Cancer Prevalence Survey in Algeria, 2002.

In 2002, Algeria recorded 29,089 cancer cases, with the central regions of Algeria having the highest number of cases at approximately 8,737. Conversely, data from 2019 and 2020 indicate the following:

Table 01: Distribution of Cancer Rates by National Regions 2019-2020 (%)

Region	2018	2019	2020
East	22.1	23	18.6
Central	65.01	67	63.9
West	7.3	4.4	8.6

Source: National Registry for Childhood and Adolescent Cancer, pp. 9-14.

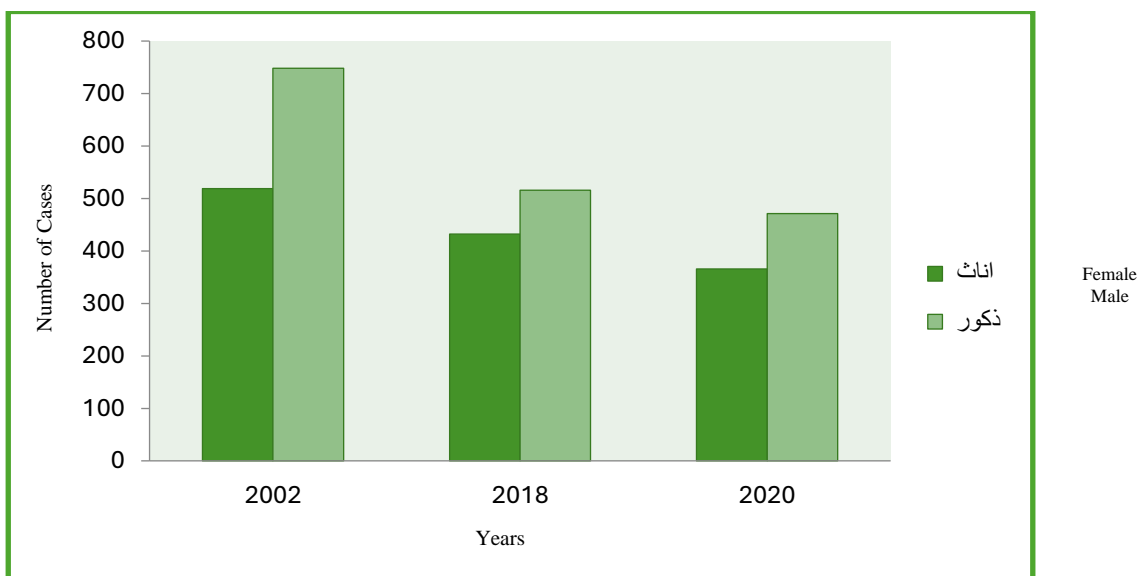
Cancer incidences among children predominantly occur in the central regions of Algeria, where they accounted for 65.01% of cases in 2018, rose to 67% in 2019, and subsequently decreased to 63.9% in 2020. Following closely are the eastern regions, which reported incidence rates of 22.1% in 2018 and 23% in 2019, before decreasing to 18.6% in 2020. Conversely, the western regions consistently recorded the lowest incidence rates, fluctuating between 7.3% and 8.6% from 2018 to 2020.

The higher incidence rates in the central and eastern regions are attributable to a combination of factors, including urban development, industrial activities, the release of toxic gases, recycling operations, the extensive use of pesticides in agriculture, all of which contribute to increased cancer risk, and a scarcity of regular diagnostic screenings, as corroborated by the national cancer prevalence survey.

4.2. Childhood Cancer Rates by Gender:

The distribution of childhood cancer cases in Algeria shows variability when segmented by gender, as detailed by data from the national cancer prevalence survey of 2002 and the national registry for childhood and adolescent cancer of 2020:

Figure 04: Distribution of Childhood Cancer Cases by Gender (2002-2020)



Source: Developed by the researchers based on data from the National Cancer Prevalence Survey 2002 and the National Registry for Childhood and Adolescent Cancer 2020.

The year 2002 saw the highest number of recorded cases, totaling 1,267 for both genders, followed by declines in 2018 and 2020 with 948 and 837 cases, respectively. It was observed that males consistently exhibited higher incidence rates than females, with 748 cases compared to 519 for females in 2002. The decline continued through the years 2018 and 2020 for both genders. Although the differences are not statistically significant, males generally have a higher incidence rate, which can be attributed to differences in age structure and genetic factors, including a higher concentration of TP53 genes in males than in females.

The observed decrease in childhood cancer rates for both genders can largely be credited to enhancements within the health system, notably the acquisition of sophisticated diagnostic tools. Health Minister Abdelhak Saayehi remarked, "Acquiring advanced diagnostic tools has facilitated significant advances in early screening and diagnosis, contributing to a reduction in mortality rates despite the increasing prevalence of this disease in Algeria and worldwide.

