

## Cancer of children in Basrah-Iraq: Person and time characteristics

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### ABSTRACT

**Background:** Cancer in children though less frequent as compared to cancer in older people, evidence accumulated across the World indicates an increasing risk during the last decades. In Iraq in general and in the south of the country in particular, claims and counter claims are propagated every now and then on the childhood cancer and the proposition that environmental factors are playing a role in the increased risk (if any) is controversial.

**Methods:** In this study data were compiled on new cancer cases diagnosed in all health care institutions in Basrah among children aged less than 15 years over an eight-year period (2004-2011). Cases were obtained mainly from the population of Basrah governorate but many cases were also visiting from neighbouring governorates. The latter were excluded from the present analysis.

**Results:** The average annual incidence rate of all childhood cancers was 11.23 per 100000 children. Three groups of cancers occupied the top list. These are leukaemias accounting for 31.1% or 3.56 per 100000 children, lymphomas accounting for 19.6% or 2.20 per 100000 children and brain tumours accounting for 9.7% or 1.09 per 100000 children. A modest rise in the incidence rate was observed over the years 2004-2011.

**Conclusions:** The evidence for increasing risk with time is not strong. Cancer of children, however, is a significant health problem and requires intensive health care to deal with. Multidisciplinary team research work is essential and comprehensive team approach to care is mandatory.

**Key words:** Childhood cancer: Basrah, epidemiology, Southern Iraq

### سرطان الاطفال في البصرة/العراق: الخصائص الشخصية والزمانية

**الخلفية:** يعتبر سرطان الأطفال أقل حدوثاً من نظيره بين البالغين إلا إن الدلائل عبر العالم تشير إلى تزايد الإصابة خلال العقود الأخيرة. في العراق عموماً وفي الجنوب بصورة خاصة هناك ادعاءات وادعاءات مضادة مع افتراض أن التغيرات البيئية تلعب دوراً في زيادة الإصابات.

**الهدف:** توثيق الجوانب الكمية الوصفية لسرطان الأطفال في محافظة البصرة للسنوات ٢٠٠٥-٢٠١٢.

**الطرائق:** تم اعتماد البيانات الموثقة عن الحالات السرطانية الجديدة في جميع المؤسسات الصحية في البصرة للسنوات ٢٠٠٥-٢٠١٢ بين الأطفال دون الخامسة عشرة من العمر. تم فرز الحالات من سكان عن محافظة البصرة واستبعاد الحالات الوافدة من محافظات أخرى في عرض النتائج.

**النتائج:** بلغ معدل نسبة الإصابات الجديدة بحدود ١١,٢٣ لكل ١٠٠,٠٠٠ طفل. وكانت الأنواع الأكثر حدوثاً هي ابيضاض الدم ومثل ٣١,١% أو ٣,٥٦ لكل ١٠٠,٠٠٠ طفل وسرطان الغدد اللمفاوية ومثل ١٩,٦% أو ٢,٢٠ لكل ١٠٠,٠٠٠ طفل و أورام الدماغ ومثلت ٩,٧% أو ١,٠٩ لكل ١٠٠,٠٠٠ طفل. أظهرت النتائج ميلاً بسيطاً لزيادة الإصابات خلال السنوات ٢٠٠٥-٢٠١٢.

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**الاستنتاج:** أظهرت النتائج وجود ميل بسيط لزيادة سرطان الأطفال في محافظة البصرة مع مرور الزمن بالرغم من هذا النوع من السرطان يمثل مشكلة صحية كبيرة ويحتاج إلى جهود مكثفة لرفع مستوى الرعاية، كما ان العمل الفرقي المنظم للبحث العلمي يمثل مطلباً أساسياً للنجاح.

