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ORIGINAL STUDY

Childhood Cancer in Al-Najaf Governorate, Iraq: Trend Analysis from 2020 to 2023

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Abstract

Background: The lack of comprehensive cancer registries and underreporting of cases may further complicate efforts to assess disease patterns and implement effective control measures.

Objectives: This study aims to analyze cancer trends in Al-Najaf Governorate, Iraq from 2020 to 2023, addressing gaps in local data and providing insights that could inform future healthcare strategies and resource allocations.

Methods: A retrospective, cross-sectional study was conducted using data from the Middle Euphrates Oncology Center and the Statistics Department for Cancer Research at Al-Najaf General Health Directorate. The study included children younger than 18 with histologically and hematologically verified cancer from January 2020 to December 2023.

Results: 417 pediatric cancer cases were documented from 2020 to 2023. A higher portion of these cases (158 cases) was documented in 2022, followed by 2023 (103 cases), 2021 (85 cases), and 2020 (71 cases). Bone cancer was the most common, particularly in 2020, 2021, and 2022, with brain cancers surpassing bone cancers in 2023. Lymphoma and blood cancers were consistently among the top three, with blood cancers peaking in 2022 (34 cases) before declining in 2023 (14 cases). The age distribution showed that most cases occurred in children older than 10 years (54%), followed by 5-10 years (27.1%) and those under 5 years (18.9%). Cancer prevalence varied by sex, with bone, blood, and brain cancers being more common in males, while thyroid, ovarian, and kidney cancers were more frequent in females. The study highlights geographic, temporal, and sex-specific differences in pediatric cancer incidence.

Conclusion: Higher cancer cases were documented across Al-Najaf within 4 years. The highest number of cases was documented in 2022. The Center district of Al-Najaf consistently reported the highest number of cancer cases across all years. Bone cancer was the most common childhood cancer over the study period, with brain cancer being the most common in 2023.

Keywords: Cancer, Time trend, Children, Al-Najaf, Iraq

1. Introduction

Pediatric cancer is a diverse group of malignancies that encompasses a variety of diseases with varying patterns of occurrence, etiology, treatment, supportive care, survival, and the risk of acute toxic

side effects and late effects [1]. In numerous nations, cancer is considered one of the most significant public health concerns, as it is the second most common cause of mortality, following cardiovascular diseases [2]. In Iraq, cancer is the third most common cause of death, following cardiovascular disease

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and accidents [3]. The pediatric cancer registry is an essential element of the pediatric cancer control initiative. Pediatric malignancies are anticipated to affect 13.7 million children worldwide between 2020 and 2050, according to experts, with the vast majority of fatalities occurring in low-income and lower-middle-income countries [4, 5].

There is a critical need to evaluate and disseminate information on pediatric cancer epidemiology in developing countries, particularly from the Middle East [6]. Identifying the most prevalent cancers in our region will highlight the magnitude of this significant threat. This offers a multitude of advantages: it enables us to monitor changes in incidence over time, informs the allocation of resources to the most critical areas, illuminates the discrepancies between our results and international data, and facilitates further research [7].

Iraq's health care services have suffered substantial damage as a result of the ongoing conflict that has plagued the country for the past four decades. The overall trajectory of total cancers in Iraq from 2000 to 2016 indicated a significant increase, which became more apparent after 2007. The primary cause is believed to be the numerous conflicts since 1980, which have significantly damaged the infrastructure, particularly the health system [8, 9].

Although there are population-based cancer registries and statistics regarding childhood cancer, they are often incomplete in many LMICs due to the relative rarity of childhood cancers, challenges in diagnosis and tracking, underreporting, and insufficient funding [10]. Estimating the trend of childhood cancer at national and subnational levels is essential in designing specific programs to control the disease burden [11]. This paper provides a cancer profile and trend that could be extrapolated to other regions in Iraq.

2. Materials and methods

2.1. Research questions

Which patterns of pediatric cancer are prevalent and distributed among Al-Najaf children, Iraq, from 2020 to 2023 registry data?

