



June 2025

Top Ten Types of Childhood Cancer in Nineveh Governorate 2018–2022: A Time Series Analysis

Marab Younis Abdullah Al-Fathy

Training and Human Development Center, Nineveh Health Directorate, Al-Seedek/Mosul City/Iraq

Ahmed Asaad Hussein

Training and Human Development Center, Nineveh Health Directorate, Al-Seedek/Mosul City/Iraq

Hiba Farooq Mohamed Ameen

Department of Chemistry, College of Science, Mosul University, Al-Seedek/Mosul City/Iraq

Maan Younis Al-fathi

College of Education for Pure Science/Computer Science, Mosul University, Al-Seedek/Mosul City/Iraq

Follow this and additional works at: <https://bmvj.alnoor.edu.iq/home>



Part of the [Alternative and Complementary Medicine Commons](#), [Health and Medical Administration Commons](#), [Medical Education Commons](#), [Medical Sciences Commons](#), and the [Public Health Commons](#)

Recommended Citation

Al-Fathy, Marab Younis Abdullah; Hussein, Ahmed Asaad; Ameen, Hiba Farooq Mohamed; and Al-fathi, Maan Younis (2025) "Top Ten Types of Childhood Cancer in Nineveh Governorate 2018–2022: A Time Series Analysis," *BioMed Visions Journal*: Vol. 1: Iss. 2, Article 3.

DOI: <https://doi.org/10.63100/3078-6738.1005>

This Original Study is brought to you for free and open access by BioMed Visions Journal. It has been accepted for inclusion in BioMed Visions Journal by an authorized editor of BioMed Visions Journal.



ORIGINAL STUDY

Top Ten Types of Childhood Cancer in Nineveh Governorate 2018–2022: A Time Series Analysis

Marab Younis Abdullah Al-Fathy ^{a,*}, Ahmed Asaad Hussein ^a,
Hiba Farooq Mohamed Ameen ^b, Maan Younis Al-fathi ^c

^a Training and Human Development Center, Nineveh Health Directorate, Al-Seedek/Mosul City/Iraq

^b Department of Chemistry, College of Science, Mosul University, Al-Seedek/Mosul City/Iraq

^c College of Education for Pure Science/Computer Science, Mosul University, Al-Seedek/Mosul City/Iraq

ABSTRACT

Background: Childhood cancer incidence and deaths reflects the low health status, which can be prevented by setting up strategies with help of different sectors in community.

Aim: To describe the childhood cancer in Nineveh governorate during 2018–2022.

Methods: A Biometry study used to review 646 a cancer registration form for five years 2018–2022, using Can-Rej 5 inquiry forms adopted by Ministry of Health measuring [sex ratio, sex and cause specific death rate, the incidence rate, the case fatality rate, the proportion mortality rate and trend of (occurrences and death)].

Results: The total number of participants was 646, the commonest childhood cancer was among (2–5) and (6–9) years it was 35.7% and 30.7% respectively, four fifth 81.7%, 59.4% and 25.5% of children were treated by chemotherapy, surgery and radio therapy respectively.

Bone marrow cancer was the top of causes it was 33.4% with trend to decrease toward 2022, then lymph node as 21.1% with unchangeable trend and while brain tumour had had fluctuating trend during study period with increasing trend in general toward 2022. The study showed that no changes in trend of childhood cancer regarding age and sex. Trend of surgical management were increase by 22%, chemo therapy 12% and radio therapy by 4% toward 2023. Trend of death was increasing toward 2022 with case fatality rate and proportional mortality were 48.1, 0.66 respectively.

Conclusion: Occurrence and death mainly among age group (2–9) years. Top ten causes and death were leukemia, lymphoma and bone with decreasing trend of certain cancer and slightly increasing of other. Although minimal changes were seen in incidence rate trend but there is increasing mortality toward 2023.

Keywords: Childhood cancer, Childhood death, Trend of childhood cancer

1. Introduction

Childhood cancer refers to a disease characterized by abnormal and uncontrolled cell growth occurring in children under the age of 15. It affects various tissues and organs of the body as leukemias, lymphomas, brain tumors, solid tumors, or other malignancies specific to children (Steliarova-Foucher et al., 2004). Their classification based on various factors including the type of tissue or organ involved, histological characteristics of the tumor, and some-

times the genetic mutations driving the cancer, The benefit of it is to help in understanding the diversity of childhood cancers, treatment decisions and predicting outcomes for pediatric cancer patients. the classification of childhood cancer was according to following: (histological, site of origin, genetic and international classification of childhood cancer) (Ward et al., 2014; Steliarova-Foucher et al., 2005). The causes of most childhood cancers are not known. About 8 to 10 percent of all cancers in children are caused by an inherited mutation that can be passed

Received 16 September 2024; accepted 21 December 2024.
Available online 16 June 2025

* Corresponding author.
E-mail address: dr.marabpublichealth@gmail.com (M. Y. A. Al-Fathy).