This reduction in mortality is largely due to timely medical interventions in treatable cases, complemented by widespread community engagement, which now categorizes cancer as a potentially curable disease" (Asma, 2023).

4.3 Childhood Cancer Rates by Age Group and Gender Under 15 Years:

Analysis of childhood cancer rates segmented by age group (0-14 years) and by gender reveals distinct epidemiological trends, which will be discussed further in subsequent sections.

Table 02: Distribution of Cancer Cases by Age Group Between Genders Under 15 Years

Age Group	2018		2020	
	Males	Females	Males	Females
0-4 years	219	157	176	157
5-9 years	133	109	121	71
10-14 years	82	90	82	75
Total	434	356	379	303

Source: National Registry for Childhood and Adolescent Cancer 2018-2020.

The table above shows the distribution of cancer cases by age group between genders under 15 years during 2018 and 2020, where:

- There was a decrease in the number of cases for both genders, with 434 cases in males in 2018 compared to 379 in 2020, and 356 cases in females in 2018 compared to 303 in 2020.
- The age group 0-4 years recorded the highest number of cases among other groups, with 219 male cases in 2018 decreasing to 176 in 2020. The number of female cases remained constant at 157 for both years.
- The 5-9 years age group also saw a decrease in cases for both genders, from 133 to 121 in males and from 109 to 71 in females.
- The 10-14 years age group had consistently lower case numbers compared to other groups. This is attributed to genetic factors, the quality of food consumed by children,

and their social circumstances, as indicated by a study conducted by the French-speaking Virtual Medical University, which noted that half of cancer cases occur in children under 5 years (Université médicale virtuelle francophone, 2013).

4.4 Distribution of Childhood Cancer Types by Age Group and Gender:

The incidence rates of childhood cancer vary by type and age group as detailed in the following table:

Table 03: Distribution of Childhood Cancer Types for Under 15 Years in 2020 (%):

Diagnostic Groups (ICCC – 3)	Effectif		0 – 4 years		5 – 9 years		10–14 years	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Leukemias, Myeloproliferative and Myelodysplastic Syndromes	46	65	28	39	11	19	7	7
Lymphomas and Reticuloendothelial Neoplasms	22	50	1	10	8	19	13	21
Central Nervous System Tumors and Various Intracranial Tumors	78	87	34	34	27	34	17	19
Sympathetic Nervous System Tumors	36	34	28	22	6	12	2	0
Retinoblastoma	26	39	26	37	0	2	0	0
Kidney Tumors	25	25	22	19	1	6	2	0
Liver Tumors	4	1	4	1	0	0	0	0
Malignant Bone Tumors	22	30	1	2	7	10	14	18
Soft Tissue and Extraosseous Sarcomas	20	25	7	12	8	11	5	2
Germ Cell, Trophoblastic, and Gonadal Tumors	13	5	4	2	3	1	6	2
Malignant Melanomas and Other Malignant Epithelial Tumors	10	18	0	0	2	7	8	11
Other Malignant Tumors	1	0	1	0	0	0	0	0
Total	303	379	156	178	73	121	74	80

Source: National Registry for Childhood and Adolescent Cancer 2020, pp. 11-14.

This distribution highlights the different cancer types affecting children under 15 years by age group and gender in 2020, providing a comprehensive view of the disease landscape and its impact on different demographic segments.

The data from the table highlights several key insights into childhood cancer rates by age and gender:

- There are 379 cases in males compared to 303 in females, indicating that males are predominantly more affected than females. This disparity could be attributed to differences in age composition between genders, genetic factors, and males experiencing certain types of rare infections that might predispose them to cancer.
- There has been a decrease in cancer cases among both genders compared to the data recorded in the national registry for childhood and adolescent cancer for the year 2018. In 2018, there were 748 cases in males and 519 in females.
- The age group of 0-4 years recorded the highest number of cases for both genders compared to other age groups. A study by the Francophone Virtual Medical University has shown that the majority of cancer cases occur before the age of five, highlighting the vulnerability of very young children to this disease.
- Central nervous system tumors are the most common, with 87 cases in males and 78 in females, followed by leukemia with 65 cases in males and 46 in females. Lymphomas also featured prominently with 50 cases in males and 22 in females among Algerian children.
- The increase in childhood cancer rates can be linked to lifestyle changes and a lack of health awareness among parents regarding their children's diet, particularly concerning fast food, fried foods, sugary drinks, and snacks rich in sugars and preservatives. These dietary habits, along with the use of harmful chemical preservatives and colorants in food, are recognized factors contributing to the rise in childhood cancer incidences. Moreover, the use of chemicals in food packaging for children adds to the risk factors, as does the absence of early diagnostic practices which could mitigate such diseases.