2.2. Research objectives

1. Describing the trends of childhood cancer occurrence in Al-Najaf governorate in the past four years.
2. Identifying some characteristics that may determine the occurrence of childhood cancer.

2.3. Research design

This retrospective, cross-sectional study involved the analysis of pre-existing data from the Middle Euphrates Oncology Center and the Statistics Department for Cancer Research at Al-Najaf General Health Directorate. The study aimed to document all registered cancer cases, acknowledging that some cases, particularly those receiving treatment abroad, might be overlooked.

2.4. Sample

The sample consisted of children under 18 who were diagnosed with histologically and hematologically verified cancer between January 1, 2020, and December 31, 2023. The International Classification of Diseases for Oncology (ICD-O) method was followed to code the collected data [12].

2.5. Data Collection

The data collection process involved several steps. First, a specialized form was designed to extract socio-demographic and medical data (age, sex, residence, life status, cancer grade, and cancer type) from the source registries. The raw data, collected in Arabic, were organized into predefined age groups (under 5 years, 5-10 years, over 10 years) and by the five main districts of Al-Najaf (Al-Najaf center, Al-Kufa, Al-Mashkhab, Al-Munathera, and North Najaf). This data was then translated into English, structured by year in MS Excel ver. 2013, and double-checked for accuracy. The final sample size was 417 cases (71 in 2020, 85 in 2021, 158 in 2022, and 103 in 2023).

2.6. Data Analysis

The data was collected and organized by Microsoft Excel 2013 and analyzed using IBM SPSS V26. The analysis consisted of descriptive statistics (frequency and percentage) for the variables: year of diagnosis, child age, sex, cancer category, residence, and grade of cancer. Time-series charts were generated to visualize the incidence trends of cancer diagnoses from 2020 to 2023. Bar charts were created to illustrate cancer distribution by age and gender over the study period.

3. Results

As shown in [Table 1](#), cancer cases across the districts of Al-Najaf are displayed by year and district. In 2020, the entire cases amounted to 71, with the center district leading the cases (No. = 34), followed by Al-Kufa

Table 1. Distribution of the registered cases of cancer per the Al-Najaf districts.

Date	Center No.	Al-Kufa No.	Al-Mashkhab No.	Al-Munathera No.	North Najaf No.	Total No.
2020	34	20	5	10	2	71
2021	50	22	4	5	4	85
2022	85	38	18	14	3	158
2023	61	25	10	4	3	103
Total	230	105	37	33	12	417

(No. = 20), Al-Mashkhab (N = 5), Al-Munathera (N = 10), and North Najaf (No. = 2).

In 2021, the total number of registered cancer cases increased to 85, with the Center district again leading (No. = 50), followed by Al-Kufa (No. = 22), Al-Mashkhab (No. = 4), Al-Munathera (No. = 5), and North Najaf (No. = 4).

In 2022, the highest total of registered cancer cases amounted to 158, with the Center district continuing to have the highest number of cases (No. = 85), followed by Al-Kufa (N = 38), Al-Mashkhab (No. = 18), Al-Munathera (No. = 14), and North Najaf (No. = 3).

In 2023, a total of 103 cases were recorded, with the Center district reporting the highest number (No. = 61), followed by Al-Kufa (No. = 25), Al-Mashkhab (No. = 10), Al-Munathera (No. = 4), and North Najaf (No. = 3).

Overall, across the four years, 417 cases have been reported in Al-Najaf, with central Al-Najaf contributing to the largest share (No. = 230), followed by Al-Kufa (No. = 105), Al-Mashkhab (N = 37), Al-Munathera (No. = 33), and North Najaf (No. = 12).

Table 2 above presents the top five children's cancers by year, from 2020 to 2023. The top five children's cancers are presented year by year from 2020 to 2023. In 2020, the most common children's cancers were bone cancer (No. = 27), followed by lymphoma (No. = 15), brain cancer (No. = 9), blood cancer (No. = 4), and kidney cancer (No. = 3). Hence, all cases in 2020 were 71.