<https://doi.org/10.63100/3078-6738.1005>
3078-6738/© 2025 Al-Noor University College. This is an open-access article under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>).

from parents to their children lead to uncontrolled cell growth and eventually cancer ([Childhood Cancers, 2024](#)).

The incidence of childhood cancer trends in United States over the recent years has been relatively stable since 2015 with 5-year survival rate for childhood cancer after being diagnosed with cancer, exceeding 80% for many types of pediatric cancers, after increasing since at 1975 when the 5-year survival rate was about 58% ([Key Statistics for Childhood Cancers \(2021\)](#)). These improvements in survival rates due to advances in treatment, early detection and the availability of clinical trials specifically designed for children ([Childhood Cancers, 2024](#); [Key Statistics for Childhood Cancers, 2021](#)). In Arabian countries, childhood cancer is a growing concern, with increasing incidence rates. However, survival rates in these countries are considerably lower compared to high-income nations, that the cure rate didn't exceed 30% due to limited access to advanced treatments, shortage of specialized healthcare professionals and lack of public awareness about early signs of cancer ([International Childhood Cancer Day, 2024](#); [Childhood cancer, 2024](#)). So that WHO Global Initiative for Childhood Cancer, 2018 had effort to improve childhood cancer care in these regions to achieve a global survival rate 60% by 2030 ([Childhood cancer \(2024\)](#)). The overall incidence of cancer in Iraq, including childhood cancer, has been rising in Iraq. This increase is partly attributed to better diagnosis and reporting, as well as environmental factors exacerbated by decades of conflict and instability. The most common types of childhood cancers in Iraq include leukemia, lymphoma, and brain tumors, similar to global patterns. The Iraqi government made collaboration between the Iraqi Cancer Board and the Ministry of Health, via help international organizations for adoption of national cancer control strategy, improved infrastructure and the availability of essential medicines and technologies, policies to improve palliative care to improve children's outcomes with cancer ([Malek, Juric and Akbarov, 2023](#); [Cancer Iraq, 2020](#)).

The aim of present study to describe the childhood cancer in Nineveh governorate during 2018–2022 to study type and put strategy to prevent it as much as possible.

2. Materials and methods

2.1. Administrative and ethical consideration

All work is approved by scientific the ethical committee of Nineveh Health Directory (DoH)/Ministry of Health (MoH)/Iraq by licenses' number (248)

in date (4 Occ. 2023) protocol research number 2023175. After taking the agreement of the Planning Department / Health and Vital statistics section, Cancer Control Center and the Directorate Statistics in Nineve.

Study setting: Planning Department/Health and Vital statistics section and Cancer Control Center.

Study design: A Biometry study design was adopted to achieve the aim of the present study.

Study period: Six months from 1st Jan–July during 2024.

Study sample: Review of records (all registered cases) of children with cancer including age, education, residence, religion, ethnicity and nationality over the last five years from (2018–2022).

Study sample size: Total numbers of recorded cases 646 child with cancer were founded during period from 2018–2022.

Data collection form: Iraqi Cancer Registry Form (CanReg5) adopted by Ministry of Health/Iraqi Cancer Board since 2009 with minimal modification done in 2019 was consist from four section: (socio-demographic characters, information regarding health institution, follow up and information related to tumour).

Statistical analysis: The data were presented in suitable tables and figures. Percentages were calculated for the various group variables. χ^2 continuity test for 2×2 table was used in comparing between two variables. P-value ≤ 0.05 was considered significant throughout data analysis. The following indices were measured: Sex Ratio (SR): Is the ratio of males to females in a given population, usually expressed as the number of males for every 100 females, Cause-Specific Death Rates (CSDR) are usually expressed in deaths per 100,000, Sex-Specific Death Rates (SSDR) among male or female are usually expressed in deaths per 100,000, Incidence Rate (IR) is the number of persons contracting a disease during a given time period per 1,000 population at risk, Case Fatality Rate (CFR) is the proportion of persons contracting a disease who die of that disease during a specified time period, Proportion Mortality death (PM) and trend measurement.

3. Results and discussion

3.1. Methodological issues

The required information on childhood cancer in Nineveh were taken from registered Can-Reg5 inquire form adopted by Iraqi MoH, in cancer registration center/DoH Nineveh. Occurrence and mortality childhood cancer data were obtained for only five

$$1\text{-SR} = \frac{\text{Number of males}}{\text{Number of females}} \times 100$$

$$2\text{-CSDR} = \frac{\text{Deaths from cancer}}{\text{Total population (children aged < 15 year)}} \times 100,000$$

$$3\text{-SSDR} = \frac{\text{Deaths from cancer among male or female}}{\text{Total population (male or female)}} \times 100,000$$

$$4\text{-IR} = \frac{\text{Number of persons developing new event during a given time period}}{\text{Population at risk (children aged < 15 year)}} \times 1000$$

$$5\text{-CFR} = \frac{\text{Number of persons dying from the disease}}{\text{Number of persons contracting the disease during a period}} \times 100$$

$$6\text{-PM} = \frac{\text{All childhood cancer death occurring within a reference period}}{\text{Total number deaths among children in that time}} \times 100$$

7-Trend measure using simple Index equation as the following formula:

$$\text{2018 Index Number.} = \frac{\text{2018 Index Number (base period)}}{\text{2018 Index Number}} \times 100 = 100\%$$

$$\text{Trend index} = \frac{\text{2019 Index Number}}{\text{2018 Index Number}} \times 100$$

years since 2018 because almost all registration of the former years were lost during the Mosul liberation.