**كلمات مفتاحية:** سرطان الأطفال، بصرة، وبائيات، جنوب العراق

## INTRODUCTION

Cancer is a major health problem across the world, in Iraq, and in Basrah governorate.<sup>[1-3]</sup> Cancer in children is less common than in adults but it is responsible for an increasing share of newly registered cancer cases globally.<sup>[4]</sup> In Western countries, leukaemia is the most common childhood cancer accounting for 34%, followed by brain tumors (23%) and lymphomas (12%).<sup>[4]</sup> In the United States of America (USA), rates of childhood cancer have increased by 0.6% per year between 1975 and 2002<sup>[5]</sup> reaching an incidence rate of 14.9 per 100,000 in 2006 in children under 15 years of age.<sup>[6]</sup> However for cancer cases as a whole, and for childhood cancers in particular, the USA has experienced a decrease in the cancer death rate between 1975 and 2010 in response to various efforts of improving quality of cancer care.<sup>[7]</sup> In Iraq, cancer among children aged less than 15 years represents approximately 8% of the total registered cases.<sup>[2,3,8]</sup> The most common cancers among children are leukaemia, brain tumours and lymphomas.<sup>[2]</sup> In Basrah, a lot has been said about the risk, time trends and risk factors of childhood cancers but the evidence displayed was inadequate to help draw clear and undebatable conclusions about the extent and patterns of incidence and mortality of childhood cancers. Previous efforts by other researchers is appreciated but certain limitations were inherited in some of these research works.<sup>[9-16]</sup> The numbers which represent incident cases were characterized by certain errors, such as the inclusion in the numerators of incident cases from outside Basrah.<sup>[10]</sup> Another limitation is the underestimation of denominator populations.<sup>[9]</sup> Both these errors lead to

overestimation of incidence rates of childhood cancer in Basrah particularly leukaemia.<sup>[9-10]</sup> In order to overcome the limitations of previous research, eight years were spent to search for and to compile data on the incidence of cancer in Basrah, with particular emphasis on childhood cancer. This paper identifies and categorizes the current status of all cancers among children in Basrah and depicts the time trend over the years 2004-2011 inclusive. It is believed that the data used for the present analysis are the most transparent epidemiological evidence available so far.

## METHODS

The cases of childhood cancer presented in this paper represent all cases diagnosed, treated and registered in Basrah during the years 2004-2011 inclusive. The cases represent the pool of cancer registries in various health care institutions dealing with cancer. The main of these are the Oncology Centre at -Al-Sadr teaching hospital, Basrah specialized hospital for children, Basrah cancer registry and the histopathological cancer registration section at the Department of Pathology-Basrah College of Medicine. The paper is part of a comprehensive project on cancer and environment adopted in Basrah by Basrah Cancer Research Group (BCRG) since 2005. The BCRG is an informal research group working on epidemiology and registration of cancer in Basrah for the purpose of measurements of epidemiological parameters and support of cancer control strategy. They have authorized access to all sources of cancer-related data in Basrah. From the pool of new cases available to the BCRG, cases with definite diagnosis of any subtype of childhood cancer

were compiled and entered into an SPSS computer programme for statistical analysis. A total of 1485 cases were identified, of whom 889 cases (59.9%) were from the inhabitants of Basrah governorate. The latter were used to present the results in this article. Included are cases with verified and confirmed diagnosis from the first week of January 2004 up to December 31<sup>st</sup>, 2011. Ascertainment of diagnosis was based on histopathological, cytological and haematological examinations by expert pathologists and haematologists in Basrah. Cases identified by various sources were compiled first in excel spread sheets in the original health care institutions, or identified from their original documents and typed by members of BCRG in excel spreadsheets. Then, all the excel files were pooled together in one file and matched and checked, by two of the authors, for any repetition resulting from cases being reported by more than one source. The cleaned data were imported into SPSS programme -version 15 for analysis. As for the population denominators, data on Basrah population are based on figures obtained from various sources, these include the Ministry of Planning and Developmental Cooperation-Central Office for Statistics,<sup>[17]</sup> The Ministry of Health,<sup>[18]</sup> and figures estimated by Basrah Cancer Research Group.<sup>[19]</sup> using extrapolation from 1997 population census. In regard to the proportion of children, we identified this figure using a multi-pronged approach: we used the figures obtained from a pool of data from multiple local household surveys in Basrah; data of previous census; and from age and sex breakdown given by the Ministry of Planning and Developmental Cooperation. Children aged less than 15 years represent between 38-43% of the total population. We've decided to use a figure of 40% as it is very logical in the light of published data on population estimates. Incidence rates were calculated for each year by dividing the incident cases by the population for each year, then multiplying by 100,000. Average annual incidence rate was calculated

by dividing the average annual number of incident cases by mid-period population (the average of 2007 & 2008).