In 2021, bone cancer (No. = 27) continued to be the most prevalent, followed by lymphoma (No. = 16), blood cancer (No. = 12), brain cancer (No. = 9), and smooth muscle cancer (No. = 6). The total for 2021 was 85.

Table 2. Top five children's cancers by year.

Cancer type	2020 No.	2021 No.	2022 No.	2023 No.
Bone	27	27	37	20
Lymphoma	15	16	22	12
Brain	9	9	18	24
Blood	4	12	34	14
Kidney	3	6	-	5
Other	13	15	40	28
Total	71	85	158	103

In 2022, bone cancer (No. = 37) remained the most common, with lymphoma (No. = 22), blood cancer (No. = 34), brain cancer (No. = 18), and unspecified gland cancer (No. = 7) being the next most frequent. Hence, all cases in 2022 were 158.

In 2023, the top five cancers were brain cancer (No. = 24), bone cancer (No. = 20), lymphoma (No. = 12), blood cancer (No. = 14), and thyroid gland cancer (No. = 5). Hence, all cases in 2023 were 103.

The "Other" category includes various fewer common cancers, with 13 cases in 2020, 15 cases in 2021, 40 cases in 2022, and 28 cases in 2023.

Table 3 below indicates the socio-economic and medical features of the newly diagnosed patients. The distribution of patients by age group reveals that 54.0% (No. = 225) are older than 10 years, 27.1% (No. = 113) are between 5 and 10 years, and 18.9% (No. = 79) are under 5 years. Regarding sex, the majority of patients are male (51.3%, No. = 214), with females comprising 48.7% (No. = 203). The majority of patients (73.6%, N = 307) reside in cities, whereas 26.4% (No. = 110) live in rural areas. Concerning life status, 85.9% (No. = 358) of patients are alive, while 14.1% (No. = 59) are deceased. Most of the patients

Table 3. Description of the characteristics of newly diagnosed patients.

	No.	%
Age group (Years)		
< 5	79	18.9%
>10	225	54.0%
5-10	113	27.1%
Sex		
Male	214	51.3%
Female	203	48.7%
Residence		
Rural	110	26.4%
Urban	307	73.6%
Life status		
Alive	358	85.9%
Dead	59	14.1%
Grade		
Grade I	21	5.0%
Grade II	33	7.9%
Grade III	23	5.5%
Grade VI	15	3.6%
T-Cell	14	3.4%
B-Cell	54	12.9%
Unknown	257	61.6%