Analysis of data were done through two main steps, first of all was the descriptive biometric analysis which utilize data from registered data in cancer registration division. The 2nd step involved trend analysis of occurrence, types and causes of death of top ten childhood cancer, type of treatment and their trend and death indicators.

3.2. Childhood cancer occurrence

3.2.1. General information of the participants and occurrence of childhood cancer

Commonest childhood cancer was seen among age group (2–5) and (6–10) years it was 35.7% and 30.7% respectively, P-value not statistically significant. This is seen in (Table 1).

Table 1. Association between gender and age group among study sample.

Ages groups in years*	Male = 360**		Female = 286		Total No. = 646	
	No.	%	No.	%	No.	%
0–1 years	50	13.9	39	13.7	89	13.7
2–4 years	136	37.8	94	32.8	230	35.7
5–9 years	105	29.2	93	32.6	198	30.7
10–14 years	69	19.1	60	20.9	129	19.9

* Chi-Square test P-Value = 0.586.

** Sex ratio 1.2:1.

Table 2 showed that, four fifth (81.7%), nearly two third (59.4%) and (25.5%) of children were treated by chemotherapy, surgery and radio therapy respectively.

The present study revealed that two third of participant affected by childhood carcinoma was aged 2–9 years with 1,2:1 male to female. Iraqi cancer registration annual report 2022, reported that age specific cancer incidence among children aged less than 15 years was 4.7% and the crude incidence rate among Iraqi children was 10.6/100,000 in addition to that, occurrences more common among boys than girls (Iraqi Cancer Board/MoH, 2022). The overall incidence of cancer in Iraq, including childhood cancer, has been rising. This increase is partly attributed to high detection rate, better diagnosis and reporting, as well as environmental factors exacerbated by decades of war and instability (Malek, Juric and Akbarov, 2023; Childhood cancer, 2022). In the United States (US), the overall incidence of cancer in children has increased over time in last decade and reach steadily line. In 2024, about 10,000 cases of cancer are expected to be diagnosed among children aged less than 15 years. At same time death rates have been decreased by 70% in children and improvements in 5-years survival rates, for period extended from (1970–2020) Key Statistics for Childhood Cancers (2021). In spite of that cancer remains a major cause

Table 2. Association between gender and type of treatment among study sample.

Categories	Male = 360		Female = 286		Total No. = 646		P-Value*
	No.	%	No.	%	No.	%	
Surgery							
Yes	210	58.4	174	60.9	384	59.4	0.527
No	111	30.8	77	26.9	188	29.1	
Unknown	39	10.8	35	12.2	74	11.5	
Radio therapy							
Yes	92	25.6	73	25.5	165	25.5	0.662
No	70	19.4	48	16.8	118	18.3	
Unknown	198	55	165	57.7	363	56.2	
Chemo therapy							
Yes	303	84.1	225	78.7	528	81.7	0.000
No	6	1.7	50	17.5	56	8.7	
Unknown	51	14.2	11	3.8	62	9.6	
Hormonal Therapy							
Yes	1	0.3	2	0.7	3	0.7	0.312
No	273	75.8	203	70.9	476	73.7	
Unknown	86	23.9	81	28.4	167	25.8	
Immune Therapy							
Yes	2	0.6	2	0.7	4	0.6	0.271
No	271	75.3	199	69.6	470	72.8	
Unknown	87	24.2	85	30.0	172	26.6	
Isotopic Therapy**							
Yes	0	0.0	2	1.1	2	0.5	Non-Applicable
No	180	80.8	139	77.2	319	79.2	
Unknown	43	19.2	39	21.7	82	20.3	
Target therapy**							
Yes	1	0.5	1	0.6	2	0.5	Non-Applicable
No	180	80.7	139	100.0	319	79.2	
Unknown	42	18.8	40	23.4	82	20.3	

* Using Chi-Square test.

** Applicable during (2020–2022).

of death among children in the US, as it is ranking the second most common cause of death among such age group [Yeo \(2024\)](#). Trends analysis from (1999–2016), Showed that the risk pattern of cancer among Iranian children seems to be fluctuated and further research is imperative to identify high-risk groups and related risk factors ([Hashemi, Mahaki and Farnoosh, 2024](#)).