## RESULTS

### **Outcome of childhood cancer registration during 2004-2011:**

A total of 1485 new cases were registered during the study period (2004-2011). Of these, 889 (59.9%) were normal residents of Basrah governorate. The statistical analysis in the following results will be restricted to these 889 cases.

### **Epidemiological characteristics of childhood cancer in Basrah governorate**

#### ***1. Types of cancer***

As shown in (Table-1), the various types of childhood cancer among children from the inhabitants of Basrah governorate are described. By far, leukaemia is the most common cancer represented by 282 (31.7%) and an incidence rate of 3.56 per 100,000 children (Figure-1) followed by lymphomas (Non-Hodgkin's Lymphoma & Hodgkin's' Lymphoma) accounting for 19.6% or 2.20 per 100,000 children, brain and other Central nervous system (CNS) tumours 86(9.7%) or 1.09 per 100,000 children, neuroblastoma 56 (6.3%) or 0.71 per 100,000 children and malignant bone tumours accounting for 48 (5.4%) or 0.61 per 100,000 children. These five cancer groups represent just under three quarters of all cases (72.7%).

#### ***2. Age and gender***

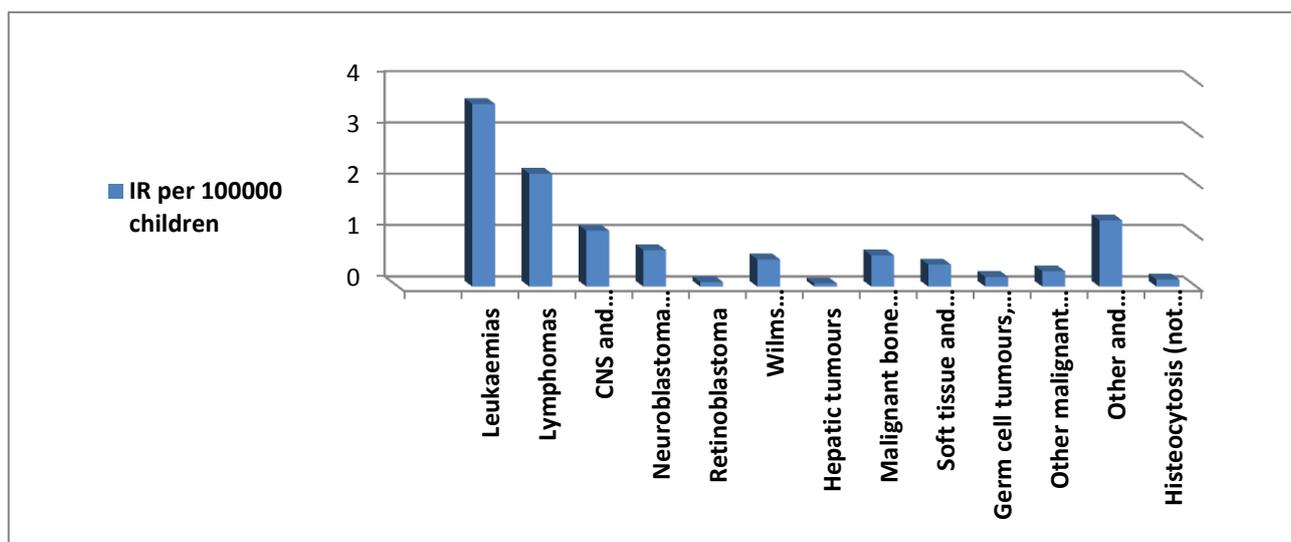
Various types of childhood cancers by gender are shown in (Table-2). Most of the types were relatively more frequent, in absolute numbers, among male children. Only Brain tumours, retinoblastoma, germ cell tumours and 'unspecified types' showed approximately equal risks between male and female children. However when the type-specific, gender-specific incidence rates were examined, it was clear that in all, except the rates for brain tumours, renal tumours and unspecified

malignancies, the rates were higher among male children. In terms of age, the gradient seems reasonably distributed (Table-3). Children aged less than five years represent 39.9%, while those aged 5-9 years represent 31.8% and children aged 10-14 years represent 28.6%. The age specific incidence rate showed very small decline with advancing age being 11.90, 10.90

and 10.75 per 100000 children in the three age groups in the same order. Gender wise, the incidence rate was higher among male children (12.90 per 100000 males) than for female children 9.43 per 100000 females). The overall average incidence rate was 11.23 per 100000 children.