4.5. Cancer Distribution Among Adolescents Aged 15-19 Years:

According to the national registry for 2020, there were 155 cases among adolescents (15-19 years), with 92 cases in males (19.5%) and 63 cases in females (17.2%), with an average age of diagnosis at 16.8 years. The crude incidence rates were 59.85 per 1,000,000 for males and 42.92 per 1,000,000 for females. In 2019, there were 148 new cases in this age group, with 72 in males and 76 in females.

Table 05: Cancer Incidence Rates Among Adolescents Aged 15-19 Years by Gender in 2020

Cancer Type (ICCC – 3)	TIB(l'incidence brute1000000/)	
	Females	Males
Germ Cell Tumors	2.73	3.90
Soft Tissue Sarcomas	4.09	5.86
Leukemias	1.36	7.8
Central Nervous System Tumors	9.54	9.11
Malignant Bone Tumors	5.45	9.76
Malignant Epithelial Tumors	11.58	10.41
Lymphomas	7.49	11.06

Source: Based on the National Registry for Childhood and Adolescent Cancer, pp. 18-19.

This table indicates that lymphomas are the most common cancer among males (11.06), followed by malignant epithelial tumors (10.41), and bone tumors (9.76). Among females, malignant epithelial tumors are most common (11.58), followed by central nervous system tumors (9.54), and lymphomas (7.49). This variation in cancer types between genders can be attributed to biological differences, which may affect how cancer spreads in the body, as well as genetic factors and the influence of sex hormones on the growth of sensitive tissues.

Conclusion:

Cancer in Algeria, particularly among children, poses a profound health challenge, necessitating an integrated response across sectors to devise effective strategies for prevention, treatment, and support. This study on childhood cancer in Algeria underscores the multifaceted nature of this health issue, emphasizing the importance of efforts not only to improve the lives of affected children and their families but also to alleviate the strain on the Algerian healthcare system. Additionally, it highlights the need to raise community awareness about cancer and its associated risk factors.

Through the analysis of data from the National Registry for Childhood and Adolescent Cancer for 2020, which formed the foundation of our study, several critical insights were derived:

- Most childhood cancer cases are concentrated in the central region of the country, accounting for 63.9% of cases, followed by the eastern region at 18.6%, while the western region recorded the lowest rate at 8.6%.
- There has been a decrease in the number of cases over the years, from 1,267 cases in 2002 to 837 cases for both genders in 2020. However, in 2024, 1,800 cases were recorded, possibly influenced by disruptions during the COVID-19 pandemic, which affected data collection.
- Male children consistently exhibit higher incidence rates than females, with 379 cases in males versus 303 in females in 2020. The crude incidence rate was 54.64 per 1,000,000 for males and 46.24 per 1,000,000 for females.
- The age group of 0-4 years recorded the largest number of cases for both genders compared to other age groups, with approximately 49% of cancers occurring before the age of five, 51.8% in males and 46.4% in females. The crude incidence rate is 66.66 per 1,000,000 for males and 61.8 per 1,000,000 for females.
- According to the 2020 National Registry, the most common cancer types among children under 15 include central nervous system tumors (26% of cases), with 87 cases in males and 78 in females, followed by leukemia (18.6%), with 65 cases in males and 46 in females, and lymphomas (10.7%), with 50 cases in males and 22 in females. Medical advances and improvements in treatment methods have led to a recovery rate of approximately 83%, with 8 to 9 cases treatable before the age of five, as reported on World Childhood Cancer Day on February 15th each year.

Based on the findings of the study, we can formulate a set of recommendations to leverage for improving our ability to control the spread of various types of childhood cancer and to enhance the level of healthcare services provided in this field. These recommendations can be summarized as follows:

- Focus on integrating demographic, social, and economic data with medical information for children who are either suffering from cancer or are at risk. This integration can aid in taking precautionary measures and implementing strategies to minimize its spread.
- Establish pediatric cancer treatment centers equipped with the latest medical technologies and also train the medical staff and professionals in these centers on these advanced techniques.
- Develop a comprehensive statistical database for childhood cancer to aid in health planning and resource allocation, as well as to serve as a valuable resource for future studies.
- Promote health education by increasing awareness among individuals, families, and healthcare sector officials about the types of childhood cancer, its symptoms, and the

critical importance of early diagnosis, which can lead to the early detection of cases and thereby increase the chances of recovery.

- Raise awareness about nutritional culture among parents to foster healthy eating habits from an early age in children.

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