3.2.2. Trend of childhood cancer according to the organ affected and histopathological finding

Figs. 1 and 2 showed that bone marrow was commonest organ to be affected by childhood cancer with trend to decrease toward 2022, then lymph node as 21.1% with unchangeable trend, bone tumor was increasing toward 2022, while brain tumor had had fluctuating trend during study period with increasing trend in general toward 2022. Acute Leukemia and lymphoma were commonest histopathological finding among children from 2018–2022 with trend of decreasing toward 2022. Unlike Nephroblastoma, Neuroblastoma and Rhabdomyosarcoma were increasing toward 2022.

Most common types of childhood cancers in Iraq include leukemia, lymphoma, and brain tumors, similar

to global patterns. ([Malek, Juric and Akbarov, 2023](#); [Cancer Iraq, 2020](#)) As Iraqi Cancer Board registration reported that top ten cancers among Iraq children aged (0–14) year 2022, were leukemia (30.0%), brain, CNS (17.7), Hodgkin lymphomas (7.6%), bone, cartilage, limbs and others (7.2%) ([Iraqi Cancer Board/MoH, 2022](#)).

3.2.3. Trend of childhood cancer according to treatment

Treatment with chemotherapy in general was seen increasing gradually toward 2022 and highest recorded in 2021, it was 110 (84.6%). Surgical and radiotherapy treatment was 83 (69.1%) and 40 (33.4%) respectively during 2019 with rising trend of childhood cancer management by 12% for chemotherapy, 22% for surgical management and 100% for radio therapy. This is clear in [Table 3](#) and [Fig. 3](#).

Childhood cancer in Hiwa Hospital Sulaimani city, 2019 among 300 children concluded that although the chemotherapy commonly affects the gastrointestinal tract and musculoskeletal system but it is drug of chose in managing most type of childhood cancer specially leukemia ([Abdulkareem et al., 2019](#)). Radiotherapy used to manage certain types of cancers,

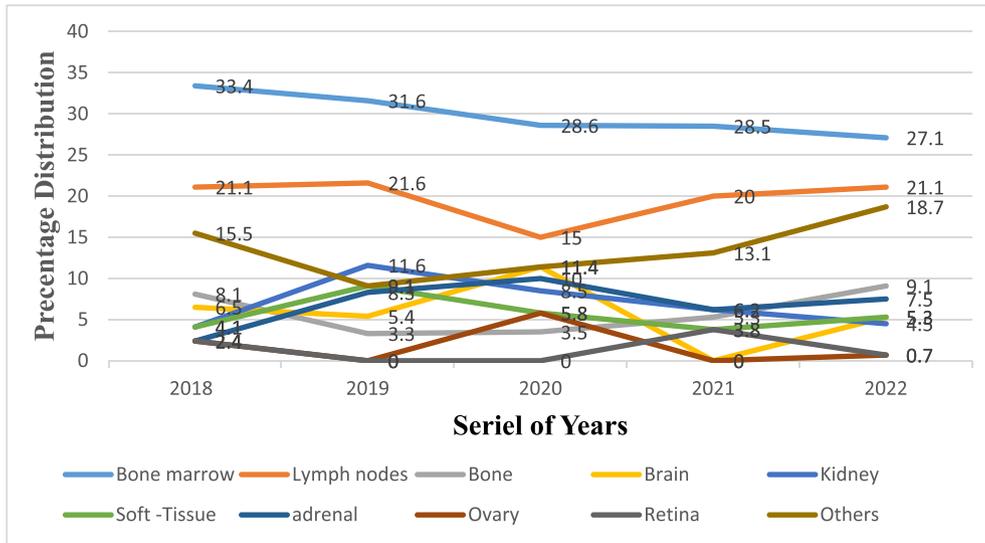


Fig. 1. Trend of childhood cancer according to organ affected.