**Table 1. Types of childhood cancers reported in Basrah over 8 years (2004-2011) by site/type according to ICCC-3<sup>(19)</sup>.**

Type of cancer	No. of cases in 8 years	% out of total	Ir/100,000 children
Leukaemias	282	31.7	3.56
Lymphomas	174	19.6	2.20
CNS and miscellaneous intracranial intraspinal neoplasms	86	9.7	1.09
Neuroblastoma and other peripheral nervous cell tumours	56	6.3	0.71
Retinoblastoma	7	0.8	0.09
Wilms tumour/Other renal tumours	42	4.7	0.53
Hepatic tumours	5	0.6	0.06
Malignant bone tumours	48	5.4	0.61
Soft tissue and other extraosseous sarcomas	49	5.5	0.62
Germ cell tumours, trophoblastic tumours , and neoplasms of gonads	17	1.7	0.19
Other malignant epithelial neoplasms and malignant melanomas	22	2.7	0.30
Other and unspecified malignant neoplasms/ not well defined	90	11.8	1.32
Histiocytosis (not classified by ICCC-3 )	11	1.2	0.14
<b>Total</b>	<b>889</b>	<b>100.0</b>	<b>11.23</b>



**Fig 1. Types of childhood cancer: Average annual incidence rates (IR) per 100, 000 children- Basrah, Iraq 2004-2011.**

**Table 2. Number, percentages and average annual incidence rate per 100,000 of childhood cancer by type and gender.**

Type of cancer	Male no.	%	IR*	Female no	%	IR*
Leukaemias	165	31.1	4.02	117	32.6	3.07
Lymphomas	129	24.3	3.14	45	12.5	1.18
CNS and miscellaneous intracranial intraspinal neoplasms	44	8.3	1.07	42	11.7	1.10
Neuroblastoma and other peripheral nervous cell tumours	35	6.6	0.85	21	5.8	0.55
Retinoblastoma	4	0.8	0.10	3	0.8	0.08
Wilms tumour/Other renal tumours	20	3.8	0.49	22	6.1	0.58
Hepatic tumours	3	0.6	0.07	2	0.6	0.05
Malignant bone tumours	28	5.3	0.68	20	5.6	0.53
Soft tissue and other extraosseous sarcomas	27	5.1	0.66	22	6.1	0.58
Germ cell tumours, trophoblastic tumours, and neoplasms of gonads	9	1.7	0.22	8	2.2	0.21
Other malignant epithelial neoplasms and malignant melanomas	15	2.8	0.37	7	1.9	0.18
Other and unspecified malignant neoplasms/ not well defined	44	8.3	1.07	46	12.8	1.21
Histiocytosis (not classified by ICC-3)	7	1.3	0.17	4	1.1	0.11
<b>Total</b>	<b>530</b>	<b>100.0</b>	<b>12.90</b>	<b>359</b>	<b>100.0</b>	<b>9.43</b>

**Table 3. New cases of childhood cancer registered in Basrah for the years 2004-2011 according to age and gender**

Age in years (estimated population)	No. of cases	% out of total	IR PER 100000 PER YEAR
<5 (36,9516)	352	39.6	11.90
5-9 (32,4698)	283	31.8	10.90
10-14 (29, 5372)	254	28.6	10.75
<b>Total (989586)</b>	<b>889</b>	<b>100.0</b>	<b>11.23</b>
Gender (Estimated population)	No. of cases	% out of total	IR per 100000 per year
Male (513595)	530	59.6	12.90
Female (475991)	359	40.4	9.43
<b>Total (989586)</b>	<b>889</b>	<b>100.0</b>	<b>11.23</b>