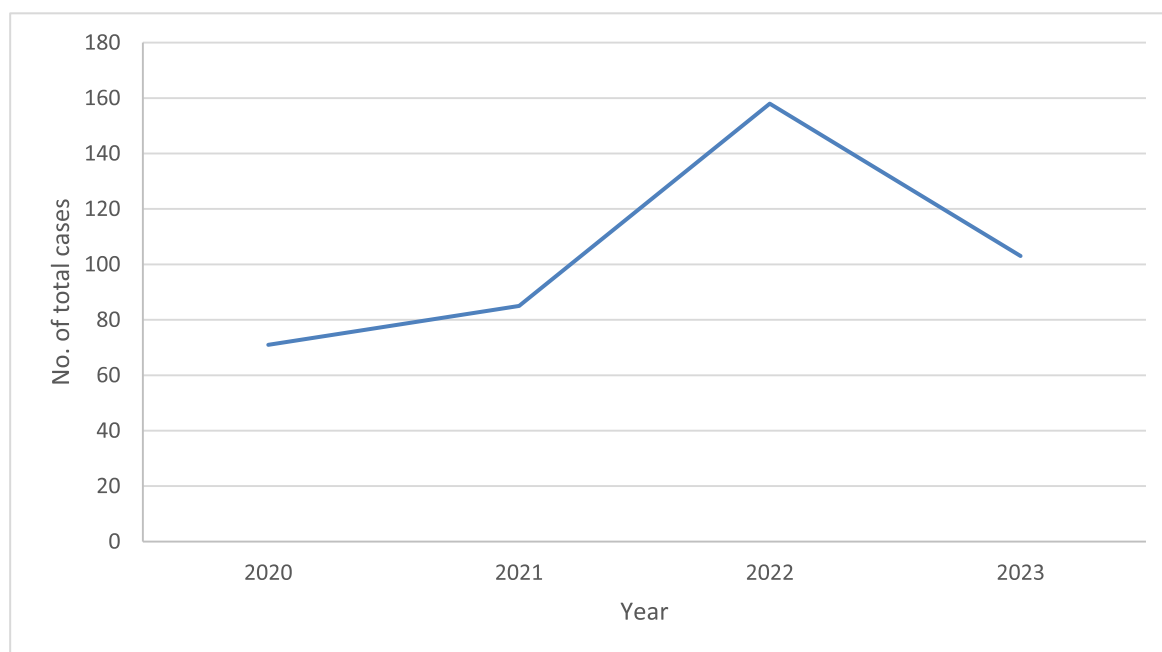


Fig. 1. Trend of cancer cases reported in central Al-Najaf from 2020 to 2023.

(61.6%, No. = 257) do not know what grade they have. Other grades they have been given are B-Cell (12.9%, No. = 54), Grade II (7.9%, No. = 33), Grade I (5.0%, No. = 21), Grade III (5.5%, No. = 23), Grade VI (3.6%, No. = 15), and T-Cell (3.4%, No. = 14).

As shown in Table 4, the distribution of children's cancer by type and sex is provided for male and female patients. Among males, bone cancer has been the most noticeable category (24.3%, No. = 52), followed by lymphoma (15.9%, No. = 34), blood cancer (19.2%, No. = 41), and brain cancer (16.4%, No. = 35). In females, bone cancer also remains the most prevalent (29.1%, No. = 59), followed by blood cancer (11.3%, No. = 23) and brain cancer (12.3%, No. = 25).

Other cancer types include lymphoma, which accounts for 15.9% (No. = 34) of cases in males and 15.3% (No. = 31) in females. Smooth muscle cancers are present in 4.7% (No. = 10) of males and 4.4% (No. = 9) of females, while adrenal gland cancer appears in 3.3% (N = 7) of males and 1.0% (No. = 2) of females. Male-specific cancers such as testicular cancer account for 2.3% (No. = 5) of cases in males, with no reported cases in females.

Other types of cancer in both genders include skin cancer (1.9%, No. = 4 for males; 0.5%, No. = 1 for females), rectal cancer (1.9%, No. = 4 for males; 0%, No. = 0 for females), and pharyngeal cancer (1.4%, No. = 3 for males; 1.0%, No. = 2 for females). Spinal cord cancer is rare, affecting 0.9% (No. = 2) of males, with no cases reported in females.

Additionally, kidney cancer accounts for 1.4% (No. = 3) of cases in males and 5.4% (No. = 11) in females. Cancer of the liver is present in 0.9% (No. = 2) of both

Table 4. Frequency and percentages of children's cancer by type and sex.

Type of cancer	Males		Females	
	No.	%	No.	%
Bone	52	24.3 %	59	29.1 %
Blood	41	19.2 %	23	11.3 %
Brain	35	16.4 %	25	12.3 %
Lymphoma	34	15.9 %	31	15.3 %
Smooth muscle	10	4.7 %	9	4.4 %
Adrenal gland	7	3.3 %	2	1 %
Testicle	5	2.3 %	-	-
Skin	4	1.9 %	1	0.5 %
Rectum	4	1.9 %	0	0
Pharynx	3	1.4 %	2	1 %
Spinal cord	2	0.9 %	0	0
Kidney	3	1.4 %	11	5.4 %
Liver	2	0.9 %	2	1 %
Stomach	1	0.5 %	2	1 %
Bladder	1	0.5 %	0	0
CNS	2	0.9 %	0	0
Colon	1	0.5 %	0	0
Pancreas	1	0.5 %	0	0
Ovary	-	-	11	5.4 %
Thyroid gland	0	0	12	5.9 %
Unspecified glands	5	2.3 %	3	1.5 %
Breast	0	0	2	1 %
Nasal cavity	0	0	1	0.5 %
Reproductive system	0	0	1	0.5 %
Salivary gland	0	0	1	0.5 %
Unspecified	1	0.5 %	0	0