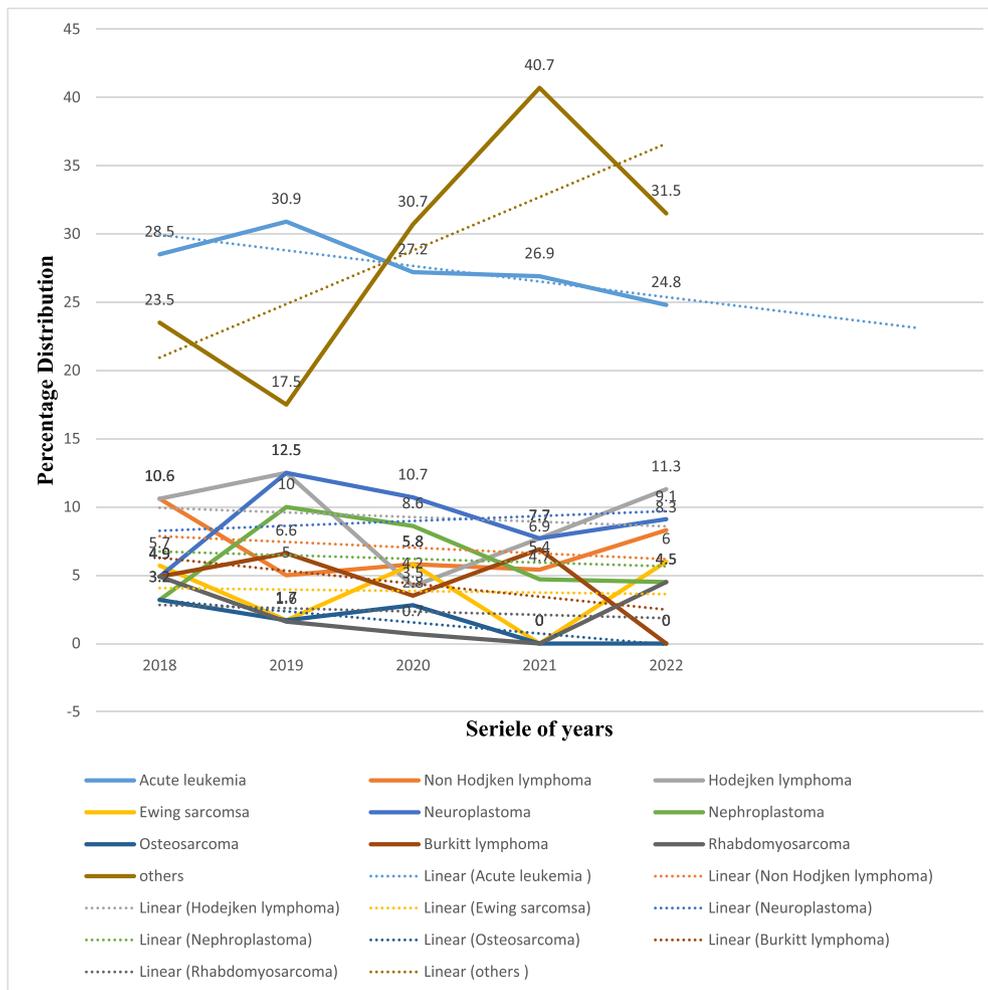


Fig. 2. Trend of childhood cancer according to histopathological finding.

Table 3. Percentage distribution of childhood cancer according to management.

Categories*	2018	2019	2020	2021	2022	Grand Total (646)	
	No. (123)	No. (120)	No. (140)	No. (130)	No. (133)	No.	%
Chemotherapy	74.8	83.4	81.4	84.6	84.2	528	81.7
Surgical	45.5	69.1	63.5	63.1	55.6	384	59.4
Radiotherapy	15.4	33.4	25.7	21.5	31.5	165	25.5
Immunotherapy	0.8	2.5	0.0	0.0	0.0	4	0.6
Hormone therapy	0.0	0.8	0.0	1.5	0.0	3	0.4
Isotope therapy	0.0	0.0	0.7	0.7	0.0	2	0.3
Target therapy	0.0	0.0	0.0	1.5	0.0	2	0.3

* Multiple Responses.

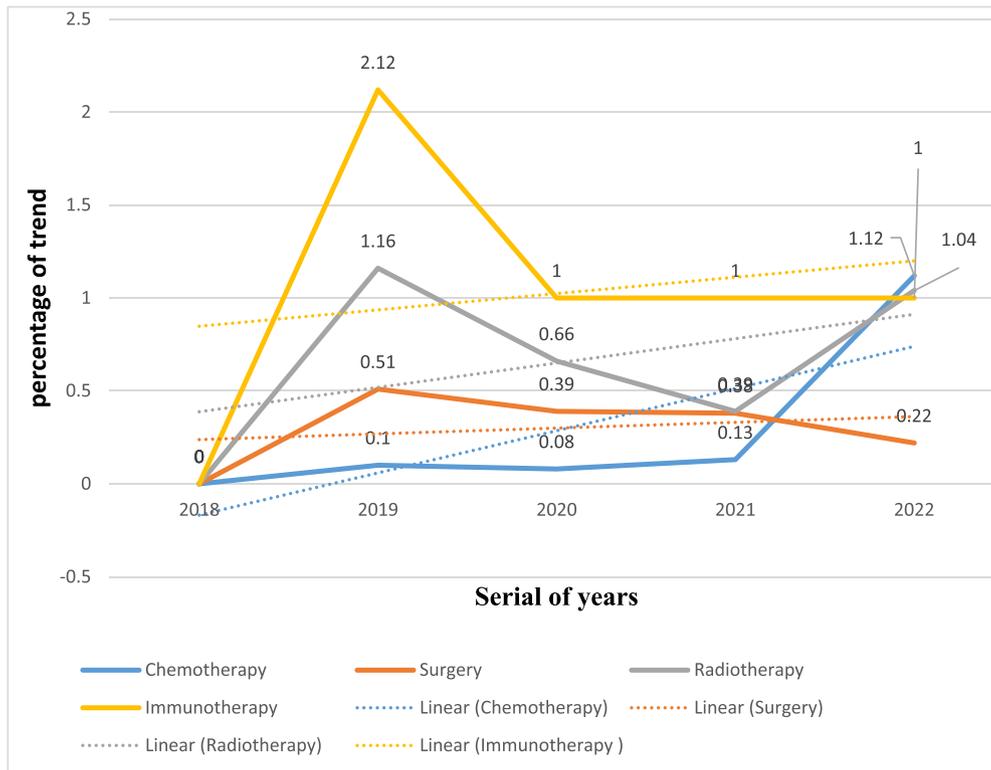


Fig. 3. Trend of child hood cancer according to management.