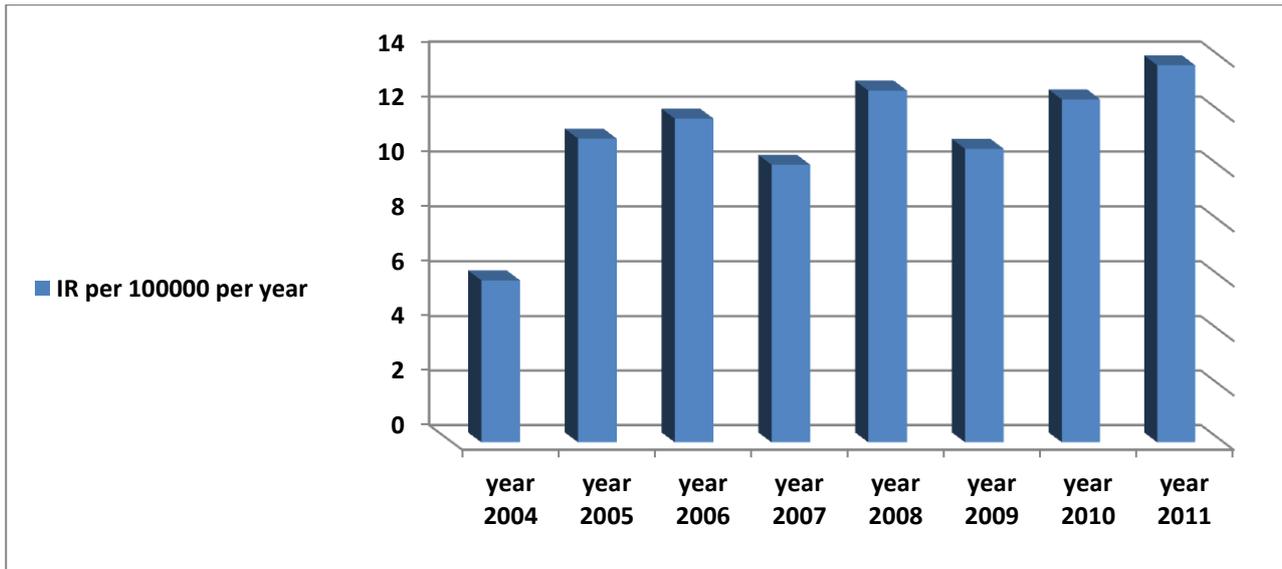
### 3. Pattern over time.

(Table-4) and (Figure-2), show the annual incidence rates for the years 2004-2011. Apart from a low rate in 2004, the time trend shows some sort of fluctuation and only a modest tendency to increased risk with years.

**Table 4. New cases of childhood cancer registered in Basrah for the years 2004-2011.**

Years	Estimated population	No. of cases	IR PER 100000
2004	892228	53	5.94
2005	918995	102	11.10
2006	946565	112	11.83
2007	974961	99	10.15
2008	1004210	129	12.85
2009	1034334	111	10.73
2010	1061038	133	12.53
2011	1088759	150	13.77
<b>Total</b>	<b>989586*</b>	<b>889</b>	<b>11.23</b>

## \*Mid-period population



**Fig 2. Time trend of childhood cancer: Annual incidence rate per 100000 children for the years 2004-2011 in Basrah governorate-Iraq**

## DISCUSSION

### *Overall burden*

Basrah medical care institutions seem very attractive to childhood cancer cases from neighbouring governorates because basic oncology paediatric services are not available in these governorates so people seek care at Basrah as it is the nearest place to their residence. The results of the present study showed that about two fifths (40.1%) of all diagnosed, treated and registered cases during the period 2004-2011 were from inhabitants of other governorates mainly adjacent Thi Qar and Missan governorates. This is definitely a burden on the restrained medical care facilities. Looking for the cases from Basrah governorate, they suggest by themselves a high burden of childhood cancer. Actually the average annual incidence rate of all childhood cancer (approximately 11.23 per 100000) is very close to the incidence in the U. K.(2001-2007) (13.86 per 100,000)<sup>[21]</sup> and the United States (2004) (14.28 per 100,000)<sup>[22]</sup> but similar to figures in Jordan (1996-2001) (11.48 per 100,000) and Turkey (11.56 per 100,000).<sup>[23]</sup> A number of risk factors have been explored and documented to have