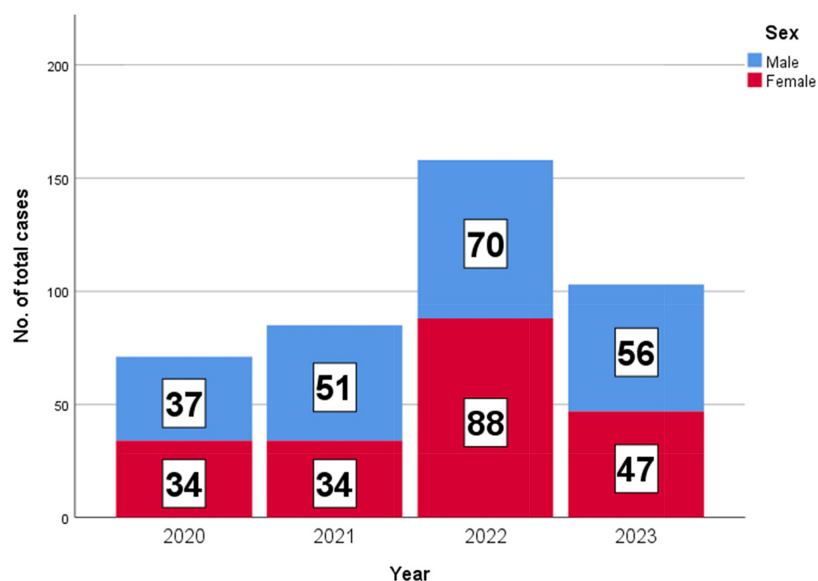


Fig. 2. Distribution of the registered cases according to sex.

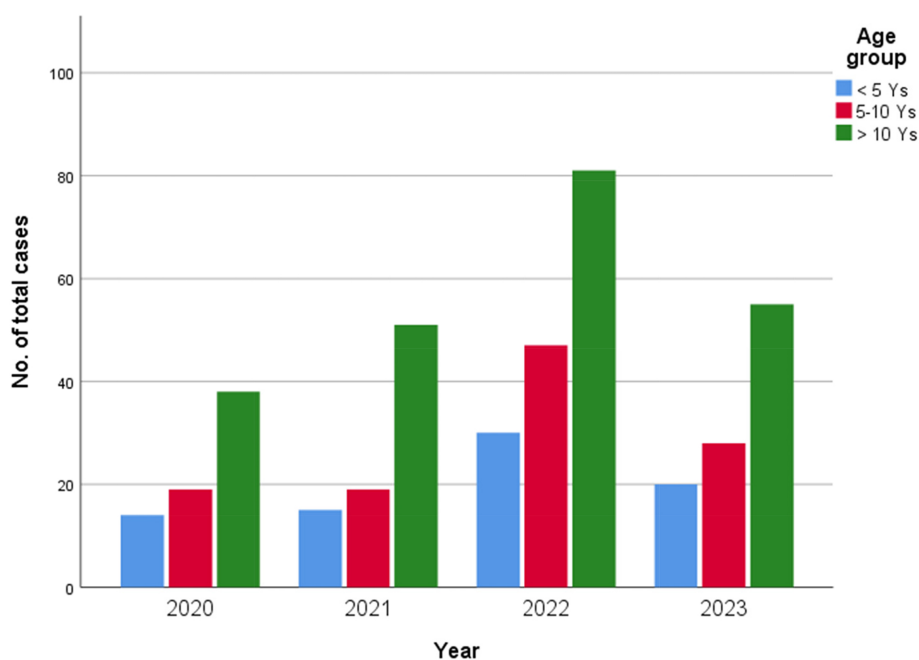


Fig. 3. Distribution of reported cancers per age.

males and females. Stomach cancer is reported in 0.5% (No. = 1) of males and 1.0% (No. = 2) of females.