such as brain tumors, Hodgkin’s lymphoma, and neuroblastoma and in spite of its side effect such as (fatigue, skin damage, hair loss in the area being treated, decreased blood counts, sore mouth and tooth decay and gastrointestinal problems) but it’s of valuable in saving child life. This clear in a study in India, 2022 reviewed of 73 case sheets, majority were males (65%), median age was 10 years revealed that radiotherapy used to treat acute lymphoblastic leukemia (30%), Ewing’s sarcoma (18%), Glioma (10%), Rhabdomyosarcoma (7%), Hodgkin’s Lymphoma (7%) (Vinin et al., 2022). While The purpose of surgery is either curative, symptom relief or

improved outcomes as a primary treatment modality or as part of a multidisciplinary approach in (Wilms tumor, neuroblastoma, rhabdomyosarcoma and brain tumors) (Nathan et al., 2010; Henderson and Nathan, 2015).

3.3. Childhood cancer death

3.3.1. Topography of childhood cancer death and their trend

Commonest cause of childhood cancer death among male were bone marrow, lymphatic tissue, brain and among females were bone marrow, lymphatic tissue and bone.

Annual report of Iraqi Cancer Registry, 2022 regarding top ten causes of Iraqi childhood mortality were: Leukemia (184 deaths) followed by brain, CNS (123 deaths). These two cancers represented 64.1% of all deaths from cancer among Iraqi children (Iraqi Cancer Board/MoH, 2022). The King Hussein Cancer Center study among 968 displaced children, showed that leukemia (41%), lymphoma (25%), solid tumors (24%), retinoblastoma (6%), and brain tumors (4%) were commonest childhood cancer. Although 948 (88%) still a life but 430 (44.4%) had distal metastases. This reflects low economic condition of such families with delay in seeking medical advice and in ability to treat their child due to high-cost treatment (Rihani et al., 2023).

Bone marrow tumor was top ten causes of death among both male and female it was 39.2% and 30.8% respectively and mainly seen during 2018 among both group. Then lymph node cancer more frequently seen among females and specially in 2022 it constitutes 22.0%, while among male was seen in 2021, it was 20.0%. Third cause of childhood cancer among male was brain cancer frequently seen in 2020 it was 23.9% and bone carcinoma constitute third cause among female mainly seen during 2022. These finding were clear in Table 4.

Although minimal changes in incidence rate but trend of cause specific death rate, case fatality rate and proportional mortality percent were increasing

toward 2022. Iraqi cancer registry 2022, reported that although Ninevah governate ranking second level in occurrence but mortality ranked six level among Iraqi government, it was 3.1% (Iraqi Cancer Board/MoH, 2022).

In Arabian region, in general leukemia was the most common cause of childhood cancer death and one third of diagnosed cases were dead due to difficulty in diagnosis. So that WHO Global Initiative their recommendation was to improve survival rate up to 60% by 2030 Childhood cancer (2024). A similar finding was seen in Latin America and the Caribbean, showed that annually one third of child affected by cancer will die from it (International Childhood Cancer Day, 2024; Childhood cancer, 2024). While WHO, 2021 used mortality database from 18 countries (12 from the Americas and 6 from Australasia) for period extended for 17 years from (1990 up to 2017) revealed that mortality continued to decline in high-income countries by approximately (2–3)% per year in Japan, Korea, and Australia, and (1–2)% in North America (Malvezzi et al., 2021). Delay in diagnosis and referreeing of cases was commonest cause of presentation of patient in late stage of disease. This finding was clear in a study in Children's Welfare Teaching Hospital in Baghdad, 2021 among 346 children under 15 years old (57.2%) aged five years and younger and over 59% were boys. Leukemias represented the largest percentage of cancers presented at the unit

Table 4. Organ affected by childhood cancer.