played some role in the aetiology of childhood cancer in Basrah. Examples were probable exposure to radiation (medical or accidental), pesticides and chemicals related to automobiles and other sources<sup>[24]</sup> but the results were conflicting in at least two studies and were limited by the sample size and could not be repeated by other researchers. This signifies the point that childhood cancer should be a subject for extensive research in the foreseeable future in Basrah, not only in terms of the burden but also in terms of important locally operating determinants.

### *Types of childhood cancer*

The highest share of childhood cancer in our study was attributed to leukaemias and the most common paediatric malignancies were leukaemias, lymphomas, brain tumours, neuroblastoma, bone and soft tissues tumours a pattern which is similar to the distribution of childhood cancer in a previous study in Iraq - Baghdad 2010<sup>[25]</sup> and also similar to the distribution of childhood cancer in Saudi

Arabia.<sup>[26]</sup> However, this distribution is different from childhood cancer pattern in Africa where lymphomas form the majority of childhood cancer probably due to exposure to different pattern of the risk factors.<sup>[23]</sup>

### **Age**

The studied children showed a distribution of age groups and gender which most likely reflects the actual pattern of risk of childhood cancer. The highest percentage of cases was in the age group < 5 years and was higher in male children cases. This pattern is similar to figures reported in other studies from the United States of America<sup>[27]</sup> and Switzerland.<sup>[28]</sup> Also the age distribution in the present study is similar to the age distribution of childhood cancer in Dar Esalam - Tanzania, although in this study there are higher percentage in older ages which may be due to differences in the populations age structure.<sup>[29]</sup> The risk of cancer, although showed slight decline with advancing age, the variation was only small.

### **Gender**

It was evident in the present study the relative predominance of male sex in the studied cases, a result which is similar to the gender distribution of childhood cancer in the United Kingdom over the years 2006-2008.<sup>[21]</sup> Reviewing a number of studies on gender distribution of childhood cancer from Singapore<sup>[30]</sup>, China<sup>[31]</sup>, United State of America<sup>[32]</sup>, Egypt<sup>[33]</sup>, and Iran<sup>[34]</sup>, variation did exist in gender distribution of various types of childhood cancer. The variation with gender is a function of differential susceptibility, differential exposure to risk factors and variation in attributes related to study design, completeness of coverage of incident cases and others. Also differential factors such as referral; patients/parents preferences may affect the choice of the medical facility to get care. This affects the representativeness of any study based on medical facilities. When various types of childhood cancers were presented for males and

females, a consistent excess of risk for male children could be observed particularly for leukaemia and lymphomas. Some types were almost equally distributed among male and female children. None of the childhood cancers in this study showed clear female sex predominance. Various studies support these results. For example a study in Pakistan reported equal gender distribution of retinoblastoma.<sup>[35]</sup> Also a study in Mexico carried out in sixteen centers over a 5-year period showed a non-significant mild male predominance for all the cases seen for all age groups.<sup>[36]</sup> But these contradicts a result reported in a study from Congo in Africa which showed predominance of male gender for all cases of retinoblastoma seen over a 6 year period.<sup>[37]</sup> A study in Brazil support the present results also.<sup>[38]</sup>

**In conclusion**, childhood cancer in Basrah is fairly common and the incidence tends to increase with passage of years, a fact which calls upon policy makers, care providers and public health authorities to envisage the expected burden on health care resources in future. Evidence from other studies in Baghdad and Basrah suggest a high fatality among children with malignant disease.<sup>[25,39]</sup> Further researches on quality of care, on risk factors and on outcome in terms of survival are highly recommended. It is believed that the results in this article represent the best and probably the most complete set of data available on childhood cancer in Basrah, yet a margin of error cannot be totally excluded., few cases (those who might have been diagnosed and treated outside Basrah) might have been excluded from registration and thus not included in this pool of data.

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