Other less common cancers include bladder (0.5%, No. = 1 for males), CNS (0.9%, No. = 2 for males), and several other specified or unspecified cancers. Notably, there are no reported cases of breast cancer in males, but 1.0% (No. = 2) of females have breast cancer, and ovary cancer is present in 5.4% (No. = 11) of females.

Several cancers were not specified by gender, including unspecified glands (2.3%, No. = 5 for males; 1.5%, No. = 3 for females), with other rare cancers such as the nasal cavity, reproductive system, and salivary gland all affecting a small percentage of females.

The children newly diagnosed cancer, as reported by the Al-Najaf health services from 2020 to 2023 were 417, with all of whom are based in central Al-Najaf (Fig. 1).

Results showed that out of the 417 reported cases, only 214 were identified as males and 203 were females, which produces a gender-based ratio of 1.05:1 (Fig. 2).

The majority of cases were children older than ten years (225 cases), than the other two groups (5–10 years and < 5 years) (Fig. 3).

4. Discussion

Al-Najaf had the highest crude incidence rate of the top ten malignancies in children (0–14 years) according to the Iraqi Cancer Registry 2021 [13]. The results of the present study, which provides a situational analysis of the epidemiologic profile of pediatric cancer in Al-Najaf governorate, Iraq, indicate that the crude incidence of children's cancers reaches its apex in 2022 and is increasing over time. This finding is consistent with a similar study conducted in India among children younger than fifteen years [14]. Sex-related differences highlighted in this study reveal a slightly higher proportion among male children compared to female children. Thus, this result is consistent with the results of a comparable investigation conducted in the Minia Governorate of Egypt [15].

The highest proportion of children's cancer in this study is among 5- to 10-year-olds. Although this finding is from a previous study [15], it, however, differs from those conducted in southern Egypt, particularly in Assuit and Aswan governorates, which revealed that the most affected age group of pediatric cancers was the group below five years of age [16, 17].

The current study indicates that the vast majority of children are urban dwellers, which is different from those indicated by the Egyptian study, which reported that the majority were rural residents. Exposure to environmental factors, such as carcinogenic pesticides and/or fertilizers used in agricultural activities, may contribute to these differences [18].

Finally, our study demonstrates that the most common cancer reported in the Al-Najaf oncology center is bone cancer, followed by blood cancer, lymphoma, and then brain cancer. These results contradict the findings of many previous studies [15, 19–21].

5. Conclusion

The examination of cancer incidence among children in Al-Najaf governorate, Iraq, shows that cancer increased from 2020 to 2023, with the highest number recorded in 2022. Bone cancer was the most prevalent children's cancer across most years, although brain cancer was the most common in 2023. Lymphoma, blood cancer, and brain cancer were also among the top five most common children's cancers. The pre-

ponderance of patients resided in urban areas and were over the age of 10. The proportion of male patients was marginally higher than that of female patients. The preponderance of cancer cases were observed in children who were over the age of 10.

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Conflict of interest

None

Ethical approval

Ethical approval for the study was obtained from the relevant ethical authorities of the University of Kufa under the code MEC-53. All research activities adhered to the ethical guidelines of the committee, ensuring data confidentiality and compliance with research standards. As this was a retrospective review of hospital records, no direct patient interaction occurred, thereby minimizing consent-related ethical concerns.

Authors' contribution

Sahar Hassan, as the corresponding author, led the study's conceptualization and design, oversaw data analysis, and was responsible for drafting the initial manuscript. Hasan Alwan Baiee contributed significantly to the data collection process and reviewed the methodology. Faten Ali Abd Alzahra Albarki and Rajaa Ali Moheiseen Al-Tae were instrumental in data acquisition and verification. Mustafa Muqdad provided critical statistical support and reviewed the final manuscript for intellectual content. All authors read, approved the final manuscript, and agreed to be accountable for all aspects of the work.

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