Topography	2018 Total	2019 Total	2020 Total	2021 Total	2022 Total	Total = 125	
	No. (16) %	No. (21) %	No. (28) %	No. (26) %	No. (34) %	No.	%
Childhood cancer death among male participant.							
1 Bone marrow	26.9	15.3	21.5	26.8	23.4	49	39.2
2 Lymph-node	3.9	12.8	2.4	20.0	12.5	24	19.2
3 Brain	11.6	2.6	23.9	0.0	0.0	14	11.2
4 Nervous system	0.0	2.6	4.7	0.0	6.25	7	5.6
5 Lung	3.9	5.1	4.7	4.4	0.0	7	5.6
6 Bone	0.0	2.6	2.4	0.0	4.6	5	4
7 Soft tissue	3.8	0	2.4	6.8	1.6	6	4.8
8 Kidny-Adrenal	3.8	7.7	0.0	0.0	0.0	4	3.2
9 Liver-Biliary passages	3.8	0.0	0.0	0.0	3.1	3	2.4
10 Others*	3.8	5.1	4.7	0.0	1.6	6	4.8
Childhood cancer death among female participant.							
1 Bone marrow	19.3	12.9	4.7	17.7	12.7	28	30.8
2 Lymph-node	7.8	2.6	0	11.1	22.0	22	24.2
3 Bone	3.8	5.1	2.3	2.2	6.3	9	9.9
4 Brain	3.8	10.2	9.5	0	0.0	9	9.9
5 Soft tissue	0	2.5	5.0	2.2	4.7	7	7.6
6 Kidney-Adrenal	0	5.2	5.0	2.2	0.0	5	5.5
7 Nervous system	3.8	2.6	0.0	2.2	0.0	3	3.3
8 Eye	0	0	0.0	2.2	1.5	2	2.2
9 Liver-Biliary passages	0	2.6	0.0	2.2	0.0	2	2.2
10 Others**	0	2.5	7.1	0	0.0	4	4.4

* Others include (major salivary gland, pancreas, oropharynx, eye and teste.

** Others include (lung, salivary gland and larynx).

Table 5. Childhood cancer indicators.

Serial of Years	Male: Female Ratio/100	The Incidence Rate/100000	CSDR/100000	SSDR/100000 among Male/100000	SSDR/among Female/100000	CFR/100	PM/100
2018	1.6:1	7.3	1.6	1.8	1.2	21.1	0.25
2019	1.1:1	6.9	2.2	2.4	2.1	32.5	0.43
2020	2:1	7.8	2.3	3.0	1.6	30.0	0.37
2021	1.6:1	7.1	2.4	2.7	2.1	34.6	0.37
2022	1.1:1	7.0	3.4	3.4	3.3	48.1	0.66

(45.0%), followed by blastomas (23.6%), and lymphomas (18.8%). Large majority of patients (68.8%) with solid tumors presenting at Stage III (32.3%) and Stage IV (36.5%), 12.7% of patients died within 30 days of admission. Among the patients that died, 58% had leukemia and 50% with a solid tumor presented as Stage IV. Revealed that high mortality rate among Iraqi child attending Welfare Teaching Hospital 80% due to physician delay as misdiagnosis of cases and less access to care. In addition to (shortages of medications, low doctor-patient ratios and limited training in pediatric oncology services) resulted in increased risk of mortality (Yadalla et al., 2021).

3.3.2. Childhood cancer death indicators

Table 5 demonstrate childhood cancer death indicators. It showed that Cause-Specific Death Rates/100000 was 3.4 during 2022 with no differences between male and females. Nearly half (48.1) of cases were dead during 2022 with Proportion Mortality Death/100 was 0.66.

4. Limitation of present study

The data collected from record and this recode subjected to miss information, miss classification, in coding, entering and managing the information. Due to socio-culture factors registration of death causes as a cancer consider social stigma to the family so that we loss many cases and reported with other indirect cause of death. Some of histopathological doctor didn't follow the ICD10 classification of disease, some physician didn't report stages, extend of disease in addition to lack of regular physical follow up examination to detect recurrence, or extend of cancer. In spite of all above limitation the result of present study is of valuable in determining the occurrence, death and their trend and expectation in future years to put strategy to overcome the problem and improve childhood cancer patient in our locality, Nineveh governorate.

5. Conclusion

Occurrence and death mainly among age group (2–9) years. Top ten causes and death of childhood

cancer were leukemia, lymphoma and bone with decreasing trend of certain cancer and slightly increasing of other. Although minimal changes were seen in incidence rate trend but there is increasing mortality toward 2023.

Acknowledgment

We extend our gratitude to the personnel of Cancer Registry Units/Nineveh Directorate of Health for their dedicated work in gathering and inputting data.

Conflicts of interest

There is no Conflicts of Interest

References

- Steliarova-Foucher, E., Stiller, C., Kaatsch, P., Berrino, F., Coebergh, J. W., Lacour, B. and Perkin, M. (2004) Geographical patterns and time trends of cancer incidence and survival among children and adolescents in Europe since the 1970s (the ACCIS project): an epidemiological study. *The Lancet*, 364(9451), 2097–105.
- Ward, E., DeSantis, C., Robbins, A., Kohler, B. and Jemal, A. (2014) Childhood and adolescent cancer statistics. *CA Cancer J Clin.*, 64(2), 83–103.
- Steliarova-Foucher, E., Stiller, C., Lacour, B. and Kaatsch, P. (2005) International Classification of Childhood Cancer, third edition. *Cancer*, 103(7), 1457–1467.
- Childhood Cancers. [Online] 2024 May 2 [cited 2024 Aug 21]; Available from: National Cancer institute. URL:<https://www.cancer.gov/types/childhood-cancers>.
- Key Statistics for Childhood Cancers. [Online] 2021 Dec. 13 [cited 2024 Sep 8]; Available from: WHO. URL: <https://www.who.int/news-room/fact-sheets/detail/cancer-in-children>
- International Childhood Cancer Day (2024). [Online] 2024 Feb 15 [cited 2024 Sep 8]; Available from: WHO. <https://www.emro.who.int/media/news/international-childhood-cancer-day-2024-reducing-the-survival-gap.html#:~:text=Media%20centre-,International%20Childhood%20Cancer%20Day%202024%3A%20reducing%20the%20survival%20gap,early%20detection%20of%20childhood%20cancers>
- Childhood cancer. [Online] 2024 Feb 15 [cited 2024 Sep 9] Available from: WHO. URL: <https://www.who.int/initiatives/gap-f-our-portfolio/childhood-cancer>
- Childhood cancer. [Online] 2024 Feb 14 [cited 2024 Aug 9] Available from international agency for research of

- cancer (IARC). URL: <https://www.iarc.who.int/cancer-type/childhood-cancer/>
- Malek, M., Juric, A. and Akbarov, K. (2023) Iraq Makes Progress in Improving Cancer Services, implements imPACT Review Recommendation. [Online] 2023Mar 30 [cited 2024 Jun 1]. Available from: International Atomic Energy Agency (IAEA).URL: <https://www.iaea.org/newscenter/news/iraq-makes-progress-in-improving-cancer-services-implements-impact-review-recommendation>.
- Cancer Iraq 2020 country profile. [Online] 2020 Jan 1 [cited 2024 Jun 1] Available from WHO:URL: <https://www.who.int/publications/m/item/cancer-irq-2020>
- Iraqi Cancer Board/MoH. (2022) Cancer Registry of Iraq. *Annual Report*, P.89–100, 122-119.
- Childhood cancer. Available from international agency for research of cancer (IARC). URL: <https://www.iarc.who.int/cancer-type/childhood-cancer/>
- Yeo, K. K., Overview of Childhood Cancer. [Online] 2024 Jun 1 [cited 2024 April 1]. URL: <https://www.msmanuals.com/home/children-s-health-issues/childhood-cancers/overview-of-childhood-cancer>
- Hashemi, H., Mahaki, B. and Farnoosh, R. (2024) Relative risk of childhood and adolescence cancer in Iran: spatiotemporal analysis from 1999 to 2016. *BMC Res Notes*, 17(29). URL: <https://doi.org/10.1186/s13104-023-06629-z>
- Abdulkareem, A. G., Ramzi, Z. S., Rashid, J. A. and Rahman, H. S. (2019) Chemotherapy-related side effects in childhood cancer in Hiwa Hospital Sulaimani city/Kurdistan region, Iraq. *Kurdistan Journal of Applied Research*, 182–189.
- Vinin, N. V., Jones, J., Jithin, T. K., Gopakumar, K. G., Geethanjali, A. and Muttath, G. (2022) Radiotherapy for Pediatric Malignancies: An Experience from a Tertiary Cancer Centre. *Asian Pacific. Journal of Cancer Care*, 7(4), 675–678.
- Nathan, P. C., Ness, K. K., Mahoney, M. C., Li, Z., Hudson, M. M., Ford, J. S., Landier, W. et al. (2010) Screening and surveillance for second malignant neoplasms in adult survivors of childhood cancer: a report from the childhood cancer survivor study. *Annals of Internal Medicine*, 153(7), 442–451.
- Henderson, T. O. and Nathan, P. C. (2015) Childhood cancer survivors: considerations for surgeons in the transition from pediatric to adult care. *In Seminars in Pediatric Surgery*, 24(2), 93–99. WB Saunders.
- Rihani, R., Jeha, S., Nababteh, M., Rodriguez-Galindo, C., Mansour, A. and Sultan, I. (2023) The burden and scope of childhood cancer in displaced patients in Jordan: The King Hussein Cancer Center and Foundation Experience. *Fron Oncol.*, 13, 1112788.
- Malvezzi, M., Santucci, C., Alicandro, G., Carioli, G., Boffetta, P., Ribeiro, K. B., Levi, F., La Vecchia, C., Negri, E. and Bertuccio, P. (2021) Childhood cancer mortality trends in the Americas and Australasia: An update to 2017. *Cancer*, 127(18), 3445–3456.
- Yadalla, W., MF, Al-J, Faraj, S. A., Ghali, H. H., Shakow, A., Kasmani, M. N., Fawzi, M. C. and SA, Al-H. (2021) Delay in diagnosis of cancer in Iraq: implications for survival and health outcomes at Children's Welfare Teaching Hospital in Baghdad. *Journal of Global Health Reports*, 5, e2021047.